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HISTRIONIC PERSONALITY DISORDER- A REVIEW ON COMORBIDITIES, ASSOCIATED FEATURES AND ASSESSMENTS WITH CONSIDERATION OF FACTITIOUS DISORDER TRAITS

Trisha Akula
Post Graduate Diploma in Counselling Psychology at Jain (Deemed-to-be) University, School of Sciences, JC Road, 560027, Karnataka

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ABSTRACT
This paper examines Histrionic Personality Disorder (HPD) by exploring its comorbidities and associated characteristics as identified in both the DSM and recent research. Special attention is given to the feature of falsifying or feigning symptoms, a prominent trait in Factitious Disorder, which shares notable overlaps with HPD but is currently underrepresented in existing assessment and screening tools for HPD.

KEYWORDS: *Histrionic Personality Disorder, Falsification, Factitious Disorder, Somatic Symptoms*

1. INTRODUCTION
Histrionic Personality Disorder (HPD), as defined by the DSM, is marked by pervasive, exaggerated emotionality and attention-seeking behaviors that typically begin in early adulthood. HPD is categorized within the Cluster B personality disorders, known for traits that are impulsive, self-destructive, dramatic, and emotionally intense. Other Cluster B disorders include Antisocial Personality Disorder, Borderline Personality Disorder, and Narcissistic Personality Disorder, which frequently co-occur with HPD.

The DSM-5 diagnostic criteria for HPD specify a "pervasive pattern of excessive emotionality and attention seeking," present by early adulthood across various contexts, with symptoms that include: discomfort when not the center of attention, inappropriate sexually seductive behavior, rapid emotional shifts, excessive reliance on physical appearance to draw attention, impressionistic speech, exaggerated emotional expressions, suggestibility, and perceiving relationships as more intimate than they are.

The estimated prevalence of HPD is 1.8% according to the National Epidemiologic Survey on Alcohol and Related Conditions, and 0.9% based on a review of five epidemiological studies. HPD appears more prevalent among females, and clinical experience suggests that individuals with HPD may exhibit an increased risk of suicidal threats.

1.1 CAUSES AND FACTORS TRIGGERING RISK
The etiology of HPD remains partially understood, with genetic factors implicated in temperament formation. Environmental influences, particularly childhood experiences and family relationships, are also associated with HPD. Risk factors may include traumatic experiences such as abuse, neglect, or assault during childhood.

1.2 TREATMENT APPROACHES
1.2.1 PSYCHOTHERAPY
Psychodynamic psychotherapy is often considered effective for HPD, given that its underlying causes are typically rooted in early developmental experiences. This therapeutic approach aims to improve relational dynamics and symptom management.

1.2.2 COGNITIVE BEHAVIOR THERAPY
CBT is frequently used to address maladaptive behaviors in HPD by promoting recognition and replacement of irrational thoughts with functional alternatives, thus improving emotional and behavioral regulation.

1.2.3 MEDICATIONS
Medications are generally prescribed to manage mood instability and associated symptoms such as anxiety and depression in HPD, with antidepressants and mood stabilizers being the most commonly used pharmacological options.

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2. HISTRIONIC PERSONALITY DISORDER-UNDERSTANDING EXISTING AND POTENTIAL COMORBIDITIES

As noted by Candel (2019), the rarity of HPD and its high comorbidity with other disorders have limited extensive research. The DSM-5 identifies Somatic Symptom Disorder, Functional Neurological Symptom Disorder (Conversion Disorder), and Major Depressive Disorder as commonly comorbid with HPD, with particular attention to somatic-related disorders. Garyfallos et al. (1999) found that 24% of patients with somatoform disorders also met criteria for HPD, while Morrison (1989) reported that 60 women with Somatization Disorder also exhibited symptoms consistent with HPD. Torrico et al. (2024) emphasize that somatic complaints in HPD may be indicators of distress, linking HPD with Somatic Symptom Disorder and Illness Anxiety Disorder.

Mood disorders also commonly co-occur with HPD. For example, Riso et al. (1996) reported a significant comorbidity between Cluster B personality traits and early-onset dysthymia, while Üçok et al. (1998) found a high prevalence of HPD in individuals diagnosed with Bipolar I Disorder.

2.1 COMORBIDITY WITH FACTITIOUS DISORDER

Factitious Disorder is characterized by the falsification of symptoms without clear external incentives, with individuals presenting themselves as ill or impaired. Both HPD and Factitious Disorder involve attention-seeking behaviours, although they manifest differently. HPD is associated with rapid emotional shifts and exaggerated emotional displays, while Factitious Disorder is marked by symptom exaggeration to garner emotional support and resources from others. Studying the coexistence of HPD and Factitious Disorder could provide a deeper understanding of the comorbid conditions linked to HPD.

3. ASSOCIATED FEATURES AND ASSESSMENTS FOR SCREENING SIGNS AND SYMPTOMS

According to the DSM, HPD is associated with an interpersonal style characterized by dominance, intrusiveness, and challenges in maintaining emotional intimacy in romantic relationships. Other noted traits include novelty-seeking, diminished interest over time, impulsivity, immaturity, and self-centeredness (Candel, 2019; Bornstein, 1999). Additionally, individuals with HPD often demonstrate pseudo-hypersexuality, somatization tendencies, and low frustration tolerance.

Mullins-Sweatt et al. (2011) state that there is no dedicated assessment tool for HPD. However, general instruments like the 'Structured Interview for DSM Personality Disorder' (SIDP), the 'Personality Diagnostic Questionnaire' (PDQ), and the Structured Clinical Interview for DSM-III (SCID) are used to screen for HPD (Nestadt et al., 1990). The Minnesota Multiphasic Personality Inventory (MMPI) is another tool employed in HPD assessment (Candel, 2019).

Some assessments specifically designed to capture HPD traits have also been developed. For instance, the SWAP-200 provides comprehensive personality descriptions for clinical use (Shedler & Westen, 2004). Additionally, Ferguson et al. (2014) introduced the Brief Histrionic Personality Scale (BHPS), while Savci et al. (2020) developed the Online Histrionic Personality Scale (OHPS), which aligns with the DSM criteria to identify HPD-related behaviours.

3.1 CONSIDERING FACTITIOUS DISORDER CHARACTERISTICS AS ASSOCIATED FEATURES

Despite the reliability of HPD-specific assessment tools, these instruments might benefit from incorporating traits associated with somatization, such as falsification and symptom exaggeration. By incorporating these behaviours into future HPD assessments, researchers may gain insight into the overlap between HPD and Factitious Disorder, potentially revealing further comorbid conditions.

4. CONCLUSION

Histrionic Personality Disorder, a member of the Cluster B personality disorders, remains under-researched, in part due to its low prevalence. This disorder is frequently observed as a comorbidity alongside other major psychiatric conditions. Expanding research on HPD's comorbidities, underlying causes, and therapeutic options could enhance understanding and support effective symptom management.

Further studies could explore the effects of cultural and gender influences on HPD symptomatology, as well as the role of childhood experiences, particularly parent-child relationships. Increasing awareness and recognition of HPD could ultimately support its categorization alongside other more extensively researched personality disorders.

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PRINCIPLES OF MYTH-MAKING IN THE POETRY OF D. A. PRIGOV

Vakhitov Yulay Salavatovich
Literary Critic, Teacher at the Almalyk Branch of the Tashkent State Technical University

ABSTRACT
The article analyzes the principle of myth-making in the lyrics of Dmitry Alexandrovich Prigov, one of the founders of Moscow conceptualism in poetry and fine art.
KEY WORDS: *poem cycle, myth, absurdity, genre, poetry, parody, «flicker»*

One of the components of the first volume of the collected poems of Dmitry Aleksandrovich Prigov, published in Vienna in 1996, is a cycle entitled “Historical and Heroic Songs” (1974). The more than twenty-year period between the creation and mass publication of the cycle is traditionally explained by the non-opportunistic nature of Prigov’s work and personality, which gained wide popularity in his homeland only during the perestroika era.

In the preface to the cycle, the author gives a lengthy discussion of the type of mythological consciousness prevalent in Soviet society, which has a “Pushkin-Dostoevsky-Tolstoyan” character, and in some cases a more destructive “Zoshchenko-Kharms” character, which, under the influence of the prevailing historical and cultural element, recodes the stable (positive) image of folk heroes. The stability of not so much these images themselves (according to Prigov, “ranks”), but the motifs that construct them by the popular consciousness is indicated by their vacancy, the replacement of which is facilitated by the “plastic and sweet fusion” in one person of previous characters of folklore and religion (St. George the Victorious + Anika the Warrior = Vasily Ivanovich Chapayev). Of no small importance for Prigov is the very perception of these candidates newly revealed in the cultural consciousness. Warning against the "danger of a purely horizontal slice of time, which gives rise to either pure irony or stylization, like neoclassicism" [1], the author sees his task as examining the entire vertical slice of time, leaving no doubt about the seriousness of the principle of reproduction. Such an approach, with an unequivocally critical perception of the content of the work by the reader, reveals the method of the absurd, when the belief in the reality of reproduction is based on the illogicality and paradoxicality of the author's thinking.

O. L. Chernoritskaya notes: “The method of reducing to absurdity, having become the flesh of artistic works, has not ceased to be a phenomenon that destroys the artistic material of culture” [4]. Deconstruction of myth, and sometimes renewal of its semantics, becomes a priority task of postmodernist literature.

The recoding of the cultural myth occurs in Prigov both at the level of anthroponymy and as a result of the unexpected intersection of key historical events and biographies of their characters. In the poem "Patriot", a plot from the Patriotic War of 1812 is unobtrusively intertwined with the author's non-trivial interpretation of the name of one of the leaders of the national liberation movement against the Polish interventionists, Dmitry Pozharsky:

When Napoleon is furious
Alexander has half of Russia,
Already chopped off, Dmitry Prince
There lived a handsome young man in Moscow.

He said: "Mother Russia!
With the Poles, with whom else are you friends,
Where are you going?" - he began to set fire to
Houses, and was nicknamed Pozharsky[1] [3, p. 131].

The same play with the semantics of the name of the historical hero is also manifested in relation to the surname of Suvorov. Moreover, the motives for the nomination, allegedly carried out in the popular consciousness, are different in different poems of the cycle. Thus, in one of them, the reason for the nickname was that "he harshly bugged the Poles" ("Servant of the Fatherland"), while in the poem "Catherine and Pugachev" the interpretation of the surname-nickname is built in the context of the suppression of Pugachev's peasant uprising.

The story of the miraculously saved sovereign, which has been around since the 18th century and on which Pugachev's imposture was based, is recoded by Prigov in the mainstream of everyday erotic jokes about a guards hussar in love with Catherine (in the author's interpretation). The figure of the tsar's guard Suvorov, who thwarted Yemelyan's plans and caught up

[1]Here and below, the poems of Dmitry Aleksandrovich Prigov are given in interlinear translation

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with the latter after his escape from the tsar's bedroom, introduced at the climax, leads to a pseudo-folk antinomy:

For this national feat,
His night fear and flaw,
Suvorov was nicknamed the stern
And the Scarecrow - Emelyan [3, p. 136].

Historical songs as a genre developed in Rus' during the era of the Tatar-Mongol conquest and existed until the mid-19th century. Their vitality can be explained by their high dynamism, which brings them closer to ditties, and a fairly simple composition, which usually includes one plot, built on the principle of a monologue or dialogue. Based on the name, the heroes of the songs were characters from Russian history, from princes and emperors to famous leaders of peasant uprisings. Thus, in attracting such figures as Catherine the Great, Suvorov, Pugachev or Pozharsky as objects of depiction, Prigov's following of the folklore tradition can be traced. Stylization under historical songs often occurs due to the use of colloquial speech of the people's language ("zhuchil", "eynoy") and the introduction of stable speech structures characteristic of the folklore tradition ("Like Stenka the scoundrel / Had a house with three porches").

On the contrary, the inclusion in the cycle of dedications to Stalin ("Stalin and the Girl", "Stalin and Alliluyeva"), Gorky ("Maxim Gorky's House"), Kalinin ("Kalinin and the Girl"), Chapaev, Budyonny ("Song of the Dashing Red Army Commander"), Gagarin, Khrushchev and others speaks of the renewal and expansion of the genre and thematic boundaries of the historical song. This task is also facilitated by the active use of colloquial vocabulary, as well as the parodic playing on the cliches and slogans of the Soviet period ("Today I praise the heroes again!"; "... In the sky the stars of the ancient Kremlin shine again / Like the Red Bear" [3, p. 125]). This wandering of the author between eras, cultures and languages corresponds to the strategy of "flickering" developed by Prigov, in which the artist's distance from texts, gestures and behavior presupposes his temporary "sticking" into the above-mentioned language, gestures and behavior for exactly the time that he is not completely identified with them, and again "flying away" from them to the meta-point of the strategeme and not "sticking" into it for a sufficiently long time that he is not completely identified with it" [2, pp. 58-59].

In some texts of the cycle, one can find references to works of classical literature or parodic imitation of a separate artistic movement. Thus, in the poem "Dmitry Donskoy", Batu is ironically presented as a traditional character of romantic poetry of the early 19th century:

Driven away from home by melancholy
And restless, like a fugitive,
Batu with his sad horde
Finally came to Russia [3, p. 137].

The key plot lines and motifs of Pushkin's "Song of the Prophetic Oleg" are found in the already mentioned text - "Song of the Dashing Red Army Commander". Prigov adopted not only the genre definition of "song", but also the poetic meter used by Pushkin - a tetrameter amphibrach, with a discrepancy in strophic units: six-line verses in Pushkin and quatrains in Prigov. The historical figure, one of the first Russian princes, acquired in the popular consciousness the features of a semi-legendary heroic personality, who, according to Prigov, was one of those ranks of folk heroes, for the position of which Budyonny was chosen.

In Prigov's poem, the place of the sorcerer is taken by a tied-up White Guard - "Belyak", who prophesies "death from cattle" to Budyonny. Thus, here we find a following of the chronicle plot about the death of Prince Oleg, set out by N. Karamzin in his "History of the Russian State", which, according to one version, Pushkin relied on when working on his historical ballad. The plot echoes of both songs continue with the motif of parting with a beloved horse, however, unlike Pushkin, Prigov does not focus on this moment, making it clear only that the army commander "preparing blow after blow, / He rushed after Mamontov" [3, p. 120]. The discrepancy is also found in the scene of the hero finding his favorite: in Pushkin's ballad, Oleg knows nothing about the fate of the horse until he asks his warriors about it, while in Prigov's poem, Budyonny is aware of its death. The absurd remark of the army commander ("I would like to look at him / Posthumously at my leisure!" [3, Ibid.]) combines the well-known military-clerical cliché "posthumously" and the common formulation accepted in popular usage "to do at my leisure." The army commander's subsequent visit to the horse's remains parodies the culminating scene of Pushkin's ballad: Budyonny, in confirmation of his daring, chops off the head of a snake that has crawled "out of the bone." The inclusion of a direct quotation from "The Song of the Prophetic Oleg" leads to a lexical repetition that stylizes the performer's popular speech:

From bone, meanwhile, a grave snake
Hissing meanwhile crawled out [3, P.121].

CONCLUSIONS

The recoding of the cultural myth occurs in Prigov both at the level of anthroponymy and as a result of the unexpected intersection of key historical events and biographies of their characters.

Historical songs as a folklore genre with a number of distinctive features arose in Rus' in the 13th century during the era of the Tatar-Mongol invasion and existed until the middle of the 19th century.

In Prigov's use of such figures as Catherine the Great, Suvorov, and Pugachev as objects of depiction, one can trace the following of the folklore tradition. Stylization under historical songs often occurs due to the use of colloquial speech of the people's language and the introduction of stable speech structures characteristic of the folklore tradition.

On the contrary, the inclusion of dedications to Stalin, Gorky, Kalinin, Chapaev, Budyonny, etc. in the cycle speaks of the renewal and expansion of the genre and thematic boundaries of

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the historical song. This task is also facilitated by the active use of colloquial vocabulary, as well as the parodic playing on cliches and slogans of the Soviet period.

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DOWN DRAFT GASIFIER TO PRODUCE SYNGAS BY BIO WASTE

K.Kalimuthu[1], Dr.A.Jany Giles[2], V.Kiruthika[3], Dr.D.Rajkumar[4], J.Ganeshamoorthi[5], Mr.C.Ashokkumar[6], M.Bhuvaneshwari[7], S.Hari Krishnan[8]

[1,2,5,6]*Assistant Professor, Department of Agricultural Engineering, RVS Technical Campus, Coimbatore, Tamil Nadu, India -641 402*

[3]*Associate Professor, Department of Agricultural Engineering, RVS Technical Campus, Coimbatore, Tamil Nadu, India -641 402*

[4]*Professor, Department of Agricultural Engineering, RVS Technical Campus, Coimbatore, Tamil Nadu, India -641 402*

[7,8]*Student, Department of Agricultural Engineering, RVS Technical Campus, Coimbatore, Tamil Nadu, India -641 402*

Correspondence: *Dr.D.Rajkumar, Professor, Department of Agricultural Engineering, RVS Technical Campus, Coimbatore, Tamil Nadu, India -641 402*

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ABSTRACT

Biowaste is a valuable resource for sustainable energy production. Through combustion, it generates thermal energy, while gasification a thermo chemical process which transforms solid fuel into gaseous fuel. This process, specifically through a downdraft gasifier, converts biowaste into a combustible gas known as producer gas. Utilizing biowaste as a fuel source plays a crucial role in reducing dependency on fossil fuels, providing a renewable, low-carbon energy alternative. Combining biowaste with other renewable sources like wind and solar power is an effective solution for small-scale, decentralized power generation. This approach not only meets local electricity needs but also supplies heat for rural development. Optimizing operating conditions and methodologies for maximum syngas production in biomass gasification is essential. The gasification system designed here includes a downdraft biomass thermo chemical conversion gasifier, a gas transport line with tar removal, and a fully enclosed combustion chamber – together, forming a robust setup for efficient, clean energy production.

KEY WORD: *Downdraft gasifier, biowaste, gasification, pyrolysis, syngas*

INTRODUCTION

Increasing prices coupled with the instability and uncertainty in the supply of fossil fuels and diminishing reserves has prompted the search for alternate energy sources. In response, the conversion of biomass to energy has gained attention. Biomass is renewable and generally low in Sulphur. Because it is renewable, it can be used without increasing the CO, content of the atmosphere, and the low Sulphur content is an asset for small-scale utilization. The main disadvantages of bio waste compared to fossil fuels are its wide distribution (non- point source) and low energy density.

The low energy density requires larger quantities processed relative to fossil fuels for a given energy need. In this regard, gasification processes (see, e.g. Bain, 1980) are available for improving the properties of biowaste. Biowaste are a prime example of improved biomass. Biowaste is major source of biomass. our total energy needs and could contribute up to 8%within the next decade (Adelekan, B.A. & Bamgboye, A.I., 2009) Over 700 million tons of this material is not used because it is not of the right species, size, length, fiber morphology etc. Thus the potential for the utilization of Biowaste to ensure a continuous supply of fuels and chemicals is significant.

Direct combustion of SSS biowaste is generally inconvenient and usually environmentally unacceptable. Hence various technologies have been investigated to convert biowaste into more attractive fuels. Among these, gasification technology. Utilization of biowaste is the need of hour today. The waste which cannot be degraded by bio-chemical route like agricultural waste, wood waste can be converted into useful fuel through the process called Gasification. Gasification is a thermo-chemical process which converts solid biomass into a mixture of combustible gases that can be used in various applications. In this project, a prototype of downdraft gasifier is designed and developed of 20 KW the capacity for generating producer gas for fulfilling heating requirement of a heat treatment furnace (Adeyosoye, O.I*et al*.,2010)

Biowaste of varying sizes are used as a feed stock in the gasifier. The performance characteristics of the gasifier are studied at different air flow rates. A reduction in the overall cost for replacing fuel oil and LPG is estimated. Performance of gasifier with other feed stocks such as agricultural waste

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(Akinbami, J-F.K.,2001)

METHODOLOGY

PRODUCT DESIGN STRUCTURE

The design has 16 parts and divided by 2 sub-assemblies: the gasifier body and body filter guts. The design consists a filter box to filter the fly ash with a circulating water tank and filter chamber. The schematic design with the function of the part the filter body was designed for good cleaning for the tar content, ash content, water absorption in the producer gas, to ensure clean and high-quality gas obtained. Gas cooling is necessary in the present work to reduce thermal stress on the gasifier and piping system. The material used as filter were fine wire mesh integrated with dried corn-cobs which has good permeability to assist producer gas flow and reduce pressure drop which may result blowback during operation. The reactor, grate and other parts were made from stainless and mild steel to ensure strength and ability of the system to ensure structural integrity.

The assembly drawing of the downdraft gasifier Final Design of the downdraft gasifier Thermal analysis Thermal analysis is one of the important analyses in the present study. This is because the gasifier is subjected to thermal load significantly in comparison with other form of loads such as structural loads. The thermals stresses arise from the high temperature ambient inside the gasifier which can be divided into four distinct regions, namely the drying region, pyrolysis region, oxidation (or combustion and finally the reduction zone. Each zone has different temperature range and this will affect the structural integrity during gasification process. The analysis was limited to gasifier body alone hence this is the region the high temperature ambient occurs. All thermal analysis was done via simulation in the Solid Works 2017, and later observed during experimental works.

GASIFICATION

Gasification is the method that can convert carbonaceous biomass material to hydrogen, carbon dioxide, and carbon-monoxide. The method can be achieved by reaction of feed material at over 700 °C temperature, with a limited amount of oxygen and steam. In the gasification method, the feed material is processed without combustion. In this method, the generated mixture of gas is considered synthetic gas or producer gas utilized as fuel.The produced power in the biomass gasification method and combustion of the generating gas. In chemical reactions of gasification method, char type carbonaceous feed material.(C) is reacted with steam (H2O) and generates carbon monoxide (CO) and hydrogen (H2) can be considered as renewable energy source.

$$C+H2O \rightarrow H2+COE \ldots. 1$$

$$C+CO2 \rightarrow 2COE \ldots\ldots. 2$$

Therefore, in the gasification method, a small amount of air or oxygen is applied to the gasifier reactor to burn the organic feed material to generate energy and carbon dioxide. The gasification method of biomass renewable energy sources is the potential sources to generate energy, chemical energy, and bio fuels. A gasifier is required to convert biomass renewable energy sources to synthetic gas in the gasification method. The generated synthetic gas is used to operate an internal combustion engine. They can also be used to produce electricity and heat energy by using a cogeneration system.

DRYING

Drying is what removes the moisture in the biomass before it enters Pyrolysis. All the moisture needs to be (or will be) removed from the fuel before any above 100°C processes happen. All of the water in the biomass will get vaporized out of the fuel at some point in the higher temperature processes. (Akinlo, A.E.,2009)

Biomass can contain more than 50% moisture (wet basis) when it is cut; it is generally desirable to dry biomass containing more than 25% moisture (wet basis) before gasification. Drying often can be accomplished using waste heat or solar energy. If the temperature of the drying air is too high, the outer surfaces of the chunk will become dry and begin to pyrolysis before the heat can reach the center. For efficient drying, hot air, which if cooled to 60' -80'C would be moisture saturated, is preferred. The moisture slows feedstock drying (as well as slowing surface pyrolysis). Thus, more air is required, improving the drying process (Thompson 1981). During operation of a gasifier and engine combination. Bio waste can be dried from 50% to 5% moisture content, with drying capacity to spare, using a 20-minute residence time with the hot engine exhaust, tempered with 90% recycle of dryer gases.(Amon, T.,*et al*., 2004)

PYROLYSIS

Pyrolysis is the process where bio waste materials are decomposed in absence of air or oxygen using heat energy. The overall process of pyrolysis method. The pyrolysis oil properties and yield of pyrolysis products depend on the operating conditions and parameters of the pyrolysis process. The pyrolysis process's operating parameters are the heating rate of feed material, the temperature of the reactor, residence time, catalysts, and reactor configurations. Biomass pyrolysis method, feed materials are decomposed to remove the moisture contents and break the bond to form CO, CO2, and residues (Anunputtikul, W. and Rodtong, S., 2004) The remaining compounds are exposed to further conversion using cracking and polymerization In this method, at a lower temperature, such as less than 500 °C temperature, the organic vapour materials are not cracked. However, at higher temperatures, they convert readily with fewer residence times. The optimum temperature to generate the maximum quantity using the bio waste pyrolysis method is over 500 °C.The residence time of vapour materials and heating rate in the pyrolysis process.

COMBUSTION

Combustion is often a complicated sequence of elementary radical reactions. Solid fuels, such as wood and coal, first undergo endothermic pyrolysis to produce gaseous fuels whose combustion then supplies the heat required to produce more of them. Combustion is often hot enough that incandescent light in the form of either glowing or a flame is produced. A simple example can be seen in the combustion of hydrogen and oxygen into water vapor, a reaction which is commonly used to fuel rocket engines (Balat, H.,2007) This

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reaction releases 242 kJ/mol of heat and reduces the enthalpy accordingly (at constant temperature and pressure) Combustion of an organic fuel in air is always exothermic because the double bond in O2 is weaker than other double bonds or pairs of single bonds involved, and the formation of the stronger bonds in the combustion products CO2 and H2O results in the release of energy (Cuéllar, A.D.& Webber, M.E.,2008) The bond energies in the fuel play only a minor role, since they are similar to those in the combustion products; e.g., the sum of the bond energies of methane, CH4, is nearly the same as that of CO2. The heat of combustion of organic fuels is approximately −419 kJ per mole of O2 used up in the combustion.

REDUCTION

Reduction is the process of stripping oxygen atoms off combustion products of hydrocarbon (HC) molecules, so as to return the molecules to forms that can burn again. Reduction is the direct reverse process of combustion. Combustion is the combination of combustible gases with oxygen to release heat, producing water vapour and carbon dioxide as waste products. Reduction is the removal of oxygen from these waste products at high temperature to produce combustion gases. (Jekayinfa, S.O. & Scholz, V. 2009) Combustion and Reduction are equal and opposite reactions. In fact, in most burning environments, they are both operating simultaneously, in some form of dynamic equilibrium, with repeated movement back and forth between the two processes. Reduction in a gasifier is accomplished by passing carbon dioxide (CO2) or water vapour (H2O) across a bed of Red-hot charcoal (C). The carbon in the hot charcoal is highly reactive with oxygen; it has such a high oxygen affinity that it strips the oxygen off water vapour and carbon dioxide, and redistributes it to as many single bond sites as possible. The oxygen is more attracted to the bond site on the C than to itself, thus no free oxygen can survive in its usual diatomic O2 form. All available oxygen will bond to available C sites as individual O until all the oxygen is gone. When all the available oxygen is redistributed as single atoms, reduction stop through this process; CO2 is reduced by carbon to produce two 15CO molecules, and H2O is reduced by carbon to produce H2 and CO. Both H2 and CO are combustion fuel gases, and those fuel gasses can then be piped off.

RESULT AND DISCUSSION

A downdraft gasifier is the typical configuration used for bio energy production. This well-established technology allows the production of syngas with low tar, due to the syngas passes through the combustion zone at high temperature and the subsequent dimensioning which in turn leads to the thermal cracking of tars.

Heat

Gasifier offer a flexible option for thermal applications, as they can be retrofitted into existing gas fuelled devices such as ovens, furnaces, boilers, etc., where syngas may replace fossil fuels. Heating values of syngas are generally around 4–10 MJ/m3.

Electricity

Currently Industrial-scale gasification is primarily used to produce electricity from fossil fuels such as coal, where the syngas is burned in a gas turbine. Gasification is also used industrially in the production of electricity, ammonia and liquid fuels (oil) using Integrated Gasification Combined Cycles (IGCC), with the possibility of producing methane and hydrogen for fuel cells. IGCC is also a more efficient method of CO2 capture as compared to conventional technologies.

Combined Heat and Power

In small business and building applications, where the wood source is sustainable, 250–1000 KW and new zero carbon biomass gasification plants have been installed in Europe that produce tar free syngas from wood and burn it in reciprocating engines connected to a generator with heat recovery. This type of plant is often referred to as a wood biomass.

Transport Fuel

Diesel engines can be operated on dual fuel mode using producer gas. Diesel substitution of over 80% at high loads and 70–80% under normal load variations can easily be achieved. Spark ignition engines and solid oxide fuel cells can operate on 100% gasification gas. Mechanical energy from the engines may be used for e.g. driving water pumps for irrigation or for coupling with an alternator for electrical power generation. While small scale gasifiers have existed for well over 100 years, there have been few sources to obtain a ready-to-use machine. Small scale devices are typically DIY projects. However, currently in the United States, several companies offer gasifier to operate small engines

Renewable energy and fuels Gasification plant

In principle, gasification can proceed from just about any organic material, including bio waste. The resulting syngas can be combusted. Alternatively, if the syngas is clean enough, it may be used for power production in gas engines, gas turbines or even fuel cells, or converted efficiently to dimethyl ether (DME) by methanol dehydration, methane via the Sabatier reaction, or diesel-like synthetic fuel. In many gasification processes most of the inorganic components of the input material, such as metals and minerals, are retained in the ash. In some gasification processes (slagging gasification) this ash has the form of a glassy solid with low leaching properties, but the net power production in slagging gasification is low (sometimes negative) and costs are higher.

CONCLUSION

The present study entitled "Down Draft Gasifier to Produce Biogas by Bio waste" was conducted at RVS Farms Unit just Opposite to Agri Engineering laboratory Sulur during March to July 2022. The objective of the study was to produce a biogas to study the characteristics of bio char and to assess the effect of biogas crop production. The salient findings of the study are summarized below. Agro residues viz., woody wild growth, coconut petiole and herbal waste which are Surplusly available in Sulur region were analysed for their suitability for biogas production. The materials used for study were woody wild growth, coconut petiole and herbal waste residue. The biowaste downdraft gasifier is mostly used for power

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generation applications. It is basically a reactor into which fuel/feed stock is fed along with a limited supply of air. The heat that is required for gasification is generated through partial combustion of the feed material Producer gas contains carbon monoxide, hydrogen, water vapour, carbon dioxide, tar vapor, and ash particles. Gasification produces a low- or medium-Btu gas, depending on the employed process, which can be used in many combustion systems such as boilers, furnaces, and gas engines Syngas is most commonly burned directly in gas engines, used to produce methanol and hydrogen, or converted via the Fischer process into synthetic fuel. For some materials gasification can be an alternative to land filling and incineration, resulting in lowered emissions of atmospheric pollutants such as methane and particulates. Some gasification processes aim at refining out corrosive ash elements such as chloride and potassium, allowing clean gas production from otherwise problematic feedstock material. Gasification of fossil fuels is currently widely used on industrial scales to generate electricity.



Figure 1: Downdraft gasifier



Figure 2: Biowaste

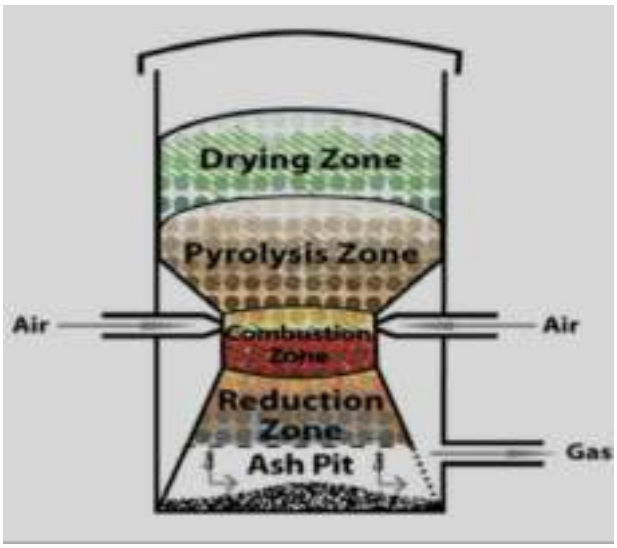


Figure 3: Process

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ROLE OF NURSING IN MANAGING POSTPARTUM DEPRESSION: A COMPREHENSIVE REVIEW

Reena Mathew[1], Dr. Robins Thomas[2]
[1]Phd Scholar, [2]Professor
[1,2] Shri JJT University, Rajasthan

ABSTRACT

Postpartum depression (PPD) is a debilitating mental health disorder that affects a significant proportion of new mothers worldwide. If untreated, PPD can interfere with maternal-infant bonding, impair breastfeeding, and disrupt family dynamics. Nurses, being the first point of contact in postpartum care, play a pivotal role in recognizing and managing PPD through screening, early interventions, psychoeducation, and providing emotional and practical support. This article offers a comprehensive review of the role of nursing in the prevention, detection, and management of PPD. It highlights evidence-based interventions, the importance of family-centered care, and the need for collaborative, multidisciplinary approaches to address the unique needs of affected women. Challenges in nursing care, including cultural stigma and time limitations, are also discussed, along with strategies to overcome these barriers.

KEYWORDS: *postpartum depression, maternal mental health, nursing care, PPD screening, family-centered care, mental health interventions, postpartum support, maternal-infant bonding*

1. INTRODUCTION

The postpartum period is a time of significant physical and emotional changes, often accompanied by social and familial adjustments. While it is a joyful phase for many mothers, a substantial number experience mood disturbances, ranging from mild "baby blues" to severe postpartum depression (PPD). PPD is characterized by prolonged sadness, irritability, anxiety, and fatigue, often affecting the mother's ability to care for herself and her infant. If left untreated, PPD can have lasting consequences, including disrupted maternal-infant attachment, developmental delays in the child, and maternal self-harm or suicide.

Nurses, particularly those involved in maternity and community health settings, are uniquely positioned to identify early signs of PPD and implement interventions to promote maternal mental health. This review explores the role of nursing in managing PPD, focusing on screening methods, education, emotional support, individualized care, and multidisciplinary collaboration. It also addresses challenges that nurses encounter and offers recommendations to improve nursing practices in postpartum mental healthcare.

2.UNDERSTANDING POSTPARTUM DEPRESSION

2.1 Definition and Diagnostic Criteria

PPD is a form of major depressive disorder that occurs after childbirth, typically within the first few weeks to six months postpartum. However, symptoms can sometimes appear even a year after delivery. The **DSM-5-TR** classifies PPD under major depressive disorder with peripartum onset, indicating that the disorder begins during pregnancy or within four weeks postpartum.

Common Symptoms of PPD:

- Persistent sadness or low mood
- Loss of interest in previously enjoyable activities
- Fatigue or lack of energy
- Changes in appetite (increased or decreased)
- Sleep disturbances (insomnia or excessive sleep)
- Difficulty concentrating or making decisions
- Feelings of guilt, shame, or inadequacy
- Thoughts of self-harm or harming the infant

2.2 Risk Factors for PPD

Several risk factors have been identified in the development of PPD, which include:

1. **Psychological and Psychiatric Factors**:
   - History of depression, anxiety, or bipolar disorder
   - Previous episodes of PPD
   - Low self-esteem or poor coping mechanisms
2. **Biological and Hormonal Factors**:
   - Fluctuations in estrogen and progesterone after childbirth
   - Thyroid dysfunction
3. **Social and Environmental Factors**:
   - Lack of social support from family and friends
   - Marital conflict or domestic violence
   - Financial stress
4. **Obstetric and Perinatal Factors**:
   - Complications during childbirth (e.g., preterm birth, unplanned cesarean section)
   - Breastfeeding difficulties

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3. ROLE OF NURSES IN MANAGING POSTPARTUM DEPRESSION

3.1 Early Identification and Screening

One of the most important roles of nurses is the **early identification** of PPD. Timely detection allows for immediate intervention, preventing the escalation of symptoms.

3.1.1 Screening Tools for PPD

Nurses use various evidence-based screening tools to assess mothers for PPD:

- **Edinburgh Postnatal Depression Scale (EPDS)**: A 10-item questionnaire specifically designed to detect PPD symptoms.
- **Patient Health Questionnaire-9 (PHQ-9)**: A widely used tool to screen for general depression that is also applicable in postpartum settings.
- **Postpartum Depression Screening Scale (PDSS)**: A longer, more comprehensive screening tool tailored for postpartum women.

3.1.2 Routine Screening in Clinical Practice

Routine screening is recommended during postpartum visits, ideally at multiple points—such as six weeks postpartum, three months, and six months. Nurses play a crucial role in **administering these tools** and discussing the results with mothers to assess the need for further intervention.

3.1.3 Observational Skills and Active Listening

In addition to using standardized tools, nurses rely on their observational skills to detect subtle signs of distress, such as:

- Lack of eye contact with the baby
- Expressions of hopelessness or guilt
- Withdrawal from social interactions

By engaging in **active listening** and providing a non-judgmental environment, nurses encourage mothers to share their feelings openly.

3.2 Providing Psychoeducation and Counseling

Education and counseling are fundamental nursing interventions in managing PPD. Nurses provide **psychoeducation** to mothers and families, helping them understand the condition and the importance of seeking support.

3.2.1 Addressing Stigma and Promoting Awareness

Many women experience shame or fear of judgment, preventing them from seeking help. Nurses play an essential role in **reducing stigma** by normalizing discussions around mental health and reassuring mothers that PPD is a treatable condition.

3.2.2 Emotional Support and Brief Counseling

Nurses offer **emotional support** to mothers, helping them process their feelings and navigate the challenges of new motherhood. Brief counseling sessions can include:

- Teaching relaxation techniques and mindfulness exercises
- Encouraging the development of coping strategies
- Supporting mothers in setting realistic expectations for themselves

3.3 Facilitating Maternal-Infant Bonding

PPD can impair a mother's ability to bond with her baby, which may affect the child's emotional and cognitive development. Nurses implement various strategies to **promote bonding**, such as:

- **Encouraging skin-to-skin contact** immediately after birth and during breastfeeding.
- Teaching mothers how to recognize and respond to **infant cues**, building their confidence in caregiving.
- Promoting **rooming-in practices** in hospitals, allowing mothers and babies to stay together.

3.4 Developing Individualized Care Plans

Each woman's experience with PPD is unique, necessitating **individualized care plans** that address her specific needs. Nurses collaborate with mothers to develop care plans that may include:

- **Psychotherapy referrals** (e.g., Cognitive Behavioral Therapy or Interpersonal Therapy)
- **Medication management** in collaboration with psychiatrists or primary care providers
- **Community-based resources** such as support groups or parenting programs

3.5 Multidisciplinary Collaboration

PPD management requires a **team-based approach** involving various healthcare professionals. Nurses work closely with:

- **Psychiatrists and psychologists** for mental health interventions
- **Obstetricians and primary care physicians** for medical management
- **Social workers and community health workers** to provide social support

3.6 Follow-Up Care and Continuity

Follow-up care is essential to ensure that mothers receive ongoing support. Community health nurses conduct **home visits** or offer **telehealth consultations** to monitor mothers' progress and adjust care plans as necessary.

4. FAMILY-CENTERED NURSING CARE IN PPD

The involvement of family members is crucial in PPD management. Nurses provide **education and guidance** to partners and family members, emphasizing their role in supporting the mother emotionally and practically.

1. **Partner Support**: Encouraging partners to participate in childcare and household tasks can reduce the mother's stress and promote recovery.
2. **Family Education**: Nurses teach families about PPD symptoms and encourage open communication to prevent misunderstandings.

5. CHALLENGES IN NURSING CARE FOR PPD

Despite their critical role, nurses face several challenges in managing PPD:

- **Time Constraints**: Limited time during postpartum visits can hinder comprehensive assessments.

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- **Lack of Training**: Not all nurses receive adequate training in maternal mental health care.
- **Cultural Barriers**: In some communities, discussing mental health issues is taboo, making it difficult for mothers to seek help.

6. CONCLUSION

Nurses are essential in managing postpartum depression through early screening, education, emotional support, and individualized care. Their role extends beyond clinical care to include family involvement and multidisciplinary collaboration. Addressing challenges such as time limitations and cultural stigma is vital for enhancing nursing practices in PPD care. Providing specialized training to nurses and integrating mental health care into routine postpartum services can significantly improve maternal outcomes. With timely intervention and comprehensive support, nurses can play a transformative role in promoting the well-being of mothers and their families.

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IMPACT OF MASS MEDIA ON LOCAL BUSINESSES CASE STUDY IN MANGOCHI DISTRICT

Dr. M. Arockia G. Ruban
Associate Professor & PG Programme Coordinator, DMI – St. Eugene University, Chibombo, Lusaka, Zambia, Southern Central Africa.

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ABSTRACT

Every business one way or the other gets advertised, it can be a poster on one's door or a commercial advert on the national broadcasting station. The aim of all these efforts is to attract customers, increase awareness, and introduces a new product and many more. Mass media is the only platform that allows entrepreneurs to reach a wide area because of its ability to extend media coverage. Mass media refers to a diversified collection of media technologies that reach a larger audience via mass communication. Mass media is every wide area that cover different media channels form print media, electronic media and social media. All these aspects are part of mass media. Therefore, having noted what mass media is, this study will aim at finding the impacts of mass media on local businesses in Mangochi district. The research will try to find how local entrepreneurs are using mass media in their business, the challenges that local entrepreneurs are facing in relation to mass media, benefits that local entrepreneurs are obtaining with the help of mass media and many more. The aim of this study is to find whether mass media is important to a local business or not. This study will use qualitative method in collecting and analyzing the data. The researcher will collect the data from 40 prominent business entities with Mangochi using a questionnaire and will analyze the data using the thematic data analysis. From, the analysis the research will present the findings in a discussion form and a comparison with the literature review will be conducted. The aim of comparing the two (actual finds and literature review) is to know whether the researcher's findings are corresponding to what other people have already find out. Finally, the researcher will write a report on his findings and give a recommendation.

KEY WORDS: *mass media, local businesses, social media, challenges and benefits.*

INTRODUCTION AND BACKGROUND

For centuries companies, industries and organizations invested in different forms of marketing. In the mid 1820 there were minimal ways to get an advert to the intended individuals. Today things are not the same, by only a click of a button companies are reaching millions of people. This has been possible with the help of mass media; mass media refers to a diversified collection of media technologies that reach a larger audience via mass communication. It comprises of internet and mobile mass communication, outdoor media, print media, event organizing and public speaking. Malawi, like any other country, need the import and export of goods and services in order to advance economically and socially. To do this, people must first know about the product before buying it. Therefore, the use of mass media in marketing Malawian products is inevitable fact, that producer cannot deviate. Therefore, to know and study the impact of the mass media on Malawian firms is of significant importance. Malawi as a country is facing the issue of lack of foreign currency and lack of promotion for local products, mass media can therefore be the tool to solve these problems the country is facing.

Problem Statement and Justification

Malawian products are facing problems when it comes to both international and local markets. Buyers prefer to buy foreign goods rather than Malawian goods even though the goods are of high quality. In addition, entrepreneurs opt to sell their products to customers around them. This is because many consumers or buyers do not know about Malawian products and most of entrepreneurs in this country do not recognize the benefits of advance models of mass media in doing their business hence low profit is made from the products. This has been the case for a very long time and it is one of the ca causing factor that has made these entrepreneurs not to enjoy the full benefits of the market. It is therefore for this reason that the project will explore the impact of mass media on Malawian firms.

Background

Malawi is a land lock country located at the southern central part of Africa. "With a population of 16.36 million and among them 50.7% live below poverty line" according to report of international monetary fund (IMF). The country has GDP rank of 150th, which is growing at 6.2% (2015 Est.). This is the according to the reserve banks' stability report that is issued annually. Malawi's economy has not been stable for years now,

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its inflation in the year 2013 was 26.9% and now in the current year of the study its 22.6%. Malawi as a land lock country does not have direct access to the see which also make transportation, communication and other things to be high expensive. Malawi's economy is many driven through agriculture products and the tourism industry. Malawi produces different products that are exported to Canada, South Africa, japan, Germany and many other countries. This alone is not enough to support the 16.36 billion population that Malawi has. It should be indicated that many Malawians do not like to buy local products. The government in an attempt to reduce this policy passed a policy of BUY MALAWI. This was to act as the way to induce or influence local Malawians to purchase locally made products and as one way of trying to reserve the foreign currency.

Mangochi district is a tourist destination due to various local resources such as Lake Malawi, Lake Malombe and other natural beauties. Mangochi is a small district but an income generating site for the country. Different investors have come to this district and build entities and business vessels that operating and facilitating in the growth of this country. In this district there is also major business of fish trade. The fish is sold domestically and also exported to nearing country like South Africa, Mozambique, Zambia and Zimbabwe. Mangochi also has lime stone, this mineral is used both domestic and it is also exported outside the country.

Mass Media

Mass media refers to a diversified collection of media technologies that reach a larger audience via mass communication. It comprises of internet and mobile mass communication, outdoor media, print media, event organizing and public speaking.it should be indicated that social media is one aspect of mass media and this is the aspect that today is very vibrant in marketing products. In today's technology-driven world, social networking sites have become a way for shops to reach a wider audience with their marketing initiatives. In the 1980 people did not have social media at their disposal for marketing their products, they used newspapers and radios to make know a product. This is not the case today, hence this study divides itself from traditional ways to modern tool/ systems of marketing (e-marketing), Companies can use social media to connect with customers in order to create connections and gain a better understanding of their needs.

Local Firms

Although there is no exact definition to local business but in simple terms it means a type of business activity that is founded locally or in other words the type of business that is originally indigenous. The opposite term for local business is foreign business, the type of business that is conducted in a foreign land and by a foreigner. Malawi is one of the growing country in terms of business, different people are being involved in different types of business for small scale to large scale businesses. Studies have shown that a lot of malawian women are involved in small scale business, that are mainly aimed at accumulating only a small percentage of money for survival and other domestic needs. It should be indicated that these studies did not hide the fact that Malawians are also involved in large scale but it is at a small percentage. Anyway, that is not the emphasis for this study, it is on local business. This means that whether small or large as long as it is a local business it will attract interest.

Social Media

Social media is now the back bone of mass media; it is with the help of the latest technology that has made every individual to be part of the global communication. This has made mass media to be of two part; traditional mass media system and modern mass media system.

The Importance for the Success of Local Businesses in Mangochi

Malawi is the country that depends on agriculture for the generation of income, this means that Malawi's economy will depend on how much is the country agriculture products are being sold on the international market. Social media will be a helpful tool in creation of demand for malawian products, hence generating income for the nation.

First of all, it should be indicated that malawian firms are the source of income for this state. As it has been stated early in this chapter that Malawi is an agriculture based country, hence many Malawians depend on agriculture as source of income. Therefore, it should be indicated that local firms are very important for the stability of the country's economy.

Secondly, development of the country depends on how much is the country is exporting. It is the aim of every nation to maximize it exports in order to generate foreign income and avoid inflations. Local firms help in exporting the countries resource to the outside world. Therefore, the well-being of local firms is very essential for a country.

Impact of Mass Media

As a tool that producers use to spread information to its customer and attract them towards his/her products, mass media has got various impact on the life of the business. One of the most interesting functions of social media is that it allows customers to communicate with one another, which is essentially an extension of conventional word-of-mouth communication (Mangold & Faulds, 2009).

FINDINGS AND CONCLUSION

The primary purpose of this research was to look into the impact of the media on Malawian businesses. These respondents were composed of entrepreneurs, representative of the entrepreneur in Mangochi district. Data was collected and it has been analyzed to find out if mass media has got a negative/ positive impact to local businesses.

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The study provides important implications for local businesses, It's crucial to understand the study's limitations first. The results provide an example of how local businesses in Mangochi district address the issue of marketing.

Below are some of the implications that the study came up with;
Mangochi is a town center of trade and culture in Malawi this makes it a very good trading post. Hence, it is not surprising to sew a lot of trade happening in this districts. According to the study, many businesses in Mangochi are using social media marketing strategy. Malawi in terms of technology is lacking behind but when it comes to Mangochi this is not the case. Many of its people go to south Africa to work and form there they bring different advanced staff include technology. Smart phones, are local found in Mangochi and this is all because of the people that go to south Africa. Thus, since social media marketing does not require much. With only a smart phone in your hands it is possible. The research found out that all most 95% of people in Mangochi have phones which make social media marketing a very viable form of marketing products to the general public. how do they use social media in marketing their product? The researcher found out that the way social media was being used by entrepreneurs I Mangochi was quite different from the way the rest of the world use social media. An entrepreneur will have a social page, they will just use their name (name of the enterprise) and all the interested customers will look it up and contact the business. In other words, local entrepreneurs use social media just to interact with their valued customers and not to advertise their product.

The researcher also identified that with the entrepreneurs, there was poor management of social media and it was not used for its intended purpose. Therefore, entrepreneurs could not enjoy full benefits that comes in with using social media as a channel of advertising ones' product. Why are local entrepreneurs failing to manage social media effectively? The research realized that many of local entrepreneurs in Mangochi were illiterate. Past research has indicated that 80% of individuals in Mangochi are school drop outs but are very rich due to business orientated minds. This research agrees to that, the research found out that illiteracy was the big problem that the district was facing and that was the reason for poor management of social media. Due to high illiteracy rates in Mangochi that is why entrepreneurs do not like to market their products in newspaper since not many can read.

In additional, the research found out that many of the entrepreneurs use social media or internet as one aspect of their business. This clearly shows that Mangochi is adopting modern ways of marketing products since local businesses are used advanced technology in marketing their products.

Mangochi as a district it is not at a high level with e-marketing, this is according to the findings that the research yield. In Mangochi many of the entrepreneurs do not know much about e-marketing. Statistics have shown that Mangochi is not at a level of using e-marketing because of the following challenges;

1. Poor network
2. Instable power supply
3. Low technology
4. Illiterate

Therefore, Mangochi as a district is quite behind in implementing the concept of e-marketing. It should be indicated that, according to the statistics of the research, Mangochi district is on its way to achieving the levels of e-marketing.

CONCLUSION

The study began with the basic question of how the media affects small businesses. Thematic analysis was used to analyze the finding from the research. Data from the study was presented. Results of this case study revealed that mass media has got positive impact to local businesses in Mangochi district. The study demonstrates that from the beginning, the participant recognized mass media's importance. But due to other challenges like high cost, unstable power supply, high illiterate levels and poor internet connection entrepreneurs did not utilize it to its best. The study illustrates that entrepreneurs in Mangochi are using different form of marketing which are all under mass media. The study also went further to tell that entrepreneurs are using these forms due to these factors; cost effect, effective and user friendly. The study also indicated that local entrepreneurs are also using modern ways of marketing like social media and the internet. Entrepreneurs expressed that mass media has given them benefits like; high sales volume, access to international markets, creating and increasing brand awareness.

The literature suggested that often mass media do help local entrepreneurs in growing their businesses and achieving their goals. The literature supported that mass media would certainly help local firms in becoming international giants. It all depends on how entrepreneurs manage their marketing strategy.

In today's marketing environment, it is essential that local businesses understand the importance of mass media and the strategies behind using social media. With this mostly controlled medium, businesses have the opportunity to communicate with a wide variety of publics. Therefore, understanding how mass media was important to local firms in Mangochi was important.

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A REVIEW PAPER ON RURAL ROAD DEVELOPMENT AT MARUNJI, PUNE

Prof. Amit B. Ghongade, Jitesh M. Chaurasiya, Raj S. Bhosale, Atharva M. Takalkar
Prof. Amit B. Ghongade, Lecturer of Civil Engineering Department, Y.B. Patil Polytechnic, Akurdi, Pune- 411044, Maharashtra.

INTRODUCTION

The main aim of Rural Road Development in Marunji is to balance the connection and provide good facilities of roads with Pune city. It provides easy to easy connectivity to rural communities, healthcare services, educational institutions, markets, opportunities, and quality of life, etc. for improving living standard. Rural road development is access to reliable, safe roads, social development, poverty reduction, etc. It helps to improve economical growth and infrastructure of Marunji. It enables timely transportations of agricultural products for agricultural growth. Roads reduce transportation costs, costs of consumption and production of goods and services for industrial development in rural area. It is a major public policy for the development of city, town and state to build a best society and countryside to support the construction. It is necessary to accelerate investment in rural infrastructure to generate additional employment, create new economic opportunities.

Rural road development in Marunji creates a connectivity of Pune for future growth in rural area and job opportunity in villages, also may Couse growing livings of human being in Marunji. Also we design side drainage and cable duct in road for future demand.



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Road Between Laxmi Chowk to Marunji

LITERATURE REVIEW

1. Rural roads are how much imported for economy of any country. Education, health and job are other important factor which affected by rural road. Comptroller and auditor General of India observed deficiencies in physical and financial planning, fund utilization, implementation, tendering process, quality assurance, and maintenance of these roads. Improvement of rural road is needed for getting best output. Developing countries has not always sufficient budget to improve rural road, so a methodology is also needed for prioritization of rural road network.[1]
2. A main bottleneck for local economic development is often a limited and poor quality rural road network. It is quite evident from the Plan documents that, private sector participation in road sector has been confined to development, maintenance and operation of specified highways (national and state), expressways, bridges and bypasses. Rural roads, particularly, those needed to link remote, hilly and backward settlements are hardly profitable to the private operator. Hence, without doing any major policy revamp on the development of rural road infrastructure, it is very difficult to expect private sector participation in this area and till that time Public investment must have to come in a big way and without any further delay.[4]

SCOPE OF WORK

- Improve road connectivity.
- Helps for agricultural and economic growth.
- Boosts rural income and infrastructure.
- Village planning for communication, public health and education.
- Easy connectivity from Marunji to Pune city.

MATERIAL

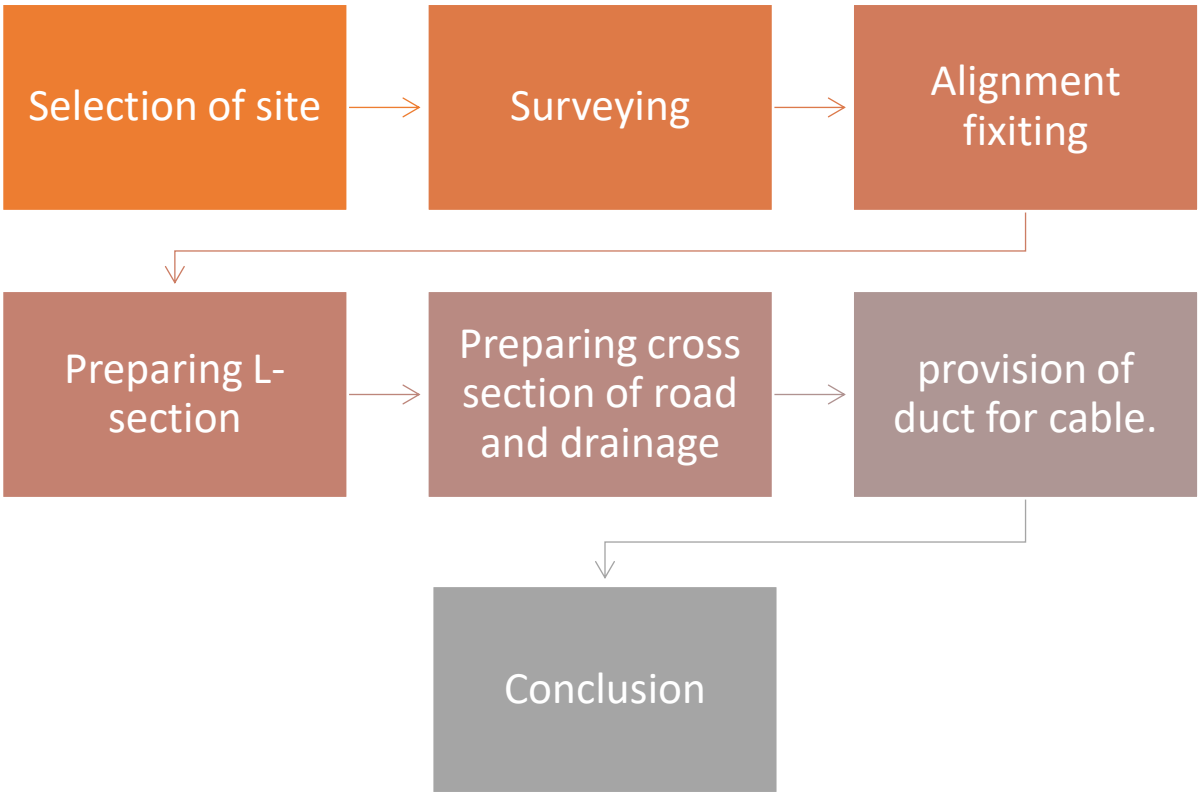
MATERIAL

- Surveying equipment's –
- Tape measure,
- Chain survey,
- Compass,
- dumpy/Auto level.

METHODOLOGY

The methodology adopted would be studying and identifying with the existing conditions. We had studied map, auto level survey and traffic survey then we have design the road.

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UTILIZATION AND ACCEPTABILITY OF ONLINE INFORMATION MANAGEMENT SYSTEM

Christian M. Niebres
Santa Rosa City

CONTEXT AND RATIONALE

Technological progress has accelerated over the last few decades, and this progress has had a profound influence on how people live, work, and learn. With the advent of the Internet, it has become increasingly important for organizations and institutions to establish an online presence in order to reach a wider audience and provide more accessible and convenient services.

Building a website has become an important step in ensuring that schools provide up-to-date and relevant information to their students. A school website can serve as a hub for all school-related activities, such as announcements, and access to learning resources. Additionally, the website helps teachers, students, parents, and administrators communicate more effectively, streamline administrative processes, and increase overall efficiency.

In this context, the Aplaya National High School – Annex utilized the Online Information Management System (OIMS) to aid in distance learning. However, even after the country resumed full face-to-face classes, the OIMS continued to be used. It serves as an online archive for school memoranda and related documents, provides downloadable learning materials, and has an SMS service that notifies teachers when a new announcement or memorandum is uploaded. Nevertheless, before considering the benefits of a school website, it is crucial to ensure that it is usable and accepted by its intended users.

The purpose of this research is to examine the efficiency and approval of the OIMS through testing its usability and acceptability. The study aims to recognize any difficulties encountered during its implementation and assess its effectiveness in facilitating communication, access to learning resources, and streamlining administrative processes. It is important for the school administration to ensure that the OIMS is user-friendly for both teachers and students to maximize its benefits. The findings of this study will aid the school administration in enhancing the usability of the OIMS. This improvement can enhance the efficiency of the school's administrative processes, create a more accessible and convenient learning environment, and improve the overall learning experience for all stakeholders.

Action Research Questions

This study aims to determine the usability and acceptability of the Project Online Information Management System (OIMS) in Aplaya National High School -Annex.

Specifically, sought to answer the following questions:

1. What is the extent of utilization of OIMS in improving school governance in terms of:
    - 1.1 content
    - 1.2 relevance
    - 1.3 suitability
    - 1.4 usability
2. What is the level of acceptability of OIMS in terms of:
    - 2.1 content
    - 2.2 serviceability
    - 2.3 applicability
3. What are the advantages and disadvantages of OIMS in improving school governance?
4. Based on the results, what enhancement may be proposed to improve its performance?

Proposed Innovation, Intervention and Strategy

To improve the implementation of the Online Information Management System, an enhancement program will be conducted to evaluate its effectiveness on the school's administrative processes and learning outcomes. This program will assess the system's usability and acceptability among the school's stakeholders, particularly the students and teachers, and identify any challenges encountered during its implementation. The evaluation results will be used to enhance the system's features and ensure that it is user-friendly and easy to navigate. This will ultimately improve the overall efficiency of the school's administrative processes, provide a more convenient and accessible learning environment, and enhance the learning experience for all its stakeholders.

Action Research Methods

Data will be gathered through various methods, including surveys, interviews, and observation. Surveys will be distributed to teachers and students to gather their feedback on the usability and effectiveness of the OIMS. Interviews will be conducted with school administrators, support staff, and selected teachers to gain a deeper understanding of the implementation process and any challenges encountered. Observation will be used to gather data on how the OIMS is

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being used in the classroom and how it affects the learning outcomes of students.

A. Participants and/or other Sources of Data and Information

The participants of this study will be the teachers and students of Aplaya National High School – Annex. The school administration and support staff who are involved in the implementation of the OIMS will also be included. Other sources of data and information will include school records and documents, such as memoranda and reports, as well as the OIMS website and other related online resources.

B. Data Gathering Methods

Data will be gathered through various methods, including surveys, interviews, and observation. Surveys will be distributed to teachers and students to gather their feedback on the usability and effectiveness of the OIMS. Interviews will be conducted with school administrators, support staff, and selected teachers to gain a deeper understanding of the implementation process and any challenges encountered. Observation will be used to gather data on how the OIMS is being used in the classroom and how it affects the learning outcomes of students.

The research will include ethical considerations to ensure that the participants' data privacy is protected. The researcher will comply with the ethical guidelines set by legal rules and seek permission from the Office of the School Principal to conduct the study. The participants will be informed through letters and e-mails about the data collection process, which will be carried out at a specified time without affecting their schoolwork. The participants' identities will remain anonymous throughout the study, and the data collected from them will be kept confidential.

The collected data will be analyzed using both qualitative and quantitative methods. Qualitative analysis will be used to evaluate the open-ended responses in the surveys and interviews. Themes and patterns will be identified, and these will be used to gain insight into the participants' experiences with the OIMS. Quantitative analysis will be used to analyze the survey data and determine the frequency and percentage of responses to specific questions. Descriptive statistics will also be used to summarize the data.

The results of the data analysis will be used to identify the strengths and weaknesses of the OIMS implementation and inform the proposed innovation, intervention, and strategy to enhance the system.

C. Data Analysis Plan

Action Research Work Plan and Timelines

ACTIVITIES *Shade the corresponding month per activity* *Add rows if necessary*	**Month 1**	**Month 2**	**Month 3**	**Month 4**	**Month 5**	**Month 6**
1. Seek permission from School Head to conduct the study						
2. Validate the researcher-made questionnaire						
3. Conduct research and Administration of the survey using the validated research questionnaire.						
4. Plan activities/ actions based on the result of the action research.						
5. Develop an intervention program for the system based on the result of the action research.						
6. Plan for the implementation of the developed intervention program for OIMS.						

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Plans for Dissemination and Utilization

DISSEMINATION ACTIVITIES *add rows if necessary*	**Month 1**	**Month 2**	**Month 3**	**Month 4**	**Month 5**	**Month 6**
1.Inform the ANHS-Annex personnel for the results of the study.						
2.Use the online evaluation tool in reviewing or assessing Project OIMS.						
3.Results of the status on the implementation of the Project OIMS.						
4. Evaluation of the effectiveness of the Project OIMS.						
5. Recommendation for the sustainability of the project or for enhancement activity program.						

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NOISE POLLUTION AND ITS EFFECTS ON HUMAN HEALTH: A REVIEW

Najmaldin Ezaldin Hassan[1]
[1]*College of Engineering, Civil and Environment Department, University of Zakho, Kurdistan region, Iraq*

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ABSTRACT
Noise pollution is a pervasive environmental issue with significant adverse effects on human health. This abstract explores the impact of noise pollution on both physical and mental well-being, emphasizing its role in increasing risks for cardiovascular diseases, hearing loss, sleep disturbances, and cognitive impairments. Vulnerable populations, including children and the elderly, are particularly affected by high noise levels, which exacerbate stress, anxiety, and depression, and impair cognitive development in children. The economic implications of noise pollution are considerable, with substantial costs associated with healthcare and productivity losses, as well as negative effects on community cohesion and quality of life. Effective noise management is essential, requiring robust regulations, improved urban planning, and heightened public awareness. Further research is needed to understand the long-term health impacts, refine noise reduction technologies, and assess effects on specific populations. Interdisciplinary studies will be crucial in developing comprehensive strategies to mitigate the health impacts of noise pollution.

KEYWORDS: *Noise Pollution; Health Impacts; Noise Reduction Technologies; Economic Costs; Interdisciplinary Research*

1. INTRODUCTION

1.1 Definition of Noise Pollution

Noise pollution, also known as environmental noise or sound pollution, refers to the presence of excessive or harmful levels of noise in the environment that disrupts the normal acoustic balance and adversely affects human health and well-being. According to the World Health Organization (WHO, 2018); Miedema and Oudshoorn (2001), noise pollution is defined as "unwanted or harmful sound emitted by various sources, which can interfere with normal activities such as sleeping, conversation, and working, and can contribute to adverse health effects" (WHO, 2018; Miedema & Oudshoorn, 2001). Noise pollution is typically characterized by its intensity, duration, and frequency, and it can have various sources.

1.2 Importance of Understanding Health Impacts

Studying the impacts of noise pollution on human health is crucial due to the wide range of adverse health effects associated with excessive noise exposure. According to the World Health Organization (WHO, 2018), noise pollution is linked to several health issues, including cardiovascular diseases, hearing loss, and sleep disturbances. The WHO report emphasizes that understanding these impacts is essential for developing effective public health strategies and mitigating the negative effects of noise pollution on populations (WHO, 2018).

Research by Basner et al. (2014) highlights that chronic exposure to high levels of noise can lead to significant health problems such as hypertension, heart disease, and stroke. The study underscores the importance of studying noise pollution's health impacts to inform public health policies and preventive measures. By identifying and quantifying these health risks, researchers can provide evidence-based recommendations to reduce exposure and protect public health (Basner et al., 2014).

1.3 Impact on Mental Health and Cognitive Function

The impact of noise pollution on mental health and cognitive function is another critical area of research. A study by Stansfeld and Matheson (2003) found that noise exposure is associated with increased stress, anxiety, and depression. The study highlights the need for comprehensive research into how noise pollution affects mental well-being and cognitive performance, as these effects can have far-reaching implications for individuals' quality of life and overall health (Stansfeld & Matheson, 2003).

Additionally, research by Stansfeld et al. (2005) discusses the effects of noise pollution on cognitive development in children. The study indicates that exposure to high levels of environmental noise can impair children's learning abilities and academic performance. Understanding these impacts is crucial for developing strategies to protect vulnerable populations, such as children, from the detrimental effects of noise pollution (Stansfeld et al., 2005).

1.4 Social and Economic Implications

Examining the social and economic implications of noise pollution is also vital. A study by Babisch (2006) explores the economic costs associated with noise-induced health problems, including medical expenses and productivity losses. The research emphasizes that quantifying these costs can help policymakers

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and stakeholders make informed decisions about noise management and interventions. By addressing the economic burden of noise pollution, societies can better allocate resources and implement effective measures to reduce noise exposure (Babisch, 2006). Furthermore, research by Weinstein (1978) investigates the broader social impacts of noise pollution, including its effects on social behavior and community well-being. The study highlights that noise pollution can lead to reduced quality of life and social cohesion, underscoring the importance of studying these aspects to develop holistic approaches to noise management and improve overall community health (Weinstein, 1978).

1.5 The Aims of the Review

The comprehensive summaries of the literature are essential to understanding the breadth and depth of research on noise pollution and its health impacts. The primary aim of this review is to summarize and analyze the existing literature on the health effects of noise pollution. A meta-analysis by Basner et al. (2014) supports the importance of such reviews, emphasizing that synthesizing existing research helps in understanding the overall impact of noise pollution on health. The meta-analysis consolidates data from multiple studies to draw broader conclusions about noise-induced health risks. This method of summarization is crucial for developing evidence-based recommendations and public health strategies (Basner et al., 2014).

Another key objective of this review is to analyze the specific health effects of noise pollution as reported in the literature. Research by Babisch (2006) highlights the need for detailed analysis of how noise exposure affects various health outcomes, including cardiovascular disease, hearing loss, and sleep disorders (Babisch, 2006).

Moreover, the review aims to explore the mechanisms through which noise pollution affects health, as discussed by World Health Organization (2011). Understanding these mechanisms is essential for developing targeted interventions and policies. The analysis of existing literature will focus on identifying common pathways and risk factors associated with noise exposure, thereby contributing to more effective noise management strategies (World Health Organization, 2011).

Finally, the review aims to inform policy and practice by providing a consolidated perspective on the health impacts of noise pollution. According to WHO (2018), summarizing and analyzing the literature helps policymakers and practitioners make informed decisions about noise control measures. By presenting a comprehensive overview of the health effects, the review can guide the development of more effective regulations and public health initiatives aimed at reducing noise pollution and its adverse effects (WHO, 2018).

2. SOURCES AND TYPES OF NOISE POLLUTION

2.1 Transportation Noise

2.1.1 Road Traffic Noise

Road traffic noise is a significant source of environmental noise pollution in urban and suburban areas. According to a study by van Kempen et al. (2002), road traffic contributes substantially to overall noise levels, with vehicles generating noise through engine operation, tire-road interactions, and aerodynamic effects. This type of noise is particularly pervasive due to the high volume of vehicles and the continuous nature of road traffic. The study highlights that road traffic noise is associated with various health problems, including increased risk of cardiovascular diseases, increased stress levels and hearing impairment (van Kempen et al., 2002).

A study by Basner et al. (2014) examines the impact of traffic noise on residential areas, noting that vehicles such as cars, trucks, and buses generate high levels of noise that can contribute to elevated noise pollution levels. The study highlights how traffic noise affects public health by increasing stress levels, causing sleep disturbances, contributing to cardiovascular problems, hypertension and impaired cognitive function. The study underscores the need for effective noise management strategies to mitigate the adverse effects of traffic noise on urban populations (Basner et al., 2014).

Another research by Babisch (2006) further explores the health impacts of road traffic noise, emphasizing its correlation with stress-related disorders and sleep disturbances. The study suggests that chronic exposure to road traffic noise can lead to hypertension and elevated cortisol levels. By examining the relationship between road traffic noise and health outcomes, this research underscores the importance of addressing road traffic noise as a public health concern (Babisch, 2006).

2.1.2 Aviation Noise

Aviation noise is another major source of environmental noise, especially in areas near airports. Research by Miedema and Oudshoorn (2001) indicates that noise from aircraft operations can significantly impact residents living near airports, with noise levels potentially reaching high decibels during takeoff and landing. The study finds that aviation noise is linked to adverse health effects, including sleep disturbances, cardiovascular problems, and cognitive impairments in children (Miedema & Oudshoorn, 2001).

The work by Ising and Kruppa (2004) supports these findings, noting that exposure to aviation noise can lead to chronic stress and exacerbate existing health conditions. The study emphasizes the need for effective noise mitigation strategies around airports to protect public health and improve the quality of life for those affected by aviation noise (Ising & Kruppa, 2004).

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2.1.3 Railway Noise

Railway noise, generated by trains and associated infrastructure, is a significant contributor to environmental noise pollution, particularly in areas near railways. A review by Basner et al. (2011) discusses the sources of railway noise, including the noise from train engines, rail-wheel interactions, and the operation of signaling equipment. The study highlights that railway noise can have substantial health impacts, including increased risk of cardiovascular disease, sleep disruption, and reduced quality of life for those living close to railways (Basner et al., 2011).

Additionally, research by Dratva et al. (2012); Van Kempen & Babisch, (2012) explores the specific health effects of railway noise, including its association with stress and annoyance. The study finds that prolonged exposure to railway noise can lead to adverse health outcomes such as hypertension and psychological distress. The research underscores the need for targeted interventions to reduce railway noise and mitigate its impact on public health (Dratva et al., 2012; Van Kempen & Babisch, 2012).

2.2 Industrial Noise

Industrial activities are another major source of noise pollution, with factories and manufacturing plants often producing high levels of noise due to machinery, equipment, and production processes. A study by Stansfeld & Matheson (2003) investigates noise pollution from industrial sources, finding that industrial noise can significantly impact nearby communities by contributing to high noise levels and disrupting daily activities. Research by Basner et al. (2014) indicates that industrial operations, such as manufacturing and processing, produce continuous and often loud noise that can affect workers and nearby communities. The studies emphasizes that noise from industrial sources can lead to hearing loss, sleep disturbances, increased risk of cardiovascular diseases and other health problems (Basner et al., 2014; Stansfeld & Matheson, 2003).

Moreover, research by Van Loenhout et al. (2016) explores the environmental impact of industrial noise, noting that it can affect not only human health but also wildlife and ecosystems. The study emphasizes the importance of implementing noise control measures in industrial settings to reduce the environmental and health impacts of noise pollution (Van Loenhout et al., 2016).

2.2.1 Factory Noise

Factory noise is a significant environmental concern, particularly in industrialized regions where manufacturing activities are concentrated. Research by Neitzel & Seixas (2005) highlights that factory noise primarily originates from machinery, equipment, and production processes. The study notes that this type of noise can lead to various health problems, including hearing loss, stress, and reduced work performance. The constant exposure to high levels of noise in factories necessitates effective noise control measures to protect workers' health and improve workplace conditions (Neitzel & Seixas, 2005).

Another study by Nelson et al. (2005) emphasizes the occupational health risks associated with factory noise. The research finds that prolonged exposure to high noise levels in factories is linked to an increased risk of developing noise-induced hearing loss and other auditory disorders. The study advocates for stringent regulations and the implementation of noise reduction strategies to mitigate these risks and ensure a safer working environment (Nelson et al., 2005).

2.2.2 Construction Site Noise

Construction sites are known for generating significant amounts of noise due to the use of heavy machinery, demolition activities, and material handling. A review by Van Kempen & Babisch (2012) discusses the sources of noise at construction sites, including excavators, bulldozers, and cranes. The study highlights the impact of construction noise on nearby residents and workers, noting that it can lead to sleep disturbances, increased stress levels, and cardiovascular issues (Van Kempen & Babisch, 2012). Research by Berglund et al. (2020) further explores the health impacts of construction noise, finding that it can lead to increased stress levels, sleep disturbances, and reduced quality of life for those living or working near construction sites. The study advocates for the implementation of noise abatement strategies and regulations to minimize the impact of construction noise on affected communities (Berglund et al., 2020).
Additionally, research by Neitzel & Seixas (2005) explores the health effects of construction noise on workers. The study reports that exposure to high noise levels on construction sites can result in auditory fatigue, decreased concentration, and heightened risk of accidents. The research underscores the need for implementing effective noise control measures and providing hearing protection to reduce these adverse effects (Neitzel & Seixas, 2005).

2.2.3 Mining Noise

Mining operations, including both surface and underground mining, generate substantial noise due to drilling, blasting, and machinery. Research by Berglund et al. (2000) examines the sources of noise in mining activities and its impact on both workers and surrounding communities. The study finds that mining noise can contribute to hearing loss, cardiovascular problems, and sleep disorders among workers. It also affects the quality of life of nearby residents, emphasizing the need for improved noise management practices in the mining industry (Dahlberg, 2000).

Another study by Neitzel & Seixas (2005) assesses the health impacts of mining noise, focusing on its effects on worker safety and health. The research highlights that prolonged exposure to mining noise can lead to significant health issues, including hearing impairment, increased blood pressure, and stress-related disorders. The study advocates for the development of noise control technologies and policies to mitigate these health risks and enhance occupational safety (Neitzel & Seixas, 2005).

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2.3 Community Noise

2.3.1 Recreational Activities

Recreational activities, such as loud music events, sports games, and outdoor gatherings, contribute significantly to community noise pollution. A study by Stansfeld and Clark (2015) examines the impact of recreational noise on local communities, particularly focusing on noise from outdoor concerts and sports events. The research highlights that such activities often generate noise levels that exceed acceptable limits, leading to increased noise complaints and health issues among residents. The study emphasizes the need for effective noise management practices during recreational events to mitigate their impact on community well-being (Stansfeld & Clark, 2015).

Research by Basner and McGuire (2018) further explores the health effects of noise from recreational activities, noting that exposure to high levels of noise can cause stress, sleep disturbances, and hearing impairment. The study suggests that noise regulations and noise control measures should be implemented to reduce the adverse effects of recreational noise on public health (Basner & McGuire, 2018).

2.3.2 Public Events

Public events, such as festivals, parades, and demonstrations, are major sources of community noise. A study by Stansfeld et al. (2005) investigates the impact of public events on noise levels and community health. The research finds that large public gatherings often lead to elevated noise levels, which can affect the quality of life of nearby residents. The study highlights the importance of balancing the benefits of public events with the need to manage noise levels to protect community health and well-being (Stansfeld et al., 2005).

Additionally, research by Basner et al. (2014) examines the long-term effects of noise from public events on residents. The study notes that frequent exposure to high noise levels from public events can lead to chronic health issues, including cardiovascular problems and psychological stress. The research advocates for the implementation of noise control strategies and effective event planning to minimize health risks associated with public events (Basner et al. 2014).

2.3.3 Social Gatherings

Social gatherings, such as parties, weddings, and neighborhood events, contribute to community noise pollution, particularly in residential areas. A study by Fields (1993) explores the impact of social gathering noise on residential communities, focusing on noise from private parties and family events. The research finds that noise from these activities can lead to significant disturbances for neighbors, including sleep disruptions and increased stress levels. The study highlights the need for community-based noise regulations and strategies to manage noise from social gatherings (Fields, 1993).

Research by Kang et al (2016) supports these findings, noting that social gathering noise can exacerbate existing health conditions and reduce overall quality of life for residents. The study emphasizes the importance of public education and awareness campaigns to encourage responsible noise management during social events (Kang et al.2016).

Additionally, research by Jarosińska et al. (2018) explores the role of noise regulations in managing noise from social events. The study emphasizes the importance of balancing the need for community events with the need to protect residents from excessive noise pollution. It advocates for the development of guidelines and policies to manage noise levels during public gatherings (Jarosińska et al., 2018).

2.4 Residential Noise

2.4.1 Household Activities

Household activities, including loud appliances, home renovations, and parties, contribute significantly to residential noise pollution. Research by Passchier-Vermeer and Passchier (2000) explores the impact of common household noise sources, such as vacuum cleaners, washing machines, and power tools. The study highlights that these activities can lead to noise levels that disrupt daily life and affect residents' well-being. It emphasizes the importance of noise control measures, such as using quieter appliances and scheduling noisy activities during less sensitive times, to mitigate these effects (Passchier-Vermeer & Passchier, 2000).

Another study by Basner et al. (2014) investigates the health impacts of household noise, finding that exposure to high levels of noise from household activities can result in sleep disturbances, increased stress levels, and cardiovascular issues. The study recommends implementing noise-reducing technologies and improving building insulation to address these health concerns (Basner et al., 2014).

2.4.2 Pets

Pets, particularly dogs and cats, can contribute to residential noise through barking, meowing, and other vocalizations. Research by Appleby et al. (2002) examines the impact of pet noise on residents, noting that pet-related noise can cause significant disturbances and stress for neighbors. The study highlights the need for responsible pet ownership practices, such as training and managing pets' vocalizations, to reduce the impact of pet noise on the community (Appleby et al., 2002).

Additionally, research by Evans and Lepore (1993) explores the psychological effects of pet noise on residents. The study finds that persistent noise from pets can exacerbate existing mental health conditions and contribute to overall stress. The research advocates for public awareness campaigns and community guidelines to address pet noise and improve residential harmony (Evans, & Lepore, 1993).

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2.4.3 Neighbors

Noise from neighbors, including loud music, parties, and social gatherings, is a common issue in residential areas. A study by Stansfeld et al. (2003) investigates the effects of neighbor noise on health, finding that noise from neighboring properties can lead to sleep disturbances, increased stress, and reduced quality of life. The research emphasizes the importance of establishing clear noise regulations and promoting good neighborly relations to manage residential noise effectively (Stansfeld et al., 2003).

Research by Brown and van Kamp (2009) further explores the impact of neighbor noise, focusing on the relationship between residential noise and mental health. The study finds that chronic exposure to noise from neighbors is associated with higher levels of anxiety and depression. It highlights the need for community-based interventions and noise management strategies to address these health impacts (Brown & van Kamp 2009).

3. HEALTH IMPACTS OF NOISE POLLUTION

3.1 Hearing Loss

3.1.1 Chronic Noise Exposure and Hearing Impairment

Chronic exposure to high noise levels is a well-documented cause of hearing impairment. A seminal study by Nelson et al. (2005) reviews the effects of occupational noise exposure on hearing loss, emphasizing that long-term exposure to loud environments significantly increases the risk of both sensorineural and conductive hearing loss. The study highlights that workers in industries such as manufacturing, construction, and mining are particularly vulnerable to hearing damage due to consistent exposure to high noise levels (Nelson et al., 2005).

Further research by Serra et al. (2005) explores the relationship between noise exposure and hearing impairment in non-occupational settings. The study finds that individuals exposed to high noise levels from recreational activities, such as concerts and loud music, also face a heightened risk of hearing loss. The research underscores the importance of protective measures and public awareness to prevent hearing damage from recreational noise (Serra et al., 2005).

3.1.2 Tinnitus and Noise Exposure

Tinnitus, characterized by a persistent ringing or buzzing in the ears, is often associated with chronic noise exposure. A comprehensive review by Henry (2005) examines the link between noise exposure and tinnitus, noting that prolonged exposure to high noise levels can lead to the development and exacerbation of tinnitus. The review highlights that tinnitus can be both a primary condition and a secondary effect of hearing loss caused by noise exposure (Henry, 2005).

In addition, a study by Shore et al. (2016) investigates the mechanisms underlying noise-induced tinnitus. The research reveals that noise-induced hearing damage can lead to alterations in auditory processing pathways, contributing to the perception of tinnitus. The study emphasizes the need for continued research into tinnitus prevention and treatment strategies, particularly in populations exposed to high levels of noise (Shore et al., 2016).

3.2 Cardiovascular Effects

3.2.1 Hypertension

Research indicates a strong correlation between noise pollution and the development of hypertension. A study by Babisch (2008) investigates how chronic exposure to traffic noise affects blood pressure. The research highlights that long-term exposure to elevated noise levels from road traffic can lead to an increase in systolic and diastolic blood pressure, contributing to the development of hypertension. The study concludes that noise pollution is a significant risk factor for high blood pressure and recommends implementing noise control measures to mitigate these effects (Babisch, 2008).

Further research by Van Kempen and Babisch (2012) explores the relationship between noise pollution and hypertension in urban environments. The study finds that individuals living in high-noise areas, such as near busy roads or industrial zones, are at a greater risk of developing hypertension compared to those in quieter areas. The research emphasizes the importance of urban planning and noise abatement strategies to address the cardiovascular risks associated with noise pollution (Van Kempen & Babisch, 2012).

3.2.2 Heart Attacks

The association between noise pollution and heart attacks has been well-documented in several studies. A study by Sørensen et al. (2012) examines the impact of noise exposure on the incidence of myocardial infarction. The research shows that individuals exposed to high levels of noise from sources like road traffic and industrial activities have an increased risk of heart attacks. The study suggests that noise pollution acts as a stressor that contributes to cardiovascular events by elevating stress hormones and disrupting normal physiological processes (Sørensen et al., 2012).

Research by Babisch (2014) provides further evidence of the link between noise pollution and heart attacks. The study analyzes data from multiple cities and finds a significant correlation between long-term exposure to environmental noise and the incidence of myocardial infarction. The research highlights the need for effective noise control measures to reduce the burden of cardiovascular diseases related to noise exposure (Babisch, 2014).

3.2.3 Stroke

Noise pollution has also been associated with an increased risk of stroke. A study by Sørensen et al. (2011) investigates the relationship between environmental noise and the incidence of stroke. The research finds that individuals exposed to high levels of noise, particularly from road traffic, are at a greater risk of experiencing stroke compared to those in quieter environments. The study attributes this risk to the effects of noise on blood

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pressure and stress levels, which can contribute to stroke (Sørensen et al., 2011).

Further research by Halonen et al. (2015) explores the effects of noise pollution on stroke risk, focusing on urban populations. The study shows that exposure to chronic noise pollution is linked to an increased incidence of stroke, highlighting the role of noise as a significant public health issue. The study recommends integrating noise reduction strategies into public health policies to address the cardiovascular risks associated with noise pollution (Halonen et al., 2015).

3.3 Mental Health

3.3.1 Stress

Noise pollution has been shown to significantly impact mental health, particularly through increased stress levels. A study by Stansfeld and Matheson (2003) reviews the relationship between environmental noise and psychological stress. The research finds that chronic exposure to high levels of noise from traffic and industrial sources can lead to elevated stress responses, including higher levels of cortisol, a stress hormone. The study emphasizes that managing environmental noise is crucial for reducing stress-related health issues (Stansfeld & Matheson, 2003).

Another study by Evans and Lepore (1993) investigates the effects of noise pollution on stress among urban populations. The study shows that individuals living in high-noise environments experience higher levels of perceived stress, which can negatively affect overall well-being. The research suggests that noise mitigation strategies and improved urban planning are essential for addressing the stress-related impacts of noise pollution (Evans & Lepore, 1993).

3.3.2 Anxiety

Noise pollution is also linked to increased anxiety levels. A study by Tortorella et al. (2022) examines the correlation between noise exposure and anxiety disorders. The research finds that chronic exposure to environmental noise is associated with higher anxiety levels and increased prevalence of anxiety disorders among affected individuals. The study highlights the need for public health interventions and noise reduction policies to address anxiety related to noise pollution (Tortorella et al., 2022).

Further research by WHO (2018) provides additional evidence on the impact of noise pollution on mental health, focusing on anxiety. The report discusses how noise can disrupt sleep and contribute to anxiety disorders, particularly in urban areas with high noise levels. The World Health Organization emphasizes the importance of reducing noise pollution to improve mental health outcomes and quality of life (WHO, 2018).

3.3.4 Depression

The relationship between noise pollution and depression has been well-documented in various studies. Research by Liu et al. (2021) investigates the effects of noise pollution on depressive symptoms. The study finds that exposure to high levels of noise from sources like road traffic and construction can contribute to the development of depression. The research suggests that reducing noise exposure through urban planning and noise abatement measures can help mitigate these effects (Liu et al., 2021).

A study by Sygna et al. (2014) explores the impact of noise pollution on depressive disorders, finding a significant correlation between chronic noise exposure and increased risk of depression. The research highlights the role of noise in exacerbating mental health conditions and advocates for comprehensive noise management strategies to address these issues (Sygna et al., 2014).

3.4 Sleep Disturbance

3.4.1 Insomnia

Noise pollution is a well-documented contributor to sleep disturbances, including insomnia. A study by Basner et al. (2014) investigates the effects of environmental noise on sleep quality and insomnia. The research shows that exposure to high levels of noise, particularly from road traffic and aircraft, can lead to significant disruptions in sleep patterns and an increased incidence of insomnia. The study highlights that persistent noise exposure can lead to difficulties in falling asleep, frequent awakenings, and reduced overall sleep duration (Basner et al., 2014).

Further research by Miedema and Vos (1998) explores the relationship between noise exposure and insomnia in urban populations. Their study finds that individuals exposed to chronic noise pollution are at a higher risk of developing insomnia symptoms. The research suggests that noise mitigation strategies, such as sound insulation and reduced noise emissions, are crucial for improving sleep quality and reducing the prevalence of insomnia (Miedema & Vos, 1998).

3.4.2 Sleep Apnea

The impact of noise pollution on sleep apnea has also been studied extensively. Research by Halonen et al. (2012) examines how noise exposure contributes to the development and exacerbation of sleep apnea. The study finds that individuals exposed to high levels of environmental noise are at an increased risk of developing sleep apnea, a condition characterized by repeated interruptions in breathing during sleep. The research attributes this risk to the physiological stress responses triggered by chronic noise exposure, which can disrupt normal sleep patterns and exacerbate sleep apnea (Halonen, et al., 2012).

Additionally, a study by Basner and McGuire (2018) investigates the relationship between noise pollution and obstructive sleep apnea. The research shows that noise-induced sleep disturbances can contribute to the severity of sleep apnea, highlighting the need for effective noise control measures to manage sleep-related health issues. The study emphasizes that addressing noise pollution can be beneficial in reducing the impact of sleep apnea on affected individuals (Basner & McGuire, 2018).

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3.5 Cognitive Function

3.5.1 Cognitive Performance

Noise pollution has been shown to negatively impact cognitive performance, affecting various aspects of mental functioning. A study by Hygge et al. (2002) examines how exposure to environmental noise impairs cognitive performance in adults. The research finds that chronic noise exposure, particularly from traffic, can lead to decreased performance on tasks requiring attention, problem-solving, and working memory. The study highlights that noise pollution disrupts cognitive processes by increasing stress and reducing the ability to focus (Hygge et al., 2002).

Further research by Jahncke et al. (2011) explores the effects of noise on cognitive performance in office environments. The study demonstrates that noise exposure impairs performance on tasks involving complex cognitive processes, such as reading comprehension and mental arithmetic. The researchers attribute these effects to the cognitive load imposed by background noise, which competes with the mental resources needed for task performance (Jahncke et al., 2011).

3.5.2 Learning

The impact of noise pollution on learning, particularly in educational settings, has been extensively studied. A seminal study by Evans and Lepore (1993) investigates the effects of noise on children's learning outcomes in schools. The research finds that high levels of classroom noise negatively affect students' ability to learn, leading to lower academic performance. The study emphasizes that noise pollution disrupts the learning environment, making it harder for students to concentrate and absorb information (Evans & Lepore, 1993).

Another study by Shield and Dockrell (2008) examines the relationship between noise exposure and learning in primary school children. The research highlights that exposure to traffic noise and other environmental noise sources can adversely affect children's academic achievement and cognitive development. The study calls for noise control measures in schools to improve learning conditions and support better educational outcomes for children (Shield & Dockrell, 2008).

3.5.3 Memory

Noise pollution has also been linked to impairments in memory function. A study by Hygge et al. (2002) explores how noise affects memory performance in young adults. The research finds that exposure to noise disrupts memory consolidation processes, leading to poorer recall and retention of information. The study suggests that the interference caused by noise can hinder the ability to encode and retrieve memories effectively (Hygge et al., 2002).

Research by Stansfeld et al. (2005) investigates the impact of noise pollution on memory in children. The study finds that children exposed to high levels of environmental noise exhibit deficits in both working memory and long-term memory. The research highlights that noise-induced stress and cognitive overload contribute to these memory impairments, underscoring the need for quieter learning environments to support cognitive development (Stansfeld et al., 2005).

3.6 Impact on Children

3.6.1 Child Development

Noise pollution can significantly impact child development, affecting various aspects of physical and cognitive growth. A study by Stansfeld and Clark (2015) examines the effects of environmental noise on children's development, finding that exposure to high levels of noise can hinder cognitive development and emotional regulation. The research highlights that children in noisy environments are at risk of developmental delays, including issues with language acquisition and executive function (Stansfeld & Clark, 2015).

Further research by Berglund et al. (2000) supports these findings, showing that noise pollution can disrupt early childhood development. The study indicates that noise exposure during critical developmental periods can lead to long-term developmental challenges, including impaired social skills and lower academic achievement. The research emphasizes the importance of reducing noise exposure to support optimal child development (Berglund et al., 2000).

3.6.2 Academic Performance

The impact of noise pollution on academic performance in children has been well-documented. A study by Haines et al. (2001) investigates how noise affects children's academic outcomes in schools. The research finds that chronic exposure to noise from traffic and other sources can lead to reduced academic performance, particularly in areas such as reading and mathematics. The study underscores the need for noise control measures in educational settings to improve learning conditions and academic achievement (Haines et al., 2001).

Another study by Evans and Lepore (1993) explores the relationship between noise exposure and academic performance among school-aged children. The findings reveal that higher levels of environmental noise are associated with lower scores on standardized tests and decreased overall academic performance. The research highlights the detrimental effects of noise on cognitive processes essential for learning and academic success (Evans & Lepore, 1993).

3.6.3 Behavioral Issues

Noise pollution can also contribute to behavioral issues in children, such as increased aggression and hyperactivity. A study by Evans and Lepore (1993) examines the relationship between noise exposure and behavioral problems in children. The research finds that chronic noise exposure is associated with increased levels of aggression, impulsivity, and behavioral difficulties. The study suggests that noise acts as a stressor, negatively influencing children's behavior and social interactions (Evans & Lepore, 1993).

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Further investigation by Hygge et al. (2002) supports these findings, showing that noise pollution can lead to heightened stress responses and behavioral issues in children. The study highlights that noise exposure can exacerbate existing behavioral problems and contribute to new issues, such as attention deficits and increased anxiety. The research emphasizes the need for interventions to reduce noise exposure and mitigate its effects on child behavior (Hygge et al., 2002).

4. GLOBAL AND REGIONAL TRENDS IN NOISE POLLUTION

4.1 Low-Income Communities

Low-income communities often experience higher levels of exposure to noise pollution due to their proximity to sources of noise such as major roads, industrial areas, and airports. Research by Evans and Marcynyszyn (2004) highlights that socio-economic disparities lead to increased noise exposure for disadvantaged populations. The study shows that lower-income neighborhoods are more likely to be located near high-traffic areas and industrial facilities, resulting in higher noise levels compared to wealthier neighborhoods (Evans & Marcynyszyn, 2004).

Additionally, a study by Carrier et al. (2016) finds that socio-economic factors contribute to greater exposure to environmental noise in low-income communities. The research suggests that these communities are often situated in areas with inadequate noise barriers and are more exposed to noise from transportation and industrial sources (Carrier et al., 2016).

The health impacts of noise pollution are disproportionately severe in low-income communities, where residents are more vulnerable to noise-related health problems. Research by Basner et al. (2014) shows that individuals in disadvantaged communities experience higher rates of cardiovascular diseases, mental health issues, and hearing loss due to chronic noise exposure. The study emphasizes that the compounded effects of socio-economic disadvantage and noise pollution exacerbate health disparities in these populations (Basner et al., 2014).

Moreover, a study by Ising and Kruppa (2004) highlights that low-income communities are more likely to suffer from stress-related health conditions linked to noise pollution. The research finds that chronic exposure to high noise levels contributes to increased stress and associated health problems, such as hypertension and anxiety, which are more prevalent in socio-economically disadvantaged groups (Ising & Kruppa, 2004).

Disadvantaged communities often lack the resources necessary to mitigate the effects of noise pollution, including access to noise barriers, soundproofing, and other noise reduction measures. A study by Haines et al. (2002) examines the socio-economic barriers to noise mitigation in low-income neighborhoods, finding that these communities are less likely to have the financial means to invest in noise-reducing measures or to advocate for noise abatement policies (Haines et al., 2002).

Furthermore, research by Evans and Marcynyszyn (2004) shows that low-income communities face greater challenges in implementing effective noise control measures. The study finds that inadequate housing conditions and limited community resources contribute to higher exposure to noise pollution and poorer health outcomes in these areas (Evans & Marcynyszyn, 2004).

4.2 Global Overview: Trends in Noise Pollution

Global trends indicate that noise pollution is a growing concern, with significant increases in noise levels due to urbanization, industrialization, and transportation. The World Health Organization (WHO) highlights that noise pollution is prevalent in many urban areas worldwide, with growing evidence of its impact on health and well-being. The WHO's report on environmental noise pollution underscores the widespread issue of increasing noise levels in cities and the need for effective management strategies (WHO, 2018).

Additionally, the United Nations Environment Programme (UNEP) reports that noise pollution has become a global environmental issue, with urban areas experiencing elevated noise levels from traffic, construction, and industrial activities. The UNEP's Global Environmental Outlook emphasizes the need for comprehensive noise management and reduction strategies to address this growing problem (Citaristi, 2022).

The health impacts of noise pollution are increasingly recognized as a significant public health issue. According to the WHO, exposure to high levels of environmental noise is associated with various health problems, including cardiovascular diseases, hearing loss, and mental health issues. The WHO's Environmental Noise Guidelines provide a comprehensive overview of the adverse health effects related to noise pollution and offer recommendations for managing noise exposure (WHO, 2018). In low- and middle-income countries often face higher exposure levels due to rapid urbanization and limited noise control measures. This underscores the need for targeted interventions to address noise pollution in high-risk regions.

4.3 Regional Focus

In North America, noise pollution is a significant issue due to high levels of urbanization and transportation infrastructure. Research by Babisch (2011) discusses the increasing noise levels in major North American cities and their associated health impacts. The study highlights that city like New York and Los Angeles experience elevated noise levels from traffic, which contributes to various health problems including cardiovascular diseases and impaired sleep quality (Babisch, 2011).

A study by Stansfeld and Matheson (2003) further explores the impact of noise pollution in Europe, emphasizing the correlation between noise exposure and adverse health effects. The research highlights that chronic exposure to noise is associated with

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increased risks of hypertension, heart disease, and stress-related conditions in European populations (Stansfeld & Matheson, 2003).

Asia faces significant challenges related to noise pollution due to rapid urbanization and industrialization. A study by Das and Basak (2020) examines noise pollution trends in major Asian cities, revealing high levels of noise from traffic and construction activities. The research highlights that these elevated noise levels are associated with a range of health problems, including hearing loss, cardiovascular diseases, and mental health issues (Das & Basak, 2020).

4.4 Technological Solutions in Noise Reduction

4.4.1 Quieter Machinery

Advancements in machinery design have significantly contributed to noise reduction. Modern engineering practices focus on reducing noise emissions from industrial and construction equipment. For example, research by Bies et al. (2017) highlights the development of quieter machinery through improved design and material selection. The study discusses innovations such as quieter engines and mufflers, which have been effective in lowering noise levels in various industrial applications (Bies et al., 2017).

Similarly, the International Organization for Standardization (ISO) has established standards for reducing noise from machinery. ISO 11688-1:1995 provides guidelines for the design and construction of machinery to minimize noise emissions. The implementation of these standards has led to significant improvements in machinery noise control, benefiting both industrial workers and nearby communities (Manvell, 2024).

4.4.2 Sound Insulation Materials

The development of advanced sound insulation materials has played a crucial role in reducing noise pollution. Materials such as acoustic panels, foams, and composites are designed to absorb and block sound effectively. Research by Gao et al. (2022) reviews the latest innovations in sound insulation materials, including the use of porous materials and acoustic metamaterials, which offer enhanced sound attenuation properties (Gao et al. 2022).

Furthermore, advancements in building construction have integrated these materials into architectural designs to improve noise control. For example, the use of double-glazed windows and acoustic insulation in walls and floors has been shown to significantly reduce indoor noise levels (Crocker et al., 2018). These solutions are widely implemented in both residential and commercial buildings to enhance acoustic comfort.

4.4.3 Noise-Canceling Devices

Noise-canceling technology has advanced significantly with the development of active noise control systems. These systems use microphones and speakers to detect and counteract unwanted noise through sound wave interference. Research by Lee et al. (2021) provides a comprehensive review of noise-canceling technologies, including adaptive algorithms and real-time noise reduction systems used in headphones and other personal devices (Lee et al., 2021).

In addition to consumer electronics, noise-canceling technology is also being applied in larger-scale environments such as aircraft cabins and offices. The integration of these systems has been shown to improve acoustic comfort and reduce the impact of noise pollution on health and productivity (Hsu et al., 2014).

4.5 Public Awareness and Education: Role in Reducing Noise Pollution Exposure

4.5.1 Public Awareness Campaigns

Public awareness campaigns are essential for educating individuals about the health risks associated with noise pollution and encouraging behavioral changes to reduce exposure. Research by Basner et al. (2014) highlights the effectiveness of noise pollution awareness campaigns in urban settings. The study demonstrates that increased public awareness leads to higher community engagement in noise reduction efforts and supports the implementation of noise control measures (Basner et al., 2014).

Additionally, the World Health Organization (WHO) emphasizes the importance of public education in managing noise pollution. The WHO's guidelines on noise pollution recommend targeted public awareness campaigns to inform citizens about the health impacts of noise and promote practices that can mitigate exposure (WHO, 2018).

4.5.2 Community Engagement

Community engagement plays a critical role in addressing noise pollution by involving local residents in noise reduction initiatives and policy-making processes. A study by King et al. (2009) explores successful community engagement strategies in noise management, highlighting that involving community members in decision-making fosters a sense of ownership and responsibility, leading to more effective noise control outcomes (King et al., 2009).

Furthermore, the European Environment Agency (EEA) reports that community involvement in noise pollution management can significantly enhance the effectiveness of noise abatement strategies. The EEA's report underscores that community-driven initiatives, such as local noise monitoring and reporting systems, contribute to a better understanding of noise issues and promote collective action to reduce noise pollution (EEA, 2014).

4.5.3 Educational Programs

Educational programs targeting schools and workplaces are vital for raising awareness about noise pollution and promoting preventive measures. A study by Basner et al. (2014) examines the impact of educational programs on noise awareness in schools, finding that such programs effectively increase students' understanding of noise pollution and encourage them to adopt quieter behaviors (Basner et al., 2014).

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Moreover, workplace noise education programs are crucial for protecting employees from noise-related health issues. Research by Lusk et al. (1999) highlights the success of workplace educational initiatives in reducing noise exposure and preventing occupational hearing loss. The study indicates that well-designed educational programs can lead to significant improvements in noise management practices and employee health (Lusk et al., 1999).

5. CHALLENGES AND FUTURE DIRECTIONS

5.1 Research Gaps: Identifying Areas for Further Study

While significant research has been conducted on the health impacts of high-level noise exposure, there is a need for further investigation into the long-term effects of low-level noise exposure. Research by Münzel et al. (2018) emphasizes the gap in understanding how chronic exposure to low-level noise affects health outcomes over extended periods. This includes potential impacts on cardiovascular health, mental health, and overall quality of life. The study suggests that more longitudinal research is needed to better understand these effects and inform public health recommendations (Münzel et al., 2018).

Additionally, the World Health Organization (WHO) has identified a need for further studies on low-level noise exposure to address this research gap. Their review indicates that while high-level noise exposure is well-documented, the health consequences of prolonged exposure to lower levels of noise remain underexplored, particularly in terms of chronic health conditions and vulnerable populations (WHO, 2018).

5.1.1 Impact of Emerging Noise Sources

The rapid development of new technologies and changes in urban environments have introduced new sources of noise pollution, which require further research. For instance, the rise of electric vehicles (EVs) presents new challenges for noise monitoring and regulation. Research by Campello-Vicente (2017) highlights that while EVs are generally quieter than traditional vehicles, they may still contribute to noise pollution in different ways, such as increased noise from tire friction and road surface interactions. Understanding the full impact of these emerging sources is crucial for developing effective noise control strategies (Campello-Vicente, 2017).

Moreover, the proliferation of digital and virtual technologies, such as online gaming and virtual reality, introduces novel noise sources that may impact residential and commercial noise environments. A study by Baliatsas et al. (2016) suggests that these new forms of noise require additional research to assess their potential health impacts and to develop appropriate mitigation measures (Baliatsas et al., 2016).

5.2 Policy Challenges: Barriers to Effective Noise Pollution Control

5.2.1 Political Challenges

Political challenges often impede the implementation of effective noise pollution control policies. One significant issue is the lack of political will or prioritization of noise pollution in comparison to other environmental and public health issues. Research by Stansfeld and Matheson (2003) highlights how noise pollution is frequently deprioritized in policy agendas, despite its significant impact on public health. This lack of prioritization can lead to insufficient regulatory measures and enforcement (Stansfeld & Matheson, 2003).

Furthermore, political fragmentation and differing priorities across jurisdictions can complicate efforts to address noise pollution comprehensively. For example, decentralized decision-making in federal systems can result in inconsistent noise regulations and enforcement practices, as noted by Miedema and Oudshoorn (2001) in their study on noise policy in the European Union (Miedema & Oudshoorn, 2001).

5.2.2 Economic Challenges

Economic factors also play a crucial role in the effectiveness of noise pollution control measures. Implementing noise control technologies and infrastructure improvements often requires significant financial investment, which can be a barrier for both governments and businesses. A study by Guski et al. (2017) discusses how economic constraints can limit the adoption of advanced noise reduction technologies and the enforcement of noise regulations, particularly in lower-income regions (Guski et al., 2017).

Additionally, the economic impacts of noise regulations on industries can lead to resistance against stringent noise control measures. For instance, industries may argue that noise reduction measures increase operational costs, leading to lobbying against such regulations. This economic resistance can delay or hinder the implementation of effective noise control policies (Andersen & Liefferink, 1997).

5.2.3 Social Challenges

Social challenges, including public awareness and community engagement, also affect noise pollution control efforts. Research by Basner et al. (2014) indicates that public awareness of noise pollution and its health impacts is often low, which can reduce the pressure on policymakers to address the issue. Without widespread public concern, there is less motivation for governments to prioritize and enforce noise control measures (Basner et al., 2014).

Furthermore, socio-economic disparities can exacerbate the challenges of noise pollution control. Low-income communities, which often experience higher levels of noise pollution, may lack the resources and political influence to advocate for effective noise control policies. Research by Morello-Frosch and Shenassa (2006) shows that marginalized communities are disproportionately affected by noise pollution and face greater challenges in achieving noise mitigation due to limited resources and political clout (Morello-Frosch & Shenassa, 2006).

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5.3 Innovative Approaches: Future Directions for Research and Policy

5.3.1 Integration of Noise Mapping

Integrating advanced noise mapping techniques into urban planning is a crucial step toward more effective noise pollution management. Noise maps provide detailed spatial information about noise levels and sources, allowing for targeted interventions. Research by Gaja (2003) highlights the benefits of noise mapping for identifying high-exposure areas and evaluating the effectiveness of noise reduction strategies. The integration of noise maps into urban planning can guide the design of noise barriers, zoning regulations, and land-use planning to minimize exposure in sensitive areas (Gaja, 2003).

Furthermore, advancements in noise mapping technology, such as the use of geographic information systems (GIS) and real-time monitoring, can enhance the accuracy and utility of noise maps. A study by Steele (2001) demonstrates how GIS-based noise mapping can support more effective policy development and public awareness efforts by providing dynamic and interactive noise information. Continued research into improving noise mapping technologies and methodologies is essential for advancing noise control efforts (Steele, 2001)

5.3.2 Urban Planning Strategies

Urban planning strategies that incorporate noise reduction principles can significantly mitigate noise pollution. Incorporating noise considerations into land-use planning and building design helps create quieter and healthier urban environments. Yang and Kang (2005) underscores the importance of integrating noise considerations into urban planning to reduce exposure and improve public health outcomes. Strategies such as the strategic placement of green spaces, noise barriers, and the use of sound-insulating materials in building construction are effective approaches (Yang & Kang, 2005).

Additionally, adopting "smart city" concepts that leverage data analytics and real-time monitoring can enhance urban planning efforts. A study by Ahvenniemi et al. (2017) explores how smart city technologies can be used to monitor and manage noise pollution more effectively. These technologies can provide real-time noise data, enabling dynamic adjustments to urban planning and noise control measures based on current conditions (Ahvenniemi et al., 2017).

5.3.3 Public Participation and Policy Innovation

Engaging the public in noise pollution management and policy development is another innovative approach. Public participation can enhance the effectiveness of noise control measures by incorporating local knowledge and preferences. Research by Koseoglu et al. (2017) highlights the benefits of involving communities in noise pollution management, including improved acceptance and compliance with noise reduction strategies (Koseoglu et al., 2017).

Innovative policy approaches, such as the use of economic incentives and behavioral interventions, can also support noise reduction efforts. A study by Dzhambov et al. (2020) explores the potential of economic tools, such as noise-related taxes or subsidies, to encourage noise reduction in both residential and industrial contexts. Integrating behavioral interventions, such as public awareness campaigns and community-based noise management programs, can further support these efforts (Dzhambov et al., 2020).

CONCLUSIONS

Noise pollution adversely affects both physical and mental health, with significant consequences for vulnerable groups such as children and the elderly. High noise levels are linked to an increased risk of cardiovascular diseases, hearing loss, sleep disturbances, and cognitive impairments. Additionally, noise pollution exacerbates stress, anxiety, and depression, and impairs cognitive development in children.

The economic costs of noise pollution are substantial, encompassing healthcare expenses and productivity losses, while also negatively impacting community cohesion and quality of life. This underscores the urgent need for effective noise management strategies, which include the implementation of regulations, enhanced urban planning, and increased public awareness.

To better address these challenges, further research is essential. More studies are needed to understand the long-term health effects of noise pollution, refine noise reduction technologies, and explore the impacts on specific populations. Interdisciplinary research will be crucial in developing comprehensive solutions and improving noise control strategies.

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HYBRID MODELS OF KINGSHIP: ARYAN AND TAMIL INFLUENCES IN CHOLA GOVERNANCE

Dr.B.Vijayalakshmi
Assistant Professor, PG Department of History, Khadir Mohideen College (Affiliated to Bharathidasan University, Tamil Nadu), Adirampattinam

ABSTRACT

The Chola dynasty, one of South India's most influential kingdoms, stands as a testament to a unique governance model that skillfully blended diverse cultural influences. This research examines the hybrid model of kingship in Chola governance, analyzing the intricate interplay between Aryan and Tamil influences that shaped its administrative, religious, and ideological structures. Through this study, we seek to unravel how these dual cultural streams contributed to a distinctive form of kingship that both reflected and adapted to the socio-political complexities of the Chola period.The research highlights Aryan influences seen in the incorporation of Dharmic principles, hierarchical structures, and administrative practices, which were rooted in Vedic traditions. These were adapted to align with Tamil cultural values, including an emphasis on local governance, kinship-based authority, and community-centric rituals. The Tamil influence, integral to Chola identity, emphasized a unique political ideology that prioritized regional autonomy, the role of Tamil language and literature, and integration of indigenous religious practices. This study reveals how Aryan religious practices were reinterpreted within Tamil cultural frameworks, leading to a governance model that reinforced Chola authority while preserving regional traditions. This synthesis of influences allowed the Cholas to maintain a stable rule and expand their influence across South Asia. Ultimately, this research underscores the importance of studying hybrid governance models in ancient Indian history. Understanding the Chola model offers insights into how cultural synthesis shaped pre-modern states, facilitating the coexistence of diverse religious, linguistic, and ideological traditions. This study contributes to broader discussions on cultural adaptation and the legacy of hybrid governance in the Indian subcontinent, shedding light on how the Chola dynasty's unique approach influenced South Asian kingship practices for centuries.

KEYWORDS: *Chola dynasty, Chola governance, Aryan influences, Dharmic principles, Cultural synthesis, Ancient Indian history*

1. INTRODUCTION

The Chola dynasty (9th-13th centuries CE) stands out as a powerful and influential South Indian empire, known for its military strength, territorial expansion, and advanced governance model. Originating along the Kaveri River, the Cholas expanded across Tamil Nadu and parts of Southeast Asia, reshaping the political and cultural landscape of South India. Their era is marked by architectural marvels like the temples of Tanjore and GangaikondaCholapuram, which not only served as religious centers but also anchored economic and social life. These temples provide key insights into Chola administration, emphasizing their commitment to public welfare, economic stability, and artistic patronage, making the period a "golden age" of Tamil culture.

The Cholas developed a hybrid kingship model blending Aryan and Tamil elements, merging Dharmic principles and divine kingship from Aryan traditions with Tamil customs of local governance, community-based authority, and language. This synthesis allowed the Chola kings to centralize power while respecting regional identities, fostering unity that strengthened their enduring rule. Their approach to governance reveals the broader dynamics of cross-cultural exchange in South Asia and highlights the Chola dynasty's role in shaping South Indian identity.

Research Question

The Chola dynasty is renowned for its powerful and lasting influence in South Indian history, but what set it apart was its distinctive kingship style, which fused Aryan and Tamil elements. This integration of diverse traditions not only solidified the Cholas' authority but also shaped their governance structures, religious practices, and cultural legacy in profound ways. Understanding how the Cholas blended these influences offers insight into the foundation of their rule and the lasting impact they left on South Indian civilization.

How did the Chola dynasty cultivate a unique model of hybrid kingship through the synthesis of Aryan and Tamil influences, and what specific effects did this integration have on their governance structures, religious practices, and cultural legacy in South India?

Research Gaps

Research gaps exist in exploring how the Cholas synthesized these influences. While Aryan and Tamil impacts on Chola rule are studied separately, there is limited analysis of their integration. Additionally, Chola temples as hybrid institutions, the role of localized governance within imperial structures, and adaptations in overseas territories need further study. Limited primary source analysis on hybrid governance has also left these intersections underexplored. In exploring these gaps, this

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research aims to provide a cohesive understanding of Cholakingship and to contribute to broader discussions on hybrid governance within multicultural states.

Objectives

1. Examine Aryan cultural and religious influences on Chola kingship, including Dharmic principles and hierarchical governance.
2. Analyze the role of Tamil traditions in shaping Chola kingship, emphasizing local governance and cultural identity.
3. Investigate the process of hybridization between Aryan and Tamil influences within the Chola dynasty.
4. Explore the impact of this hybrid model on the dynasty's stability, expansion, and diplomatic relations.
5. Contribute to understanding cross-cultural adaptation in ancient Indian governance, using the Chola dynasty as a case study.

2. LITERATURE REVIEW

Sastri (1955) details how the Cholas effectively ruled a vast empire, spanning from Tamil Nadu to Southeast Asia, through the integration of local village assemblies, or sabhas, into their governance framework. This approach empowered local communities within a broader centralized system.

Stein (1980) and Karashima (1984) further reveal, through temple inscriptions and land records, a bureaucratic system that engaged local landowners and merchants, thus balancing centralized authority with local oversight. This approach, as these scholars argue, was central to the stability and longevity of Chola rule.

Thapar (2004) examines the adoption of Aryan principles by South Indian dynasties like the Cholas. Aryan concepts of dharma and divine kingship helped reinforce the Cholas' legitimacy, as they aligned themselves with deities through religious practices associated with Shaivism and Vaishnavism. This connection to divinity emphasized the king's role as a divinely sanctioned authority, enhancing the Chola rule's ideological foundation.

Hart (1975) and Ramanujan (1985) highlight the Tamil conception of kingship, emphasizing the king's reciprocal relationship with his subjects. These scholars note that this cultural expectation of a "venthan" (king) as a protector and benefactor influenced the Chola rulers to incorporate regional customs and kinship structures.

Champakalakshmi (1996) points out that the Cholas actively promoted the Tamil language and literature, using them to foster a strong cultural identity that resonated locally, distinguishing the Chola dynasty from other rulers.

The concept of hybrid kingship, combining Aryan and Tamil elements, is explored by Kulke (1995), who suggests that this blending was instrumental in sustaining political stability and appealing to both local and wider audiences.

Champakalakshmi (1996) emphasizes the role of temples as symbolic and administrative centers that fused Aryan and Tamil cultural elements, serving as a practical manifestation of hybrid kingship that unified diverse communities under a single rule.

3. METHODOLOGY

This research on Chola kingship explores how Aryan and Tamil influences combined to form a hybrid governance model. Using a qualitative historical analysis, the study examines inscriptions, royal decrees, temple records, and archaeological findings.

Research Design

Contextualizationsituates the Chola dynasty within South India's broader historical context.

Documentary analysis of primary and secondary sources reveals how Chola rulers expressed authority through a blend of cultural elements.

Comparative Analysis with other regional empires identifies unique features in Chola kingship.

Data Collection

Primary sources include inscriptions, temples, and historical texts like Periya Puranam, documenting Chola governance and cultural integration.

Secondary sources (books, theses) provide interpretations, filling gaps in the literature.

Analytical Framework

Comparative analysis contrasts Aryaand Tamil elements.
Thematic analysis identifies themes like divine kingship, community rule, and religious syncretism.
Contextual interpretation explores socio-political influences and cultural exchanges.
Cross-referencing validates findings across multiple sources, ensuring accuracy.

4. ARYAN INFLUENCES ON CHOLA KINGSHIP

The Chola dynasty, a key force in South Indian history, integrated crucial Aryan concepts, particularly Dharma and Varna, into its kingship. These principles bolstered the Cholas' legitimacy, structured their governance, and strengthened their religious authority, creating a solid foundation for their rule. Additionally, the Chola dynasty was instrumental in the development of regional identity and cultural synthesis, which had lasting impacts on South Indian society.

i. Dharma as a Guiding Principle

The Chola kings adopted Dharma to legitimize their rule and reinforce their role as protectors of justice. They enacted laws and policies that reflected moral and ethical standards, emphasizing their responsibilities toward their subjects. Through public rituals and ceremonies, they presented themselves as intermediaries between the divine and earthly realms, underscoring their commitment to maintaining cosmic order (Rita) and moral authority. The Chola kings also

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emphasized their duty to uphold Dharma in times of crisis, further solidifying their image as righteous rulers.

ii. Varna and Social Order

The Chola kings embraced their Kshatriya identity, aligning with Aryan ideals of kingship as a warrior duty. They maintained a hierarchical social structure that ensured loyalty and stability. Their alliance with Brahmins through land grants and privileges secured ritual support, reinforcing the social hierarchy that upheld Chola authority. This collaboration not only enhanced the kings' religious legitimacy but also facilitated the administration of their vast empire, integrating local customs with Aryan traditions.

iii. Temple Patronage and Religious Syncretism

The Chola rulers' temple-building efforts, such as the iconic Brihadeeswarar Temple, showcased a blend of Aryan and Tamil religious elements. These monumental structures served as cultural and economic centers, attracting pilgrims and fostering trade. The Cholas' patronage of art, architecture, and literature reflected a synthesis of diverse traditions, contributing to a rich cultural heritage. This patronage reinforced their divine status and strengthened their role as cultural leaders, promoting a shared religious identity that transcended regional boundaries.

iv. Military Conquests and Political Expansion

The Chola dynasty's military prowess and strategic conquests further illustrated their commitment to Aryan ideals of kingship. Expanding their territory through military campaigns, the Chola kings positioned themselves as protectors of the realm, responsible for safeguarding the principles of Dharma across their domains. Their victories enhanced their wealth and influence, providing them with the means to support religious and cultural initiatives.

v. Cultural Legacy and Influence

The integration of Aryan concepts into Chola governance established a model of kingship that influenced subsequent South Indian rulers. The Chola emphasis on moral kingship and divine legitimacy inspired later dynasties, promoting a tradition of ethical governance and cultural patronage. Their legacy is evident in the continued reverence for the principles of Dharma and the hierarchical social order that shaped the political landscape of South India.

The Cholas' strategic incorporation of Aryan principles helped them establish a governance model that unified diverse groups, reinforced their authority, and created a lasting legacy of moral kingship in South Indian history. Their achievements in administration, military conquests, and cultural patronage continue to resonate in the historical narrative of the region.

5.TAMIL INFLUENCES ON CHOLA KINGSHIP

The Chola dynasty's governance, distinctively rooted in Tamil culture, integrated local customs, religious practices, and societal values that strengthened the bond between the rulers and their subjects. Although the Cholas adopted some Aryan influences, they maintained a strong Tamil identity that shaped their political organization, cultural patronage, and religious affiliations.

i. Cultural Practices

The Chola rulers were ardent patrons of Tamil language and literature, supporting renowned poets like Kambar, who wrote the Ramavataram, an epic that celebrated Tamil culture and values. This patronage of literature elevated the status of the Tamil language in governance, education, and culture, fostering regional pride and a unique Tamil identity among the populace. Chola temples, like the Brihadeeswarar Temple at Thanjavur, are famous for their grand scale and intricate Tamil architectural styles. These temples were cultural centers where religion, art, and community life converged, reinforcing the Chola rulers' role as protectors of Tamil culture and patrons of religious devotion. The Chola architectural style combined Tamil artistic expressions with symbolic elements that conveyed spiritual and political messages.

ii. Social and Political Organization

The Chola administration incorporated village assemblies, or sangams, reflecting Tamil traditions of local governance. These assemblies, made up of local landowners and community representatives, managed local affairs, resource allocation, and dispute resolution, fostering a strong sense of community involvement and ownership in governance. Empowering these assemblies allowed the Cholas to maintain local engagement and ensure stability across their territories.

Although the Cholas established a centralized administration, they allowed significant autonomy at the local level. The Chola empire was divided into provinces (mandalams) and districts (nadus), with local leaders or chieftains managing day-to-day governance. This balance of centralized oversight and local autonomy reflected Tamil governance traditions, promoting efficient resource management and loyalty within the Chola territories.

The Cholas developed a land revenue system that respected Tamil agrarian practices and focused on sustainable agriculture. They granted land to local leaders, temple institutions, and military officials, who were responsible for managing these lands and contributing to state revenue. Taxation policies were designed to respect local agricultural cycles, supporting the welfare of farming communities essential to the economy.

iii. Religious and Ideological Dimensions

Chola kings aligned themselves with Tamil deities like Shiva and Murugan, blending Aryan and Tamil traditions in their religious practices. They sponsored the construction of numerous Shaiva temples and promoted Shaivism as a core part of Tamil identity. Emphasizing their roles as Nayanars (devotees of Shiva), the Cholas cultivated spiritual authority, reinforcing their legitimacy as divine rulers connected to Tamil spiritual heritage.

Temples under the Cholas served not only as religious centers but also played critical roles in administration and community welfare. The Cholas endowed temples with land and resources,

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reinforcing the connection between religion and state. These temples often maintained detailed records of land grants, donations, and local governance, intertwining religious life with administrative functions and strengthening the Cholas' social support base.

In Tamil culture, the concept of mariyatai(respect and dignity) was central to the relationship between the king and his people. Chola rulers were expected to uphold high moral standards, act justly, and demonstrate a deep commitment to the welfare of their subjects. This principle aligned with the Aryan concept of Dharma but was uniquely expressed through Tamil values of community welfare, charity, and public works, enhancing the Chola kings' image as guardians of the Tamil people.

iv. Language and Literature in Governance

Unlike many other Indian dynasties that emphasized Sanskrit, the Cholas established Tamil as the official language for administrative documents, inscriptions, and royal decrees. This practice strengthened the Chola identity, making governance accessible to the Tamilspeaking populace and reinforcing the bond between the rulers and their subjects.

Chola inscriptions, found in temples and public spaces, served as essential historical records that documented administrative decisions, land grants, and royal edicts in Tamil. These inscriptions often included narratives celebrating the achievements and moral virtues of Chola rulers, reinforcing their divine authority and inspiring loyalty among subjects. Embedding Tamil values in official records allowed the Cholas to reinforce their legitimacy and cultural alignment with their people.

v. Military Organization and Local Support

The Chola military organization combined a central standing army with local militias made up of landowning villagers, reflecting Tamil practices of community defense. This dual approach allowed the Cholas to mobilize forces quickly and fostered loyalty among local communities, who saw the defense of their land as a shared responsibility with the monarchy.

Chola kings often rewarded loyal military leaders with land grants, a practice rooted in Tamil traditions. This system encouraged loyalty and allowed local leaders to maintain armed forces for regional protection, strengthening the socio-political ties between the Cholas and their subjects.

The Tamil influences on Chola kingship were extensive, shaping cultural, social, and political dimensions of governance. Through support of Tamil arts, literature, religious practices, and local governance structures, the Cholas developed a governance model that resonated deeply with the Tamil people. This integration of local traditions reinforced the dynasty's legitimacy, promoted social cohesion, and ensured stability across the Chola empire, establishing a legacy that left a lasting imprint on South Indian history.

6. HYBRIDIZATION OF KINGSHIP MODELS

The Chola dynasty (9th to 13th centuries) exemplified a unique, hybrid kingship model through its integration of Aryan and Tamil influences, combining centralized authority with local, community-based governance. This approach strengthened their rule and fostered a culturally rich, cohesive society.

i. Ideological Confluence

Aryan Influence: Emphasized Dharma (moral duty), with the king as a divine figure upholding social order. Concepts of Varna (social hierarchy) were adopted, promoting structured governance.

Tamil Traditions: Focused on community participation and the king's role as a benevolent leader. Ideals like Manniyam (moral governance) and Koodal (collaboration) emphasized close engagement with subjects.

Chola kings embodied divine kingship through the incorporation of both Aryan deities and Tamil gods, fostering loyalty with a governance model that balanced ethical leadership and direct community interaction.

ii. Administrative Structures and Local Governance

Centralized Bureaucracy with Local Autonomy: While a strong central administration controlled the empire, local councils (sangams) and village assemblies (sabhai) had decision-making power, reflecting Tamil traditions of communal governance.

Different castes were assigned roles within administration, reinforcing social structure and cooperation across communities.

A standing army supported by local militias allowed rapid mobilization and local loyalty. Rewarding military service with land grants tied Aryan patronage and Tamil social ties to the monarchy.

iii. Cultural Integration and Identity Formation

The Chola rulers promoted Tamil as the official language and sponsored literature that celebrated both Tamil heritage and Aryan values, enhancing cultural unity.

Temples and festivals honored both Aryan and Tamil deities, promoting an inclusive identity and unifying the populace through shared traditions.

iv. Long-term Governance Implications

Administrative hybrid model governance influenced later South Indian kingdoms, like the Pandya and Vijayanagara, embedding practices of efficient administration and local autonomy.

Cultural and Religious Pluralism: The Chola promotion of Aryan-Tamil syncretism set a cultural precedent, enriching South Indian heritage and fostering social cohesion.

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7.DISCUSSION

The analysis of the Chola dynasty's hybrid kingship offers valuable insights into its governance, cultural integration, and long-lasting influence on South Indian history.

i. Integration of Aryan and Tamil Influences

A Unique Governance ModelBalance of Central Authority and Local Autonomy: The Chola dynasty combined a strong centralized government with empowered local assemblies, striking a balance that allowed both cohesion and adaptability across diverse regions. This model contrasted with more rigid or entirely decentralized governance systems, highlighting the Cholas' unique responsiveness to cultural diversity.

The Chola governance approach influenced subsequent South Indian kingdoms, like the Pandya and Vijayanagara, which adopted similar structures. The Chola model, thus, stands as a foundational period in the evolution of South Indian governance, emphasizing the value of cultural inclusivity and local governance.

ii. Cultural and Religious Syncretism

Embracing both Aryan and Tamil elements, the Cholas cultivated a shared cultural identity across diverse communities, fostering unity and stability. They promoted Shaivism alongside local Tamil deities, encouraging religious tolerance and reducing potential conflicts, which helped shape a distinct South Indian identity.

The Chola's patronage of diverse religious traditions set a precedent of pluralism that helped ensure mutual respect among different communities. This legacy of tolerance remains relevant in understanding South India's religious diversity and cultural harmony.

iii. Ethical Governance and Social Norms

Chola rulers presented themselves as divine kings upholding Dharma, establishing a model of ethical governance that resonated deeply with their subjects. Their leadership model was anchored in moral responsibility, supporting broader discussions on the role of ethics in effective governance.

Empowering local assemblies, the Chola kings fostered a tradition of community participation and accountability, which supported effective governance and promoted social cohesion. This participatory governance model remains relevant in contemporary discussions on civic engagement.

iv. Historical Narratives and Modern Implications

The Chola hybrid model challenges traditional, one-dimensional perspectives on ancient South Indian governance, emphasizing the significance of cultural synthesis. This reassessment aligns with modern historiographical approaches that value inclusive narratives.

The Chola model exemplifies how hybrid governance structures with centralized authority and local autonomy foster inclusivity and stability, offering valuable lessons for modern pluralistic societies through the emphasis on cultural sensitivity, ethical leadership, and civic engagement.

v. Comparison with Other Indian Dynasties

The Chola governance model can be contrasted with other Indian dynasties, providing insight into their distinctive approaches.

Maurya Empire: Known for its centralization under Ashoka, the Maurya model promoted Buddhism but lacked the Chola's integration of local cultural identities. The Maurya model's rigidity contrasts with the Chola's flexible, inclusive governance.

Gupta Empire: The Gupta dynasty practiced a form of decentralized governance similar to the Chola model. However, the Gupta's emphasis on Sanskrit and Hinduism contrasts with the Chola promotion of Tamil and religious pluralism.

Mughal Empire: The Mughals under Akbar implemented a centralized administration with local revenue systems (zamindars) and fostered cultural synthesis (Din-iIlahi). However, unlike the Cholas, the Mughals promoted ideological unity rather than integrating local cultural practices.

vi. Comparisons and Insights

Administrative Structures: The Cholas' governance model balanced central authority and local governance, unlike the more centralized Maurya and Mughal systems or the looser structure of the Gupta Empire.

Cultural Policies: The Chola dynasty embraced pluralism, integrating Aryan and Tamil elements, while the Mauryas and Mughals promoted dominant cultural, religious ideologies (Buddhism, Islam). The Gupta period encouraged Hinduism, without the deep local integration seen in the Chola model.

Ethical Governance: Chola kingship emphasized Dharma, creating a collaborative governance model. In contrast, other dynasties were more ideologically driven, with a focus on top-down ethical governance rather than the Chola's inclusive civic model.

8. CONCLUSION

The Chola dynasty's hybrid kingship model is notable for its balance of central authority and local autonomy, combined with a deep commitment to cultural pluralism. Unlike other Indian dynasties, the Cholas effectively managed a diverse population through the blending of a strong centralized governance system with empowered local assemblies, which promoted civic engagement and social cohesion.This unique model not only influenced the governance of later South Indian dynasties but also contributed significantly to South Indian history. Embracing both Aryan and Tamil traditions, the Cholas cultivated a distinct regional identity characterized by religious tolerance and pluralism. This contrasts with the more centralized or culturally dominant narratives seen in the Maurya, Gupta, and Mughal empires. Furthermore, the Chola kingship, grounded in the ethical principle of Dharma,

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positioned the Chola rulers as moral leaders, which legitimized their authority and reinforced societal expectations for ethical governance. This study of the Chola dynasty's governance approach highlights its relevance as a historical model, offering valuable insights into managing diversity in societies. Future research could deepen our understanding through an examination of the geographic, economic, and social factors that shaped Chola governance, enriching both the historical and contemporary appreciation of adaptive governance models in diverse societies.TheChola dynasty's hybrid model serves as a crucial case study in the interplay of culture, governance, and identity throughout history.

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SOCIO-ECONOMIC DYNAMICS OF RELATIONS BETWEEN INDIA AND THE MIDDLE EAST

Dr Rachana Sharma
Assistant Professor, Department of Sociology, Guru Nanak Dev University, Amritsar

ABSTRACT
The objective of this review paper is to analyse the significance of the India's Economic Corridor and its relationship with the Middle-East in fostering the economic growth and social opportunities in India and middle-East. This review paper intends to examine firstly the historical background and context of India's economic corridor, and secondly the implications of the India- Middle-East Corridor. The paper also highlights the Middle East connection, explaining how it has played a significant role in enhancing trade, investment and diplomatic relations between India and Middle Eastern countries and what are the possible challenges.
KEYWORDS: *Arab, China, Economy, India, Middle East*

INTRODUCTION

In this paper, an effort has been made to sociologically examine the role of the Economic Corridor between India and the Middle East. There are three main perspectives which can be used to understand this relationship. Abdel Khalek and Korayem (2007) states that one can sociologically analyse this relationship using structural functional perspective as the Economic corridor acts as a mechanism and harbinger of unity and integration between the two nations which can result in drawing mutual benefits as for instance, raise in trade, investments and jobs. Likewise, one can also use dependency perspective to understand the asymmetrical relationships between the two nations which are unequal in various ways but at the same time have been exploited by the northern nations for labour, capital etc. In this context, with two countries sharing a more or less somewhat shared history dependency perspective can help us in understanding the potential of the third world economies which can assist them in coming out of circle of exploitation. Thirdly, the conflict perspective can help one in understanding how the power dynamics and inequalities through economic corridors which are in a way a tool for major countries like India to increase their economic influence and control over the world. In this paper, several approaches have been used to assess the effects of relations between the two countries.

In the post-independence period, various political leaders took initiatives to connect the Indian economy to global markets, although the efforts were small scale. In the 1950s, five-year plans were launched to promote the reconstruction and industrialization of the nation. However, it was only in the late 20th century that the Indian government adopted the concept of more open economic corridors. Shri AB Vajpayee started with the Golden Quadrilateral Project in the early 2000s. Its objective was to establish highways to connect four metropolitan cities of India thereby helping in reducing transportation costs as well as improving infrastructural development and connectivity within the country.

Development of India's corridors include efforts of PM Shri Narendra Modi, Shri Nitin Gadkari, Minister of Road Transport and Highways (including the Bharatmala project) who modernized Indian Railways, and Piyush Goyal (Minister of Railways and Commerce) who supported him as part of his government's "Act East" policy. Therefore, the contribution of current Indian leadership which has given a high priority to bridging the international ties cannot be ignored. PM Modi's active leadership has proven India's Mettle in the Global political landscape, his personal visits to the Middle East have resulted in establishing positive ties and signing of number of trade agreements which have backed the Indian businesses in the foreign landscape. If one sees in the past two decades the LPG policy has proved to be successful in making Indian economy outward looking and more competitive and has improved the overall economic scenario in India with the development of new markets and spaces of production and consumption, tapping of emerging markets and increased mobility of people both physical and economic (Dreze and Sen, 2002). One of the key features of India's economic corridor is its connection with the Middle East. Middle East relations play an important role in enhancing trade, investment and diplomatic relations between India and Middle Eastern countries. India's economic corridor and its connection with the Middle East has played an important role in promoting economic growth and social opportunities in both regions (Wu, 2015). A quiet shift is taking place in geopolitics, with East Asia and the Middle East moving closer to each other. Energy trade, especially oil and gas, has been an important factor in deepening economic ties between East Asia and the Middle East.

For Middle Eastern countries, China's comparative economic advantage means new opportunities for their development; For China, cooperation with Middle Eastern countries will bring economic benefits through oil and gas trade as well as investments in the petrochemical industry and infrastructure construction. Furthermore, the Middle East region plays an important role in the broader framework of China's Belt and Road Initiative (Wu, 2015). China's increasing investment in

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Myanmar has led to a prosperous economic corridor with China-Myanmar oil and gas pipelines.

India's economic move towards the Middle East has played an important role in promoting economic cooperation between them. India and Saudi Arabia, United Arab Emirates, Qatar and Oman had strong relations which had a lasting impact on the socio-economic development of both the regions. If one looks at the historical context of India's engagement with the Middle East it is during the period of 'mercantile capitalism' which connected them through trade/Silk Road. Although relations between the two have existed since then, India's recent strong economic, political, and cultural position has laid a strong foundation for integration and cooperation between the two, especially through initiatives such as the India-Middle East Economic Corridor (IMEEC). India's foreign policy towards the countries of the Middle East is shaped by the Gandhian idea of non-violence, universal brotherhood and welfare and the Nehruvian approach to capitalism and diplomatic relations. Prime Minister Shri Narendra Modi is the flag bearer of India-Middle East cooperation, a proposed corridor that on one hand will enhance better connectivity between the two countries, while on the other it will take advantage of India's strategic geographical location as a gateway in both the Middle East and Africa.
This will mutually enhance market potential by improving trade, investment, infrastructure development and public mobility. The key stakeholders in this India-Middle East Economic Corridor will be government officials, business leaders and experts in the field of international relations and economics. Many business tycoons like Mukesh Ambani of Reliance Industries, Ratan Tata (Tata Group), are going to play an important role in this direction through strategic collaborations, partnerships which will help in improving trade, investment inflows and leapfrogging growth. Sheikh Abdullah bin Zayed Al Nahyan, Minister of Foreign Affairs and International Cooperation of the UAE, Sheikh Mohammed bin Zayed Al Nahyan, Crown Prince of Abu Dhabi and Deputy Supreme Commander of the UAE Armed Forces play an important role in enhancing economic ties through IMEEC Fulfilling. Youssefali MA (Lulu Group), who has built a successful business empire in the Middle East, employs thousands of Indians in the region and has expanded its ventures into India.

SOCIO-ECONOMIC IMPACTS

If one looks at what impact this connectivity will have on both, it will have positive consequences for both India as well as the Middle East. Apart from increase in investment and infrastructure development there will be creation of more jobs, better understanding among people which will help in cultural and socio-economic exchanges, upgradation of some of the vital sectors like agriculture, energy, healthcare and technology. There may be a reduction in risk that is usually associated with excessive reliance on a single market and sources of income. Since the Middle East is a major supplier of oil and gas to India, such ties could help India meet its demand and cut into the monopoly of other markers. The Middle East will also benefit from exports of textiles, machines, pharmaceuticals etc. The Indian diaspora will also benefit more from the cooperation between the two countries which will help in integration and bridging the gap between cultures. This will promote cooperation between the two societies and reduce geopolitical tension between them.

However, along with this some challenges and obstacles may also arise and need to be addressed. The main obstacle in this could be the complex geopolitical dynamics of the Middle East countries and India. Given the current global politics, if any kind of tension, sanctions, fundamentalist forces emerge stronger than it may disrupt relations and cause uncertainties for investors. on the other hand, several other shortcomings as for instance laggard infrastructure, connectivity deficiency could also negatively impact the cooperation and participation. The stakeholders of both the nations are although drafting efficient policies and taking pro-active steps so as to improve transportation, logistics and digital connectivity, this could still hinder trade and investment flows. Therefore, there is a need for coordinated efforts of various stakeholders to improve and enhance connectivity and reduce transaction costs to ease flows. Fluctuations in oil prices and dependence on oil and gas imports from Middle East countries may increase India's dependence which may negatively impact growth in the future. Lastly, China's growing economic presence in the Middle East can also give a tough competition to India.

CONCLUSION

The India-Middle East Economic Corridor will therefore serve as an important instrument to accelerate economic integration and cooperation between India and the Middle East. It can act as a booster in case of falling trade, investment and infrastructure development, while enhancing people-to-people connectivity and mutual development. In fact, IMEEC will help in development and prosperity in India and the Middle East, harnessing the positive aspects in these regions and eliminating the negatives through strategic cooperation and collaboration. Indeed, influential people were at the helm of events that were shaping the trajectory of the corridor; Stakeholders must be able to work together to realize its full potential for a prosperous future for both regions.

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STRATEGIES FOR PRAGMATIC IMPROVEMENT IN THE TRANSLATION OF PUBLIC SIGNS AT ZHAOQING XINGHU NATIONAL PARK FROM THE PERSPECTIVE OF HIGH-QUALITY DEVELOPMENT

Xu Zhenhui
School of Foreign Languages and Culture, Zhaoqing University, Guangdong Province, P.R. China

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ABSTRACT

As the only national 5A-level tourist attraction in Zhaoqing, the Xinghu National Park serves as a crucial window for cultural dissemination and city branding. This paper systematically analyzes the current state of Chinese-English translations of public signs at this scenic area, identifying issues such as spelling and grammar mistakes, and overly literal translations. These errors reduce the effectiveness of information transmission and weaken cross-cultural communication. To address this, based on the concept of high-quality development, this paper proposes a multi-layered strategy involving translation standardization, cross-cultural adaptation review, and professional training, aiming to enhance the international image and cultural outreach of the Xinghu National Park, and to serve as a reference for other tourist sites.

KEYWORDS: *Zhaoqing Xinghu National Park, Chinese-English translation, pragmatic failure, cross-cultural communication, translation norms*

1. INTRODUCTION

As the only national 5A-level tourist attraction in Zhaoqing, the Xinghu National Park serves as a vital platform for showcasing local culture and enhancing the international image of the city. Against the backdrop of accelerated globalization, the role of cultural dissemination in tourist attractions has become increasingly significant. The Xinghu National Park, with its unique natural landscapes and rich historical heritage, not only draws numerous domestic and international visitors but also serves as a crucial medium for promoting Zhaoqing's folk culture globally. Consequently, the translation of public signs within the Xinghu National Park plays an essential role in both cultural communication and image-building. High-quality translation can accurately convey information about the scenic area, prevent cross-cultural misunderstandings, and thus enhance the effectiveness of cultural transmission. Such standardized translations are not only a basic requirement for service quality in scenic areas but also a vital tool for Zhaoqing to present its openness, inclusiveness, and cultural confidence to the world.

Under the guidance of the high-quality development concept, the advancement of tourism focuses not only on economic growth but also on the improvement of cultural dissemination capabilities and social benefits. As Zhaoqing's "city emblem", the standardization of translation work in the Xinghu National Park directly influences the first impression foreign tourists towards the city. The high-quality development concept emphasizes that translation should adhere to language norms, respect cultural differences, and meet the needs of visitors. By improving the accuracy and adaptability of public sign translations, the Xinghu National Park can better showcase the unique charm of Chinese culture to international visitors and enhance Zhaoqing's competitiveness in the global tourism market. Thus, integrating the high-quality development concept into scenic area translation work can increase visitor satisfaction, foster cultural integration, and lay a solid foundation for Zhaoqing's internationalization.

The objective of this study is to systematically analyze the status quo of public sign translations in the Xinghu National Park, explore types and sources of translation errors, and propose improvement measures aimed at enhancing the scenic area's capacity for cultural dissemination and image-building. The study reveals that the current Chinese-to-English translations of public signs in the Xinghu National Park commonly exhibit spelling errors, grammatical incorrections, and overly literal translations, all of which seriously impair effective information transmission and weaken the area's role as a platform for cultural exchange. Thus, through standardized translation criteria and management measures, the cultural dissemination capabilities of the Xinghu National Park can be strengthened, thereby contributing to the high-quality development of Zhaoqing's city image. Moreover, the translation challenges observed at the Xinghu National Park are representative to a certain extent, making the study's findings applicable as a reference for translation practices at other tourist attractions (Yang, 2024).

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In summary, the standardization of public sign translations at the Xinghu National Park is not merely a technical requirement for language expression but also a crucial component of Zhaoqing's high-quality development strategy. Using the Xinghu National Park as a case study, this paper conducts an in-depth analysis of types and sources of translation issues, combining insights from the high-quality development concept to propose systematic improvement strategies aimed at supporting the scenic area's cultural dissemination and city image-building. Ultimately, the goal is to further promote the high-quality, sustainable development of Zhaoqing's tourism industry.

2. THEORETICAL BASIS FOR CHINESE-ENGLISH TRANSLATION OF PUBLIC SIGNS AT SCENIC SITES

The translation of public signs and notices at tourist attractions serves not only as a means of information transmission but also as an essential window to showcase regional cultural characteristics and attract foreign tourists. In cross-cultural communication contexts, conveying a site's unique culture and social values accurately requires translations that adhere to language norms and reflect the cultural habits and pragmatic conventions of the target language. The importance of public sign translation for cultural dissemination and tourism experience has become increasingly prominent, especially in iconic local attractions such as the Xinghu National Park, where the quality of translation directly impacts visitors' understanding and overall impression of the site. Thus, exploring strategies for government-led communication efforts and scenic area translation from a high-quality development perspective has become a core approach to optimizing both cultural dissemination and visitor experience (Yang, 2024).

2.1 Government-Led Publicity Efforts and Translation at Zhaoqing Xinghu National Park from a High-Quality Development Perspective

Under the high-quality development framework, government-led communication activities not only involve cultural dissemination but also emphasize the enhancement of regional branding and international influence. As the only national 5A-level tourist site in Zhaoqing, the Xinghu National Park serves as a significant model for showcasing local culture and shaping the city's image. With the accelerating pace of globalization, tourist attractions are evolving beyond local tourism hubs to become platforms that exhibit national image and promote cross-cultural exchanges. The translation at the Xinghu National Park, as a vital component of its cultural outreach, is pivotal for enhancing visitors' cultural experience and strengthening China's cultural soft power. Accurate and natural Chinese-to-English translations can effectively reduce cross-cultural misunderstandings, allowing international visitors to appreciate the unique appeal of Chinese culture.

From the perspective of government-led publicity efforts, the translation of public sign at scenic areas functions not merely as language conversion but as a cultural bridge. High-quality development necessitates consideration of both linguistic accuracy and cultural adaptability in translation, enabling foreign visitors to appreciate the cultural value and atmosphere of the scenic site. Common errors such as spelling, grammar, and lexical misuse frequently appear in the Chinese-English translations at the Xinghu National Park, impacting both the image of the site and the acceptance of local culture by international tourists. Therefore, translation work should adhere to rigorous standards, skillfully bridging cultural differences to ensure that the conveyed information aligns closely with the thought patterns and expressions common in English-speaking countries. The involvement and support of government departments are essential; they can provide high-quality translation solutions through professional translation and management mechanisms, thereby elevating the overall level of cultural dissemination (Chang, 2024).

In the context of high-quality development, the translation quality of scenic area signs and notices directly influences the international image of the region. Thus, the establishment of standardized management and professional translation systems for translation work can not only enhance the role of the Xinghu National Park as a cultural window but also support Zhaoqing's efforts toward greater openness and international presence. By establishing specialized institutions and incorporating expert teams to oversee translation work at scenic sites, translation accuracy and cultural adaptability can be ensured. Additionally, the continuous modification and refinement of translations can better serve visitors, providing them with a more authentic and in-depth cultural experience. Under the guidance of high-quality development, the translation work at scenic areas has already become a critical means of cultural exchange and international image-building.

2.2 Pragmatic Failure Theory

The importance of pragmatic failure theory in cross-cultural communication is self-evident, as it provides a theoretical basis for analyzing misunderstandings caused by cultural differences in language exchange. Pragmatic failures include both inappropriate language use and expressions that fail to achieve the intended communicative effect. These failures are categorized into pragma-linguistic failures and socio-pragmatic failures. Pragma-linguistic failures refer to language forms that do not conform to the conventions of the target language, often manifesting as errors in vocabulary, structure, or other linguistic aspects. In contrast, socio-pragmatic failures stem from cultural background differences that lead to interpretive discrepancies in cross-cultural exchanges. For example, common errors in the Chinese-to-English translations at the Xinghu National Park, such as spelling errors, grammatical mistakes, and overly literal translations, are typical pragma-linguistic failures. By analyzing these errors in depth, we can better understand the differences in language conventions across cultures, which in turn allows for more appropriate adjustments in translation (Thomas, 1983; House, 1997; Shen, 2024).

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Pragmatic failure theory further emphasizes that language communication is not merely the transmission of literal meaning but also involves context, social identity, and other factors. For instance, in scenic area translations, neglecting the cultural background and social status of the audience can lead to content that does not align with the reading habits or comprehension of foreign visitors. Translating "小心碰头" as "please meet carefully" is a classic example of pragmatic failure, as its literal meaning is entirely disconnected from conventional English expression. In such cases, translators should adjust the language form in accordance with pragmatic failure theory, opting for expressions that better comply with English conventions to achieve the intended communicative effect. This underscores that translation in cross-cultural communication extends beyond simple word-for-word conversion and should prioritize contextual adaptation and cultural compatibility (Leech, 1983; Grice, 1975).

Additionally, pragmatic failure theory reminds translators to cultivate cross-cultural sensitivity, recognizing potential misunderstandings and conflicts arising from cultural differences. Many errors in Chinese-to-English translation result from overlooking differences in cognitive styles, social customs, and values between Chinese and English cultures. For instance, when "大车停车场" is directly translated as "big car parking", foreign visitors may struggle to comprehend its specific meaning. This indicates that translators need to deepen their understanding of cross-cultural communication principles, guided by pragmatic failure theory, to avoid literal translations and accurately convey the cultural meaning behind the language (Searle, 1969; Blum-Kulka & House, 1989). Ultimately, pragmatic failure theory offers a diagnostic framework for common communication issues in the translation of scenic area sign, enabling translators to better identify and rectify expression errors caused by cultural differences.

3. ANALYSIS OF CURRENT ISSUES IN THE TRANSLATION OF PUBLIC SIGNS AT XINGHU NATIONAL PARK

Zhaoqing is a city rich in historical and cultural heritage, with rapid economic development and abundant tourism resources, making it a promising tourism destination. As an important "window" for Zhaoqing, the Xinghu National Park fulfills dual roles of showcasing local culture and shaping the city's image. However, numerous issues persist in the translation of public signs and notices at the scenic area, where translation errors are commonplace and fail to align with Zhaoqing's image as a strong economic, cultural, and tourism hub. This problem not only affects tourists' overall experience at the site but also weakens Zhaoqing's cultural soft power in the minds of international visitors. Consequently, the related city government sectors should address this issue and adopt effective measures to standardize translation practices, thereby enhancing Zhaoqing's image as a "window" to the world. Through on-site investigation of several scenic areas in Zhaoqing, with a focus on the Xinghu National Park, this study recorded and analyzed the current state of written English translations on tickets, guidebooks, and signs. Findings reveal significant issues in sign translation at Xinghu National Park, as detailed below:

First, in recent years, the Xinghu National Park has shown a growing awareness of multilingual sign translation, especially during its efforts to achieve and maintain its 5A-level scenic area status over consecutive years. The authorities have actively introduced multilingual signs in English, Japanese, Korean, and other languages, achieving some progress in publicity service improvement. This progress is closely related to Zhaoqing's status as a historically significant city and a major urban hub in the Guangdong-Hong Kong-Macao Greater Bay Area. However, despite these efforts in translation, the quality of translation remains suboptimal, particularly in the following areas.

Firstly, spelling errors are relatively common. Although the Xinghu National Park has taken some steps to address translation issues on public signs, low level problems such as spelling errors continue to appear frequently, suggesting a degree of negligence and management oversight in the translation process. Such elementary mistakes not only detract from the professionalism of the translation but may also cause confusion or elicit negative feedback from foreign visitors. Secondly, inconsistency in translated names is another notable issue. For example, the same place or name may be translated differently; "星湖" may appear as both "Xinghu Scenic Area" and "Star Lake Scenic Area", while "七星岩" is translated as both "Seven Star Crags" and "Qixingyan." This inconsistency in terminology not only leads to conceptual confusion but also affects tourists' perception of the attraction.

In addition, grammatical errors are also prevalent in the translations at Xinghu National Park, indicating that some translators' poor mastery of English. Such errors create syntactic and semantic obstacles that hinder accurate information transmission. For instance, some sign translations are syntactically flawed and semantically ambiguous, making it difficult for tourists to grasp the intended meaning. Another frequent issue is overly literal translation, where Chinese expressions are directly converted word-for-word into English without regard for the cultural conventions of the English language. This method often results in translations that appear illogical to native English speakers, causing foreign visitors to "read without comprehension" (Xue, 2024).

Finally, the lack of consistency and standardization in terminology translation also deserves extra attention. Taking the translation of "星湖景区" as an example, multiple variations are used, including "Xinghu Scenic Area", "Star Lake Scenic Area" and "Xinghu National Park", while "七星岩" appears as "Seven Star Crags", "Qixingyan", and "Qi Xing Yan." This inconsistency reflects not only a lack of organized terminology management but also highlights the absence of a unified translation standard. Further analysis reveals that management of bilingual sign lacks adequate oversight, as those responsible fail to grasp the specific

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requirements of translation and lack awareness of the need to promptly replace signs containing translation errors. This lack of attention directly affects the scenic area's image as a "civilized window", undermining its appeal to international tourists. Therefore, enhancing the focus on translation quality, strengthening management efforts, and standardizing terminology have become essential to improving the overall image of the Xinghu National Park.

3.1 Analysis of Specific Cases of Translation Issues

Pragmatic failures are a crucial concept in cross-cultural communication research, referring to situations in verbal exchanges where the communicator fails to use expressions appropriately or employs language forms that do not align with the target language's conventions, thus failing to achieve the intended communicative effect. Such failures often result in information transmission errors and may even lead to cross-cultural misunderstandings. In scholarly classification, pragmatic failures can be divided into two main types: pragma-linguistic failures and socio-pragmatic failures. The former refers to instances where language usage does not conform to the conventional expressions of the target language, often manifesting as improper use of the source or target language forms, thus failing to convey the intended function accurately. This type of failure generally involves deficiencies in language structure, word choice, and contextual adaptation. The latter, socio-pragmatic failures, typically arise in cross-cultural communication settings, rooted in differences in cultural understanding between communicators, which cause deviations in language form selection (Shen, 2024). Simply put, socio-pragmatic failures occur when communicators overlook factors like cultural customs and social identity, leading to communicative obstacles.

It should be noted that pragmatic failures generally exclude simple language performance errors, such as spelling mistakes, capitalization errors, punctuation errors, and grammatical errors. However, in discussing scenic area translations, considering these basic language errors is also essential due to their impact on overall communication quality. While these types of errors may appear basic, they can still cause misunderstandings in cross-cultural communication, thereby affecting the success of exchanges. Thus, in classifying translation errors in scenic areas, this paper further subdivides pragmatic failures into three categories: basic language errors, pragma-linguistic failures, and socio-pragmatic failures (Sun, 2024).

3.1.1 Basic Language Errors

Basic language errors typically refer to elementary mistakes in spelling, capitalization, punctuation, and grammar, as well as inconsistencies between Chinese and English content and discrepancies in translated names. While these errors may not directly hinder communication or lead to misunderstandings, their frequent occurrence can cause audiences to question the professionalism and cultural literacy of the information provider, potentially leading to negative perceptions of their overall image. In contexts such as tourist attractions, where cultural representation is paramount, improper spelling and grammar may be perceived by foreign visitors as signs of negligence or even cultural insensitivity. Minor basic language errors might be viewed as occasional lapses; however, if these errors persist and remain uncorrected, they can have a lasting impact on an institution's image, potentially damaging the cultural reputation of the region or even the country.

For example, a sign by the lake in the Xinghu National Park states "Please don't fishing", where "fishing" is an incorrect grammatical form; the correct phrase should be "Please don't fish." Although this is a basic grammatical issue, if such errors frequently appear on public signs, they may leave foreign visitors with the impression that the scenic area's management lacks rigor. Additionally, there is a notable inconsistency in translating the names of Xinghu National Park and Qixingyan, with "Star Lake Scenic Area" and "Xinghu Scenic Area" both used to refer to the same site, while "Qixingyan" and "Seven Star Crags" appear on different signs. This inconsistency in naming not only undermines the directive function of the signs but can also lead to visitor confusion or even misunderstandings, affecting their overall perception of the site.

The inconsistency in translated names reflects a lack of coherence and standardization in the language conversion process, which is particularly evident in translations in public spaces. Standardizing and unifying translated names is an essential step in ensuring that translated information is clear and accurate, as any inconsistency in language usage can affect the effectiveness of communication and reduce the clarity of information transmission. Therefore, to avoid inconveniences and misunderstandings caused by basic language errors, scenic area managers should introduce systematic translation standards, ensuring name consistency and conducting regular checks on the spelling, grammar, and other aspects of signs. By doing so, not only can the overall image of the scenic area be effectively enhanced, but foreign visitors' understanding and acceptance of the local culture can also be improved (Xue, 2024).

3.1.2 Pragma-Linguistic Failures

Pragma-linguistic failures primarily manifest in the misuse of vocabulary and syntax during translation, rigid application of Chinese expression patterns, ambiguities in grammatical structure, and misalignment of illocutionary force. These issues are especially prominent in the translation of scenic area signs, where the translator's choice of vocabulary and sentence structure directly affects the readability of the translation and the accuracy of information delivery. In English, the existence of numerous synonyms and varied expressions means that even slight missteps in word choice can lead to ambiguity and misunderstanding. For example, in the Xinghu National Park, "小心碰头" was translated as "please meet carefully ."This phrasing not only fails to convey the original meaning but also introduces a unreasonable tone that

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confuses visitors. Furthermore, language forms and functions do not always correspond directly across languages, and the illocutionary force of expressions can vary depending on contexts. If translators fail to adjust the form and function of expressions according to context, it leads to misalignment of illocutionary force, weakening or misdirecting the intended message.

In the men's restrooms at Qixingyan Scenic Area, a sign reads "细微之处见公德，举手之间显文明", intended in Chinese to promote public civility. However, the English translation, "Morality sees from subtleties, civility shows between hands", clearly does not conform to English grammar and vocabulary norms. The grammar is awkward, and word choice is inappropriate, with phrases like "sees" and "between hands" producing unintended connotations that could easily discomfort readers. This translation fails not only to convey the intended message of civility but also risks causing unnecessary confusion and misunderstanding, serving as a classic example of mistranslation and misinterpretation that highlights the issue of illocutionary misalignment.

Illocutionary misalignment is not merely a structural issue but also reflects a deficiency in the translator's understanding of context. Especially in the translation of culturally significant or public-intended information, translators should pay attention to the specific context and intended communicative effect of the original language, choosing expressions that are more culturally appropriate in the target language. To avoid pragma-linguistic failures of this kind, scenic area management can provide training to translators before they undertake their tasks, enhancing their understanding of the target language's culture and pragmatic theories. Additionally, an expert review stage should be introduced to examine and refine expressions involving complex cultural contexts, ensuring that the translated content accurately conveys the intended illocutionary force and adheres to the pragmatic conventions of the target language. This approach not only improves readability but also effectively reduces cultural misunderstandings, thereby enhancing the overall image of the scenic area.

3.1.3 Socio-Pragmatic Failures

Socio-pragmatic failures often arise when translators overlook factors such as the identity, status, cultural customs, and values of the targeted readers and audience. These failures are particularly common in the translation of tourist site signs, as they involve not only the transformation of linguistic forms but also a sensitivity to cultural differences within cross-cultural communication. A typical example of socio-pragmatic failure is found at the entrance of the newly constructed East Entrance of Qixingyan, where the parking lot signs "大车停车场" and "小车停车场" were translated as "big car parking" and "car parking", respectively. This English translation is unclear to foreign visitors, as it does not specify whether the terms refer to the size of the parking area or different types of vehicles. This example illustrates how such translations fail to convey the original information accurately, creating communicative barriers.

Furthermore, certain culturally embedded slogans are also constrained by socio-pragmatic failures during translation. The slogan "排队我快乐，礼让我文明" was translated directly as "line up me happy, courtesy me civilization", a mechanical, word-for-word translation that bypasses cultural adaptation. This translation disregards the expression patterns and cultural understanding of native English speakers, resulting in a rendering that neither conforms to English language norms nor effectively communicates the social and cultural values embedded in the Chinese slogan. While local visitors may easily understand this message, for foreign visitors, the information is not only obscure but also lacks appeal, failing to convey the intended values and behavioral norms of the original Chinese slogan.

The occurrence of socio-pragmatic failures often stems from a lack of adequate understanding and respect for the cultural background of the target audience. Directly converting these slogans into English fails to account for differences in cultural values and language usage habits, preventing the slogans from achieving their communicative goals. To avoid such failures, translators should deepen their understanding of the target culture during the translation process, fully considering the cultural context of the intended audience and adapting their language choices to align with the social and cultural norms of the target language. This approach not only enhances the effectiveness of information transmission but also improves the international image of the scenic area, offering foreign visitors a more culturally enriching experience. Additionally, scenic area management can establish more systematic translation standards and review mechanisms to ensure that translations convey both cultural meaning and clarity, thus enhancing accessibility and comprehensibility (Ma, 2022).

3.2 Root Causes of Translation Irregularities at Xinghu National Park

The translation errors at Xinghu National Park fall primarily into three categories: basic language errors, pragma-linguistic failures, and socio-pragmatic failures. These categories often overlap, forming complex and interwoven issues that can be traced back to deficiencies at both the translator and managerial levels. On the translator's side, three main issues are noteworthy. First, translators lack a solid foundation in both Chinese and English. Many basic language errors indicate that translators are not proficient in the fundamentals of phonology, vocabulary, semantics, syntax, discourse, and pragmatics in both languages. This weak foundation leads directly to frequent mistakes in spelling, grammar, and punctuation. Second, translators show limited cross-cultural communication skills. Due to a lack of understanding of the psychological traits, cultural values, aesthetic preferences, and customs associated with Chinese and English speakers, translators are prone to cross-cultural conflicts and pragmatic errors during translation, failing to meet the expression needs of the target culture. Finally, translators lack a

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thorough understanding of translation theory and techniques. This results in inflexibility during translation, where translators cannot effectively apply code-switching techniques, leading to mechanical, literal, and rigid translations that hinder accurate information transfer and reduce the naturalness of the script.

On the managerial side, there are also three primary problems. First, managers lack sufficient understanding of the translation industry. Because some scenic area managers have limited English proficiency, they struggle with quality control in translation, either failing to identify translation errors in time or lacking effective measures to address these issues even when identified. Second, the scenic area lacks a dedicated institution for translation oversight. There is a "responsibility vacuum" among government management departments in the scenic area, leading to insufficient supervision and the absence of an effective management system for translators. Currently, outsourced translation personnel at the scenic area vary widely in competency and professional expertise, lacking uniform selection and training standards, which directly affects the consistency and stability of translation quality. Finally, there is a lack of attention and awareness regarding translation errors and rectification among managers. Due to insufficient understanding and focus on translation quality issues, even when managers become aware of translation problems, they often remain perplexed, lacking effective mechanisms for modification, allowing issues to persist over time.

The root causes of translation errors at Xinghu National Park lie in the inadequate linguistic and cross-cultural competence of translators and the lack of oversight and management by administrators. To improve translation quality, it is essential to not only strengthen translators' linguistic foundations and cross-cultural competencies but also to establish a dedicated translation supervision agency within the scenic area management. Such an agency should regulate translator management and assessment processes and establish regular translation review and rectification mechanisms, ensuring consistent and stable translation quality. This would provide foreign tourists with more accurate and natural translation services, enhancing the international image of the scenic area.

4. TRANSLATION QUALITY IMPROVEMENT PLAN FOR PUBLIC SIGNS AT ZHAOQING XINGHU NATIONAL PARK

Based on the previous analysis of the current state of translation at Xinghu National Park, it is evident that pragmatic failures, basic language errors, and inadequate cross-cultural adaptation negatively impact the international image of the scenic area. Therefore, developing strategies to reduce translation errors and enhance translation quality is not only an effective way to improve scenic area services but also a practical need to foster international cultural exchange. By establishing standardized translation procedures, enhancing translators' cross-cultural understanding, and developing a professional management system, the scenic area can achieve a systematic improvement in translation quality. The following sections will outline the response measures for each type of error and discuss specific implementation methods.

4.1 Mechanism for Preventing and Correcting Basic Language Errors

The frequent occurrence of basic language errors not only affects the overall image of the Xinghu National Park but also undermines its effectiveness in cultural dissemination. To ensure translation accuracy and professionalism, the scenic area management needs to implement systematic oversight measures to reduce basic errors in spelling, punctuation, and grammar. First, establishing a rigorous review and proofreading mechanism is an effective approach to minimize such errors. The scenic area can form a specialized review team to regularly check bilingual signs, promotional materials, and guidebooks for spelling and grammatical issues. By periodically inspecting signs and other texts, the team can promptly identify and correct language errors, enhancing linguistic accuracy and readability and strengthening the professional image of the scenic area.

Second, improving translators' foundational proficiency is a key to reducing basic language errors. Translators need to develop a strong command of phonology, vocabulary, grammar, punctuation, and syntax in both Chinese and English, with heightened sensitivity and accuracy in spelling, grammar, and syntax. To this end, the scenic area can organize regular professional language training, including grammar and spelling exercises, analysis of common errors, and learning translation techniques, enabling translators to switch languages flexibly and minimize common mistakes during the translation process. This improvement in foundational skills not only ensures translation quality but also helps build the scenic area's public image (Tang, 2023).

Finally, introducing automated proofreading tools can provide technological support for managing basic errors. Modern automated proofreading tools can detect issues with spelling, punctuation, and grammatical inconsistencies, effectively reducing oversights in manual review. Additionally, the scenic area should compile a standardized translation manual to unify the translation of place names, terminology, and proper nouns, thus avoiding inconsistencies in translated names. By combining a standardized manual with automated proofreading, the scenic area can significantly lower the frequency of basic errors, thereby improving the accuracy and consistency of translations and enhancing foreign visitors' positive impressions and satisfaction.

4.2 Adaptive Strategies for Optimizing Pragma-Linguistic Translation

Reducing pragma-linguistic failures is crucial to improving translation quality and enhancing the visitor experience. To address pragma-linguistic issues in the translation at Xinghu National Park effectively, the management should focus on increasing translators' pragmatic awareness, ensuring that they possess solid pragmatic knowledge and flexible expression skills.

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Through systematic pragma-linguistic training, translators can master methods for word choice and syntactic adjustment, avoiding literal translations and conveying information accurately. For example, in translating warning or advisory signs, translators should adapt expressions to suit English norms, using "Mind your head" rather than the literal version "please meet carefully" to improve the fluency and readability of the translation.

To address the contextual adaptation issues associated with pragmatic failures, the scenic area should incorporate a cross-cultural adaptation review mechanism in the translation process. This ensures that translations not only conform to the target language's expression habits but also meet the comprehension needs of visitors from different cultural backgrounds. For this purpose, the scenic area can establish a multi-level review system, engaging experts or consultants with native English backgrounds to review translations and optimize cultural and pragmatic adaptability. Such a review mechanism ensures that translations align with the target culture's context and semantics, reducing misunderstandings caused by cultural differences and enabling visitors to comprehend the site's informational signs more naturally.

Additionally, the scenic area should encourage translators to accumulate practical experience and increase their exposure to the target culture. By conducting on-site studies and simulating everyday expressions in the target language environment, translators can gain a deeper understanding of language usage among native English speakers, enhancing their cultural sensitivity during translation. The scenic area could set up a regular practice platform, allowing translators further insights into English cultural expression habits and socio-pragmatic norms. By combining pragmatic training, cultural adaptation reviews, and practical experience platforms, the scenic area can significantly reduce the occurrence of pragma-linguistic failures, elevate the professional level and cultural adaptability of translations, and ultimately enhance the scenic area's international image and cultural outreach effectiveness (Yin, 2023).

4.3 Cultural Adaptation Strategies for Socio-Pragmatic Failures

Socio-pragmatic failures have particularly adverse effects in cross-cultural communication, often leading to misunderstandings or dissatisfaction among foreign visitors regarding the management and service quality of the scenic area. To reduce such failures, the first step is to enhance translators' cross-cultural awareness, ensuring that they fully consider visitors' cultural backgrounds and social customs in their translations. Scenic area management should organize regular training in cross-cultural communication for translators, covering areas such as polite expressions, values, and contextual requirements in the target culture. Through systematic study and practice, translators can develop a deeper understanding of the levels of politeness in the target culture, avoiding socio-pragmatic errors that result from direct translations, and thereby increasing the acceptance of translated content by the audience. For example, translating "请勿吸烟" as "Please refrain from smoking" instead of the literal "Please don't smoking" aligns better with English norms of polite language.

Secondly, to ensure cultural adaptation in translated content, the scenic area should introduce a "socio-pragmatic adaptation review" process, focusing on the politeness and appropriateness of language in signs and promotional materials. Experts in cross-cultural communication can be invited to review translation content, ensuring that expressions align with the communicative conventions of the target culture. This review process allows the translation's content, tone, and wording to better comply with the cultural habits of the target audience, reducing misunderstandings caused by socio-pragmatic failures. This not only improves the accuracy of information delivery but also enhances visitors' experience, bolstering the international image and service standards of the scenic area.

Additionally, scenic area management can establish practical training programs to deepen translators' cultural understanding, helping them develop more flexible language expression skills. By partnering with universities, translators can participate in simulation-based training in real-world scenarios, further enhancing their cultural sensitivity in authentic communication contexts. Through observational and simulated training, translators can gain insights into the cognitive habits and cultural needs of foreign visitors when reading scenic area information, enabling them to adjust pragmatic strategies in translation. A comprehensive approach involving cross-cultural training, adaptation review, and practical training programs can effectively reduce the occurrence of socio-pragmatic failures, providing foreign visitors with more personalized and natural language services and increasing their satisfaction and approval of the scenic area.

4.4 Establishing a Long-Term Translation Quality Monitoring System

To comprehensively improve translation quality at the Xinghu National Park, in addition to addressing basic language errors, pragma-linguistic failures, and socio-pragmatic failures, scenic area management should adopt systematic management measures and establish a long-term translation monitoring mechanism. First, it is recommended to set up a dedicated translation oversight body, such as a "Scenic Area Translation Office", led directly by the city government authorities to manage all translation-related work for the scenic area. This office would establish translation standards, monitor translation quality, and coordinate with related departments in translation management and optimization, ensuring a systematic and standardized approach to translation work. This structure would effectively reduce translation errors, increase the professionalism and consistency of bilingual signs, and ultimately enhance the international image of the scenic area.

Secondly, to ensure ongoing improvement in translation work, the scenic area should implement a regular evaluation mechanism,

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conducting periodic inspections and evaluations of bilingual signs, promotional materials, and other translated content. This mechanism could involve a quarterly or annual review by expert groups, who would comprehensively examine translation content, analyze common issues, provide recommendations for improvement, and generate evaluation reports for the translation team and management to use as reference in identifying deficiencies and refining processes. Such a periodic evaluation mechanism not only helps in identifying translation mistakes but also provides data to support long-term management, ensuring that translation work meets high-quality standards and continuously enhances the scenic area's international presentation.

Finally, scenic area management should ensure adequate resource support for translation work, providing the translation team with stable funding and technological resources. The city government could allocate special funds for hiring professional translators, conducting regular training, and introducing high-quality translation tools. Additionally, the scenic area could collaborate with university linguistics departments or professional translation agencies, leveraging external resources to improve translation accuracy and adaptability. With a stable investment in resources, the translation team can continuously optimize their translation quality in a resource-rich environment, delivering accurate and natural language services for international tourists, while strengthening the scenic area's cultural dissemination capabilities and international competitiveness.

5. CONCLUSION

This research, using Zhaoqing Xinghu National Park as a case study, conducts a thorough analysis of common pragmatic failures in Chinese-to-English translations of public signs, such as spelling errors, grammatical mistakes, and overly literal translations. It explores the need for pragmatic improvement from the perspectives of cross-cultural communication and high-quality development. The findings reveal that the translation issues in Xinghu National Park's public signs go beyond basic language errors, extending to inadequate cultural adaptation and a lack of pragmatic strategy. These issues hinder the precise transmission of information, affect foreign visitors' comprehension and appreciation of the cultural significance of the site, and weaken the scenic area's competitiveness in the international market. In response, this paper proposes a multi-layered improvement strategy focused on translation standardization, cross-cultural adaptation, and management regulation, aiming to enhance the quality of public sign translations through scientific translation management and systematic cultural adaptation, thereby strengthening the scenic area's function as a cultural dissemination window.

In the long term, the translation optimization strategies proposed in this paper are not only applicable to improving the public signs at Xinghu National Park but also offer a practical framework for other tourist attractions. Standardized translation procedures, rigorous cultural adaptation mechanisms, and efficient management systems will help address the inconsistent quality of public sign translations across China's tourist sites, thereby enhancing the international image of China's tourism industry as a whole and advancing the country's cultural "going global" strategy. Future research could further investigate the translation practices at scenic areas in other regions, testing the applicability and generalizability of the strategies proposed here. This could lead to refinements in translation management and cultural dissemination strategies, providing practical insights to enhance China's discourse power and cultural influence in international cultural exchanges.

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COMPARISON OF HAEMATOLOGICAL AND BIOCHEMICAL PARAMETERS IN SHEEPS AND MICE BALB\C STRAIN INFECTED WITH HYDATID CYST

Muslim Abbas Allu
Departmet of Biology,University of Zakho, Ministry of Higher Education and Scientific Research, Kurdistan Region, Iraq.

ABSTRACT

The paper reviews Human hydatid cyst or cystic echinococcosis is a life-threatening zoonotic disease that occurs in most countries worldwide and is recognized as a major public health problem. Following, ingestion of Echinococcus granulosus eggs, hydatid cysts which is the larval stage of the worm are formed mostly in liver and lungs, and occasionally in other organs of human,the infection with hydatid disease effect on the liver and lung function after examination of some biochemical parameters that related to liver and lung function,. Aspartate Total Protein, Total Bilirubin, Aminotransferase (AST), Lactate Dehydrogenase (LDH) were decrease while aspartate Blood Urea Nitrogen (BUN), Creatinine, Albumin has increase,Values of hemoglobin and red blood cells and packed cell volume in sheep infested by E. granulosus, appear low compared with reference values. While hyper eosinophilia, lymphocyte and monocyte was high, and this typical of parasitic diseases. In mice Balb\c strain and sheep found that the number of white blood cell has increase (eosinophilia, lymphocyte and monocyte) and decrease of neutrophils after counting the differential WBC of positive group and increase of MCV, MCH, MCHC.

KEYWORDS: *hydatid cyst,haematological parameters,biochemical indicators,sheeps, mice balb\c.*

INTRODUCTION

Hydatid disease is a wide spread in all countries of the world, and for large numbers of dogs and adults' worms (1). It is one of the chronic diseases in humans to continue having a cyst for long time (2) Cystic echinococcosis is a zoonotic disease caused by the larvae of the *Echinococcus granulosus (E. granulosus*) infecting the intermediate hosts, and the disease represents a significant threat for human and animal health all around the globe (3,4,5,6). The disease infected by E. granulosus most often spreads to the liver (50%-70%) and less frequently the lung and in other parts of the body. (7)

EPIDEMOLOGY

The hydatid cyst remains a significant public health hazard in endemic areas such as Iraq, Turkey, the Middle East, South America, New Zealand, Africa, China, northern Kenya, Australia, and other sheep-raising areas (8). As an endemic disease, it causes social and economic losses for countries. WHO reports stated that approximately100,000 people in the world are infected with this disease every year (9) which is common in rural populations of underdeveloped countries because of their close association with domestic and wild animals (10).The incidence of infestation by E. granulosus in endemic areas rangesfrom 1 - 220 cases per 100,000 inhabitants. Diagnosis of hydatid disease is based on the epidemiological background of patients, clinical signs and symptoms, and radiographic and related imaging studies. Serodiagnostic assays can be particularly helpful and detection of antibody to specific echinococcal antigens has the highest degree of specificity.

PATHOGENESIS

Hydatid cysts are generally asymptomatic until expanding cysts gradually effect in the liver and elicit pressure symptoms. Cysts may grow for a period of 5-20 years, and may be discovered incidentally on a routine ultrasound or CT examination. Expanding cysts present with abdominal pain or palpable mass in the right upper abdomen. (11) HCs may compress the bile ducts and result in obstructive jaundice and cause fever, pruritus, eosinophilia, dissemination, or fatal anaphylaxis after a cyst ruptures into the peritoneum or biliary tract. Infection of the cyst can facilitate the development of liver abscesses and mechanic local complications, such as mass effect on bile ducts and vessels that can induce cholestasis, portal hypertension, and Budd-Chiari syndrome. (12-16) As a result, the diagnosis of HCs should be as fast as possible because of the relevant complications that may arise with disease progression.

HOSTS AND TRANSMISION

A special feature of the liver, as a body, is the fact that its pathologies, in most cases, are not manifested clinically, and the damage that comes from their health and animal production, is great (17). Touching the body will affect systemic change and ultimately causes a decrease in production. The disease is known as many labels, including Hydatidosis , echinococcosis or cystic echinococcosis (18-21)Carnivorous definitive host for the parasite and include the canine (Dogs, hyenas, wolves, vanity and some For other fierce animals) while animals are Herbivorous such as (sheep, cows, camels, buffalo, horses and others) Intermediate Host for parasite (22-24) The disease affects parts that exsist in human and the intermediate host, especially liver and lung, followed by the rest of the parts, such as spleen, brain and other muscles except for hair and nails (25-28). The most important source of infection for humans and animals that are the intermediate hosts are the infected dogs. The vegetables, fruits, and drinking waters contaminated with the dog feces form the source of infection (29). The parasite is

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reported to be capable of settling into almost every organ, including lungs, kidneys, spleen, brain, and heart (30).

DIAGNOSIS

Imaging studies, combined with immunodiagnostic techniques, often help to make a diagnosis (31,32). Ultrasonography (USG) is the initial imaging modality of choice because it is easy to perform, widely available, and inexpensive and can help define the number, site, size, and vitality of cysts (33). Antibody assays can add weight to the presumptive imaging diagnosis. However, a negative serologic test rarely rules out echinococcosis (34). Computed tomography (CT) scan and magnetic resonance imaging can help diagnose deep-seated lesions and determine the extent and condition of the avascular fluid-filled cysts (31,35).

All cases have hydatidosis disease according to identification of the parasite's structures by imaging techniques, including ultrasound, x-ray diagnosis and accentuated surgery operation of each patient. Cysts also contain 'daughter cysts' which, if released, may diffuse to other areas of the body3 (36). Many substances have recently been used to activate and modify the host's immune system in order to control the growth and development of the cyst (37).The clinical manifestation of Echinococcosis infection depends on the site and size of the cyst. The infection may remain asymptomatic in earlier stages when the cyst is small (38). Eventually, as the disease progresses, HCL can present with epigastric or right upper quadrant abdominal pain, nausea, vomiting, and hepatomegaly (39-40).

BLOOD PARAMETERS

In sheep and mice Balb\c strain injected by hydatid cyst protoscoleses. it was found that the numbers of WBC, lymphocytes, eosinophils and monocyte have increased while the number of neutrophils decreased in the positive group compared with the control group,these results agreed with the study of (45,46), who found an increase in the number of leukocytes, lymphocytes and eosinophils and a decrease in the number of neutrophils. They, however, disagree with (42) who found an increase in the number of neutrophils. Increases in numbers of WBC, lymphocytes and eosinophils were observed in the present study which may be considered as a defense mechanism against the inflammatory processes in the body especially in the liver, spleen and kidneys where the inflammation stimulates the bone marrow to produce a large number of WBC. The increase of the eosinophil count could be attributed to the long period of the disease (47) explained that eosinophilia was produced due to the ability of parasites to infect the tissue and this agreed with (40). PCV, HB, MCV, MCH and MCHC had decrease of positive group comparison with control groups in sheep and mice Balb\c strain injected by hydatid cyst protoscoleses. Our values compared to the reference, indicate for significant anemia of sheep. HB, PCVlevel was significantly lower than the reference value by (48,49,50). Elevated levels of eosinophils, neutrophils and lymphocytes particularly, and the early period of the infection encountered in this study is in conformity with the findings of (51) that elevated eosinophils, neutrophils and lymphocytes participate in the defense against F. hepatica. This significant increase in the number of eosinophils, hipereosinophilia, shows high parasitic burden of these animals since the increase in the number of these cells in peripheral blood is characteristic of parasitic infestation and is cited by some authors (52). Significant changes reportedly occur in blood parameters of animals exposed to the parasitic invasion (53,54,55). Parasitic infections seem to cause increased hepatic enzyme activity and decreased trace element levels by causing liver damage (56-58). The determination of blood parameters is further important as the rate of success in the treatment increases with early diagnosis of the disease (59).

BIOCHEMICAL ANALYSIS

HCs also plays a definitive role in the metabolism,physiology and immunology of cystic echinococcosis (60), radiologic appearance of HCs depends on the stage of maturity and ranges from completely liquid type to com.pletely solid type (61). Some researchers report that investigating the hepaticenzyme activities and total bilirubin, protein, and albumin levels are helpful in theevaluation of the liver functions (62), minerals, on the other hand, have an importantrole in maintaining normal physiological functions and protecting organisms againstdisease. substances are found in the structure of cofactors that These are necessary forenzymatic activity (63).

Biochemical profile in sheep infested naturally by CE and comparison these value with the biochemical value in mice Balb\c strain injected by hydatid cyst protoscoleses, and investigate the value of biochemical profile for infected group and comparison with control group. after examination of some biochemical parameters that related to liver and lung function, Aspartate Total Protein, Total Bilirubin, Aminotransferase (AST), and Lactate Dehydrogenase (LDH) had decrease while aspartate Blood Urea Nitrogen (BUN), Albumin and Creatinine, has increase, comparison with control group in sheep,While in mice aspartate Total Protein, Total Bilirubin, Aminotransferase (AST), and Lactate Dehydrogenase (LDH) had decrease while aspartate Blood Urea Nitrogen (BUN), Creatinine and Albumin has increase, comparison with control group.

Low serum urea concentrations have been recognized previously in association withliver failure and have been suggested to indicate reduced hepatic synthesis of urea from ammonia. The decreased serum urea is associated with more severe hepatopathies and has prognostic relevance. on the other hand, it may be absorbed by the hydatid cystsince (65) detected a large number of carbohydrate, Aspartate aminotransferase (AST) was also measured showed an increase among the positive group compared to the negative control group; a result agreed with (64) who found that the liver infection with cestoda tapeworms led to hepatocyte destruction and enzyme release, therefore, the concentration of AST increased.

The values of these indicators vary; several indicators are in normal limits and somechange. Determination of the activity of some enzymes in serum gives us a more complete picture of activity and functional status of the liver. We have selected some enzymes, but also can serve as biological markers with diagnostic value. It has been reported that host biochemistry shows some alterations from normal physiology in animals with

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parasitic infections (66,67,62). In studies conducted on parasite infested animals (68,69), changes in total serum protein levels, and the levels of certain vitamins, enzymes, and minerals were reported, while the parasitic diseases were reported to make infected animals susceptible to vitamin and study conducted by (66) found that there were some increases in some biochemical parameters including total protein,globulin, amylase, chlor, and vitamin B12 levels, and some decreases in albumin,magnesium, and phosphorus levels of sheep diagnosed with cyst hydatid (66). In the physiopathology of the liver, AST, ALT, ALP, GGT, CPK, bilirubin and albumin,globulin protein tests are important parameters (70). Increased AST activity in the serum is a sensitive. marker of liver damage (71,72) report that the ALP and ASTactivities of sheep infected with end parasites are higher compared to healthy animals and that the increase is caused by the necrosis or cholestasis of the hepatic cells. It is believed that the increase in AST activity and bilirubin levels might be due to hepatocytes, while the increase in total protein and necrosis and/or cholestasis of the globulin levels might be attributed to the deterioration of the protein metabolism.

TREATMENT

Medication

Small, superficial cysts in one location may respond to antiparasitic drugs called benzimidazoles. Benzimidazoles destroy parasites and shrink cysts. Your healthcare provider may combine medication with aspiration or surgery.

PAIR

(puncture, aspiration, injection, re-aspiration): The PAIR technique uses a needle or catheter to drain the cyst. A parasite-fighting chemical is injected into the cyst before it's drained again. Your healthcare provider repeats the process until the cyst is completely emptied.

SURGERY

Furthermore, despite the availability of novel therapeutic options, surgery remains the most prevalent treatment option for this condition, resulting in significant economic and health consequences for nations (41), hydatid cysts, according to certain research, have distinct clinical-radiological features and treatment approaches, clinicians frequently struggle to make a solid diagnosis for this condition (42) Parasitic infection seem to cause increased hepatic enzyme activity and decreased trace element levels by causing liver damage (43,44)

PREVENTION

Control measures discussed above are directed toward prevention of infection. In relation to such measures, the prevention of human infection by E. granulosus eggs is based primarily on health education. It is important to determine the per-sonal, socioeconomic, and environmental risk factors involved in the transmission of human hydatidosis in each country or region .One risk is the lack of potable water and the use of rural water tanks that collect rainwater from the ground surface and roofs . All personnel handling dogs in endemic areas should be aware of the health risk of acquiring hydatidosis and must take safety precautions. At a personal level, the prevention is mainly based on simple rules of personal hygiene, such as avoiding contact with unknown dogs that may be infected, washing hands before eating, and washing vegetables before eating them raw. Dog owners should treat the dogs regularly with pra-ziquantel and avoid feeding them with raw offal potentially infected with cysts.

CONCLUSION

The number of eosinophils shows interest because it can be used routinely as a biological indicator for establishing a preliminary diagnosis which is likely accurate for parasitic. Hematological indicators with diagnostic value, resulted HB, PCV, eosinophils. Their evaluation, can be used as a routine screening test from districts laboratories determining preliminary diagnosis in sheep and mice infested of liver parasites. The change of hepatic enzymes level serves to monitor the progress of parasitic infection in animals and as a sensitive diagnostic aid in field infections. Albumin, BUN,creatinine and total bilirubin are reliable indicators of the stage and severity of parasiticliver naturally infested sheep and in doing so, and constitute an important diagnostic tool in determining of the official diagnosis and an efficient treatment process. The results of the study indicate that the determination of the changes in AST, total protein, total bilirubin levels of the animals infected with cystic echinococcosis could be used as assistive laboratory analyzes to determine the physio pathological changes in their livers and the prognosis of the diseased animals.

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STUDENTS' BASIC SKILLS AS MEASURED ALONG SIX DIMENSIONS: RELATIONSHIP TO PHYSICAL EDUCATION INSTRUCTORS' ATTRIBUTES

Marilyn J. Esteban, Vivencio N. Esteban, Jr., Rhodalyn J. Sibayan
Nueva Ecija University of Science and Technology, Cabanatuan City

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ABSTRACT

The main problem of the study was to assess the basic skills of students and their relationship to the attribution of instructors in Physical Education. The specific problems of the study were the following:

1. *How may the student's basic skills be described along the following dimension:*
   - *1.1 Attentiveness*
   - *1.2 Facility to recall*
   - *1.3 Dexterity*
   - *1.4 Communication*
   - *1.5 Resourcefulness, and*
   - *1.6 Peer relationships?*
2. *How may the instructor's attributes be described as perceived by students?*
3. *Do the students differ in their basic skills across sex and year level?*
4. *Are the six dimensions of student's basic skills and their instructor's attributes significantly related*

The following hypotheses were tested:

1. *The students do not differ in their basic skills across sex and year level.*
2. *The six dimensions of student's basic skills and their valuations of their instructor's attributes are not related.*

INTRODUCTION

Success in the instruction of Physical Education requires teacher's identification of student's basic skills. Students are expected to be equipped with the competence, facility and adeptness in becoming skilled at something as the subject involves multifarious activities that require student's basic skills. The basic skills which students possess should be operational for successful learning. These include attentiveness, ability to recall, facility for communication, dexterity, resourcefulness, and favorable peer relationships.

There are instances when students easily get bored listening to their teacher's instruction. Teacher who are very observant can easily distinguish them from among the rest as the students find it hard to sit still in the class. Their minds tend to wander elsewhere while lessons are being explained by teachers. In some cases, there is the presence of students in the classroom who find it hard to memorize and remember lessons taught. Alertness and mindfulness of a student to situations, circumstances, and situations related with the subject matter taught is imperative if the teacher of Physical Education desires to ensure success in school work among his or her students. Student's skills to situate places and events pursue information and to commit to memory ideas and concepts in succession must be looked into by every teacher. Added to this, teacher must exert effort to look into their student's facility in working out difficulties in various ways, assisting students to arrive at simplifications or solutions, the use of judgment and opinion, and efficiency to expound matters. Finally, if accomplishment of goals and objectives are hoped to be accomplished by teachers of Physical Education, student's sensitivity and consideration for genial and warm interactions should be painstakingly considered too, by teachers.

Student's basic skills enable teachers of Physical Education to closely monitor the performance of their students in school and the quality of the teaching- learning processes involved. Effective delivery of Physical Education instruction is insured when teachers are cognizant of who their students are in terms of their basic skills. Teacher's awareness of learner's basic skills will provide grounds on which they may be able to assess and evaluate their students, specifically how well the student's basic skills

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equipped of capabilities that they can fully employ to acquire knowledge rather than counting on others.

Exploring student's basic skills to intensify the instruction of Physical Education and employing strategies to embellish instruction spells success in the effective conveyance of teaching-learning scenarios associated with Physical Education. Thus, it can be affirmed that teacher's consideration of student's basic skills are imperatives and are worth looking into since these are essentials that will enable teachers to know better their students in school.

Statement of the Problem

The main problem of the study was to assess the basic skills of the students and their relationship to the attribution of instructors in Physical Education. The specific problems of the study were the following:

1. How may the student's basic skills be described along the following dimension:
   1.1 Attentiveness
   1.2 Facility to recall
   1.3 Dexterity
   1.4 Communication
   1.5 Resourcefulness, and
   1.6 Peer relationships
2. How may the instructor's attribute be described as perceived by students?
3. Do the students differ in their basic skills across sex and year level?
4. Are the six dimensions of student's basic skills and their valuation of their instructor's attributes significantly related?

MATERIALS AND METHODS

Methodology

This study utilized the descriptive type of research among the 50% of the College students who are enrolled in Physical Education on four (4) campuses of Nueva Ecija University of Science and Technology namely: Main Campus, San Isidro, Gabaldon and Penaranda during the school year 2006-2007. Checklists, which was adapted Benjamin and White (1998) were the main tools used to gather data.

The instrument was consisted of six (6) parts with 5 item-statements each. It focused on awareness, facility to recall, efficacy for communication, dexterity, resourcefulness and per relationships to draw the respondents' basic skills associated with the teaching of Physical Education.

The responses were subjected to statistical analysis and the verbal descriptions of each statement were described using the following arbitrary scale:

3.25 – 4.0	-	Very True /Always
2.50 – 3.24	-	True / Often
1.75 – 2.49	-	Sometimes True / Sometimes
1.0 – 1.74	-	Not True / Never

Weighted mean, ANOVA, and Pearson Product Moment Correlation Coefficient were the statistical tools used.

RESULTS

Table 1.1
Weighted Mean and Verbal Description of Responses of the Students to the Attentiveness Scale

Item	WM	Verbal Description
1. I get tired when I sit and listed to my instructor in Physical Education	1.73	Never
2. I find it hard to sit still in my class in Physical Education	1.93	Rarely
3. I keep on looking at other things while my Physical Education instructor is explaining the lessons	2.01	Rarely
4. I find it easy to finish all assignments given by my instructor in Physical Education	3.52	Often
5. I find it hard to concentrate when I study my lesson in Physical Education	2.24	Rarely

Table 1.2
Weighted Mean and Verbal Description of Responses to the Facility to Recall Scale

Item	WM	Verbal Description
1. I find it hard to memorize	2.26	Rarely
2. I have techniques to memorize things	3.63	Often
3. I have trouble remembering past lessons taught by my instructor in Physical Education	2.15	Rarely
4. It takes too long to remember facts	2.39	Rarely
5. I forgot what to do during activities in my class in Physical Education	2.0	Rarely

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Table 1.3
Weighted Mean and Verbal Description of Responses to the Communication Scale

Item	WM	Verbal Description
1. The words of my Physical Education instructor are hard to understand	1.45	Never
2. I find it difficult to remember long directions given by my instructor in Physical Education	2.04	Rarely
3. I have good vocabulary	3.57	Often
4. I feel my classmates in Physical Education are better than I am	2.82	Sometimes
5. I understand what my Physical Education	4.05	Often

Table 1.4
Weighted Mean and Verbal Description of Responses to the Dexterity

Item	WM	Verbal Description
1. I learn well with actual demonstration	4.24	Always
2. I have trouble following so many instructions	2.24	Rarely
3. I have poor sense of direction	1.77	Never
4. I come late to my class in Physical Education	1.48	Never
5. I find it hard to remember things in order	2.01	Rarely

Table 1.5
Weighted Mean and Verbal Description of Responses to the Resourcefulness Scale

Item	WM	Verbal Description
1. I easily understand the values behind any lesson taught by my instructor in Physical Education	4.11	Often
2. I am not good at taking up new ideas	2.14	Rarely
3. I feel that I am not better at imagination than my other classmates in Physical Education	2.22	Rarely
4. I am good in solving problems in other ways	3.55	Often
5. I find it difficult to follow even the simplest dance steps	1.82	Rarely

Table 1.6
Weighted Mean and Verbal Description of Responses to the Peer Relationship Scale

Item	WM	Verbal Description
1. I am popular among my classmates	2.85	Sometimes
2. Some classmates hurt my feelings	2.47	Rarely
3. I know how to keep a close friend	4.19	Often
4. Some classmates ask me to do things for them	3.09	Sometimes

Table 2.1
Weighted Mean and Verbal Description of Responses of Students to the Instructors' Attributes Scale

Item	WM	Verbal Description
1. has routines that are neede to keep activities running efficiently	3.91	Often
2. uses rewards / incentives to keep students involved in physical education activities	**3.22**	**Often**
3. motivates students to actively participate in school program	4.19	Often
4. has skills toward effective management of students' activities	4.04	Often
5. communicates to students the need for appropriate behavior	4.14	Often
6. instruct students at the first day of classes the importance of good manners and conduct	4.42	Always
7. listen and tries to useideas raised by students	3.81	Often
8. assesses accurately students' strenghts and weaknesses	3.91	Often
9. has techniques to redirect students' behavior that disrupt classroom activities	3.86	Often
10. comes up with good ideas and presents ideas convincingly	4.12	Often

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11. is aware of the needs of students with problems	3.77	Often
12. uses practical experiences to aid students in understanding the lesson better	4.17	Often
13. has the ability to identify students with behavior problems	3.81	Often
14. can influence students to achieve more success in Physical Education	4.37	Always
15. is a role model for students to emulate	4.22	Always

DISCUSSION

1. Basic Skills of Students

1.1 Attentiveness

Table 1.1 presents the weighted mean and verbal description of the responses of the students to the attentiveness scale.

The students never get tired when they sit and listen to their Physical Education teacher (WM= 1.73).

They rarely find it hard to sit still in their Physical Education class (WM= 1.93), to keep on looking at other things while their instructor is explaining the lesson (WM= 2.01), and to find it hard to concentrate when they study their lessons in Physical Education (WM= 2.24).

They often find it easy to finish all assignments given by their instructor in Physical Education (WM= 3.52)

The results showed that the students are attentive during their Physical Education class. They are never bored listening to their teacher's lesson. They behave well in class and rarely find it hard to keep still in their class. This suggest that the teachers are able to gain their student's interest in the lesson. The students stay focused while attending their Physical Education class, listening intently to their instructor's lecture.

It can also be gleaned from the results that the students can concentrate in their lessons. They participate actively in activities their instructor asks them to do.

The students often find it easy to finish the assignments given by their instructors. This is a consequence of their attentiveness in class. By paying attention and listening to their instructor's teachers, they can easily do whatever assignments they are sked to do. The results suggest that the students are attentive during their Physical Education Class.

1.2 Facility to Recall

Table 1.2 presents the weighted mean and verbal description of responses to the facility to recall scale.

The students rarely find it hard to memorize (WM= 2.24), to have trouble remembering past lessons taught by their PE instructor (WM= 2.15), to take too long to remember facts (WM= 2.39), and to forget what to do during activities their PE class (WM= 2.0)

The students often have techniques to memorize things (WM=3.63).

The findings showed that the students have the facility to recall facts. They rarely find it hard to memorize. This can be attributed to the skills or techniques they use to memorize things. Most students, through their years of schooling, have learned ways to make memorization easy. It does not take them long to memorize facts.

The students have no trouble remembering past lesson in PE. This is a result of their attentiveness in class. Since they listen to their teachers, it is not, difficult for them to remember the steps in a dance, the rules of a game, and how to execute a rhythmic activity, to name a few.

The results indicate that the students have the ability to recall facts.

1.3 Communication

Table 1.3 presents the weighted mean and verbal description of responses to the communication scale

The results showed that the students never find it hard to understand the words never find it hard to understand the words of their Physical Education instructor (WM=1.45) and to find it difficult to remember long directions given by their Physical Education instructor (WM=2.04). Sometimes they feel that their classmates are better in what they do (WM=2.82).

They often have good vocabulary (WM= 3.57) and understand what their PE teacher instructs them to do (WM=4.05). The findings showed that the students easily understand the words of their Physical Education instructor which means the instructor use the right medium of instruction in teaching Physical Education. As a consequence, the students easily learn their lesson well. Sometimes students feel that their other classmates are better than they are simply because the right directions and clear demonstrations, the students can easily grasp what their PE instructors teach them to do.

It can be gleaned from the findings that the students can understand what their teachers is communicating to them.

1.4 Dexterity

Table 1.4 presents the weighted mean and verbal description of the responses to the dexterity scale.

The results showed that the students never have poor sense of direction (WM=1.77) nor come late to their PE class (WM=1.48).

They rarely find it hard to remember things in order (WM=2.02).

It can be seen from the findings that the students have good sense of direction, which implies that they can find the right path to a place they want to reach.

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They are practical in attending their PE classes. This means they observe a time schedule which enables them to keep up with their daily activities.

The students rarely find it hard to remember things in order. This supports the finding that they have the facility to recall things. They rarely have trouble following so many instructions. This can be explained by their skill in listening to their teacher, and their ability to focus.

The students always learn well with actual demonstrations. This result suggests that while it is true that they can learn by listening, it is better for them if they can actually see what they supposed to do in an activity. It is implied that PE instructors should often demonstrations as a teaching strategy.

The results indicate that the students have dexterity.

1.5 Resourcefulness

Table 1.5 presents the weighted mean and verbal description of responses to the resourcefulness scale.

The results showed that the students rarely are not good at taking new ideas (WM=2.14); rarely feel that they were not better at imagination than any of their classmate in PE (WM=2.22), and rarely find it difficult to follow even the simplest dance steps (WM=1.82).

The students often easily understand the values behind taught by their instructor in PE (WM=4.11) and are often good in solving problems in other ways (WM=3.55).

It can be seen from student's responses that the students believe in their ability to take up new idea. This finding suggest that the students are open to innovations and creativity.

The students tend to be competitive. They feel that their imagination is comparable to their classmates. This suggest the finding that they are open to new ideas, resulting in creative imaginations.

It is notable that the students can easily understand the values behind every lesson taught by their PE instructor.

It can be deduced that they can pick up the meanings conveyed in every lesson, which indicates sensitivity and high sense of values.

It is also noteworthy that the students see themselves as good problem solvers. They try to find alternative solutions to problems.

The results indicate that the students are resourceful.

1.6 Peer Relationship

Table 1.6 presents the weighted mean and verbal description of responses to the peer relationship scale.

The results revealed that rarely do some classmates hurt their feelings (WM=2.47).

Sometimes, the students are popular among their classmates (WM=2.85)., or ask them to do things for them (WM=3.09).

The students often know how to help friends (WM=4.19).

It can be seen from the findings that the students have friendly relationship with their peers. Their feelings are rarely hurt by their classmates, which suggest that they get along each other well.

There are times when their classmates request them to do something for them, which shows that their classmate are comfortable and ease with them

Another indication of good peer relationship is their ability to keep friends. They are able to have long standing friendship with their peers. This suggest that the students have good interpersonal relationship.

2. Instructors' Attributes

Table 2.1 presents the weighted mean and verbal description of responses to the instructors' attributes scale.

The instructors often use routines that are needed to keep activities running smoothly (WM= 3.91); use rewards/ incentives to keep students involved in Physical Education activities (WM=3.22); motivate students to actively participate in program/ activities (WM+4.19); has skills toward effective management to students' activities (WM=4.04); communicate to students (WM=3.81); assess accurately students' strengths and weaknesses (WM= 3.91); have techniques to redirect students' behavior that disrupt classroom activities (WM=3.86); come up with good ideas and presents ideas convincingly (WM=4.12); are aware of the needs of the students with problems (WM3.77); uses practical experiences to aid students in understanding the lessons better (WM=4.17); and has the ability to identify students with behavior problems (WM=3.81)

The instructors always teach students at the first day of classes the importance of good manners and conduct (WM=4.42); influence students to achieve more success in Physical Education (WM=4.37); and a role model for students to emulate (WM=4.22).

The findings showed that the PE instructors employ a variety of teaching strategies in order to provide effective instructions and promote learning.

They often use routine that are needed to keep activities running efficiently. For example, it is part of the class routine to review the past lesson before starting a new lesson or doing a new activity.

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The teachers realize the value of extrinsic motivation so they use rewards/ incentives to keep the students involved in PE activities and to participate in related activities.

The students rated their teachers as effective in the management of their activities. This means teachers can make their students obey rules and regulations in performing PE activities, as well as having the ability to manage classroom behavior to avoid disruption of activities or classes.

The students believe in their teachers' openness to ideas. This suggest that the PE instructors listen to their students when they raise issues concerning their class. The teachers are also perceived to be fair in their assessment of the strengths and weaknesses of students.

A significant finding is the students' belief that their PE instructor is aware of their needs and problems. This awareness enables the teacher to design or come up with ways and means to meet the students' needs and to address their problems.

It is also significant to note that the students believe that their PE teachers serve as role model to them. And are therefore worthy to emulate

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PUBLIC VALUE MANAGEMENT REVOLUTION: MOVING BEYOND NEW PUBLIC MANAGEMENT

Prof. (Dr.) Shyam Shirsath
Head of the Department, Department of Public Administration,
Dr. Babasaheb Ambedkar Marathwada University, Chhatrapati Sambhajinagar

ABSTRACT

This paper explores the evolution from New Public Management (NPM) to Public Value Management (PVM) as a response to the limitations and evolving societal expectations confronting traditional public administration. In the context of globalization and post-modern societal shifts, NPM emerged in the late 20th century advocating for efficiency and market-oriented approaches in public sector governance. However, its emphasis on economic reforms overlooked broader social values and citizen-centric outcomes, prompting the development of PVM.

PVM prioritizes public values over mere efficiency, aiming to align governmental actions with societal aspirations and needs. Coined by Mark Moore, PVM emphasizes accountability, equity, and responsiveness to public concerns, marking a departure from NPM's market-centric strategies. This paradigm shift reflects a deeper integration of citizen perspectives and collective societal values into public service delivery and policy formulation.

Through a comparative analysis with traditional public administration and NPM, this paper illustrates how PVM bridges the gap between administrative efficiency and societal expectations, thereby offering a nuanced approach to contemporary governance challenges. It argues that PVM's focus on public values presents a compelling framework for fostering trust, transparency, and legitimacy in public administration amidst dynamic societal changes.

KEYWORDS: *Public Value Management (PVM), New Public Management (NPM), governance, public administration, societal values.*

INTRODUCTION

In the continuous process of social change, it is natural to change the problems, demands, expectations and attitudes of society along with the condition of society. Naturally, the process of this transformation inevitably affects the political and administrative system of that country. That is why it is necessary to improve the administrative system, working methods and the entire administrative process from time to time.

Especially on the background of post-modernism, the fragmented idealism, fragmented thoughts and fragmented behavior or public affairs of the fragmented society has made it more complicated to control the behavior of the public than to provide service facilities (Elliott, 2021: 98-115). Hence, public administration has to play its role on the dual front of reforming in line with continuous social change on the one hand and adjusting to globalization on the other. Indeed, globalization has inevitably resulted in the global spread of goods, services, technologies, processes and transactions. This has resulted in new social expectations, changing value systems and, in turn, the nature of the state and governance *(Arora, 2004:86).* As a consequence of all these changes, the three powers *'state government'*, *'civil society'* and *'market system'* have emerged *(Bawa, 2008:7-9).* It is possible to achieve any goal only through their mutual cooperation. As a result of all these factors, radical changes are expected in the traditional role of public administration. It is from this transformational thinking that new concepts and models started to be discussed in the development process of public administration. And the reforms in the public sector that broke with the function of traditional public administration came to be called 'New Public Management (NPM)' *(John & Owen, 2007: 2-5).* In short, it has to be admitted that 'New Public Management' was a response to the weakness or failure of traditional public administration *(O Flynn, 2007: 254*). However, due to the changes in the last few decades and the changed context, new thinking started to be different from public management, due to which network governance, public-private participation, participative governance, disaster management and especially Public Value Management (PVM) were born and new formats have been promoted.

If we want to think about public value management, the ideology of public value management has changed based on the experience of new public management in the last three decades and its limitations. Here new public management was primarily motivated by economic reforms; So, the fundamental difference to be noted is that public value management has come forward to guide social mentality. In short, the spirit of this concept is that the government should perform public management by giving attention to public values.

New Public Management

Public administration has to face many problems due to the rigid and framed system and mechanized working methods of

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public administration. In particular, traditional public administration carried out government functions under the Weberian model of bureaucracy, and sought to solve social problems through it. This moldy form of public administration was not conducive to giving direction to the changing social mentality. Primarily the failure of traditional public administration to meet the needs of the citizens and the efficient use of capital, the concept of 'New Public Management' began to take shape out of the need for a sound policy and a different model for effective service delivery (Gerry, 2008:3-4).

The following ideologies were born out of the failure of traditional public administration to inspire change (Arora, 2004:87).

1. A changing scenario of the present society; Due to which reforms in administration have became necessary.
2. Necessity of adjusting to the changing mindset from mere task execution to task completion.
3. The need for public organizations to be risk-taking, action-oriented and service-oriented

Along with this, in the decade of the 1970s, the first discussion about the 'New Right' started at the University of Chicago. It was later transformed into a movement and a philosophy that came before the world. The basis of this philosophy is that citizens need some new rights beyond the fundamental rights and human rights. The rights of individual values and the right to choose services was the manifestation of the demand in this movement (Arora, 2004:90). Of course, to be clear, the latent desire of the citizens to know what the government is doing and to be governed according to our wishes has been manifested through *'new rights philosophy'*.

Against the backdrop of the above transformative thoughts, the need for radical reforms in public administration and the result of long reflection on this, the concept of 'New Public Management' emerged. New public management was first conceptualized by David Osborn and Ted Gabler in the book 'Reinventing Government-1992' (Osborn, 1992:1). Hood Christopher in his book published in 1991, *'A Public Management for all seasons'*, expressed the model of *'professional management in the public sector'* which was embodied in the form of new public management (Hood, C, 1998: 122, 207).

In terms of new public management, R. A. W. Rhodes put forward his famous '3-E's' theory and emphasized that '3-E's-Economy-Efficiency-Effectiveness' are the essence of new public management. Moreover, it is asserted that the role of government is decreasing and the responsibility of citizens is increasing (Rhodes, 1996: 652). However, we have to admit the existence of new public management even beyond this framework. American thinker Kettle in the year 2000 explained the following points regarding the trend of new public management (Kettl, 2000:1-3).

- Determination of productivity with the aim of more production
- Marketing with an autonomous and independent style
- Service orientation with more responsibility
- Decentralization as per citizens' needs
- Policy formulation for development roadmaps
- Determining accountability for the outcomes

David Rosenbloom in 2002 included the following elements in the new public management concept. (Arora, 2004:89).

- Emphasis on outcomes rather than process
- Adoption of market principles
- Consumer-based administrative system
- Teamwork/group work for service
- Change in the entire public administrative culture (flexibility, innovation, entrepreneurship etc.)

Rosenbloom's distinctiveness was instead of individual performance he emphasized group work, consumerism, and creation of a new administrative culture. Osborne and Gabler's New Public Management has been reasonably and appropriately presented in ten characteristics of catalytic governance, community-oriented governance, competitive governance, proactive governance, result-oriented governance, demand-oriented governance, proactive governance, expectation-oriented governance, decentralized governance and market-oriented governance. From this, it seems that the theoretical and practical face of public administration has changed with the influence of new public management. Nevertheless, the overemphasis given to 'market strategy' and the limitations of adjustment to the 'post-modern' mindset of society, led to the search for alternative forms of new public management as well (West, D. C, 2015:18). Attributes: Since the last few years, new ideas have come forward due to changing social conditions and attitudes. It is in this ideology that *'Public Value Management'* (PVM) takes precedence over the insistence of public opinion.

Public Value Management (PVM)

Indeed, new public management has narrowed the divide between governments and governed consumer and provider, and efficiency measurer and public service provider. It is within this reduced gap that 'Public Value Management' finds its origins. This means that the end result of new public management is the beginning of public value management. It has become imperative for the government to give priority to the *'public value'* which was lacking in traditional public administration and new public management (Gerry, 2006: 41-57).

Mark Moore coined the concept of 'Public Values Management' in 1997 in the context of evaluating and improving public services based on public values (Kate, 2004:3). Since this concept is related to the public mentality, postmodernism seems to have an influence on it as well. It is felt that 'public values' are embodied in post-modern attitudes such as self-determination, preference-choice differentiation, voracious consumerism, individualism, self-sufficiency and theism.

What is 'Public Value'? : The concept of 'public value' is multifaceted. But even this concept is not very mature. Public value is not only created by results but also comes from a process where there is trust, accountability, openess and transparency. Public values are conveyed to the people and collectively expressed through the political system.

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Public values are based on the public's expressed feelings, expressed expectations and tangible efforts. Louise Horner and Stephen Bevan have explained public values in very simple terms. According to them, 'What is Public Value? Public Value is what the Public Values...' (Louise, 2006:1). In short, the latent desires of the society are expressed through the public values, it comprises of the expressed desires, and collective desires are preferred by government. Hence, public values represent the overall mentality of the society.

Characteristics of Public Value Management: Public values are expressed through public affairs that reflect traditions, customs, beliefs, values, expectations, demands, and interpersonal relationships. It assumes that management of all these public affairs is under government institutions.

Features of Public Value Management may be stated as follows;

- Regulates public behavior as expressed through outcomes, trust and legitimacy.
- Equity, Morality and Accountability are integral components of government service delivery mechanism.
- Public representatives, whether political or executive (administrative), should create and direct public values.
- Public values may be enabled by showing sensitivity to changing consumer preferences.
- It is important for the government to keep in strategy to change 'public opinion' and give appropriate response to it, such 'public opinion' should be get through polling and consumer market research.
- Public Values Management is motivated by 'Public Interest' or 'Public Domain'.

In short, public value management seems to support aspects of people's mentality that are different from traditional public administration and new public management.

Comparative Perspective

Comparative Consideration of Traditional Public Administration - New Public Management-Public Values Management shows in following Table no.1.

Table No. 1
A Comparative Perspective
(Traditional Public Administration - New Public Management - Public Value Management)

Elements	Traditional Public Administration	New Public Management	Public Value Management
Main Objectives	- Service delivery from a bureaucratic perspective. - Input through Political Process.	- Management of inputs-outputs - Assurance of economy and consumer response	- Priority to Public values. - maintenance of Services and system
Public Interest	- Expressed by politicians - Neglected in terms of public input.	- Comprise of individual preferences - Consumer choice based	- Integrated process of individual and collective choices
Service Delivery	- Hierarchical departmental or - Self-controlled by professionals.	- Private sector or clearly defined public agencies	- Emphasis on goals achievement through mediating mechanisms - Utilitarian
Public Services Value Approach	- Public Sector monopoly in service values.	- Suspicion on the public sector values - Preference to consumer services	- No single sector has monopoly on public service values. - Correlation of essential participatory values
Accountability	- Election voting - Party politics - Functions performed by Controlled bureaucracy.	- Separation of Politicians and Managers - Politicians will direct but not control comprehensively - Managers will maintain a consumer oriented system	- Elected Leadership, Managers and key stakeholders solving community problems and create effective Mechanism through collective efforts of stakeholders. - Public opinion through Elections, referendum, purposive organizations

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Role of Government & Administration	- Guarantee of execution of rules and fixed process.	- Assist for explanation - Task target consensus	- Networking of thoughts and actions. - Maintenance of every areas of system.
Nature	- Government centralized	- Market or consumer centric	- Public interest, preference and public values centric

Source: Kelly & Muers (2002), O. Flynn (2005) & Stoker (2006)

This process of transition seems to have changed drastically. While traditional public administration appears to prefer formalities, political influence and more bureaucratic; new public management is somewhat flexible but consumer-oriented and embraces private entrepreneurship. But in public value management, 'public values' are at the center, political leadership and administrative officers are entrusted with the responsibility and trust to create public values; In the end, it has to be admitted that an attempt has been made to bring a proper balance between public administration and private administration through this model.

In fact, public value management is a result of the process of social change. But still the development of this concept is in the preliminary stage. Public values were neglected in the quest for efficiency in the process of traditional public administration and new public management. This deficiency has been filled by this new concept. However, it is yet to mature. Public values are a collective appearance of social behavior; it reflects the demands, expectations, ethics and relationships of the community. Naturally, the government needs basic respect for the people while determining its policy and action plan, because public values can be rooted.
Public value management has become the need of the hour in line with postmodernism; because the traditional public administration and the new public management are perceived as unable to adjust to the impending changes. It is to fill this gap that public value management has gained a theoretical foundation. The government intends to determine its policy according to public values. Therefore, it is expected that social problems can be eradicated or even prevented, and since they are related to the behavior and attitudes of the society. Hence, public value management mainly emphasizes on the desires of the citizens may be satisfied.

CONCLUSION

In conclusion, the transition from Traditional Public Administration to New Public Management (NPM) and subsequently to Public Value Management (PVM) reflects a significant evolution in governance paradigms driven by changing societal dynamics and global pressures. While Traditional Public Administration emphasized bureaucratic efficiency and hierarchy, NPM introduced market-oriented reforms to enhance effectiveness and responsiveness. However, NPM's exclusive focus on economic metrics and efficiency often overlooked broader public values and societal aspirations.

The emergence of PVM represents a corrective response to these limitations, advocating for a governance approach that integrates public values such as equity, accountability, and responsiveness into policy-making and service delivery. PVM shifts the focus from mere outputs to the broader outcomes that matter to society, thereby enhancing the legitimacy and trustworthiness of governmental actions.

Through a comparative analysis, this paper has demonstrated how PVM complements and extends the principles of NPM by emphasizing citizen-centric governance and fostering a deeper connection between government and society. By prioritizing public values, PVM offers a pathway towards more inclusive, participatory, and effective governance in the face of complex societal challenges and expectations.

Moving forward, the adoption and adaptation of PVM principles by governments worldwide hold promise for enhancing public sector effectiveness, responsiveness, and accountability. As societies continue to evolve, PVM provides a robust framework for aligning governmental actions with the diverse values and aspirations of the public, thereby contributing to more sustainable and equitable governance practices.

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NEED OF SECURITY SYSTEMS IN LIBRARIES: AN OVERVIEW

Mrs. Ambhore Vandana J.
Librarian, Government Law College Mumbai (MS) India

ABSTRACT

A library is a place where you can find many types of information, both in print and digital forms. It's a key source of knowledge, making this information easy to access for its users through different formats, including books, magazines, research reports, e-books, and e-journals in CD-ROM and online formats. Libraries are always adding new materials to their collections while also working to keep them safe for the future. To do this, they use a strong security system. The main goal of this security is to protect all library items from harm. In the past, libraries had limited access, so staff would bring materials to users instead of allowing them to go into the stacks. This was thought to prevent theft because users couldn't directly access the materials. However, this changed to include a security guard at the exit to prevent items from being hidden. As libraries became more open, allowing users to freely browse and select materials, new problems like theft and damage appeared. To tackle these issues, libraries are now focusing on electronic security systems, which are seen as more effective than old methods. This shift has led to many libraries adopting electronic security to better protect their collections. This paper explores the different tools and techniques used to ensure library security and discusses the reasons behind library security, the role of library staff, and the challenges they face.

KEY WORDS: *Library Security, Library Security Tools, Definition of security terms, Type of Library Security tools, Security Manager, security planning*

I. INTRODUCTION

Libraries play a crucial role in the advancement of civilized society, serving as vital hubs for education, learning, research and the dissemination of information for the betterment of all. Libraries can be defined as places that not only store information in printed format but also organize and store various forms of information in electronic format. It is in their capacity as directors that the libraries have the function of not only handling knowledge but also managing the procurement of information resources in the library. Libraries are now more focused on security to protect their valuable books and resources. These investments are worth it because the cost of maintaining them can be much higher than the initial purchase. Losing or damaging these items can make them impossible to replace, especially if they are out of print. The security system's main goal is to keep the library safe for staff, resources, and visitors, while also allowing easy access for patrons. It should work smoothly without getting in the way of the library's mission to serve its users.

II. SECURITY SYSTEM

* According to wikipaedia : Security generally refers to physical security protection that includes fire protection and emergency planning. Security is the degree of resistance to, or protection from harm.

* The term is also used to refer to acts and systems whose purpose may be to provide security (security company, security police, security forces, security service, security agency, security guard, cyber security systems, security cameras, remote guarding). Security can be physical and virtual.

III. LIBRARY SECURITY

A security system is designed to help unauthorized removal of particulars from the library. Its primary purpose is to ensure a safe and secure environment for library staff, resources, equipment, and patrons. likewise , these systems must operate without hindering the library's objects, services, and functions.

The security concerns at a library can be distributed into two main areas.

a) The first is physical security, which focuses on securing the physical means of the library such as books, journals, magazines, the library building, and its surroundings.

b) The second is electronic and information security, which is concerned with protecting the library's databases, patron information, and key components such as electronic resources and the systems and hardware used to store and distribute that information. To insure that security measures are effectively implemented in the library, it is essential for every library to have policies, promote awareness, give training and education, and regularly update their technology.

IV. NEED OF SECURITY SYSTEMS

Implementing the effective security systems in libraries is crucial for securing resources against theft, damage, and other crimes, thereby reducing the threat of resource loss and inconvenience to patrons. Although the initial costs may appear modest, the time spent managing missing items can quickly escalate expenses. Jagdish Patange noted Need of Security systems as follows.

- Security systems help keep our collection safe and accessible for users.

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- Libraries have a large variety of materials, including books, magazines, reference sources, and digital media.
- The adding quantum of information and the complex nature of library work, along with evolving document formats, are making it harder to manage.
- Libraries face a big problem with missing materials, which requires a system to reduce these losses.
- Libraries need to improve how they manage their collections and check-outs to better use their resources.
- Self-service check-outs are becoming more popular worldwide.
- Libraries must ensure the safety of their collections to avoid problems like missing materials or theft.
- The main goal of a library is to provide the best service to its users by offering the materials they need.
- If a user can't find a book or other material, it can be frustrating. The question is, where did it go? It might have been lost or stolen, which is why security systems are important.
- Libraries also need to cover their digital collections, including software and hardware.
- To prevent theft, libraries should have a strong security plan.
- When creating a security plan, library managers need to think about their long-term goals, budget, how they serve their users, the size of their collection, and other factors.

I. CAUSES OF SECURITY ISSUES IN LIBRARIES

The issue of theft from libraries is not a recent development; it has persisted for many years. The root causes of theft in libraries include:

- Library staff dissatisfaction
- Disaster of natural origin
- Learning material expenses
- Inadequacy of library materials
- Lack of discipline
- Self-centered behavior
- Misplacement of library card

II. RISK ASSESSMENT

Before implementing preventive measures, it is important to assess the risks associated with library security, including both external threats such as proximity to residential, industrial, or recreational areas and internal threats like the placement of collections in relation to plumbing, electrical, and fire-resistant structures , and to identify any shortcomings in existing disaster prevention measures.

III. PREVENTION

After evaluating the risks, ensure the library's buildings and collections are safe. Librarians should handle the situation carefully. Library collections and materials can be protected using both physical and electronic security systems.

a. Physical or Non-Electronic Security Systems

- Building Design: It is important that every security measure for the library is considered in the building's design.
- Fire Extinguisher: Fire extinguishers are essential safety equipment for homes, offices, and public spaces to control small fires or smog during emergencies. These are simple to use and could potentially be life-saving.
- Id-card: All library patrons need a valid ID-card to access resources and facilities. Without it, borrowing materials, using computers, or joining programs isn't allowed. Access is limited to authorized individuals only.
- Library policy: A library policy is a guide for operations and decision-making. It outlines strategic goals and how to achieve them, ensuring efficient services that meet diverse needs. Policies are essential for effective library.
- Locks & Key system: A lock and key system consists of a key that operates a lock, allowing it to be locked or unlocked. Generally, a key is a small metal object made up of two main components: the bit or blade, which fits into the lock's keyway and differentiates between various keys, and the bow, which remains outside the lock for the user to turn. The key acts as a security token, granting access to the secured area; only individuals with the correct key can unlock the lock and gain entry.
- Security Guard: Having a dedicated security guard in the library is vital. A well-trained and proactive guard plays an important role in maintaining a calm and organized atmosphere throughout the library.
- Security Awareness: Every library should ensure that librarians and staff actively create awareness programs. These programs need to teach visitors about the library's rules, regulations, and security measures. By sharing clear and easy-to-understand information, libraries can promote a safe and respectful space for everyone.

b. Electronic security system

- CCTV

  CCTV is a closed-circuit TV system that provides video to distinct viewers on a limited set of monitors. It is used for various purposes such as security, disaster prevention, and military fields. Open circuits refer to devices focused on a wide variety of people.

- RFID

  RFID (Radio Frequency Identification) is a modern technology that uses radio waves to track and identify objects or people with tags and readers. It's very useful in many areas, especially in libraries for managing books and preventing theft. However, in India, many libraries

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haven't adopted it because it's expensive to set up. This means they might not be able to improve their services or keep up with new technology.

- Barcodes

  Barcodes are a simple and cost-effective method for encoding text data. They are made up of a series of parallel lines and spaces with specific patterns known as "symbologies." To read a Universal Product Code, a scanner measures the light reflected by the white spaces. A photodiode detects this pattern of reflected light, generating a signal that corresponds precisely to the barcode's design. This signal is then processed by inexpensive electronic circuits to retrieve the original data.

- A Magnetic Tape

  A magnetic strip is added to books, CDs, DVDs, or videos during checkout. If an item isn't deactivated, the library's exit safety gate detects the strip and triggers an alarm. Upon return, the magnetic strip is reactivated. Magnetic security systems primarily detect unauthorized removal of materials and do not scan barcodes or RFID tags. They are reliable, effective, and least susceptible to tampering, providing the highest level of security for your library's collection.

- 3M Exit Detection

  The 3M Exit Detection technology is a highly effective security solution that offers comprehensive protection for libraries utilizing state-of-the-art Tattle-tapes security strips. This cutting-edge technology is specifically designed for identification purposes and is widely adopted in various establishments such as banks and shopping malls, where it aids in detecting individuals entering and exiting the premises with precision and accuracy. With its advanced sensors installed on doors and windows, the 3M Exit Detection ensures maximum safety and security at all times.

- Biometric: Biometrics uses physiological and behavioral traits to identify individuals for library entry. It prevents unauthorized access and enhances data protection by associating physical attributes with access permissions. Biometric security systems improve security.
- Accessed controlled gate: The access controlled gate uses electronic technology to manage who can enter the library. Staff and students receive electronic cards, which they must swipe to get in. This ensures only authorized people can enter and helps prevent unauthorized access.
- Alarm systems: Alarm systems are devices or systems that produce sounds, lights, or other signals to alert people about a problem or situation. They usually have a siren.
- Antivirus Software: There are many free and paid antivirus software options available now that help protect your data. Install one on your computer to keep your information safe.
- Backup: Regularly backup data to a secure and durable location to prevent loss in case of system failure or unforeseen circumstances. Use antivirus software like Kaspersky, Quick Heal, or McAfee to protect data from virus attacks.
- Smart card: A smart card is a compact, credit card-sized device that houses an integrated chip and functions as a secure memory storage solution. This highly efficient technology operates by being inserted into a designated reader, granting authorized access to stored data.

CHALLENGES FACED BY LIBRARIES

Gupta and Madhusudhan (2018) reported challenges as.

- Insufficient funding
- Mishandling and delayed arrival of library collections
- Inadequate support from management and library leadership in addressing security issues
- A lackadaisical attitude of library staff towards ensuring a secure library environment
- Lending out items without following proper procedures
- Finding appropriate storage for patrons' and professionals' collections
- Insufficient staff or training workshops on security issues and systems
- Lack of user awareness about what constitutes security breaches.

CONCLUSION

Libraries play a important role in helping people learn and develop in various aspects of life. To use library services, users need to follow rules and take care of the books and materials. Libraries spend a lot on buying books, so keeping them safe is very important. Choosing the right security system for a library is important, considering its size, layout, and challenges. Enhancing library security involves leveraging advanced ICT applications to safeguard documents from theft, mutilation, and other crimes, as it is challenging to replace stolen or damaged rare materials. Dealing with a growing number of resources and users, librarians face significant security challenges with both printed and digital materials, necessitating a focus on preventive, detective, and corrective security measures that encompass physical and technological aspects, as well as the updating of plans, procedures, policies, and tools to safeguard library systems. Traditional security measures are insufficient in the digital age, making it crucial to focus on good staffing and raising awareness to effectively address library security concerns. The use of electronic measures can help identify and secure materials, relieving some of the librarian's burden. However, due to limited budgets, most libraries in India fail to implement digital measures.

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MULTICOMPONENT INTERVENTION PROGRAM ON MEDICATION ADHERENCE, REPORTED SIDE EFFECTS AND GENERAL FUNCTIONING AMONG CAREGIVERS OF PATIENT RECEIVING ANTIPSYCHOTICS

Mrs. Chandni CV[1], Dr. Starmine C[2], Prof. Dr. Sheela Shenai N A[3]
[1]MSc Nursing Student, Mental health nursing, M.O.S.C. College of Nursing, Kolenchery
[2]Associate Professor, Department of Mental Health Nursing, M.O.S.C. College of Nursing, Kolenchery
[3]Principal, M.O.S.C. College of Nursing, Kolenchery

ABSTRACT

Objectives: *This study was conducted to estimate the medication adherence, reported side effects and general functioning among caregivers of patient receiving antipsychotic medication, to determine the effect of a multicomponent intervention program on medication adherence, reported side effects and general functioning among caregivers of patient receiving antipsychotics and to find the association of medication adherence, reported side effects and general functioning with selected socio personal variables.* ***Methods:*** *A quantitative research approach and one group pre test post test design were adopted. Using convenience sampling, 80 caregivers of patient receiving antipsychotic medication who attended psychiatric outpatient department were enrolled in the study. Socio personal proforma, Clinician rating scale, Glasgow antipsychotic side effect scale and Lawton instrumental activities of daily living scales were used to collect the data.* ***Results:*** *Findings of the study showed a significant difference in the pre and post test results of medication adherence ($z = 4.256$) at $p<0.001$, reported side effects ($z = 4.302$) at $p<0.001$ and general functioning ($z = 4.218$) at $p<0.001$ scores after the multicomponent intervention program. The study also found that, there was no significant association between medication adherence, reported side effects and general functioning with the selected socio personal variables.* ***Conclusion:*** *The study concluded that multicomponent intervention program helps to provided medication adherence, management of antipsychotic side effects and improved the general functioning among caregivers of patient receiving antipsychotics.* ***Keywords:*** *Multicomponent intervention program, Medication adherence, Reported side effects, General functioning, Caregivers of patient receiving antipsychotics.*

INTRODUCTION

Antipsychotics, also known as neuroleptics, are the first line pharmacological intervention for severe mental illnesses such as schizophrenia and other psychotic disorders. First generation antipsychotics are known as typical antipsychotics, were introduced in the year 1950 and second generation drugs known as atypical antipsychotics that introduced clozapine in the year 1970. These two generations of medication block the dopamine receptors in the brain, whereas atypical medication tends to act on serotonin receptors[1]. Antipsychotic drugs have become the cornerstone of treatment for psychiatric disorders.

These are effective in reducing psychotic symptoms, relapses and psychosocial functioning. However, nonadherence to medication is one of the biggest problems that increases rehospitalisation and psychotic symptoms[2]. Thus, lack of adherence to pharmacological treatment is associated with worsening of symptoms and decrease prognosis. Whereas, various patient related factors are responsible for nonadherence such as age, lack of insight, negative attitude towards treatment and substance use. The family related factors are ignorance of benefits and unrealistic expectations. The illness related factors are aggressive behaviour and cognitive impairments[3]. The health related factors are negative impact on adherence and lack of supervision. Antipsychotic medications can produce various adverse effects that may significantly affect the quality of life that causes distress. These produce own spectrum of adverse reactions such as extra pyramidal side effects, weight gain, seizures, hypotension, hyperlipidaemia and increased risk of diabetes mellitus. Most common extra pyramidal symptoms include acute dystonia, akathisia, tardive dyskinesia, neuroleptic malignant syndrome and parkinsonism, which develop within hours after initiating doses of antipsychotics[4]. Activities of daily living (ADLs) are the fundamental skills required to perform activities independently without any assistance. The activities of daily living were introduced by Sidney Katz in 1950 and it is used as an indicator of a person who had normal general functioning. The dependence may happen if there is any difficulty to perform the activities of daily living[5]. The inability to accomplish essential activities may lead to poor quality of life. Psychoeducation is an evidence based therapeutic intervention for patients and family members to provide information to cope with illness. Psychoeducation can be done on group or one to one basis. It has been emphasized as an evidence based practice with various beneficial health outcomes[6]. It has the first choice of strategies to provide medication adherence, management of side effects and improve general functioning of patient receiving antipsychotic medications. It could increase patients responsibility to face the illness and it allows to participate with treatment regimens actively.

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Statement Of the Problem

A study to assess the effect of a multicomponent intervention program on medication adherence, reported side effects and general functioning among caregivers of patient receiving antipsychotics at psychiatric outpatient department of a selected tertiary care hospital in Ernakulam district, Kerala.

Objectives

- To estimate the medication adherence, reported side effects and general functioning among caregivers of patient receiving antipsychotic medication.
- To determine the effect of a multicomponent intervention program on medication adherence, reported side effects and general functioning among caregivers of patient receiving antipsychotics.
- To find the association of medication adherence, reported side effects and general functioning with selected socio personal variables.

Operational Definitions

- **Medication adherence**: Refers to the extent to which a patient takes prescribed medications according to the dosage and frequency, recommended by the psychiatric consultants.
- **Side effects:** Refers to effect of a drug, chemical and other medications that are in addition to its intended effect, especially harmful or unpleasant that are reported by caregivers.
- **General functioning:** Refers to the physical, social and psychological wellbeing that involves in activities of daily living.
- **Caregivers:** Refer to family members or significant others who are actively involved in caring of patient who are receiving antipsychotics for minimum 6 months and accompanies the patient more than 6 months for continuing treatment in selected setting.
- **Chronic psychotic disorders:** Refer to selected chronic mental illness such as bipolar affective disorder, schizophrenia, and other psychotic disorders diagnosed by psychiatrist using ICD 10 guidelines.
- **Multicomponent intervention:** Refers to information, education and communication (IEC) given for 30 - 45 minutes to the caregivers of patient receiving antipsychotic medication. which includes medication adherence, benefits, associated factors, management of antipsychotic medication side effects and remedies to improve general functioning among caregivers of patient receiving antipsychotic medication. It aims to provide medication adherence, management of antipsychotic medication side effects and improve general functioning.

Assumptions

a. Patients receiving antipsychotics may face nonadherence to medication.
b. Patients receiving antipsychotic generally experience some side effects.
c. Patients receiving antipsychotic may affect with poor general functioning.
d. Multicomponent intervention program may provide medication adherence, manage antipsychotic side effects and improve general functioning.

Hypotheses

H1: There is a significant difference in the average medication adherence, reported side effect and general functioning scores after the multicomponent intervention program on the experimental group.

H2: There is a significant association of selected socio personal variables with medication adherence, reported side effects and general functioning among caregivers of patient receiving antipsychotics.

METHODOLOGY

Research approach: Quantitative research approach

Research design: Pre experimental design (one group pre test post test design)

Variables

Outcome variables

Medication adherence, reported side effects and general functioning

Socio personal variable: Age in years, gender, religion, marital status, educational status, occupation, type of family, relationship with the patient and duration of stay with the patient

Setting of the study

Psychiatric outpatient department of M.O.S.C. Medical college hospital, Kolenchery

Population

Target population: Caregivers of patient receiving antipsychotic medication in Ernakulam district

Accessible population: Caregivers of patient receiving antipsychotic medication from the selected setting of M.O.S.C. Medical college hospital, Kolenchery

Sample and sampling technique

Sample: Caregivers of patient receiving antipsychotic medication from the selected setting who met the inclusion criteria

Sampling technique: Convenience sampling technique

Sample size: 80 caregivers of patient receiving antipsychotic medication from the selected setting

Sample Selection Criteria Inclusion Criteria:

a. Patients with psychiatric disorders receiving antipsychotic medication more than 6 months from a selected tertiary care centre.
b. The patient those who have nonadherence on medication,

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mild to severe side effects of antipsychotic medications and impaired in general functioning will be selected for study.

c. Adult family members or significant others who are actively involved in caring of patients with chronic psychiatric disorders for more than 6 months and accompanies the patient for
continuing treatment in the selected setting.

Exclusion Criteria

a. Caregivers who have physical or mental illness which incapacitate them to participate in the study.

Tools and Techniques

Socio personal Proforma: Socio personal proforma for caregivers of patient receiving antipsychotic medication including age in years, gender, religion, marital status, educational status, occupation, type of family, relationship with the patient, duration of stay with the patient.

Clinician Rating Scale (CRS): It is a standardized scale used for assessing the medication adherence of patient receiving antipsychotic medication. The scale has 7 items scored from one to seven. The maximum score is 7 and minimum score is 1. The score is 3 or above indicates adherence and 2 or less than 2 indicates non adherence. The reliability of the tool was established by using Cronbach's alpha method and tool was found to be reliable with r= 0.83.

Glasgow Antipsychotic Side Effect Scale (GASS): Glasgow antipsychotic side effect scale used for assessing the reported side effects of patient receiving antipsychotic medication. The scale has 22 items rated from 0 - 3. The maximum score is 63 and minimum score is 0. A score between 43 - 63 indicates severe side effects, 22 - 42 indicates moderate side effects and 0 - 21 indicates absent or mild side effects. The reliability of the tool was established by test retest method and tool was found to be reliable with r= 0.82.

Lawton Instrumental Activities of Daily Living (IADL) Scale: Lawton Instrumental Activities of Daily Living Scale (IADL) used for assessing the general functioning of patient receiving antipsychotic medication. The maximum score is 8 and minimum score is 0. A score 8 indicates high function and 0 indicates low function. The reliability of the tool was established by test retest method and tool was found to be reliable with r=0.88.

Ethical Considerations: Approval was obtained from the institutional ethics committee of Malankara Orthodox Syrian Church Medical College Hospital, Kolenchery. Informed consent was obtained from the subjects.

Pilot Study

The pilot study was conducted among 15 subjects who met the inclusion criteria. The study was found to be feasible in terms of time, money and manpower resources

Data Collection Process

The study was conducted after obtaining ethical clearance from the institutional ethics committee. Formal administrative permission was obtained from the Administrative Director, M.O.S.C. Medical College Hospital and Principal, M.O.S.C. College of Nursing. Totally 150 caregivers of patient receiving antipsychotics were screened from psychiatric outpatient department as per the inclusion criteria. In that 80 participants were selected by convenience sampling technique. After a brief self introduction by the researcher, the purpose of the study were explained to the subjects. The subjects were allowed to read the participant information sheet and made provision to clarify the doubts for informed consent. One group pre test post test design were selected for the study. The pre test was done by using socio personal proforma, Clinician rating scale for assessing medication adherence, Glasgow antipsychotic side effect scale for assessing side effects of antipsychotic medications and Lawton instrumental activities of daily living scale. The caregivers of patient who had medication nonadherence, mild to severe antipsychotic side effects and impaired general functioning were selected for the study. The multicomponent intervention program were administered for 30 - 45 minutes by using flash cards and booklets. The reinforcement was given by the researcher once in every week for the period of 30 days. The supervised multicomponent intervention program follow up was done at seven days of interval for the caregivers of patient receiving antipsychotics. The post test was done at the end of month (4th week) to reassess the medication adherence, reported side effects and general functioning to check the effect of multicomponent intervention program. The Confidentiality was ensured during and after the study.

Plan for Data Analysis

For assessing the effects of a multicomponent intervention program on medication adherence, reported side effects and general functioning, Wilcoxon signed rank statistics was performed as data violated the normality. For determining the association of medication adherence, reported side effects with socio personal variables Fisher's exact test/ Chi square test was performed as data follows normality, Kruskal Wallis test/ Mann whitney U test was used to find the association between general functioning with socio personal variables as data violates normality. The p value <0.05 was considered as to be statistically significant.

Results

The median and interquartile range score of medication adherence 3 (Q1 = 2, Q3 =4), reported side effects 35 (Q1 = 28, Q2 = 38) and general functioning 4 (Q1 = 2, Q3 =5) among patient receiving antipsychotic medication (Table 1, Table 2 & Table 3). The median score of medication adherence after multicomponent intervention program was (4.5) significantly higher than the median score of medication adherence (2) before the multicomponent intervention program. Therefore, there was a statistic significant difference between the adherence score between before and after the intervention (z = 4.256) at p<0.001 (Table 4). The

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median score of reported side effects after the multicomponent intervention program was (13.50) significantly reduced in the median score of reported side effects (37) before the multicomponent intervention program. Therefore, there was a statistical significant difference in the reported side effects score between before and after the intervention (z = 4.302) at p<0.001 (Table 5). The median general functioning pre test score before the multicomponent intervention program was (3) significantly lower than the median general functioning post test score (6) after the multicomponent intervention program. Therefore, there was a statistical significant difference in the general functioning score between before and after the intervention (z = 4.218) at p<0.001 (Table 6). The study also found that, there was no significant association between medication adherence, reported side effect and general functioning with the selected socio personal variables. Hence the study concluded that multicomponent intervention program helps to provided medication adherence, management of antipsychotic side effects and improved the general functioning among caregivers of patient receiving antipsychotics.

Table 1: Median and Interquartile range of medication adherence among caregivers of patient receiving antipsychotics

Variable	Median	Q1	Q3
Medication adherence (Score ranges from 01- 07)	03	02	04

Table 2: Median and Interquartile range of reported side effects among caregivers of patient receiving antipsychotics

Variable	Median	Q1	Q3
Reported side effects Score ranges from (13 - 48)	35	28	38

Table 3: Median and Interquartile range of general functioning among patient receiving antipsychotic medication.

Variable	Median	Q1	Q3
General functioning Score ranges from (0 - 7)	04	02	05

Table 4: Median, Interquartile range and Wilcoxon signed rank test of pre and post test score of medication adherence

Time points	Median (Q1, Q3)	Wilcoxon signed rank Statistic (z)	p-Value
Pre test	2 (2, 3.5)	4.256	**p<0.001***
Post test	4.5 (4, 6)		

*Significant (p< 0.05)

Table 5: Median, Interquartile range and Wilcoxon signed rank test of pre and post test score of reported side effects

Time points	Median (Q1, Q3)	Wilcoxon signed rank Statistic (z)	p-Value
Pre test	37 (35, 41)	4.302	**P<0.001***
Post test	13.50 (10, 18)		

*Significant (p< 0.05)

Table 6: Median, Interquartile range and Wilcoxon signed rank test of pre and post test score of general functioning

Time points	Median (Q1, Q3)	Wilcoxon signed rank Statistic (z)	p-Value
Pre test	**3 (1, 4)**	**4.218**	**P<0.001***
Post test	**6 (6,7)**		

*Significant (p< 0.05

DISCUSSION

The present study revealed the score of medication adherence 3 (Q_1 = 2, Q_3 =4) among caregivers of patient receiving antipsychotics and 55% of subjects were had adherent to medication and 45% of subjects were had nonadherence to medication. This finding is supported by Vieta E[7] to assess the perceptions of potential reasons for nonadherence to medication among psychiatrists. This study estimated that 57% of bipolar patients was partially nonadherent with medication. A wide range of nonadherence rates have been reported for patients with unipolar depression were (10% - 75%), anxiety was (57%), schizophrenia was (20% - 72%) and

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attention deficit hyperactivity were (50% - 75%). The present study revealed the score of reported side effects 35 (Q1 = 28, Q2 = 38) among caregivers of patient receiving antipsychotics and 86.30% were having moderate side effects, 07.50% were having severe side effects and 06.30% were not having any side effects of antipsychotic medications. This finding is supported by Marco Dibonaventura[8] to assess the impact of medication side effects of patients with schizophrenia. This study reported that majority of patients had at least one side effect due to the medication were (86.19%). The most commonly reported side effects were difficulty in concentration(32.2%), restlessness (28.2%), weight gain (25.8%), and insomnia (25.1%). The present study revealed the score of general functioning 4 (Q1 = 2, Q3 =5) among caregivers of patient receiving antipsychotics. This finding is supported by Reema Samuel[9] to assess the prevalence of instrumental activities of daily living dysfunction in people with schizophrenia. The study found that 2% patients were completely independent in activities of daily living. The present study revealed that there is a statistically significant difference in the adherence score between before and after the intervention ($p<0.001$). This finding is supported by Jeffrey M. MD[10] to assess the patient centered and sustainable antipsychotic medication adherence intervention program. The researcher found that there was a significantly improved adherence score ($p<0.001$) before and after the intervention program. The present study revealed that there is a statistically significant difference in the reported side effects score between before and after the intervention ($p<0.001$). An experimental study was conducted by Pope et al[11] to assess the adverse effects of antipsychotic medication among patients with schizophrenia. The study reported that there was a statistically significant difference in pre and post test scores ($p=0.001$). The present study revealed that there is a statistically significant difference in the general functioning score between before and after the intervention ($p<0.001$). This finding is supported by Eman S. Soliman[12] to assess the impact of psychoeducation program on quality of life of schizophrenic patients and caregivers. This study reported that there was a high statistical significant difference between patients received psychoeducation program ($p=0.015$) and not received psychoeducation program ($p=0.28$). There is no significant association found in medication adherence score with socio personal variables. This finding was supported by Zaid Demoz[13] found that there was no statistical significant association between marital status and adherence level. There was no significant association found in reported side effect score with socio personal variables. This finding was supported by Sayali Devidas Dambhe[14] found that there was no significant association ($p<0.05$) in age, gender, education status and occupation. There was no significant association found in general functioning score with socio personal variables. This finding was supported by Ken Yamauchi[15] there was no significant association found in the general functioning score and duration of stay with the patient.

NURSING IMPLICATIONS

Nursing Practice

- Play in primary prevention by facilitating early detection and management of medication nonadherence, reported side effects and general functioning among caregivers of patient receiving antipsychotics
- Identify the areas where the caregivers of patient receiving antipsychotics need more help, support and confidence building.
- Play a supportive role in caregivers of patient receiving antipsychotics for their emotional issues.
- Mass health education camping should be organized regularly by the health teams to provide education on medication nonadherence, reported side effects and general functioning.

Nursing Education

- Suggest incorporating the mental health issues among caregivers of patient receiving antipsychotic medications regarding early identification, and its management in the nursing curriculum.
- Train the student nurses to identify the factors affecting medication adherence, reported side effects and general functioning among caregivers of patient receiving antipsychotics based on which appropriate nursing interventions can be a planned for patients and caregivers.

Nursing Administration

- Develop psycho education protocols for educating the caregivers of patient receiving antipsychotics for identifying and managing the medication nonadherence, side effects of antipsychotic medications and general functioning.
- Nurse administrator should take the initiative in organizing continuing education programs regarding various aspects of medication nonadherence, side effects of antipsychotic medications and general functioning.
- Appropriate teaching learning material need to be prepared and made available for nurse.

Nursing Research

- Based on the findings of the present study, further studies should be encouraged to improve the medication adherence, reported side effects and general functioning in patients with suitable intervention packages need to be developed.
- The findings of the present study can be considered as a cornerstone for future researches.

CONCLUSION

The study concluded that multicomponent intervention program helps to provided medication adherence, management of antipsychotic side effects and improved the general functioning among caregivers of patient receiving

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antipsychotics.

Conflict of interest

There are no relevant conflicts of interest

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BRIGADA PAGBASA: ISANG INTERBENSYON SA KAHIRAPANG MAGSALITA NG WIKANG FILIPINO NG MGA MAG-AARAL SA IKA-10 BAITANG

Shieraline M. Supot[1], Rhea Mae C. Oñez[2], Chariza B. Pagal[3], Mecca Joy J. Abiado[4], Shane Sanchez[5], Jonever Paden[6], Archel M. Supot, MAEd[7]

[1]ORCID No. 0009-0004-8155-9179
Student, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[2]ORCID No.0009-0000-9762-9152
Student, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[3]ORCID No. 0009-0005-4058-9803
Student, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[4]ORCID No. 0009-0008-5770-9637
Student, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[5]ORCID No. 0009-0005-4359-865X
Student, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[6]ORCID No. 0009-0001-4679-7233
Student, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[7]ORCID No. 0009-0004-5824-7070
Teacher III, Pamacaun Integrated School, Pamacaun, Asuncion, Davao del Norte, Philippines

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ABSTRAK

Ang pag-aaral na ito ay isinagawa upang suriin ang antas ng kahirapan sa pagsasalita sa wikang Filipino bago at pagkatapos ipatutupad ang interbensyong Aksyong 4Ps (Pagsulat, Pagsuri at Pagbigay ng Pidbak). Kabilang din pagtukoy sa makabuluhang pagkakaiba sa kahirapan sa pagsasalita sa wikang Filipino bago at pagkatapos ipatutupad ang interbensyong Brigada Pagbasa. Ang pananaliksik na ito ay ginamitan ng pre-experimental na disenyo. Ang mga respondente ay kinapalooban ng 32 na mga mag-aaral mula sa baitang 10 – seksyon Jacinto ng Asuncion National High School. Sa resulta ng pag-aaral, kahirapan sa pagsasalita bago ang ipinatupad ang interbensyon ay may kabuoang mean na 4.18, ibig sabihin madalas lamang itong naipapakita. Samantala, pagkatapos naman ipinatupad ang interbensyon ay may kabuoang mean na 4.53, ibig sabihin na laging na itong naipapakita. Ipinakita rin sa pag-aaral na ito na may makabuluhang pagkakaiba ang kahirapan sa pagsasalita bago at pagkatapos ng interbensyon dahil sa < .001 na p-value. Nangangahulugan lamang na may malaking papel na ginagampanan ang interbensyong brigada pagbasa sa pagpapaunlad sa pagsasalita ng mga mag-aaral.

MGA SUSING SALITA*: bokabularyong Filipino, pre-experimental, kwantitatib*

INTRODUKSYON

Ang Brigada Pagbasa ay isang interbensyon na naglalayong mahasa ang kakayahang magsalita ng mga mag-aaral na may kakulangan sa aspektong ito ng kanilang edukasyon. Ito ay isang solusyon upang matugunan ang kahirapan ng mga mag-aaral sa pagsalita ng wikang Filipino. Ang kahirapan sa pagsasalita ay maaaring magresulta sa mga hindi pagkakaunawaan at pagbawas ng kumpiyansa sa sarili. Ang mga limitasyon sa bokabularyo ay naghihigpit sa kasanayan ng mga mag-aaral na maghatid ng mga tiyak na kahulugan at ganap na makisali sa mga pag-uusap, na nakakaapekto sa pangkalahatang kasanayan sa wika. Bukod pa rito, ang takot na magkamali ay lumilikha ng isang sikolohikal na hadlang na humihinto sa kanila sa pagsasanay at pagpapabuti ng kanilang mga kasanayan sa pagsasalita (Chan at Abdullah, 2019).

Sa Nepal, maraming estudyante ang nahihirapan sa pagsasalita ng matatas. Kabilang sa mga karaniwang problema ang kaba, takot na magkamali, limitadong bokabularyo, at kawalan ng tiwala. Ang kaba o nerbiyos ay madalas na nararanasan ng mga estudyante kapag sila ay kinakailangang magsalita sa harap ng kanilang mga kamag-aral o guro. Ang takot na magkamali ay nagdudulot ng pag-aalinlangan sa pagsasalita, lalo na kapag iniisip ng mga estudyante na sila ay huhusgahan o pagtatawanan dahil sa kanilang mga pagkakamali. Ang limitadong bokabularyo naman ay nagiging hadlang sa

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kanilang kakayahan na maipahayag nang maayos ang kanilang mga ideya at saloobin, na nagiging sanhi ng pagkaantala at pagkalito sa kanilang pagsasalita (Chand, 2021).

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Sa Pilipinas, partikular na sa Saint Michael College, Caraga, isinagawa ang pananaliksik kasama ang 320 mga mag-aaral sa high school ay nagpapakita na kahirapan sa pagsasalita ang pangunahing isyu na kinaharap ng mga mag-aaral. Nahihirapan silang magpahayag ng kanilang sarili nang may kumpiyansa kagaya ng paghahayag ng opinyon o pananaw, paglutas ng mga alitan o pakikipag-ugnayan sa iba. Natuklasan din ng pag-aaral na sila ay mayroong kahirapan sa pagtukoy ng tamang paggamit ng bokabularyo sa pakikipagkomunikasyon (Bartilo et al., 2019).

Sa Division ng Davao Del Norte, partikular sa Asuncion National High School, ang kahirapan sa pagsasalita sa wikang Filipino ay isang makabuluhang suliranin na kinakaharap ng mga guro sa Filipino. Marami sa mga mag-aaral ang nahihirapan sa pagpapahayag ng kanilang mga ideya nang malinaw at epektibo. Ang kanilang kakulangan sa wastong bokabularyo sa Filipino ay nagiging hadlang sa maayos na komunikasyon, kung saan ang mga maling paggamit ng salita ay maaaring magdulot ng kalituhan at pagkawala ng kahulugan ng kanilang mensahe. Halimbawa, kapag hindi wasto ang bokabularyo na ginagamit ng mga estudyante, maaaring hindi nila maipahayag nang tama ang kanilang mga saloobin at opinyon, na nagreresulta sa hindi pagkakaunawaan. Ang ganitong mga pagkakamali ay nagiging balakid sa kanilang akademikong pag-unlad at sa kanilang kakayahan na makipag-ugnayan nang mahusay sa kanilang mga guro at kamag-aral.

Ang suliraning kinahaharap ng mag-aaral ay nararapat na mabigyang-pansin sa pamamagitan ng pananaliksik upang magbigyan agad ng solusyon. Ito ay mahalaga sapagkat sa pamamagitan ng pagkakaroon ng kasanayan sa pagsasalita sa wikang Filipino, ang mga mag-aaral ay mas magiging epektibo hindi lamang sa mahusay na pagsasalita kundi magiging makabuluhan din sa kanilang pang-akademikong pag-unlad. Mahalaga ang pagbigay ng sapat at agarang interbensyon upang maiwasto ang hindi wastong kasanayan sa paggamit ng bokabularyo sa pamamagitan ng paghubog gamit ang makabagong aktibidad na tugma sa interes at kakayahan ng mga mag-aaral.

Layunin ng Pananaliksik

Ang layunin ng pananaliksik sa ibaba ay gagamitin upang alamin ang bisa ng Brigada Pagbasa bilang interbensyon sa kahirapang magsalita ng wikang Filipino ng mga mag-aaral sa ika-10 na baitang. Ang mga katanungan sa pananaliksik na magiging gabay sa pag-aaral na ito ay ang mga sumusunod:

1. Alamin ang antas ng kahirapan sa pagsasalita sa wikang Filipino bago ipatutupad ang interbensyong Brigada Pagbasa.
   1.1 Pangkat Eksperimental
2. Alamin ang antas ng kahirapan sa pagsasalita sa wikang Filipino pagkatapos ipatutupad ang interbensyong Brigada Pagbasa.
   2.1 Pangkat Eksperimental
3. Alamin ang makabuluhang pagkakaiba sa kahirapan sa pagsasalita sa wikang Filipino bago at pagkatapos ipatutupad ang interbensyong Brigada Pagbasa.

Haypotesis

Ang null haypotesis na kung saan ay sinukat sa 0.05 na antas ng katiyakan ay nagsasaad na walang tiyak na pagkakaiba sa kahirapan sa pagsasalita sa Wikang Filipino bago at pagkatapos ipatutupad ang interbensyong Brigada Pagbasa.

METODO

Disenyo

Ang pre-eksperimental na disenyo ay isang pinakasimpleng anyo ng disenyo ng pananaliksik na sumusunod sa mga batayang hakbang sa eksperimento. Hindi ito nagtataglay ng mga grupong paghahambingan, bagkos isang grupo lang ang nilalapatan ng tiyak na paggamot. Layunin nito ay upang matukoy ang interbensyon ng mananaliksik sa isang grupo ng mga tao upang malaman kung ang pagg-aaksaya ng oras at pundo para isagawa ang tunay na eksperimento ay makabuluhan.

Sa pag-aaral na ito, ang pre-experimental ay gagamitin bilang disenyo ng pananaliksik upang magsagawa ng aksyon na pananaliksik. Ang mananaliksik ay pipili ng isang seksyon na magiging respondente sa pag-aaral at ito ay ang ikasampung baitang ng Asuncion National High School. Ang seksyong natalaga ay kukuha ng pre-test na tatanggap ng treytment o interbensyon na pinamagatang Brigada Pagbasa sa loob ng isang buwan, pagkatapos ay kukuha ng post-test pagkatapos ng interbensyon.

Lokal ng Pananaliksik

Ang pag-aaral na ito ay isasagawa sa *Asuncion National High School*, isang sekundaryang pampublikong paaralan na matatagpuan sa Cambanogoy, Asuncion, Davao del Norte. Sa paaralang ito, maraming mga mag-aaral ang nakaranas ng mga kahirapan sa pagsalita ng wikang Filipino. Mayroon ding nakilalang mga mag-aaral na may kahirapan sa pagsalita ng wikang Filipino lalo na sa mga mag-aaral sa baitang-10.

Populasyon at Sampol

Ang mga respondente ng pananaliksik para sa pag-aaral na ito ay ang mga mag-aaral sa seksyon Jacinto ng ikasampung baitang na may kabuong bilang na 32. Ang mga respondente ay binubuo ng isang seksyon lamang na kasalukuyang nakatala sa taong panuruan 2023-2024 sa Asuncion National High School.

Ang mga respondente ay pinili gamit ang purposive sampling na tumutukoy sa isang grupo ng mga teknik ng non-probability sampling kung saan ang mga yunit ay napili dahil mayroon silang mga katangian na kailangan sa sampol. Sa ibang salita,

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ang mga yunit ay napili "nang sadya" sa purposive sampling. Tinatawag din itong judgmental sampling, ang pamamaraang ito ng sampol ay umaasa sa pagpapasya ng mananaliksik sa pagtukoy at pagpili ng mga indibidwal, mga kaso, o mga pangyayari na maaaring magbigay ng pinakamahusay na impormasyon upang maabot ang mga layunin ng pag-aaral (Nikolopoulou, 2023).

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Instrumento ng Pananaliksik

Ginamit ng mananaliksik ang mga talatanungang mula sa pinagbatayang pag-aaral ni Balqisa at Masyhur (2024). Ang unang talatanungan ay sinuri ang mga kahirapan sa pagsasalita ng mga respondente sa baitang-10 batay sa mga sumusunod na indikeytor: linggwistikang aspekto at sikolohikal na aspekto. Ang mga talatanungang ginamit ay sumailalim muna sa masusing balidasyon mula sa panel ng mga eksperto.

Five-point Likert Scale ang ginamit bilang batayan upang malaman ang antas ng kahirapan sa pagsasalita. Sa sukatang ito ang mga respondente ay tumugon sa pamamagitan ng pagtsek o pagbilog ng mga numero. Dahil dito, ang mga respondente ay ginamit ang limang-puntong Likert scale (mula sa pinakamataas hanggang pinakamababa). Ang mga datos ay kinalkula batay sa bilang nito upang maitala ang inaasahang marka.

Paglikom ng Datos

Sinunod ng mananaliksik ang sumusunod na mga pamamaraan sa pangangalap ng datos upang makuha ang impormasyon na kailangan para sa pagsisiyasat.

Pagbubuo ng Talatanungan – Pre-test at Post-test na mga Talatanungan. Ang mananaliksik ay ginamit ang talatanungan mula sa pinagbabatayang pag-aaral ni (Balqisa at Masyhur (2024). Ang test questionnaire ay magiging kasangkapan sa pangangalap ng kwantitatibong datos tungkol sa kanilang antas ng kahirapan sa pagsasalita. Mayroong dalawang set ng test questionnaire na ipapatupad, ang pre-test at post-test na mga katanungan.

Balidasyon ng Talatanungan. Hihilingin ng mananaliksik ang balidasyon ng talatanungan mula sa mga eksperto na bihasa sa pagbuo ng talatanungan upang matiyak ang bisa at katumpakan nito.

Paghingi ng Pahintulot na Magsagawa ng Pag-aaral. Hihingi ng pahintulot ang mga mananaliksik sa punong guro ng paaralan na ipamahagi ang mga talatanungan (pre-test) sa mga respondente. Gayundin, hihilingin ng mananaliksik ang pahintulot upang ipatupad ang interbensyon sa nakilalang grupo ng klase.

Pamamahala ng Pre-test Assessment. Bago isagawa ang interbensyon, ipapatupad ng mananaliksik ang isang pre-test sa eksperimental na grupo. Layunin ng pre-test na ito na sukatin ang mga antas ng kahirapan sa pagsasalita bilang pagbatayan sa post-test.

Pagpapatupad ng Interbensyon sa Eksperimental na Grupo. Kasama sa yugtong ito ng pagpapatupad ang pagsasagawa ng Brigada Pagbasa na interbensyon sa eksperimental na grupo. Ipatutupad ng mga mananaliksik ang Brigada Pagbasa na interbensyon Biyernes sa asignaturang Filipino. Inaasahang magbibigay ito ng pagsasanay upang sundin ang mga hakbang na ito sa bawat isa. Regular na susubaybayan ang progreso ng mga mag-aaral sa kanilang kasanayan sa pagbasa at pagsasalita gamit ang pre-test at post-test upang masukat ang pag-unlad nila. Magkakaroon ng regular na feedback sessions sa mga guro at boluntaryo upang malaman ang mga kalakasan at kahinaan ng programa. Magbibigay din ng mga pagkakataon sa mga mag-aaral na magbahagi ng kanilang natutunan batay sa mga ginawang gawain, upang mapalakas ang kanilang kumpiyansa sa pagsasalita ng wikang Filipino. Batay sa puna at resulta ng mga pagtatasa, gagawa ng mga kinakailangang pagbabago sa kurikulum, materyales, at mga aktibidad upang mapabuti ang programa. Sa pamamagitan ng sistematikong implementasyon ng Brigada Pagbasa, matutulungan ang mga mag-aaral na mapabuti ang kanilang kasanayan sa pagbasa at pagsasalita sa wikang Filipino, na magdudulot ng mas mahusay na pagkatuto at pagpapahalaga sa sariling wika at kultura.

Pamamahala ng Post-test Assessment. Pagkatapos ng isang buwan ng pagpapatupad sa eksperimental na grupo, isasagawa ang isang post-test upang masuri ang pag-unlad ng mga mag-aaral sa pagsasalita ng wikang Filipino. Susukatin ng pagsusulit na ito ang kakayahan ng mga mag-aaral sa pagsasalita matapos ang interbensyon.

Tabulasyon at Ebalwasyon ng Datos. Ang nakuhang datos mula sa pre-test at post-test ay dadaan sa tabulasyon. Ang kumpletong katanungan ay kukunin ng mga mananaliksik at saka ililipat sa isang spreadsheet ng Microsoft Excel para sa pagtala ng datos. Bibigyan ng kompidensyal na pahintulot ang estadistiko upang gumawa ng mga kalkulasyon, lumikha ng mga talahanayan, at suriin ang datos na may pinakamalaking pag-iingat. Ang mga resulta ng tabulasyon mga natuklasan ay magbibigay gabay sa mga posibleng pagbabago o pagpapabuti sa mga estratehiya ng interbensyon upang lalo pang mapabuti ang mga pamamaraan ng pagtuturo

Istatistikal na Tritment ng Datos

Sa pagsuri, mean ang ginamit sa pagkalkula ng mga datos sa pag-aaral partikular na sa pagsukat sa antas ng antas ng kahirapan sa pagsasalita bago at pagkatapos ng interbensyon. Samantala, T-test naman ang ginamit sa pagsuri sa makabuluhang pagkakaiba ng kahirapan sa pagsasalita bago at pagkatapos ng interbensyon.

MGA RESULTA

Antas ng Kahirapan sa Pagsasalita sa wikang Filipino batay sa Linggwistikang Aspekto

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Ipinapakita sa Talahanayan 1 ang antas ng kahirapan sa pagsasalita na indikeytor ng linggwistikang aspekto bago ipinatupad ang interbensyong brigada pagbasa na may kabuoang mean na 4.21 na may mataas na katumbas na paglalarawan. Nangangahulugan lamang na madalas lang naipapakita ng mga respondente ang kahirapan sa pagsasalita ng Filipino. Samantala, ang kahirapan sa pagsasalita pagkatapos ng interbensyong brigada pagbasa ay may kabuoang mean na 4.55 na may napakataas na katumbas ng paglalarawan. Ibig sabihin, laging naipapakita ng mga respondente ang kanilang kahusayan sa pagsasalita ng wikang Filipino pagkatapos ng interbensyon.

Talahanayan 1: Antas ng Kahirapan sa Pagsasalita sa wikang Filipino batay sa Linggwistikang Aspekto

Problema sa Pagsasalita	Pre-Test	Deskripsyon	Post-Test	Deskripsyon
1. Natatakot akong magsalita sa Filipino dahil limitado lamang ang aking bokabularyo.	4.25	Mataas	4.44	Napakataas
2. Mahirap para sa akin na ipahayag ang aking mga ideya kapag nagsasalita.	4.25	Mataas	4.53	Napakataas
3. Madalas akong malito sa pagsasama at paggamit ng tamang bokabularyo sa pagsasalita.	4.56	Mataas	4.53	Napakataas
4. Bihira akong makasagot sa aking kausap kapag nagsasalita dahil mas mabilis silang magsalita.	4.00	Mataas	4.47	Napakataas
5. Nahihirapan akong ayusin ang mga salita upang makabuo ng mga pangungusap sa Filipino.	4.00	Mataas	5.00	Napakataas
6. Nagsasalita lang ako kapag sa tingin ko ay tama ang aking gramatika.	4.19	Mataas	4.53	Napakataas
7. Nakasanayan kong gumamit ng katutubong wika kapag nagsasalita upang maiwasan ang mga pagkakamali sa pag-unawa.	4.25	High	4.63	Napakataas
8. Nahihirapan akong tumugon sa mga nagsasalita na may iba't ibang aksento.	4.19	Mataas	4.63	Napakataas
9. Nahihirapan akong tumugon sa isang pag-uusap kung hindi ko maintindihan ang intonasyon ng nagsasalita.	4.09	Mataas	4.63	Napakataas
10. Nahihiya akong magsalita ng Filipino dahil hindi ako marunong sa pagbigkas.	4.28	Napakataas	4.59	Napakataas
KABUOAN	**4.21**	**Mataas**	**4.55**	**Napakataas**

Batay sa resulta bago ipinatupad ang interbensyon, ang pahayag sa Aytem 3 – Madalas akong malito sa pagsasama at paggamit ng tamang bokabularyo sa pagsasalita ang nakakuha ng pinakamataas mean na 4.56 na may nakapataas na katumbas na paglalarawan. Sumunod naman ang Aytem 10 – Nahihiya akong magsalita ng Filipino dahil hindi ako marunong sa pagbigkas na may nakapataas din na katumbas na paglalarawan. Ibig sabihin, lagi itong naipapakita ng mga respondente. Habang ang pahayag sa Aytem 1 – Natatakot akong magsalita sa Filipino dahil limitado lamang ang aking bokabularyo na may mean na 4.25, ang Aytem 2 – Mahirap para sa akin na ipahayag ang aking mga ideya kapag nagsasalita na may mean na 4.25, at ang Aytem 7 – Nakasanayan kong gumamit ng katutubong wika kapag nagsasalita upang maiwasan ang mga pagkakamali sa pag-unawa. Ang tatlong Aytem ay may parehong mataas na katumbas na paglalarawan. Ibig sabihin, madalas itong naipapakita ng mga respondente. Sumunod naman ang Aytem 6 - Nagsasalita lang ako kapag sa tingin ko ay tama ang aking gramatika at Aytem 8 - Nahihirapan akong tumugon sa mga nagsasalita na may iba't ibang aksento na may parehong mean na 4.19 na may mataas na katumbas ng paglalarawan. Sumunod ang Aytem 9 - Nahihirapan akong tumugon sa isang pag-uusap kung hindi ko maintindihan ang intonasyon ng nagsasalita na may mean na 4.09 na may mataas rin na katumbas ng paglalarawan. Sumunod ang Aytem 4 - Bihira akong makasagot sa aking kausap kapag nagsasalita dahil mas mabilis silang magsalita at Aytem 5 - Nahihirapan akong ayusin ang mga salita upang makabuo ng mga pangungusap sa Filipino na parehong nakakuha ng mean na 4.0 na may mataas na katumbas ng paglalarawan. Ibig sabihin, madalas itong naipapakita ng mga respondente.

Samantala, pagkatapos ipinatupad ang interbensyon, ang pahayag sa Aytem 5- Nahihirapan akong ayusin ang mga salita upang makabuo ng mga pangungusap sa Filipino ang nakakuha ng pinakamataas na mean na 5.0 na may napakataas na paglalarawan. Sumunod naman ang Aytem 7- Nakasanayan kong gumamit ng katutubong wika kapag nagsasalita upang maiwasan ang mga pagkakamali sa pag-unawa, ang Aytem 8- Nahihirapan akong tumugon sa mga nagsasalita na may iba't ibang aksento, at ang Aytem 9- Nahihirapan akong tumugon sa isang pag-uusap kung hindi ko maintindihan ang intonasyon ng nagsasalita ay parehong nakakuha ng mean na 4.63 na may napakataas na katumbas ng paglalarawan. Ibig sabihin, ito ay parehong laging naipapakita ng mga respondente.

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Samantala, sumunod dito ang Aytem 10- Nahihiya akong magsalita ng Filipino dahil hindi ako marunong sa pagbigkas na may mean na 4.59 at may napakataas din na katumbas ng paglalarawan. Sumunod ang Aytem 2- Mahirap para sa akin na ipahayag ang aking mga ideya kapag nagsasalita ang Aytem 3- Madalas akong malito sa pagsasama at paggamit ng tamang bokabularyo sa pagsasalita at ang Aytem 6- Nagsasalita lang ako kapag sa tingin ko ay tama ang aking gramatika ay parehong nakakuha ng mean na 4.53 na may napakataas na katumbas ng pag-aaral. Sumunod dito ang Aytem 4- Bihira akong makasagot sa aking kausap kapag nagsasalita dahil mas mabilis silang magsalita na may mean na 4.47 na may napakataas din na katumbas ng paglalarawan. Sumunod nito ay ang Aytem 1- Natatakot akong magsalita sa Filipino dahil limitado lamang ang aking bokabularyo na may mean na 4.44 at may mataas na katumbas ng paglalarawan. Ibig sabihin, ito ay parehong laging naipapakita ng mga respondente.

Antas ng Kahirapan sa Pagsasalita sa wikang Filipino batay sa Sikolohikal na Aspekto

Ipinapakita sa Talahanayan 2 ang antas ng kahirapan sa pagsasalita na indikeytor ng sikolohikal na aspekto bago ipinatupad ang interbensyong brigada pagbasa na may kabuoang mean na 4.15 na may mataas na katumbas na paglalarawan. Nangangahulugan lamang na madalas lang naipapakita ng mga respondente ang kahirapan sa pagsasalita ng Filipino. Samantala, ang kahirapan naman sa pagsasalita ng wikang Filipino pagkatapos ng interbensyong brigada pagbasa ay may kabuoang mean na 4.51 na may napakataas na katumbas ng paglalarawan. Ibig sabihin, laging naipapakita ng mga respondente ang kanilang kahusayan sa pagsasalita ng wikang Filipino pagkatapos ng interbensyon.

Batay sa resulta bago ipinatupad ang interbensyon, ang pahayag sa Aytem 8- Hindi ko maunawaan kung ano ang sinasabi ng aking kapares kaya nananahimik na lamang ako na may mean na 4.41 at ang Aytem 4- Nahihiya akong magsalita ng Filipino dahil hindi ako matatas sa pagsasalita ng wikang ito na may mean na 4.34 at parehong nakakuha ng napakataas na katumbas ng paglalarawan.

Sumunod ang Aytem 5- Kinakabahan ako kapag magsalita ng wikang Filipino sa harap ng maraming tao at ang Aytem 7- Ayoko magsalita ng Ingles dahil ako ay takot na baka hindi maintindihin ng aking kapares aking sinasabi na may parehong mean na 4.25 at may mataas na katumbas ng paglalarawan. Sumunod ang Aytem 1- Takot akong magkamali sa pagsasalita dahil takot akong mapuna ang aking kamalian na may mean na 4.19, ang Aytem 3- Kapag nagsimula na akong magsalita ng Filipino, bigla akong nabablangko at nakakalimutan ko lahat na may mean na 4.16, ang Aytem 10- Nagsasalita ako ng Filipino dahil lang sa ito ang gusto ng aking guro na gawin ito,na may mean na 4.0, sumunod ang Aytem 9- Mas pipiliin kung magtrabaho mag-isa kaysa magtrabaho kasama sa isang grupo na pipilitin akong magsalita ng Filipino na may mean na 3.97, at ang Aytem 2- Wala akong mataas na kumpiyansa sa aking sarili sa pagsasalita ng Filipino dahil takot akong pagtawanan ng aking mga kaibigan na may mean na 3.81 na parehong nakakuha ng mataas na katumbas ng paglalarawan. Ito ay nangangahulugan na angkahirapan sa pagsasalita ng wikang Filipino ng mga mag-aaral ay madalas lang na naipapakita.

Pagkatapos ng interbensyong Brigada Pagbasa, ang Aytem 3- Kapag nagsimula na akong magsalita ng Filipino, bigla akong nabablangko at nakakalimutan ko lahat at ang Aytem 10- Nagsasalita ako ng Filipino dahil lang sa ito ang gusto ng aking guro na gawin ito ay parehong nakakuha ng mean na 4.63 na may napakataas na katumbas ng paglalarawan. Sumunod dito ang Aytem 8- Hindi ko maunawaan kung ano ang sinasabi ng aking kapares kaya nananahimik na lamang ako na may mean na 4.59 at ang Aytem 9- Mas pipiliin kung magtrabaho mag-isa kaysa magtrabaho kasama sa isang grupo na pipilitin akong magsalita ng Filipino at may mean na 4.59 ay kapwa nakakuha ng napakataas na katumbas ng paglalarawan. Sinundan ito ng Aytem 4- Nahihiya akong magsalita ng Filipino dahil hindi ako matatas sa pagsasalita ng wikang ito na may mean na 4.56, ang Aytem 6- Nakararamdam ako ng pagkabalisa kapag nagsasalita ng Filipino at nagtatapos ng walang sinasabi na may mean na 4.53 at ang Aytem 7- Ayoko magsalita ng Ingles dahil ako ay takot na baka hindi maintindihin ng aking kapares aking sinasabi na may mean na 4.53, ang Aytem 5- Kinakabahan ako kapag magsalita ng wikang Filipino sa harap ng maraming tao na may mean na 4.47, sumunod ang Aytem 2- Wala akong mataas na kumpiyansa sa aking sarili sa pagsasalita ng Filipino dahil takot akong pagtawanan ng aking mga kaibigan na may mean na 3.81 ay parehong nakakuha ng napakataas na katumbas ng paglalarawan. Ibig sabihin, lagi itong naipapakita ng mga respondente. Samantala, ang Aytem 1- Takot akong magkamali sa pagsasalita dahil takot akong mapuna ang aking kamalian na may mean na 4.25 na may mataas na katumbas ng paglalarawan. Ibig sabihin, madalas itong naipapakita ng mga respondente

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Talahanayan 2: Antas ng Kahirapan sa Pagsasalita sa wikang Filipino batay sa Sikolohikal na Aspekto

Sikolohikal na Aspekto	Pre-Test	Deskripsyon	Post-Test	Deskripsyon
Takot akong magkamali sa pagsasalita dahil takot akong mapuna ang aking kamalian.	4.19	Mataas	4.25	Mataas
Wala akong mataas na kumpiyansa sa aking sarili sa pagsasalita ng Filipino dahil takot akong pagtawanan ng aking mga kaibigan.	3.81	Mataas	4.31	Napakataas
Kapag nagsimula na akong magsalita ng Filipino, bigla akong nabablangko at nakakalimutan ko lahat.	4.16	Mataas	4.63	Napakataas
Nahihiya akong magsalita ng Filipino dahil hindi ako matatas sa pagsasalita ng wikang ito.	4.34	Napakataas	4.56	Napakataas
Kinakabahan ako kapag magsalita ng wikang Filipino sa harap ng maraming tao.	4.25	Mataas	4.47	Napakataas
Nakararamdam ako ng pagkabalisa kapag nagsasalita ng Filipino at nagtatapos ng walang sinasabi.	4.09	Mataas	4.53	Napakataas
Ayoko magsalita ng Ingles dahil ako ay takot na baka hindi maintindihin ng aking kapares aking sinasabi.	4.25	Mataas	4.53	Napakataas
Hindi ko maunawaan kung ano ang sinasabi ng aking kapares kaya nananahimik na lamang ako.	4.41	Napakataas	4.59	Napakataas
Mas pipiliin kung magtrabaho mag-isa kaysa magtrabaho kasama sa isang grupo na pipilitin akong magsalita ng Filipino.	3.97	Mataas	4.59	Napakataas
Nagsasalita ako ng Filipino dahil lang sa ito ang gusto ng aking guro na gawin ito.	4.00	Mataas	4.63	Napakataas
KABUOAN	**4.15**	**Mataas**	**4.51**	**Napakataas**

Buod ng Antas ng Kahirapan sa Pagsasalita ng Wikang Filipino

Ipinapakita sa Talahanayan 3 ang antas ng kahirapan sa pagsasalita bago ipinatupad ang interbensyong brigada pagbasa na may kabuoang mean na 4.18 na may mataas na katumbas na paglalarawan. Nangangahulugan lamang na madalas lang naipapakita ng mga respondente ang kahirapan sa pagsasalita ng wikang Filipino. Samantala, ang kahirapan naman sa pagsasalita ng Filipino ng mga mag-aaral pagkatapos ng interbensyong Brigada Pagbasa ay may kabuoang mean na 4.53 na may napakataas na katumbas ng paglalarawan. Ibig sabihin, laging naipapakita ng mga respondente ang kanilang kagalingan sa pagsasalita ng wikang Filipino. Samantala, ang kahirapan naman sa pagsasalita ng Filipino ng mga mag-aaral pagkatapos ng interbensyong Brigada Pagbasa ay may kabuoang mean na 4.53 na may napakataas na katumbas ng paglalarawan. Ibig sabihin, laging naipapakita ng mga respondente ang kanilang kagalingan sa pagsasalita ng wikang Filipino pagkatapos ng interbensyon.

Batay sa resulta bago ipinatupad ang interbensyon,indikeytor na nakakuha ng pinakamataas na pangkalahatang mean ay ang linggwistikang aspekto na may mean na 4.21 na may mataas na katumbas na paglalarawan. Ibig sabihin, ito ay madalas naipapakita ng mga respondente. Samantala, pagkatapos ipinatupad ang interbensyon, ang indikeytor naman na ito ay nakakuha ng mean na 4.55 na may napakataas na katumbas na paglalarawan. Ibig sabihin, ito ay laging naipapakita ng mga mag-aaral pagkatapos ang interbensyon.

Sa kabilang dako, bago ipinatupad ang interbensyon, ang indikeytor na sikolohikal na aspekto naman ang sumunod na nakakuha ng pinakamataas na mean na 4.15 na may mataas na katumbas na paglalarawan. Ibig sabihin, madalas lang naipapakita ng mga respondente ang kahirapan sa pagsasalita ng Filipino. At pagkatapos ipinatupad ang interbensyon, ang indikeytor na pagbasa muli ang sumunod na nakakuha ng pinakamataas na mean na 4.51 na may napakataas na katumbas na paglalarawan. Ibig sabihin, ito ay laging naipapakita ng mga respondente

Talahanayan 13: Buod ng Antas ng Kahirapan sa Pagsasalita sa Wikang Filipino

Kahirapan sa Pagsasalita	Pre-Test	Deskripsyon	Post-Test	Deskripsyon
Linggwistikang Aspekto	4.21	Mataas	4.55	Napakataas
Sikolohikal na Aspekto	4.15	Mataas	4.51	Napakataas
KABUOAN	**4.18**	**Mataas**	**4.53**	**Napakataas**

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Makabuluhang Pagkakaiba ng Kahirapan sa Pagsasalita Bago at Pagkatapos ng Interbensyon

Batay sa pagsusuri ng estadistika, ang kahusayang panggramatika bago ang interbensyon ay may kabuoang mean na 4.10, at pagkatapos naman ng interbensyon ay may kabuoang mean na 4.49. Ang baryabol na ito ay may P-value na <.001 ibig sabihin, ang P-value ay mas mababa sa 0.05 na antas ng kahalagahan na nangangahulugang hindi tinanggap ang haypotesis na nagsasaad na walang makabuluhang pagkakaiba sa kahusayang panggramatika bago at pagkatapos ng interbensyong 4Ps. Sa madaling salita, may makabuluhang pagkakaiba ang kahusayang panggramatika ng ikasampung baitang bago at pagkatapos ng interbensyon.

Talahanayan 13: Makabuluhang Pagkakaiba ng Kahirapan sa Pagsasalita Bago at Pagkatapos ng Interbensyon

Type of Test	N	df	Mean	SD	t-value	P-value	Decision $\alpha = 0.05$
Pre-Test	32	31	4.18	0.17	-9.384	**< .001**	**Significant**
Post-Test	32		4.53	0.10			

DISKUSYON

Antas ng kahirapang magsalita ng wikang Filipino bago at pagkatapos ng interbensyon

Ang pangkalahatang antas ng kahirapang magsalita ng wikang Filipino bago ang interbensyon mula sa lahat ng mga indikeytor nito: linggwistikang aspekto at sikolohikal na aspekto ay inilarawang mataas. Ibig sabihin, madalas naipapakita ng mga mag-aaral sa baitang sampu ang kahirapang magsalita ng wikang Filipino. Samantala, ang kahirapan sa pagsasalita ng wikang Filipino pagkatapos ng interbensyong brigada pagbasa ay inilalarawang napakataas. Ibig sabihin, lagi nang naipapakita ng mga mag-aaral ang kanilang kahusayang magsalita ng wikang Filipino pagkatapos ng interbensyon.

Sa pagsusuri ni Reyes at Lapid (2021) sa kahirapang magsalita, napatunayan nilang may matinding kaugnayan ito sa kakulangan sa pagsasalita ng mga mag-aaral sa baitang sampu. Binigyang-diin sa kanilang pag-aaral ang mga salik na nagdudulot ng suliranin, partikular na ang kawalan sa praktikal na paggamit ng wikang Filipino sa loob at labas ng paaralan. Layunin ng kanilang pananaliksik na maglaan ng linaw sa mga hamon na hinaharap ng mga mag-aaral at magbigay ng gabay sa paglikha ng mga solusyon upang mapabuti ang kanilang kakayahan sa pagsasalita. Ang kanilang mga natuklasan ay maaaring maging batayan para sa mga susunod na hakbang sa pagtugon sa mga isyu sa pagsasalita ng Filipino sa baitang sampu.

Higit pa rito, ayon sa pag-aaral ni Cruz (2019 ang kahirapang magsalita ng wikang Filipino ng mga mag-aaral sa baitang sampu ay isang kritikal na isyu na dapat bigyang-pansin. Sa kanyang pag-aaral, ipinakita niya ang malawak na saklaw ng mga suliraning kinakaharap ng mga mag-aaral sa pagsasalita. Binigyang-diin din rito ang kahalagahan ng pagtukoy sa mga sanhi ng kahirapan sa pagsasalita at ang pangangailangan ng mga solusyon upang mapabuti ang kakayahan ng mga mag-aaral sa paggamit ng wikang Filipino. Ang kanyang pag-aaral ay nagbibigay ng malinaw na tuntunin para sa mga hakbang na dapat gawin upang tugunan ang hamong ito sa larangan ng edukasyon.

Batay sa resulta sa antas ng kahirapang magsalita batay sa linggwistikang aspekto bago ipinatupad ang interbensyong brigada pagbasa ay inilalarawang mataas. Nangangahulugan ito na ang kahirapan sa pagsasalita ng wikang Filipino ay madalas na naipapakita ng mga mag-aaral sa ikasampung baitang. Samantala, matapos ipatupad ang interbensyong brigada pagbasa, ang linggwistikang aspekto ay inilalarawan na napakataas. Ibig sabihin, laging naipapakita ng mga mag-aaral ang kahusayan sa pagsasalita ng wikang Filipino.

Bukod pa rito, ayon sa pag-aaral ni Hernandez (2018) ipinakita niya ang mahalagang papel ng linggwistikang aspekto sa pagpapahayag ng kultura at identidad ng isang pangkat etniko. Ayon sa kanyang pananaliksik, ang paggamit ng wikang katutubo at ang pag-unawa sa kahulugan ng mga salita at konsepto nito ay nagbibigay ng mas malalim na pag-unawa sa kultura at paniniwala ng isang komunidad. Ipinapakita ng kanyang pag-aaral na ang Linggwistikang Aspekto ay hindi lamang tungkol sa komunikasyon kundi pati na rin sa pagpapatibay ng pagkakakilanlan ng isang grupo.

Gayunpaman, sa pag-aaral ni Cruz (2020) ipinakita ang kahirapan ng ilang mag-aaral sa pagsasalita ng wikang Filipino at ang epekto nito sa kanilang linggwistikang aspekto. Napansin sa pananaliksik na ang ilang mag-aaral ay may kakulangan sa kaalaman at kumpiyansa sa pagsasalita ng Filipino, na maaaring humantong sa pagkakaroon ng kakulangan sa kanilang kakayahan sa komunikasyon at akademikong tagumpay. Kaya't mahalaga ang pagpapatibay ng mga programa at estratehiya upang mapabuti ang linggwistikang aspekto ng mga mag-aaral sa Filipino.

Batay sa resulta sa antas ng kahirapang magsalita ng wikang Filipino batay sa sikolohikal na aspekto bago ipinatupad ang interbensyong brigada pagbasa ay inilalarawang mataas. Ibig sabihin, ito ay madalas na naipapakita ng mga mag-aaral. Samantala, ang kahusayan naman sa pagsasalita ng wikang Filipino pagkatapos ng interbensyong brigada pagbasa ay may napakataas na katumbas ng paglalarawan. Ibig sabihin, laging naipapakita ng mga mag-aaral ang kanilang kahusayan sa pagsasalita ng wikang Filipino pagkatapos ng interbensyon.

Makabuluhang Pagkakaiba ng Kahirapang Magsalita Bago at Pagkatapos ng Interbensyon

Ang resulta ng makabuluhang pagkakaiba ng kahirapang magsalita bago at pagkatapos ng interbensyong brigada pagbasa (Linggwistikang aspekto at Sikolohikal na aspekto) ay nagsiwalat na mayroong makabuluhang pagkakaiba ang kahirapan sa pagsasalita at pagkatapos ng nasabing

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interbensyon. Ito ay batay kung saan ang p-value ay hindi tinanggap ang haypotesis na nakasaad na walang makabuluhang pagkakaiba sa kahusayang magsalita ng wikang Filipino bago at pagkatapos ng interbensyong brigada pagbasa. Ito ay nangangahulugan lamang na malaki ang papel ng interbensyong brigada pagbasa sa pagpapaunlad ng kahirapang magsalita ng mga mag-aaral sa ikasampung baitang ng Asuncion National High School.

Sa pag-aaral ni Tanaka (2018), ipinakita kung paano nakatutulong ang interbensyon sa pagpapabuti ng kahirapang magsalita ng mga mag-aaral, partikular sa mga may mababang antas ng kahusayan noong simula. Layunin ng interbensyon na mapabuti ang kasanayan sa pagsasalita ng wikang Filipino sa mga mag-aaral na may mababang marka sa pre-test. Ginamit ng mananaliksik ang iba't ibang pagsasanay sa bokabularyo, talasalitaan, indibidwal na tulong, at mga aktibidad sa pangkat upang suportahan ang pag-unlad ng mga mag-aaral.

Matapos ang interbensyon, naitala ang malaking pagtaas sa antas ng kahusayang magsalita ng wikang Filipino ng mga mag-aaral na bahagi ng pag-aaral. Ang mga resulta nito ay nagpapakita ng kahalagahan ng mga interbensyon sa pagtuturo para sa pagpapabuti ng kahusayang magsalita ng wikang Filipino ng mga mag-aaral, lalo na sa mga may mababang antas ng kahusayan. Ang nasabing pananaliksik ay nagbibigay-diin sa potensyal ng mga estratehiya at aktibidad na naglalayong mapalakas ang kasanayan sa wika, partikular sa Filipino, ng mga mag-aaral na nangangailangan ng dagdag na suporta at gabay.

Sa pag-aaral ni Lopez (2018), ipinakita ang kahalagahan ng interbensyon sa pagpapabuti ng kahusayang magsalita ng mga mag-aaral. Isinagawa sa pananaliksik na ito ang pag-aaral ng epekto ng isang sistematikong programa ng interbensyon sa pagtuturo sa mga mag-aaral na may mababang antas ng kahusayan noong pre-test. Ginamit ng mananaliksik ang mga pagsasanay na naglalayong palakasin ang pag-unawa sa mga konsepto, pagsasanay sa pagsasalita, at pagsusuri ng mga teksto upang mapalakas ang kasanayan ng mga mag-aaral.

Matapos ang interbensyon, nakitaan ng mas mataas na pag-angat sa antas ng kahusayan sa pagsasalita ang mga mag-aaral na sumailalim sa programa kumpara sa mga hindi. Ang mga resulta ng pag-aaral ay nagpapakita ng epektibong papel ng interbensyon sa pagpapabuti ng kahusayang magsalita ng mga mag-aaral, partikular sa mga may mababang antas ng kahusayan. Ang nasabing pananaliksik ay nagbibigay-diin sa potensyal ng mga estratehiya at programa ng interbensyon upang mapalakas ang kakayahan sa pagsasalita ng wika ng mga mag-aaral na nangangailangan ng dagdag na suporta sa kanilang pag-aaral.

Konklusyon

Batay sa resulta ng pag-aaral, ang mga mag-aaral sa ikasampung baitang ng Asuncion National High School ay may mataas na antas ng kahirapang magsalita ng wikang Filipino bago ipinatupad ang interbensyon. Ibig sabihin, pinaboran ng mga respondente na ang kanilang kahirapang magsalita batay sa linggwistikang aspekto at sikolohikal na aspekto ay madalas lang nilang naipapakita sa klase sa Filipino.

Samantala, pagkatapos ng interbensyon, ang kahirapang magsalita ng wikang Filipino batay sa linggwistikang aspekto at sikolohikal na aspekto ay napakataas. Ibig sabihin, palagi nang naipapakita ng mga mag-aaral sa bawat klase sa Filipino ang kahusayan sa pagsasalita pagkatapos ng interbensyong brigada pagbasa.

Sa kabilang dako, ipinapakita ng pangkalahatang resulta na may makabuluhang pagkakaiba ang kahirapang magsalita ng wikang Filipino bago at pagkatapos ng interbensyon. Dahil ang null haypotesis ay hindi tinanggap, nangangahulugan lamang na ang p-value ng isang baryabol ay mas mababa sa antas ng kahalagan.

Dahil ang resulta sa pag-aaral na ito ay nagsiwalat may makabuluhang pagkakaiba ang kahirapang magsalita ng wikang Filipino bago at pagkatapos ng interbensyon sa mga mag-aaral sa ikasampung baitang ng Asuncion National High School. Kaya, iminumungkahi ng mga mananaliksik na ipagpatuloy ng mga guro ang interbensyong brigada pagbasa (linggwistikang aspekto at sikolohikal na aspekto) upang mapaunlad pa ang kahusayan ng mga mag-aaral sa pagsasalita. Hindi lamang ito ipagpapatuloy sa ikasampung baitang kundi sa lahat na rin ng baitang sa maatas na paaralan ng Asuncion at maaari din itong gamitin ng iba pang paaralan upang matugunan din ang kanilang pangailang kaugnay rito.

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THE TRANSFORMATIVE JOURNEY OF INDIA'S EDUCATION SYSTEM THROUGH NEP 2020-A STUDY

E.Kaviyarasu[1], Dr.D.Devanathan[2]
[1]*Ph.D. Research Scholar, Dept. of Poli Sci & Public Admin., Annamalai University*
[2]*Professor & Head, Dept. of Poli Sci & Public Admin, Annamalai University*

ABSTRACT
The National Education Policy 2020 (NEP 2020), which replaces the National Educational Policy of 1986, represents a significant contribution to the nation by aiming to reform India's education system. Implementing a unified policy in a country characterized by its diversity is no small feat. However, education is recognized as a pivotal tool for national development. Specifically, the NEP 2020 focuses on overhauling the higher education sector by addressing various longstanding issues, such as fragmentation within the education system, a lack of emphasis on skill development and learning outcomes, premature specialization, limited accessibility in disadvantaged regions, and insufficient focus on research. Furthermore, the policy highlights problems related to governance and regulatory inefficiencies. By aiming to rectify these challenges, the NEP 2020 seeks to elevate India's educational standards to an international level, fostering continuous improvement and inclusivity across all student demographics. It also looks forward to setting trends for future generations, addressing the specific needs of the research and innovation sectors, and considering the implications of education on the concurrent list. In essence, the NEP 2020 aspires to dispel the 'darkness of education' by transforming India into a "Viswa Guru" – a global leader in education – through a comprehensive and forward-thinking approach. Despite the positive aspects of the policy, critics argue that it poses challenges such as impacting the concurrent list and leading to privatization and commercialization, which may disadvantage the poor. This article explores what the National Education Policy (NEP) 2020 entails and the issues surrounding it.

KEY WORDS: *Indian Education System, National Education Policy 2020, Higher Education, Memorandum of Understanding.*

INTRODUCTION

In this era, the world has become a global village. Competition operates on a global scale, where individuals possessing skills are the ones who secure jobs and succeed in their fields. This is the rationale behind the launch of National Skill Development Missions. In the context of higher education, it signifies that tertiary education, also known as higher education, represents the optional final stage of formal learning that follows the completion of secondary education, leading to the awarding of an academic degree. However, at the school level, students only learn the basics. Higher education refers to the education subsequent to the secondary stage of school education, where students delve deeper into their field's curriculum and also engage in research in their chosen field and curriculum. This transforms them into masters or scientists in their desired field. For this purpose, not only is skill important in that field, but a deeper knowledge of the curriculum is also crucial. According to Justice K.S., the report of the Verma Commission highlighted that many Teacher Educational Institutions (TEIs), numbering over 10,000, are not genuinely pursuing serious teacher education but are essentially selling degrees for a price (Ministry of Human Resource Development, n.d.). If these kinds of activities continue, we will not achieve the moral development of the students. From the foundational knowledge curriculum, higher education needs to impart deep knowledge to the students. Therefore, it must begin with teacher education; only then will students reap the benefits. And also for achieving success in the global level competition, the education given to the students is the global level updating curriculum needed. And also the research also not only need one focus research the to be negotiable in curriculum needs there must be foster cross –disciplinary research needed which means Research and creative practices that engage two or more academic disciplines are referred to as cross-disciplinary research. These activities can vary widely, from merely juxtaposing insights from different disciplines to adopting approaches that are much more integrative or transformative. And also, the MoUs signed between India and different countries make the students to learn collaboration with foreign colleges, but is this one handled by the state or center? These points are really in the NEP 2020 proposal? Like-wise questions that arise in our mind .what is the importance of higher education in education fields, and how will the NEP 2020 handle higher education? What is behind higher education, and are there any issues in the education journey? Let describe.

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EVOLUTION OF INDIAN EDUCATION SYSTEM

The Indian education system has its roots in the traditional Gurukula system, which dates back to the Vedic period. Over time, this system evolved with the establishment of ancient universities like Nalanda and Taxila. During the medieval period, the introduction of Islamic education brought Arabic and Persian influences into the Indian education system. The British colonization led to significant changes, including the introduction of the Macaulay education system to serve British interests. This system was named after the committee formed under Macaulay. Prior to the modern school system, the Madras presidency witnessed the existence of Thinai Pallikoodam, a type of school conducted in teachers' homes, laying the groundwork for English education. By 1822, more than twelve thousand schools were operational in the Madras presidency, with each village hosting at least one school. After India's independence, the Radhakrishnan Committee, led by Dr. Radhakrishnan, was the first to restructure the Indian education system significantly, recommending the establishment of the University Grants Commission (UGC) for higher education. This was followed by the Kothari Commission (1964–1966), the Acharya Narendra Deva Committee, and the Mudaliar Committee under Dr. A. Lakshmanswami Mudaliar. In 1986, under Prime Minister Rajiv Gandhi, the National Education Policy was introduced. After that 1992 some modifications made on that policy ,After a 34-year hiatus, the National Education Policy 2020 was formulated under Prime Minister Narendra Damodardas Modi and led by Dr. K. Kasturirangan. NEP 2020 reaches a significant milestone in the evolution of the Indian education system.(test book 2024)

NEP 2020 AND THE HIGHER EDUCATION

"The National Education Policy 2020 (NEP 2020) is designed to encompass four major parts: Part I: School Education; Part II: Higher Education; Part III: Other Key Areas; and Part IV: Making It Happen. This part focuses on action plans in the education field. In this article, we discuss Part II, which pertains to higher education. Higher education encompasses eleven points: Quality Universities and Colleges: A New and Forward-Looking Vision for India's Higher Education System; Institutional Restructuring and Consolidation; Towards a More Holistic and Multidisciplinary Education; Optimal Learning Environments and Support for Students; Motivated, Energized, and Capable Faculty; Equity and Inclusion in Higher Education; Teacher Education; Re-imagining Vocational Education; Catalyzing Quality Academic Research in All Fields through a New National Research Foundation; and Transforming the Regulatory System of Higher Education. (Ministry of Human Resource Development, n.d.) These subtopics under Part II regulate higher education in accordance with the proposals of NEP 2020, outlining how the new education system will be implemented."

ENCHANCING QUALITY AND NEW INNOVATION IN EDUCATION

Quality Universities and Colleges: A New and Forward-Looking Vision for India's Higher Education System and Towards a More Holistic and Multidisciplinary Education aim to enhance quality and introduce new innovations in education. These initiatives envision improving the quality of education in India. The four pillars of the NEP 2020—Access, Equity, Quality, Affordability, and Accountability—are crucial, with each point reflecting its importance. In The Quality Universities and Colleges: A New and Forward-Looking Vision for India's Higher Education System, the main emphasis is on how quality education leads to meaningful lives for students. It proposes making multidisciplinary universities and colleges accessible in every district, while also promoting the use of local languages in India. However, a challenge arises regarding financial feasibility. The NEP 2020 states that the financial expenditure for education allocated in the GDP (Gross Domestic Product) is 6% (Ministry of Human and Resource Development, n.d.). Additionally, it discusses how improvements in curriculum and teaching methods will aid in the curriculum's implementation, as outlined in Part IV, Making It Happen. (Ministry of Human and Resource Development, n.d.)The proposal suggests that curriculum development is managed by both the center and the states since education is on the concurrent list. It involves careful and joint monitoring by committees, although each state has its own board and regulations for specifically framing the syllabus. India, known for its unity in diversity, has each state boasting unique cultural values and languages. Implementing education in local languages appears to be an easy task. However, the real challenge lies in accommodating students who migrate from their home state to another for higher studies. For instance, students from Tamil Nadu are studying in Delhi, or those from the northeastern states are studying in Bengaluru. The all-state students are studying all over India. This aspect must be considered when developing curricula for higher education.

Catalyzing Quality Academic Research in All Fields through a New National Research Foundation: This point in the proposal indicates how NEP2020 addresses research-oriented fields. Societies that have valued research since ancient times have become marvelous and have contributed geniuses to the world. This section of NEP 2020 also emphasizes the importance of research, explaining how the field will evolve through collaboration with researchers, private institutions, government, and industry. The National Research Foundation (NRF) is established for research purposes. The NRF will collaborate with existing funding agencies to avoid the duplication of work and will be governed by top researchers and innovators, taking research to the next level. A point in Catalyzing Quality Academic Research in All Fields through a New National Research Foundation criticizes the previous policy for allocating only 0.69% of its budget to research (Ministry of Human Resource Development, n.d.). However, how much this policy allocates to research-oriented fields is important. Social science research is also noted in NEP2020, but the arts and sciences need the same attention because science solves problems while social science research analyzes the impact of science and technology. Thus, these fields should collaborate to benefit society. Government institutions like the Department of Science and

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Technology (DST), Department of Atomic Energy (DAE), Department of Bio-Technology (DBT), Indian Council of Agricultural Research (ICAR), Indian Council of Medical Research (ICMR), Indian Council of Historical Research (ICHR), and University Grants Commission (UGC) will be funded by the NRF to enhance research. Peer-reviewed grant proposals from all disciplines will yield better research results, opening the gates for new innovators to contribute to the nation. However, most higher education institutions are run by private entities. If the NRF imposes more rules and regulations while funding, it will purely contribute to national development, considering that 65% to 75% of students are studying in private institutions(Dr.T.Sundararasan 2022). Thus, the research education field will smoothly progress along a good path.

Creating Supportive and Inclusive Educational Environments

Optimal Learning Environments and Support for Students: This section argues that curriculum, pedagogy, continuous assessment, student support, institutional autonomy, and innovation, along with institutional development plans (IDP), are crucial. A positive aspect of the proposed NEP2020 is the regular updating of the curriculum to reflect new innovations, especially in the science fields, which influence changes in society and are reflected in arts fields such as social sciences. Furthermore, institutional development plans support student development by improving clubs and activities. Granting more autonomy to institutions is seen as beneficial, although it affects the decision-making restrictions of universities and their operational dependency. However, this autonomy allows for the adoption of best practices in institutional planning, implying that universities will still have some influence post-autonomy. Specific conditions for institutional autonomy eligibility include ten years of experience, an NBA (National Board of Accreditation) assessment score above 675, and Higher Education Institutions (HEIs) with a score of 3.0 or higher from NAAC/NBA or a corresponding accreditation agency, contingent upon an on-site peer visit committee's decision. HEIs achieving a NAAC/NBA or corresponding accreditation score between 3.26 to 3.5 in one cycle and accredited in the second cycle are eligible without requiring an on-site expert visit. Additionally, HEIs with a score of 3.51 in NAAC/NBA or corresponding accreditation and a score of 750 qualify for eligibility without needing an expert on-site visit. It is mandatory for HEIs to adhere to UGC Regulations, including ensuring no incidents of ragging (Regulations 2012), promoting equity (Regulations 2012), and providing proper grievance redressal (Regulations 2012), both in writing and in spirit. (balram corde 2021)Equity and Inclusion in Higher Education: This section mainly focuses on achieving the Sustainable Development Goals (SDGs) and outlines steps the government intends to take to increase the Gross Enrollment Ratio (GER), conduct programs in higher education, and address the needs of migrant student populations.

Re-imagining Vocational Education: There is a misconception in India that vocational education is only for those who do not perform well academically or are unable to pursue higher education. This perception negatively impacts students genuinely interested in vocational education. According to the 12th Five Year Plan (2012-2017), less than 5% of students in India receive vocational education, which is significantly lower than in the USA (52%), Germany (75%), and South Korea (95%). Before NEP 2020, vocational education was targeted at students who had completed 8th grade and were in grades 11 and 12. India, with its large youth labor force, aims to enhance skill development in vocational fields, as addressed by the National Skill Qualification Framework (NSQF). This initiative promotes skill development, enabling students to pursue jobs they are passionate about, thereby fostering entrepreneurship and leading the nation towards self-sufficiency in its economy. (Ministry of Human and Resource Development, n.d.)

Strengthening Institutions and Governance

Institutional Restructuring and Consolidation: in this section giving the autonomy to the college of undergraduate program by certificate given by the acceleration council it will become established slowly as autonomous colleges. But need to be consideration with some rules and regulations the research in public and private collaborations to get high quality is encouraging welcome one. Motivated, Energized, and Capable Faculty: Focuses on faculty development, fair compensation, and creating a supportive environment for research and innovation, recognizing the central role of faculty in the educational ecosystem. Teacher Education: the education wants to good in manner means the teacher education wants to regualat6e as per above said that k.s varma the teacher education wants to learn it not for sell. It regulates strictly the rules and regulations of teacher education, the fours B.ED system is introduced and also if any subject the students already finished the four years degree give 1year B.Ed it reduces the time limit for the students, internalization points the Lot of Mous signed between the various Universities and foreign colleges. On internationalization this topic explore that the foreign universities which came here and open their branches in the India to give foreign colleges and universities education to Indian students for that and also various MoUS singned for this In a bid to bolster international collaborations, 6 MoUs have been signed, including the IIT-Madras Zanzibar campus MoU. Additionally, MoUs were also signed between IIT Tirupati and IIFCET, for offering the advanced certification and training course on “Digital Manufacturing and Automation for Foundry Industry” for training and enriching the knowledge of diploma holders/graduate engineers employed in the industry; IIT Tirupati and M/s Siemens/ Wipro for establishing Centre of Excellence on “Smart manufacturing and Electric Vehicle Technologies”; IIT Jodhpur and CU/Raj; IIT Ropar and five Central Universities of North India for academic collaboration and sharing of resources; VNIT Nagpur and TCS to path breaking research in the area of automotive electronics, powers electronics and other related interdisciplinary subjects; NIT Raipur and the Bhilai Steel Plant, the largest steel plant in India giving opportunity of entrepreneurship skill to budding students by exposing them to

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industrial training and joint degree programmes. The PM-USHA initiative also resulted in 15 MoUs with various states.An MoU was signed between DHE with BISAG-N as well. The UGC signed 5 MoUs: University of Mumbai and University of Illinos, USA; University of Mumbai and Saint Louis University, USA; Guru Ghasidas Vishwavidlaya and L N Gumilyov Eurasian National University, Kazakhstan; University of Lucknow-Lincoln University College Kualalumpur, Malaysia; University of Lucknow and Universidade Federal do Ceara, Brazil.In the realm of higher education, 6 MoUs were established to promote the Indian Knowledge System. 14 MoUs under the National Educational Technology Forum (NETF) and All India Council for Technical Education (AICTE) were also signed in partnership with: SkillDzire Technologies Pvt Limited, MathWorks India Private Limited, TimesPro, Google India, Gate India Electronics Private Limited, Future Minds, The Open Group, CONSORTIUM FOR TECHNICAL EDUCATION (CTE), Maha Learning Tab India, Durjeya Solutions Private Limited, Flaunch Innovation Pvt. Ltd, Electronics Sector Skill Council, NIELIT, and the Instrumentation Automation Surveillance & Communication Sector Skill Council. Furthermore, 2 SAMARTH MoUs with different states were also inked, alongside an MoU with SAMARTH DU and EdCIL.[1]. The foregin education universities and the colleges were setup their campus in the India and taking classes to the ODL (Online Distance Learning) (PIP 2023)but the education is in the concurrent list so there is clear cut definition needed whether it handled by the center or state the universities taxes handle by who both or only by the state. Transforming the Regulatory System of Higher Education: Aims to overhaul the regulatory framework to promote autonomy, innovation, and accountability, simplifying processes and establishing quality standards. Effective Governance and Leadership for Higher Education Institutions: this section talks about the BoG(Board of Governors) the governors.

CONCLUSION

The National Education Policy (NEP) 2020 aims to significantly improve the Indian education system. While it introduces commendable reforms, there is a need for adjustments considering education falls under the concurrent list, necessitating modifications to align with the cultural values and specific needs of different states. Careful implementation and curriculum development are crucial, incorporating both national and international concepts. MoUs have played a vital role in elevating Indian education to the next level. The introduction of multiple entry and exit options, along with a designated year for research, enhances students' interest in research. The policy also streamlines the path to obtaining a Ph.D. by eliminating the M.Phil. program, thus reducing the time required for research scholars to complete their doctorates. This approach is academically sound and promises to bolster research and innovation within the educational landscape.

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QUALITY ASSURANCE INDICATORS AS PREDICTOR OF PRINCIPALS' ADMINISTRATIVE EFFECTIVENESS IN SECONDARY SCHOOLS IN ABIA STATE, NIGERIA

Ngene, Adaku Ngozi *Ph.D*[1], Nebo, Chizoba Nwanneamaka[2]
Willie, Talithacumi Bassey[3]

[1]*Department of Educational Management and Policy Management, University of Nigeria Nsukka.*
[2]*Department of Educational Foundations, Faculty of Education, Federal College of Education Technical, Isu Ebonyi State, Nigeria.*
[3]*Department of Educational Management, Faculty of Educational Foundation Studies, University of Calabar, Nigeria.*

Corresponding Author: Obona, Edut Egbe.

ABSTRACT

The study was conducted to examine quality assurance indicators as predictor of principals' administrative effectiveness in secondary schools in Abia State, Nigeria. Specifically, the study investigated the contribution of ***school leadership and instructional supervision*** *to principals' administrative effectiveness. Two null hypotheses were formulated to guide the study. The design adopted for the study was correlational research design. The population comprised 244 public secondary schools and 244 principals in Abia State covering three education zones in Abia State namely; Aba, Ohafia and Umuahia. Census technique was used to select all the 244 secondary school administrators for the study. The instrument used for data collection was a questionnaire designed and administered by the researcher tagged: "Quality Assurance Indicators and Principals' Administrative Effectiveness Questionnaire (QAIPAEQ)." The validity of the instrument was confirmed by three experts from the Department of Educational Management and the Department of Educational Foundations (Measurement and Evaluation Unit) University of Calabar. The reliability of the instrument was determined using the Cronbach alpha method, yielding coefficient values of 0.81 and 0.87, respectively. The null hypotheses were tested at .05 level of significance using Simple Linear Regression analysis. Findings of the study revealed that* ***school leadership and instructional supervision*** *significantly predicts secondary schools' effectiveness in Abia State. Based on the findings of this study, it was concluded that quality assurance indicators significantly predict principals' administrative effectiveness in Abia State, Nigeria. The study concluded that school leadership and instructional supervision are significant predictors of principals' administrative effectiveness. This means that effective school leadership which is characterized by clear vision, strong decision-making, and collaborative practices, combined with consistent instructional supervision, substantially enhances the ability of principals to manage school operations efficiently, support teachers, and improve student outcomes. Based on the findings, it was recommended that: Ongoing professional development programs should be provided for school leaders, focusing on instructional leadership, effective communication, and change management. This will enhance their capacity to foster a conducive learning environment and drive continuous school improvement.*

KEYWORDS: *Quality Assurance Indicators, School Leadership, Instructional Supervision as Principals', Administrative Effectiveness, Secondary Schools.*

INTRODUCTION

Secondary education is a crucial stage that comes before tertiary education. In Nigeria, its main aim is to provide students with a comprehensive education, equipping them with the knowledge, skills, and competencies needed for academic and social success as they move on to higher academic or vocational pursuits. Society expects secondary schools to effectively develop students in cognitive, affective, and psychomotor areas. Odigwe (2019) notes that an effective secondary school typically has a clear mission, high expectations, strong instructional leadership, regular monitoring of student progress, a safe environment, good academic performance, high tertiary enrollment, and a strong alumni network. Etor et al. (2019) further emphasize that students should acquire sufficient knowledge and skills by the time they leave secondary school to make them either employable or eligible for higher education. The effectiveness of secondary school education heavily depends on the administrative competence of principals, who are the heads of these institutions. Effectiveness is one key characteristic of the school system. The concept connotes the idea of an organization accomplishing its specific objectives (Ogonor & Omajuwa, 2020). Principals' administrative effectiveness is the capability of school leaders to

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efficiently manage and guide a school toward achieving its educational objectives and improving overall school outcomes. This effectiveness is determined by their ability to allocate resources, enforce policies, offer instructional leadership, uphold discipline, promote a conducive learning environment, support the growth of both staff and students, and maintain high academic standards. It also encompasses their skills in strategic planning, decision-making, and collaborating with stakeholders like teachers, parents, and the community to advance the school's mission. It is also the ability to accomplish school objectives as stated in the NPE (FGN 2013).

Administrative effectiveness in schools plays a vital role in boosting academic achievement, managing resources efficiently, cultivating a positive school environment, and improving teacher retention and development. Skilled administrators ensure the effective execution of instructional practices, make optimal use of resources, and create a nurturing atmosphere for both students and staff. Furthermore, they actively engage with stakeholders, such as parents and the community, fostering collaboration and support for the school's objectives, all of which are essential for the school's overall success and seamless functioning (Bush & Glover, 2020; Leithwood & Sun, 2021; Mulford, 2019; Robinson et al., 2020; Bhengu & Naicker, 2021).

The secondary school system in Nigeria, like other levels of education, faces numerous challenges that undermine its effectiveness. These issues include poor funding, deteriorating infrastructure, and inadequate human capital development. According to Olayemi (2001, p. 11) in Ugwu (2018), the decay of public schools in Nigeria is a major factor that led to the rise of private schools. Ahmed (2003) in Olanrewaju (2016) also highlighted that teaching and learning often occur in unfavorable environments, with insufficient materials, thereby obstructing the achievement of educational objectives. Obona et al. (2021) observed that many secondary schools suffer from a shortage of qualified and competent teachers, largely because these teachers rarely have opportunities to attend professional development programs or teaching-related conferences. The neglect of key aspects of teacher education has resulted in classroom underperformance. Obona et al. (2021) further noted the lack of emphasis on teacher development to expose educators to modern teaching methods, skills, and strategies, which is crucial for effective teaching but is often neglected, sometimes driven by bias. According to Babalola (2007) in Ugwu (2018), this situation has contributed to broader societal problems such as unemployment, a declining economy, moral decay, underqualified workers, poorly prepared secondary school graduates, and excessive reliance on developed Western nations. The overall learning environment in these schools does not seem to support the sustainability of the secondary education system.

In many schools in Abia State, for instance, it was observed that there are insufficient classrooms, staff offices, laboratories, workshops, libraries, and essential furniture like student seats and teachers' tables and chairs. Additionally, the facilities that do exist are often poorly equipped and poorly maintained, with broken floors, leaking roofs, and cracked walls, forcing teachers and students to work in harsh conditions. Furthermore, the researcher observed that many teachers exhibit a negative attitude towards their duties, including reluctance to prepare lesson notes, disregard for school rules, and other unprofessional behaviors. These conditions have led to widespread examination malpractices, poor literacy skills among students, and general inefficiency in the secondary education system. Educational administrators are tasked with ensuring the delivery of quality and efficient education. Quality assurance services, when effectively utilized, can significantly enhance their effectiveness in secondary schools, potentially leading to a complete transformation of the school environment. This underscores the need for school administrators to be actively involved in quality assurance processes.

Quality assurance involves planned and systematic actions necessary to ensure that a product or service meets established quality standards (Borahan & Ziarati, 2002, in Ogbonna, 2012). It is about implementing systems to assess the quality of work across all levels, providing feedback on strengths and areas for improvement, and taking corrective action when needed (Odigwe, 2019). Quality assurance involves meeting standards in resource usage and management, ensuring that the output meets expectations (Obona et al, 2024). The focus of quality assurance in education is on ensuring sound processes that result in high standards, targeting three key areas: input, process, and output. This approach helps identify potential issues in the educational process. There are various indices for school quality assurance. Adewale (2004) in Odigwe (2019) identifies factors such as the principal's instructional leadership, discipline, school climate, and school-community partnership programs as key elements of school effectiveness. For the purpose of this study, two quality assurance indicators will be examined namely school leadership and instructional supervision.

The leadership quality of a school administrator can significantly influence the effectiveness of the school system. Principals serve as role models that staff members look up to for guidance. According to Arop et al. (2019), the leadership traits of secondary school administrators or principals can either enhance or diminish teachers' job performance, as every action by the school head can either support or obstruct the school's development. Organizational success largely hinges on leadership. Boonla and Treputtharat (2013) describe leadership as the ability to use influence to guide decision-making and establish organizational goals. For a school leader (principal) to efficiently fulfill administrative tasks and achieve school goals, they must possess specific qualities.

Omar et al (2021) explored the effectiveness of principal leadership practices in secondary schools in Niger State, Nigeria. The study surveyed 154 principals, 269 heads of departments, and 25 staff members from the Secondary Education Board. The

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findings indicated a high level of principal leadership practices and school effectiveness in the state. Multiple regression analysis showed that leadership practices accounted for 14% ($R^2 = 0.14$) of the variation in school effectiveness. In another study, Alzubi (2021) investigated the relationship between principals' leadership qualities and their effectiveness in performing administrative tasks, as perceived by secondary school teachers in the Irbid Governorate. Using a sample of 120 teachers, the study revealed a significant positive correlation between principals' leadership qualities and their effectiveness in administrative tasks. Okere and Wike (2023) examined the administration of secondary education during economic decline and its impact on teachers' effectiveness in Rivers State. The study involved 16,680 teachers across 247 public secondary schools, with a sample of 613 teachers selected through stratified random sampling. Data was collected using the "Administration of Secondary Education in a Dwindling Economy Questionnaire" and the "Teachers' Effectiveness in Secondary Schools in Rivers State Questionnaire." The study found significant relationships between remuneration, promotion, learning facilities, and teachers' effectiveness in secondary schools in Rivers State.

There is no organization can operate efficiently without supervision. Ogonor and Omajuwa (2020) describe instructional supervision as an interaction between individuals aimed at improving teachers' instructional practices, which in turn enhances students' learning and contributes to both teachers' personal and professional growth. Supervision is essential for school administrators to uphold performance standards and achieve positive outcomes. It is a vital activity conducted by principals to enhance classroom instruction and ensure overall school effectiveness. Shuaibu (2016) found that supervision is crucial for achieving organizational goals and maintaining educational standards. Babatope and Alonge (2013) showed that in Ekiti Central Senatorial District, Nigeria, there was a positive relationship between principals' supervisory roles and teachers' motivation, with effective supervision directly influencing teacher motivation. Similarly, Torukwein and Lesi (2017) revealed a positive correlation between principals' supervisory techniques and teachers' job performance in Rivers State public secondary schools. Onyeike and Nwosu (2018) emphasized that instructional supervision is a key tool for managing teaching and learning, showing that principals' administrative and supervisory roles positively affected teachers' job effectiveness in Rivers State.

Ogonor and Omajuwa (2020) also investigated the relationship between principals' supervisory roles and school effectiveness in Delta State, Nigeria. Using a correlational research design with a sample of 43 principals, the study revealed a high level of school effectiveness linked to effective supervisory practices. A positive correlation was found between principals' supervisory performance and school effectiveness. In Tanzania, Dafa, Muteti, and Mandila (2020) examined the effectiveness of school heads in practicing instructional supervision in Ilala Municipality. Data were collected through questionnaires and structured interviews, and analyzed using SPSS. The findings, presented through frequencies and percentages, indicated that instructional supervision by school heads was perceived positively by teachers as being effective.

The literature review shows that numerous studies have examined various dimensions of quality assurance indicators and school effectiveness. Based on the findings of these studies, it can be inferred that there is a relationship between quality assurance indicators and administrative effectiveness. However, certain gaps were identified, which this study aimed to address. Most of the reviewed studies were conducted in foreign countries or regions quite different from Abia State. There appears to be no prior research in Abia State that investigated quality assurance indicators and principals' administrative effectiveness using the same approach and variables as this study. Therefore, this research was conducted to fill that gap in the literature.

STATEMENT OF THE PROBLEM

Secondary education plays a crucial role in providing students with the knowledge, skills, and competencies necessary for academic, social, and economic success. To achieve these goals, secondary schools must effectively develop students' cognitive, affective, and psychomotor abilities. Society and parents expect schools to offer strong instructional leadership and a safe, conducive environment that promotes good academic performance in both internal and external examinations.

However, in many public secondary schools in Abia State, Nigeria, the researchers observed a significant decline in quality. Schools are plagued by a lack of basic teaching and learning materials, insufficient classrooms, inadequate seating, poor office conditions, and poorly maintained facilities such as laboratories, workshops, and libraries. Some schools have deteriorating infrastructure, including broken floors, leaking roofs, and cracked walls. In the few schools with available resources, maintenance is often neglected, creating an unconducive learning environment. Moreover, many teachers fail to uphold their professional responsibilities, and some principals neglect their supervisory roles. As a result, students resort to various forms of examination malpractice and demonstrate poor reading, writing, and communication skills. These shortcomings from students, teachers, and administrators contribute to the overall ineffectiveness of the secondary school system, preventing it from achieving its stated objectives.

Despite government efforts to improve teaching conditions, provide facilities, recruit teachers, and enhance supervision, the researchers noted an apparent lack of corresponding improvement in the administrative effectiveness of school principals. This inconsistency led the researchers to question whether quality assurance indicators have a significant relationship with principals' administrative

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PURPOSE OF THE STUDY

The main purpose of the study was to examine quality assurance indicators as predictor of principals' administrative effectiveness in public secondary schools in Abia State, Nigeria. Specifically, the study sought to examine if:

1. S**chool leadership** predicts principal's administrative effectiveness in public secondary schools in Abia State. significantly predict principal's administrative effectiveness in public secondary schools in Abia State
2. **Instructional supervision** predicts principal's administrative effectiveness in public secondary schools in Abia State.

STATEMENT OF HYPOTHESIS

The following null hypotheses were formulated to guide the study.

1. **School leadership** does not significantly predict principal's administrative effectiveness in public secondary schools in Abia State.
2. **Instructional supervision** does significantly predict principal's administrative effectiveness in public secondary schools in Abia State.

SIGNIFICANCE OF THE STUDY

The findings can help school administrators identify areas needing improvement, allowing them to make data-driven decisions to enhance education quality. This may involve implementing effective strategies, optimizing resources, and cultivating a positive school environment. For policymakers, the insights can be valuable in shaping and refining educational policies. The data can guide decisions on resource distribution, curriculum development, and teacher training programs, ensuring high standards across schools. Researchers can also use the findings as a foundation for further investigation into quality assurance and its impact on educational outcomes.

RESEARCH METHODOLOGY

The study adopted correlational research design, and study area was Abia State. The population comprised 244 public secondary schools and 244 principals in Abia State covering three education zones in Abia State namely; Aba, Ohafia and Umuahia. Census technique was used to select all the 244 secondary school administrators for the study. The instrument used for data collection was a questionnaire designed and administered by the researcher tagged: "Quality Assurance Indicators and Principals' Administrative Effectiveness Questionnaire (QAIPAEQ)." The validity of the instrument was confirmed by three experts from the Department of Educational Management and the Department of Educational Foundations (Measurement and Evaluation Unit) University of Calabar. The reliability of the instrument was determined using the Cronbach alpha method, yielding coefficient values of 0.81 and 0.87, respectively.

To collect data, the instruments were administered to the respondents in the respective schools by the researcher with the help of five trained research assistants. To do that, the research team visited each of the schools and sought for permission from the school authorities. Next, the consent of the respondents was sought and were also duly informed of the importance of the exercise and the need to provide honest responses to the instruments. The respondents were also assured that the data requested would be treated with total confidentiality and hence, were advised to willingly respond to the items there-in and not to share opinion with anyone. At the end of the process, copies of the instruments were all retrieved from the respondents.

The collected data were prepared on a person by item matrix using a computer spreadsheet program. The scoring of the questionnaire was done both for positively worded and negatively worded items. Thus for positively worded items, the scale used to score each response was: Strongly Agree (SA) 4 points, Agree (A) 3 points, Disagree (D) 2 points, Strongly Disagree (SD) 1 point. For negatively worded items, the scale used to score each response was reversed as follows: Strongly Agree (SA) 1 points, Agree (A) 2 points, Disagree (D) 3 points, Strongly Disagree (SD) 4 point. To analyze the data, each hypothesis used for the study was re-stated, both the independent and dependent variables were identified. Simple Linear Regression Statistical technique was adopted in testing all the hypotheses at .05 level of significance.

PRESENTATION OF RESULTS

Hypothesis One

School leadership does not significantly predict principal's administrative effectiveness in public secondary schools in Abia State. The two variables in this hypothesis are **school leadership** and principal's administrative effectiveness. Simple Linear Regression analysis was used to test the hypothesis and the result of the analysis is presented in Table 1. Table 1 showed that **school leadership** significantly predict principal's administrative effectiveness in Abia State as shown by the simple linear regression coefficient (R) of .723 and a coefficient of determination (R^2) of .523 obtained. The R^2 (R^2=.523) meant that the variable of **school leadership** contributed 52.3% of the total variance in principal's administrative effectiveness while the remaining percentage score 47.7% was predicted by other external factors outside **school leadership**. This showed that the independent variable (**school leadership**) significantly predicts the dependent variable (principal's administrative effectiveness), F264.894, p (.000) <.05. Referring to the coefficients in table 1, the unstandardized coefficient for **school leadership** is .712. This meant that for every point increase in principal's administrative effectiveness, there is .712 increase in **school leadership** scores from the questionnaire instrument used. Based on this result, the null hypothesis which stated that **School leadership** does not predict principal's administrative effectiveness in public secondary schools in Abia State, was rejected.

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Table 1

Summary of simple linear regression analysis showing the contribution of **school leadership** to principal's administrative effectiveness in public secondary schools in Abia State. (N=244)

Anova[a]

Model		Sum of Squares	df	Mean Square	F	Sig.	Decision
1	Regression	1267.621	1	1267.621	264.894	.000[b]	Rejected
	Residual	1158.063	242	4.785			
	Total	2425.684	243				

*Significant p<.05; R=.723; R^2 =.523; Adj. R^2=.521

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	5.094	.880		5.789	.000
	School leadership	.712	.044	.723	16.276	.000

a. Dependent Variable: Principals' administrative effectiveness
b. Predictors: (Constant), School leadership

Hypothesis Two

Instructional supervision does not significantly predict principal's administrative effectiveness in public secondary schools in Abia State. The two variables in this hypothesis are **instructional supervision** and principal's administrative effectiveness. Simple Linear Regression analysis was used to test the hypothesis and the result of the analysis is presented in Table 2. Table 2 showed that **instructional supervision** significantly predict principal's administrative effectiveness in Abia State as shown by the simple linear regression coefficient (R) of .827 and a coefficient of determination (R^2) of .684 obtained. The R^2 (R^2=.684) meant that the variable of **instructional supervision** contributed 68.4% of the total variance in principal's administrative effectiveness while the remaining percentage score 31.6% was predicted by other external factors outside **instructional supervision**. This showed that the independent variable (**instructional supervision**) significantly predicts the dependent variable (principal's administrative effectiveness), F524.937, p (.000) <.05. Referring to the coefficients in table 2, the unstandardized coefficient for **instructional supervision** is .597. This meant that for every point increase in principal's administrative effectiveness, there is .597 increase in **instructional supervision** scores from the questionnaire instrument used. Based on this result, the null hypothesis which stated that **instructional supervision** does not predict principal's administrative effectiveness in public secondary schools in Abia State, was rejected.

Table 2

Summary of simple linear regression analysis showing the contribution of **instructional supervision** to principal's administrative effectiveness in public secondary schools in Abia State. (N=244)

Anova[a]

Model		Sum of Squares	df	Mean Square	F	Sig.	Decision
1	Regression	1660.282	1	1660.282	524.937	.000[b]	Rejected
	Residual	765.403	242	3.163			
	Total	2425.684	243				

*Significant p<.05; R=.827; R^2 =.684; Adj. R^2=.683

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	7.789	.512		15.204	.000
	Instructional supervision	.597	.026	.827	22.911	.000

a. Dependent Variable: Principals' administrative effectiveness
b. Predictors: (Constant), I**nstructional supervision**

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DISCUSSION OF FINDINGS

The result of hypothesis one indicated that **school leadership** significantly predict principal's administrative effectiveness in public secondary schools in Abia State. This is likely because school administrators possess qualities that enable them to perform administrative tasks efficiently and effectively, contributing to the attainment of school goals and objectives. This suggests that leadership qualities are key determinants of principals' administrative effectiveness in secondary schools. The strength of this relationship aligns with Omar et al (2021) explored the effectiveness of principal leadership practices in secondary schools in Niger State, Nigeria. Multiple regression analysis showed that leadership practices accounted for 14% ($R^2 = 0.14$) of the variation in school effectiveness. It is in tandem with the findings of Okere and Wike (2023) who examined the administration of secondary education during economic decline and its impact on teachers' effectiveness in Rivers State. The study found significant relationships between remuneration, promotion, learning facilities, and teachers' effectiveness in secondary schools in Rivers State.

Similarly, Boonla and Treputtharat's (2013) study examined the relationship between leadership style and school effectiveness in schools under the Office of Secondary Educational Service Area 20. They found a positive relationship at a medium level. This is consistent with Alzubi's (2021) research, which investigated the relationship between principals' leadership qualities and their administrative performance as perceived by secondary school teachers in Irbid Governorate. The study revealed a significant positive correlation between principals' leadership qualities and the effectiveness of their administrative tasks.

The result of hypothesis two indicated that **instructional supervision** significantly predict principal's administrative effectiveness in public secondary schools in Abia State. The findings may result from the fact that quality supervision of instruction, as a crucial activity, is carried out by principals to improve classroom teaching and, consequently, enhance school effectiveness. This implies that effective instructional supervision is key to improving job performance. The findings align with those of Wabuko (2016), who investigated the influence of principals' supervisory practices on teachers' job performance in public secondary schools in Lang'ata Sub County, Nairobi County. The study concluded that principals who consistently conduct lesson observations and hold model teaching sessions with teachers significantly influence teacher performance and, as a result, student performance.

Similarly, the findings are consistent with those of Ogonor and Omajuwa (2020), who investigated the relationship between principals' supervisory role performance and school effectiveness in Delta State public secondary schools. To carry out this study, three research questions were raised, two were answered, and one was hypothesized. The study, which was a descriptive survey using a correlational research design, revealed a high level of principals' supervisory role performance and school effectiveness, with a positive correlation between the two variables.

CONCLUSION

The study concluded that school leadership and instructional supervision are significant predictors of principals' administrative effectiveness. This means that effective school leadership which is characterized by clear vision, strong decision-making, and collaborative practices, combined with consistent instructional supervision, substantially enhances the ability of principals to manage school operations efficiently, support teachers, and improve student outcomes. Therefore, when principals exhibit strong leadership skills and consistently supervise instructional activities, they are more likely to be effective in their administrative roles.

RECOMMENDATIONS

Based on the findings of this study, it was recommended that:

1. Ongoing professional development programs should be provided for school leaders, focusing on instructional leadership, effective communication, and change management. This will enhance their capacity to foster a conducive learning environment and drive continuous school improvement.
2. School administrators and supervisors should regularly conduct classroom observations and offer constructive feedback to teachers. This will help identify areas needing improvement and promote the adoption of best teaching practices.

CONTRIBUTION TO KNOWLEDGE

This study contributes to the body of knowledge by highlighting the critical impact of school leadership and instructional supervision on enhancing principals' administrative effectiveness. By establishing these factors as significant predictors, the research underscores the importance of developing leadership skills and robust supervision practices in school management. This finding provides educational policymakers and stakeholders with evidence-based insights, suggesting that investing in leadership training and structured instructional supervision can directly contribute to more effective school administration, ultimately leading to improved teaching quality and student performance educational institutions.

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DECLARATION OF CONFLICTING INTERESTS

No potential conflict of interest was reported by the authors.

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EVALUATING NON-PERFORMING ASSETS IN SELF-HELP GROUP-BANK LINKAGE PROGRAMME: ECONOMIC INSIGHTS FROM CENTRAL AND NORTHERN REGIONS OF INDIA

Arghya Mondal[1], Gargi Bhattacharjee[2]
[1]*Faculty of Economics, Department of Commerce, Surendranath College, Kolkata*
[2]*Ex-Faculty of Economics, Kankhuli High School, Kolkata*

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ABSTRACT

The Self-Help Group Bank Linkage Programme (SHG-BLP) plays a crucial role in providing affordable and timely credit to India's impoverished and vulnerable populations, who are often excluded from formal credit delivery systems. However, the high incidence of Non-Performing Assets (NPAs) within this sector poses a significant barrier to the continued availability of formal loans, as elevated NPAs disrupt the credit cycle and undermine efforts to alleviate poverty. Historically, the central and northern states of India have recorded NPAs above the national average within the SHG-BLP framework. In this study, we employ multiple linear regression analysis to identify the factors contributing to high NPAs in these regions. Our findings reveal a positive correlation between larger loans and higher NPAs, emphasizing the need for thorough risk assessment and ongoing monitoring when extending substantial credit to SHG members. Additionally, the regression analysis underscores the importance of considering gender dynamics within SHGs. Although women-led SHGs generally perform well, there are inherent credit risks, particularly as both loan size and group size increase. Targeted interventions to support women-led SHGs could enhance repayment rates and reduce NPAs, given that the majority of SHG loans in these regions are managed by female-led groups.

KEY WORDS: *Non-Performing Asset, Self-Help Group, Bank-Linkage Programme, Loan, Financial Inclusion, Multiple Linear Regression.*
JEL Classification: G210, G280, G510

1. INTRODUCTION

Credit serves as a crucial tool for the poor and vulnerable populations across many South Asian countries. In India, credit is essential for different entrepreneurial activity and covering daily expenses, such as food consumption, education, litigation, social festivities and medical needs. Often, these credit needs are so minimal that formal financial institutions may be reluctant to provide. Additionally, individuals in poverty often lack adequate collateral to qualify as credible borrowers for formal financial entities. Self-Help Group-Bank Linkage Program (SHG-BLP) has emerged as an innovative financial instrument in this regard (Ramesh, 2023). SHG-BLP has experienced substantial expansion in India since 1992. The primary objective of SHG-BLP is to foster financial inclusion by building connections between formal financial institutions and informal groups. These groups possess the capacity to address the challenges faced by economically disadvantaged individuals in accessing financial services from formal banking systems (Devi, Kumar, and Rede, 2018). According to (Kom et al., 2024), the SHG-BLP plays a significant role in providing timely and affordable credit to the economically disadvantaged. (Srinivas and Banothu, 2024) have demonstrated that the SHG-BLP functions as an essential financial mechanism for alleviating rural poverty.

The SHG-BLP plays an essential role in facilitating savings accumulation and providing subsidized loans to self-help groups for a range of productive activities. (Status of Microfinance Report, NABARD, 2023-24) indicates a substantial increase in both savings accumulation and loan disbursement in India following the COVID-19 pandemic. However, significant regional disparities exist in savings accumulation during the post-COVID period (Mondal and Bhattacharjee, 2024). The paper further emphasizes the growth of women-centered SHGs in the post-pandemic context, particularly in loan disbursement. Among formal financial institutions, public sector banks play a key role in extending credit to women-exclusive SHGs.

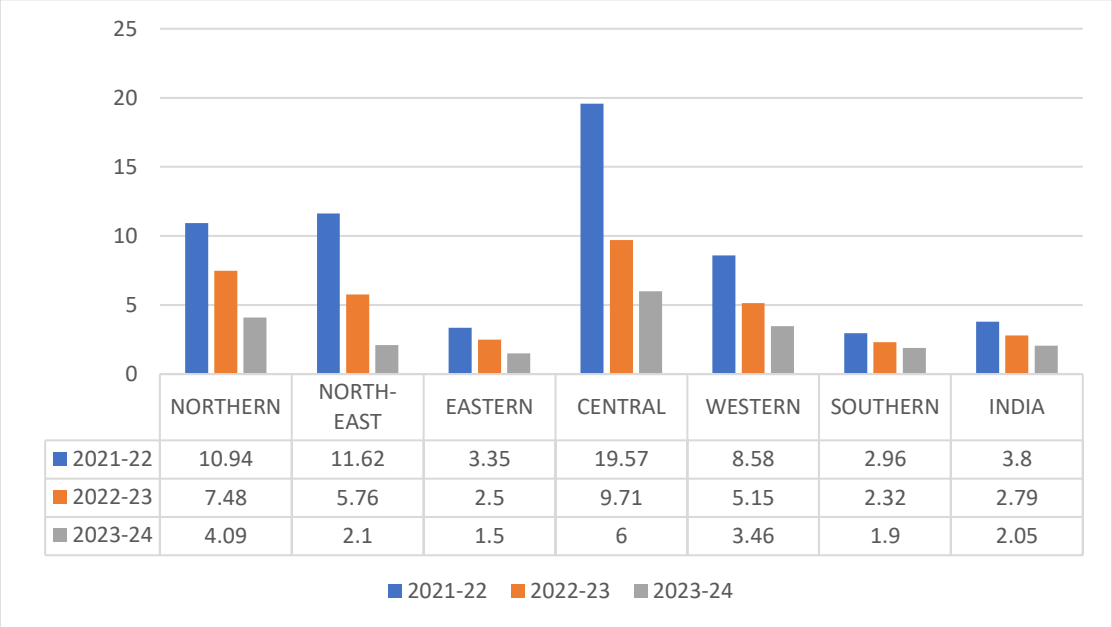
However, high NPAs in this segment can lead to reduced trust from financial institutions, making them hesitant to lend to SHGs, which would disproportionately impact women and marginalized groups who form the majority of SHG members (Patel and Jalota, 2023). The SHG-BLP model supports micro-entrepreneurship, agriculture, and small businesses, which contribute to local economic activity and job creation (Hashimy, 2023). High NPAs can disrupt credit cycle by reducing available funding, stalling growth, and hindering poverty alleviation efforts (Muduli and Sharma, 2022). This paper further highlights high NPAs reduce the profitability of banks and microfinance institutions (MFIs) participating in

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SHG-BLP by affecting their income from interest and increasing their provisioning costs for potential losses. Thus, managing NPAs in SHG-BLP is vital for ensuring the sustainable flow of credit to vulnerable populations, maintaining the financial health of lending institutions, supporting local economic growth, and fostering long-term poverty alleviation.

The Status of Microfinance Report by NABARD indicates a region-wise and overall decline in non-performing assets (NPA) within the Self-Help Group-Bank Linkage Programme (SHG-BLP) in India for the fiscal year 2023-24, compared to 2021-22 (refer to Figure 1). However, certain regions, namely the Central, Northern, and Western parts of the country, reported NPAs exceeding the national average.

Figure 1: Region-wise Percentage (%) of NPA to loan-outstanding

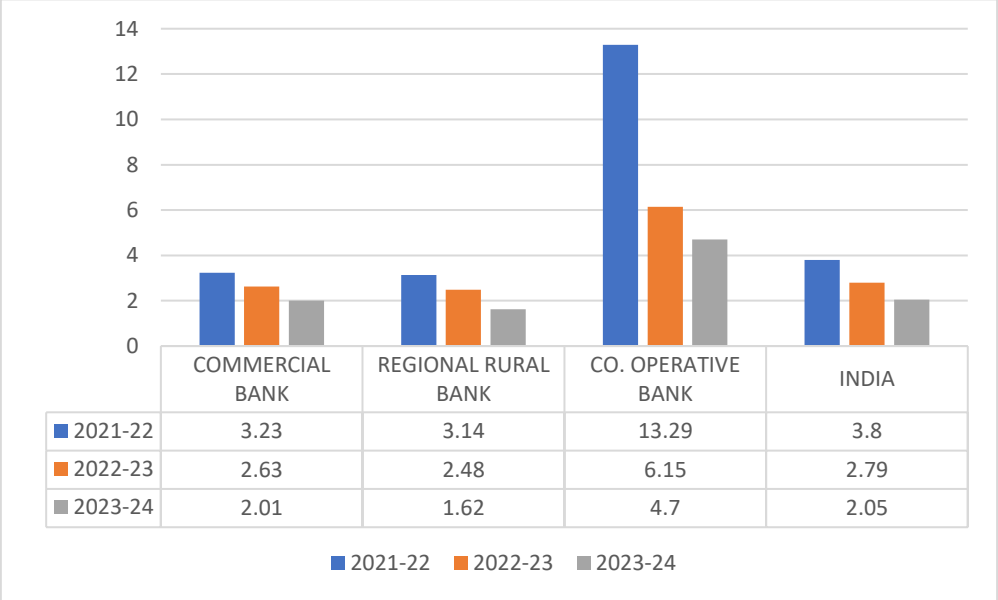


	NORTHERN	NORTH-EAST	EASTERN	CENTRAL	WESTERN	SOUTHERN	INDIA
2021-22	10.94	11.62	3.35	19.57	8.58	2.96	3.8
2022-23	7.48	5.76	2.5	9.71	5.15	2.32	2.79
2023-24	4.09	2.1	1.5	6	3.46	1.9	2.05

Source: Status of Microfinance Report, NABARD

Examining the agency-wise NPA of the SHG-BLP, we observe a notable overall decline in NPAs in 2023-24 compared to 2021-22 (see Figure 2). Among the major lenders of the SHG-BLP, cooperative banks have consistently recorded the highest NPAs over this period.

Figure 2: Agency-wise Percentage (%) of NPA to loan-outstanding



	COMMERCIAL BANK	REGIONAL RURAL BANK	CO. OPERATIVE BANK	INDIA
2021-22	3.23	3.14	13.29	3.8
2022-23	2.63	2.48	6.15	2.79
2023-24	2.01	1.62	4.7	2.05

Source: Status of Microfinance Report, NABARD

This paper aims to analyze the potential factors contributing to the high NPA levels of the SHG-BLP in specific regions, particularly the central and northern states in 2023-24. The paper is structured into five sections. Section 1 provides a

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concise overview of the agency-wise and region-wise NPA status of the SHG-BLP in India. Section 2 outlines the research objectives. Section 3 details the data, description of variables and methodology. Section 4 presents the discussion and analysis, while Section 5 offers the conclusion.

2. OBJECTIVES OF THE STUDY

(i) To identify and evaluate the potential factors contributing to the high Non-Performing Assets (NPAs) within SHG-Bank Linkage Program (BLP) in the Central and Northern states of India for 2023-24.

(ii) To find economic insights into the prevalence of high NPAs within the SHG-BLP across the Central and Northern Regions.

3. DATA, DESCRIPTION OF VARIABLES AND METHODOLOGY

For this study, we utilized data from the Status of Microfinance Report, NABARD (2023-24) in India. This report offers comprehensive insights into various aspects of the SHG-Bank Linkage Program (SHG-BLP), including agency-specific outreach, state and region-wise savings, bank loan disbursements, and non-performing assets (NPAs) related to SHG loans, among other key metrics.

We conducted an analysis of the NPA data for the SHG-BLP, segmented by both agency and region. To meet this objective, we compiled data from SHG-BLP agencies—including public sector banks, private banks, regional rural banks, and cooperative banks—focusing on Central and Northern India for the year 2023-24. The Central region encompasses the states of Chhattisgarh, Madhya Pradesh, Uttarakhand, and Uttar Pradesh, while the Northern region includes Chandigarh, Haryana, Himachal Pradesh, Jammu & Kashmir, New Delhi, Punjab, and Rajasthan.

For the purpose of our analysis, the total non-performing assets (NPA) of SHG-BLP (denoted as total_npa) are considered the dependent variable. The explanatory variables include the total number of Self-Help Groups (SHGs) in terms of accumulated savings (number_sav_shg), the total number of SHG members (shg_member), the total savings of SHGs (total_saving), the total number of SHGs in terms of loan disbursement (number_loan_shg), the total SHG loan (total_loan), the total number of exclusive women-focused SHGs in terms of loan disbursement (number_womenshg), and the total loan disbursed to exclusive women's SHGs (total_womenloan).

It is hypothesized that an increase in the total number of SHGs-both in terms of savings accumulation and loan disbursement may lead to a decrease in the overall NPA of SHGs. This is because heightened competition among SHGs seeking loans from formal financial institutions could push out underperforming or delinquent groups from the market. Moreover, it is expected that a rise in SHG savings would result in a reduction in NPA, as a greater savings propensity may encourage members, especially those with previous debt issues, to be more mindful of timely loan repayments.

Conversely, an increase in the total loan amount disbursed to SHGs and the overall membership size of SHGs may have an adverse effect, potentially straining the repayment capacity of these groups and contributing to a higher NPA. Finally, it is anticipated that an increase in the number of exclusive women's SHGs and the total loan disbursed to such groups may lead to a decrease in NPA, as recent data indicate significant growth in women-centric SHGs.

Table 1: Descriptive Statistics of relevant variables

Variable	Observation	Mean	Std. Dev.	Min	Max
total_npa	42	1614.38	4029.266	0	22358.82
number_sav_shg	42	67622.36	105702.1	3	456862
shg_member	42	757761.3	1248134	36	5694607
total_saving	42	18210.79	36610.51	0	178361
number_loan_shg	42	12757.24	22011.12	0	83532
total_loan	42	25962.81	44110.94	0	157999.9
number_womenshg	42	12498.64	21521.65	0	82520
total_womenloan	42	25574.53	43419.81	0	157999.9

Source: Computed by Authors using data from Status of Microfinance Report, NABARD (2023-24)

In order to analyze the potential factors contributing to the high NPA levels of the SHG-BLP particularly in central and northern states, we have employed Multiple Linear Regression Model.

Multiple Linear Regression Model can be defined as:

$Y_i = \alpha + ß_1 . X_{1i} + ß_2 . X_{2i} + ß_3 . X_{3i} + \ldots\ldots\ldots + Ɛ_i$

Where; Y_i= total non-performing assets (NPA) of SHG-BLP (amount in akh) (total_npa)

α = intercept term

$ß_i$'s= coefficients of independent variables

X_{1i}= total number of SHG (in terms of savings activity) (number_sav_shg)

X_{2i}= total SHG member (shg_member)

X_{3i}= total amount of SHG-BLP saving accumulation (amount in Lakh) (total_saving)

X_{4i}= total number of SHG (in terms of loan disbursement activity) (number_loan_shg)

X_{5i}= total amount of SHG-BLP loan disbusement (amount in Lakh) (total_loan)

X_{6i}= total number of Exclusive-Women SHG (in terms of loan disbursement activity) (number_womenshg)

X_{7i}= total amount of Exclusive-Women SHG-BLP loan disbusement (amount in Lakh) (total_womenloan)

$Ɛ_i$ = random error ter

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4. DISCUSSION AND ANALYSIS

Table 2: Results

Source	SS	df	MS	No. of Obs	42	
Model	637710399	7	91101485.5	F (7,34)	110.92	
Residual	27923846.2	34	821289.593	Prob>F	0.0000	
Total	665634245	41	16234981.6	R-squared	0.9580	
				Adj R-squared	0.9494	
				Root MSE	906.25	
total_npa	Coef.	Std. Err.	t	P> |t|	95% Conf. Interval	
number_sav_shg	-.0511262	.0143956	-3.55	0.001	-.0803816	-.0218708
shg_member	.0095636	.0011761	8.13	0.000	.0071735	.0119536
total_saving	-.0321639	.0105406	-3.05	0.004	-.053585	-.0107428
number_loan_shg	3.227849	1.195731	2.70	0.011	.7978317	5.657866
total_loan	-1.220124	.4698782	-2.60	0.014	-2.175032	-.265217
number_womenshg	-3.219312	1.226453	-2.62	0.013	-5.711764	-.7268592
total_womenloan	1.140777	.4766502	2.39	0.022	.1721074	2.109447
_cons	-27.90595	178.7074	-0.16	0.877	-391.083	335.2711

Source: Computed by Authors using data from Status of Microfinance Report, NABARD (2023-24)

From an economics perspective, the regression analysis appears to investigate the impact of various factors related to Self-Help Groups (SHGs) and on the level of Non-Performing Assets (NPAs), as represented by the dependent variable total_npa. Here is an interpretation of the results.

Firstly, number_sav_shg and total_saving have negative coefficients and significant relationship (P values are 0.001 and 0.004 respectively), meaning that higher SHG activity and savings within these groups are associated with lower NPAs. This suggests that as SHGs grow and accumulate more savings, they may improve repayment behaviours and financial discipline among their members, which reduces the level of non-performing loans. This aligns with economic theories emphasizing the role of community-based financial groups in enhancing creditworthiness and promoting savings. SHGs often provide a support structure for members, enabling better financial management and reducing credit risk.

Secondly, shg_member has a positive coefficient and high significant relationship (P value=0.000), implying that an increase in SHG membership correlates with an increase in NPAs. While counterintuitive at first glance, this could indicate that larger group sizes may dilute the effectiveness of peer monitoring or result in lending to riskier individuals, leading to higher defaults.

Similarly, total_womenloan has a positive coefficient and significant relationship (P value=0.022). This suggests that loans specifically directed toward women's SHGs might be associated with increased NPAs, potentially due to socio-economic challenges faced by female borrowers, such as lower income stability or limited access to financial resources. It highlights a possible need for tailored support programs to improve repayment performance in women-led groups.

Further, number_loan_shg shows a positive coefficient and significant relationship (P value=0.011), suggesting that higher loan taking SHGs are associated with higher NPAs. This could indicate a higher risk associated with larger loan taker SHGs, as larger debts may strain the repayment capacity of SHG members, particularly if they lack diverse income sources or experience business volatility.

On the other hand, total_loan has a negative coefficient and significant relationship (P value=0.014), meaning that higher aggregate loan levels (perhaps from non-SHG sources) are associated with lower NPAs. This could reflect better repayment performance for larger loans outside SHGs, possibly due to stricter eligibility criteria, better risk assessment, or higher creditworthiness of individual borrowers.

Finally, number_womenshg has a significant negative coefficient (with P value=0.013), indicating that a higher count of women's SHGs is associated with lower NPAs. This suggests that women-led SHGs as a whole contribute positively to repayment outcomes, possibly due to stronger community bonds, peer accountability, or better financial management.
The significant R-squared value (over 0.95) suggests that the model explains a substantial proportion of the variation in NPAs, indicating that SHG activities and associated factors are strong predictors of loan performance in this context. This reinforces the important role of SHGs in the economic landscape.

5. CONCLUSION

Regression result highlights the importance of understanding gender dynamics in SHGs particularly in central and northern regions of India. While women-led SHGs may perform well collectively, targeted interventions to support SHGs,

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particularly those led by women, could improve repayment rates and reduce NPAs. Policy measures could include capacity-building programs to enhance financial literacy, offering flexible repayment schedules, or providing business development services to boost income generation.

Moreover, the positive association between larger loans within SHGs and NPAs suggests that careful risk assessment and monitoring are essential when extending significant credit to SHG members. Formal credit institutions in central and northern states may benefit from developing specific guidelines for lending to SHGs, with a focus on ensuring loan amounts are manageable relative to the repayment capabilities of group members. The analysis supports the view that while SHGs can improve financial inclusion and economic empowerment, there are inherent risks, especially when credit size increases or when group size grows too large. Effective management of these groups and provision of appropriate financial products tailored to the needs of SHGs are crucial to minimizing the risk of default.

In summary, this regression analysis reveals a nuanced picture where SHGs contribute positively to financial inclusion but also introduce specific challenges in credit risk. Policies that balance support for SHGs with risk management practices are essential for sustainable economic development and financial stability.

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KAPANATAGANG EMOSYUNAL AT PAGTATAGUYOD NG DISIPLINANG PAMPAG-AARAL

Aileen Chavez-Miranda
The Rizal Memorial Colleges, Inc. Davao City 8000, Philippines

ABSTRAK

Ang mga hamon sa disiplinang pampag-aaral ng mga guro ay naka-angkla, hindi lamang sa eksternal na kilos ng mga mag-aaral sa silid, kung hindi pati na rin sa mismong nangunguna nito. Kung kaya ang pananaliksik na ito ay binigyang pansin ang ugnayan ng lawak ng kapanatagang emosyunal ng mga guro at ang epekto nito sa kanilang napagtantong antas ng sarili nilang disiplinang pampag-aaral. Batay sa mga pagsusuri sa mga natuklasan, humantong ang mananaliksik sa sumusunod na konklusyon: mataas ang lawak ng kapanatagang emosyunal ng mga guro. Ito ay batay sa resultang natamo gamit ang apat na indikeytor na: optimismo, pagkamahinahon, awtonomiya, at pagmamalasakit. Mataas din ang digri ng pagtataguyod ng disiplinang pampag-aaral ng mga guro. Napagtanto rin na may makabuluhang ugnayan ang kapanatagang emosyunal at disiplinang pampag-aaral; dahil dito ang hipotesis na nagsasabing walang makabuluhang ugnayan ang kapanatagang emosyunal at disiplinang pampag-aaral ng mga guro ay tinanggihan. Upang mabuo may makabuluhang impluwensiya sa digri ng pagtataguyod ng disiplinang pampag-aaral ng mga guro. Gayunpaman, ang indibidwal na indikeytor ay hindi makabuluhang salik ng disiplinang pampag-aaral. Sa pangkalahatan, mas mapapalawak pa ang ugnayan ng dalawang salik kung titingnan ang ibang anggulong nakatutok sa mga nasabing salik.

SUSING SALITA: *Kapanatagang Emosyunal, Disiplinang Pampag-aaral*

1. MGA SULIRANIN AT KALIGIRAN NITO

Madalas nahihirapan ang mga guro sa pagtataguyod sa disiplinang pampag-aaral dahil maraming limitasyon sa silid sa bansang Anatolya, mayroong mga pagkakataong hindi nabibigyang solusyon ang kilos o gawi ng mga mag-aaral dahil naka-ugat ito sa ugnayan o interaksyon na mayroon ang mag-aaral sa kaniyang mga magulang (Rubin, Root, at Bowker, 2010). Ang pag-iwas ng mga magulang ang kanilang responsibilidad sa pagdidisiplina sa kanilang mga anak ay nagdudulot ng paghihirap sa disiplinang pampag-aaral. Ang iba pang nakitang madalas na sitwasyon ay ang hindi pakikinig ng mga mag-aaral, ang kanilang pagsasalita nang walang pahintulot, at ang paglalakad sa loob ng silid (ÅžanlÄ, 2019).

Karaniwang nararanasan ng mga gurong nasa Australia ayon sa hamon sa pagtataguyod ng disiplinang pampag-aaral ay ang pagpapatupad ng kapayapaan at kaayusan sa silid. Katulad ng pananaliksik sa Anatolya, nakita rin nilang madalas ang pakikipag-usap sa katabi nang walang pahintulot. Isa rin ang hindi pakikilahok sa mga diskusyon habang nagkaklase (McCormack, 1997). Sa iba pang pananaliksik na ginawa nina Erdogan et al. (2010), nalaman nilang ang kawalan ng kaganyakan, ang hindi pagsunod sa mga patakaran, ang kakulangan sa pangangasiwa ng kani-kanilang oras, at ang bihirang ugnayan sa mga silid ang karaniwang hamon sa disiplinang pampag-aaral.

Sa isang pananaliksik na ginawa sa unang rehiyon ng bansa, nalaman na ang mga guro ng asignaturang Agham ay mas ipinatutupad ang pamamaraan ng pagtuturo na naka-sentro sa mag-aaral. Nalaman nilang tumataas ang kaganyakan ng mga mag-aaral sa pakikilahok sa klase kapag mas nararamdaman nilang may positibong ugnayan sa loob ng kanilang silid (Llego, 2017). Subalit, tulad din ng ibang bansa, marami ring pagsubok ang nararanasan ng mga Pilipinong guro sa kani-kanilang pagtataguyod ng disiplinang pampag-aaral. Ayon kay Gavino (2013), ang disiplinang pampag-aaral na ipinapairal ng mga guro ay bahagyang naapektuhan ng personal nilang pangyayari sa paaralan, kapwa guro, at pati na rin sa kani-kanilang mga komunidad. Kung ihahambing ang nakikitang resulta ng mga pananaliksik, masisilayan ang katotohanan na halos naka-sentro sa kawalan ng interes at kakulangan sa gamit ang limitasyon ng disiplinang pampag-aaral. Ang mga nasabing pagsubok ay nararanasan rin ng mga guro sa lokal na dibisyon ng Lungsod ng Davao.

1.1. Rebyu ng mga Makabuluhang Literatura

Kapanatagang Emosyunal ng mga Guro

Bilang isang malayang baryabol, ang kapanatagang emosyunal ng mga guro ay mahalagang mabigyan ng mahaba at malakas na diskusyon, lalo na ang mga salik nito. Batay sa kahulugan ni Li (2005), ang emosyunal na kapanatagan ay isang bahagdan o paraan ng pagbibigay ng marka kung ang isang sistema ay may kakayanang i-balanse ang equilibrium nang maigi. Kung gagamiting lente ang mga baryabol ng pananaliksik na ito, ang sistema ay ang guro at ang emosyunal na kapanatagan ay ang tugon at paraan ng pagbawi ng nasabing guro sa kung anong eksternal na salik o hamong ibibigay sa kaniya.

Mga Salik o Indikeytor ng Kapanatagang Emosyunal

Optimismo. Ang unang kategorya o indikeytor ng kapanatagang emosyunal ay ang konsepto ng optimismo. Ayon kay Khaleq (2000), ang optimismo ay ang pagtingin sa hinaharap sa positibong lente. Ito ay ang antisipasyon ng

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kaligayahan, kabutihan, at katagumpayan ng isang tao. Sabi naman ni Al-Ansari (2003), ang tao ay nasa sentro ng linyang ang magkabilang dulo ay ang pesimismo at optimismo. Ibig sabihin, ang posisyon ng tao sa linyang ito ang magdidikta kung anong digri ng optimismo mayroon ang isang tao.

Pagkamahinahon. Ang pangalawang indikeytor ay ang pagkabalisa at pagkamahinahon. Ang pagkabalisa ay ang matinding takot, kaba, at hindi pagkapakali (Ahmed at Cerkez, 2020). Malakas rin ang asosasyon ng pagkabalisa sa kapanatagang emosyunal ng isang tao. Ayon kanila Reich, Noyes, Coryell, at O'Gorman, ang isang uri ng pagkabalisa o state anxiety ay maaaring makita sa mga tao, ngunit iilan lang ang taong may manipestasyon nito o trait anxiety. Ang taong mahinahon ay may digring mas resistant sa matindi o minsan ay irasyonal na takot, kaba, at hindi pagkapakali.

Awtonomiya. Ayon kina Beller at Turner (1964), hindi tulad ng pesimismo at optimismo, ang pagsasarili at pagpapakalinga ay hindi talaga nasa magkabilaang dulo ng isang kontinyuwum. Ang pseudo na awtonomiya ay ang manipestasyon ng pagkakaroon ng tunggalian sa natural na konsepto ng pagpapakalinga. Ang taong totoong may kalayaan ay hindi gaanong mahigpit sa sarili.

Pagmamalasakit. Ang kaganyakan ay hindi lamang kaso ng motibasyon na sinusukat ang abilidad na tapusin ang isang gawain (Judge, Erez, at Bono, 1998). Ang sinasabing kaganyakan ay ang sukat ng motibasyong makibagay at umunawa sa karanasan ng ibang tao. Ang mga taong may mataas na empathy para sa ibang tao ay mas mataas na kaganyakan (Lockwood, 2017).

Disiplinang Pampag-aaral

Ayon sa isang pananaliksik na ginawa sa India, nakita ang hirap na nararanasan ng mga guro na nagdudulot sa mababang lebel nito sa pagtuturo. Nagsisimula ito sa oras na inilaan sa silid. Halos umuukupa ng malaking bahagdan ng oras sa trabaho sa aktuwal na pagtuturo at wala gaanong oras para sa ibang tungkulin. Napagtanto nilang may presyon nang nararanasan sa trabaho. Ngunit nakita rin ng pananaliksik na ang mga guro ay nagaganyakan sa mga estudyanteng may responsibilidad sa pag-aaral at sa layunin. Sa pagtataguyod din nila sa disiplinang pampag-aaral, may pagkakaiba-iba sa kanilang mga pamamaraan pero halos lahat ay nakapokus sa kanilang mag-aaral (Rao, 2016).

Kagalingan. Binibigyang kahulugan nito ang pangangailangan ng mga mag-aaral na unawain ang kanilang mga gawain pang-akademik (Stefanou, 2004). Katulad ng katotohanan na ang disiplinang pampag-aaral ay isang konseptong napakalawak at matuturing na relatib base sa nagtataguyod nito, ang bunga nito sa anyo ng kagalingan ay may kani-kaniya ring interpretasyon (Sun, 2015). Ang mga mag-aaral na nakikilahok sa isang epektibong sistema sa silid ay mas nagiging positibo at nagkakaroon ng mas mataas na lebel ng kaganyakan (Eranil, 2019).

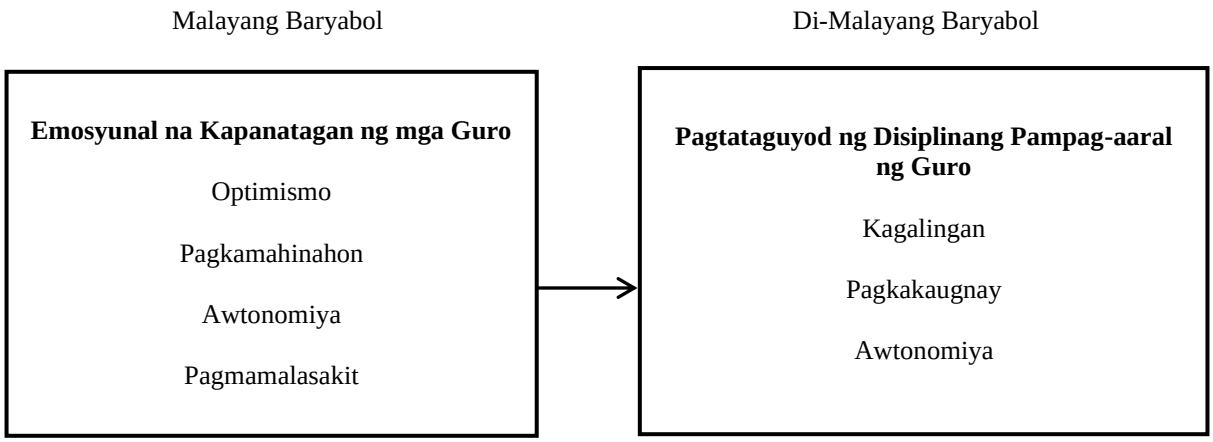
Pagkakaugnay. Binibigyang diin nito ang kahalagan ng pangangailangan ng mga mag-aaral sa aspeto ng pagmamay-ari, personal na suporta, at seguridad sa kani-kanilang relasyon sa paaaralan (Stefanou, 2004). Ang pananaliksik na ginawa nina Fedesco, Bonem, Wang, at Henares (2019), nalaman nilang ang intrinsik na kaganyakan ng mga mag-aaral ay naiimpluwensyahan ng kung sino ang may malakas na pagkakaugnay ang tao.

Awtonomiya. Mahalaga sa isang sistema ang pagkakaroon ng awtonomiya. Ito ang nagbibigay ng tiwala sa mga mag-aaral na may kakayanan silang gumawa ng kanilang sariling desisyon. Ayon sa ibang pananaliksik nina Zuckerman, et. al. (1978), may positibong korelasyon ang pagkakaroon ng awtonomiya sa silid dahil pinapalakas nito ang kaganyakan ng mga mag-aaral at ng guro.

1.2. Teoretikal/Konseptuwal na Balangkas

Ang pag-aaral na ito ay nakabatay sa teorya nina Li at Ahlstrom (2015) na kung nagkakaroon ng ugnayan ang kapanatagang emosyunal ng isang tao sa kaniyang kapaligiran, lalong lalo na sa pangangasiwa sa trabaho at sa akay na kalugurang makukuha mula rito. Tinutukoy ng teorya ang kawalan ng malakas na pagkakatatag ng kahulugan at saklaw ng kapanatagang emosyunal. Ayon kina Morris et al. (2005), ang self-organization ay isang proseso ng pagkabuo at pagsasaayos ng mga indibidwal sa kani-kanilang gawi upang makamit ang katiwasayan ng sariling loob at maging sa ugnayan sa ibang indibidwal. Nagiging konektado ito sa kapanatagang emosyunal dahil ito ay nagmumula sa pagnanais ng taong mas magkaroon ng matatag at balanseng damdamin at reaksyon sa bagay-bagay. Ang aspetong tinitingnan ang impluwensiya ng kapanatagang emosyunal ay ang pagtataguyod ng mga guro sa kanilang disiplinang pampag-aaral.

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Talangguhitan Bilang 1. Konseptuwal na Balangkas ng Pag-aaral.

1.3. Paglalahad ng Suliranin

Ang pananaliksik na ito ay ginawa upang malaman ang ugnayan ng emosyunal na kapanatagan at pagtataguyod ng guro ng disiplinang pampag-aaral. Bilang isang deskriptib kwantitatib na pananaliksik, nilalayon nitong bigyang sagot ang sumusunod na tanong:

1. Ano ang lawak ng kapanatagang emosyunal ng mga guro ayon sa:
   - 1.1optimismo;
   - 1.2 pagkamahinahon;
   - 1.3 awtonomiya; at
   - 1.4 pagmamalasakit?
2. Ano ang digri ng pagtataguyod ng mga guro sa disiplinang pampag-aaral ayon sa:
   - 2.1 kagalingan;
   - 2.2 pagkakaugnay; at
   - 2.3 awtonomiya?
3. Mayroon bang makabuluhang ugnayan ang kapanatagang emosyunal at pagtataguyod ng disiplinang pampag-aaral ng mga guro?
4. Ano-anong indikeytor ng kapanatagang emosyunal ang may mahalagang impluwensiya sa pagtataguyod ng disiplinang pampag-aaral ng mga guro?

2. PAMAMARAAN

2.1. Disenyo ng Pananaliksik

Ginamit sa pag-aaral na ito ang kwantitatibo at di-eksperimental na disenyo gamit ang deskriptib-korelesyon na metodo ng pananaliksik. Sa disenyong ito na nakabatay sa patakarang pananaliksik ng Higher Education Funding Council for England (2000) na ang pinakatuon nito ay tukuyin ang kinakailangang impormasyon na naglalarawan sa tunay na kalagayan, larawan, at estado ng isang naobserbahang pangyayari batay sa baryabol na pinag-aaralan.

2.2. Ang mga Kalahok

Sa pagpili ng mga tagatugon sa pananaliksik, may iba't ibang pamantayan o batayang ipapairal. Ito ang mga nasabing batayan: (1) sila ay isang guro ng asignaturang Filipino, (2) sila ay nakapagturo na ng tatlong taon, at (3) sila ay guro sa mga sekondaryang paaralan sa Klaster 1 ng Lungsod ng Dabaw para sa Taong Panuruan 2021-2022.

2.3. Mga Hakbang sa Paglilikom ng mga Datos

Ang mga datos at literaturang ginawang bahagi ng pananaliksik ay siniguradung napapanahon, mapagkakatiwalaan, at nakaukol sa paksa upang mabawasan ang probabilidad ng pagkakamali at palakihin ang bahagdan ng kahuasayan ng papel. Ikalawa, dahil malaki ang populasyong naidawit sa pananaliksik, ang pagpili ng sample size gamit ang simple random sampling na metodolohiya ay ginamit. Ang mananaliksik ay humingi ng pahintulot sa Dekano ng Paaralang Gradwado ng Rizal Memorial Colleges, Lungsod ng Davao, at sa Tagapamahala ng mga Paaralan ng Sangay ng Lungsod ng Davao, upang maisagawa ang pag-aaral.

2.4. Pagsusuri ng Datos

Mean. Sa istatistika, ito ay isang sukatan ng gitnang pagkahilig ng isang pamamahagi. Sa pag-aaral na ito, ito ay ginamit upang matukoy ang antas ng kapanatagang emosyunal ng mga guro at ng digri ng pagtataguyod ng disiplinang pampag-aaral.

Pearson product moment Correlation Coefficient o ang Pearson r. Ang kagamitang pang-istatistikang ito ay ginamit upang matukoy ang makabuluhang ugnayan ng antas ng kapanatagang emosyunal at pagtataguyod ng disiplinang pampag-aaral ng mga guro.

Multiple Regression Analysis. Ito ay ginamit upang matukoy kung anong domeyn ng kapanatagang ang may makabuluhang impluwensiya sa pagtataguyod ng disiplinang pampag-aaral ng mga guro.

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3. PAGTALAKAY SA MGA KINALABASAN

Talahanayan 1. Lawak ng Kapanatagang Emosyunal ng Guro Ayon sa Optimismo

Blg.	Optimismo	Mean	Palarawang Katumbas
1.	Umaasa akong magiging tama at matagumpay ang lahat ng mangyayari pagdating sa aking mga ginagawa at gagawin.	4.66	Lalong Mataas
2.	Nakakamtan ko ang lahat ng aking ninanais sa madaling panahon, kung may tiyaga at tiwala ako sa aking sarili.	3.33	Katamtaman
3.	Idinadaan o ipino-proseso ko ang aking problema sa mas magaan at maaliwalas na paraan.	4.19	Mataas
4.	Naniniwala akong nararapat magkaroon ng boses at mabigyan ng pantay na oportunidad ang lahat ng tao.	3.90	Mataas
5.	Ginagawa at nakikilahok ako sa mga bagay na nagbibigay sigla sa akin kahit na hindi tiyak ang hinaharap.	3.44	Mataas
Kabuoan		3.90	Mataas

Ang limang aytem sa indikeytor na optimismo ay nangangahulugang ang mga guro ay sumasang-ayon sa mga aytem nakatuon ang pansin sa optimismo na bahagi ng lawak ng kapanatagang emosyunal. Masasabing ang mga kalahok ay may mataas na antas ng kapanatagang emosyunal sa larangan ng optimismo. Pinatingkad sa pananaliksik na ginawa nina Augusto et al. (2010) na ang optimismo ay may positibong korelasyon sa sikolohikal na dimensyon ng isang tao.

Talahanayan 2. Lawak ng Kapanatagang Emosyunal ng Guro Ayon sa Pagkamahinaon

Blg.	Pagkamahinaon	Mean	Palarawang Katumbas
1.	Nakapag-iisip at nakapag-dedisisyon pa rin ako ng maayos sa gitna ng pagsubok o okasyong malaki ang pressure.	3.60	Mataas
2.	Tinitiyak kong magaling akong guro sa aking mga mag-aaral.	4.69	Lalong Mataas
3.	Ginagawa ko ang mga aksyon at desisyong komportable ako.	3.58	Mataas
4.	Napapanatag ko at nako-kontrol ang aking takot at kaba sa tuwing nasa negatibong sitwasyon ako.	3.38	Katamtaman
5.	Tinututukan ko nang walang kahirap-hirao ang mga dapat gawin.	4.58	Lalong Mataas
Kabuoan		3.96	Mataas

Ang limang aytem sa indikeytor na ito ay may pangkalahatang mean na (3.96) o mataas. Ito ay nangangahulugang ang mga guro ay sumasang-ayon sa mga katanungang nakatuon ang pansin sa pagkamahinahon na bahagi ng lawak ng kapanatagang emosyunal. Isa sa mga okupasyong madaling makapagbigay ng stress at pagkabalisa ang pagtuturo. Kung kaya ay mainam magkaroon ng pisikal at emosyunal na kapanatagan ang mga guro (Kaur, 2011). Mula sa datos na nakalap, makikitang mataas ang pagkamahinahon ng mga guro.

Talahanayan 3. Lawak ng Kapanatagang Emosyunal ng Guro Ayon sa Awtonomiya

Blg.	Awtonomiya	Mean	Palarawang Katumbas
1.	Nananalig ako sa mga desisyong ako mismo ang gumawa.	4.65	Lalong Mataas
2.	Nagtatanong ako sa mga awtoridad o nakatataas kung may bahagi akong hindi maintindihan.	3.79	Mataas
3.	Nalalaman ko nang madali ang aking mga ninanais, mga lakas, mga ayaw, at mga kahinaan.	4.69	Lalong Mataas
4.	Naniniwala akong lahat ay may kapangyarihang baguhin ang takbo ng buhay nila.	3.31	Katamtaman
5.	Nilulutas ko ang isang problema nang mag-isa, kahit na may limitadong gamit.	4.56	Lalong Mataas
Kabuoan		4.20	Lalong Mataas

Ang limang aytem sa indikeytor na awtonomiya ay nangangahulugang ang mga guro ay lubos na sumasang-ayon sa mga katanungang nakatuon ang pansin sa awtonomiya na bahagi ng lawak ng kapanatagang emosyunal. Isa ang awtonomiya sa mga komplikadong indikeytor ng kapanatagang emosyunal ng isang tao. Bukod sa konsepto ng

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awtonomiya at ng karaniwan nitong katunggali – pagpapakalinga, mayroon ding konsepto ng pseudo na awtonomiya (Beller at Turner, 1964).

Talahanayan 4. Lawak ng Kapanatagang Emosyunal ng Guro Ayon sa Pagmamalasakit

Blg.	Pagmamalasakit	Mean	Palarawang Katumbas
1.	Binibigyang konsiderasyon ko ang nararamdaman ng aking mag-aaral.	4.81	Lalong Mataas
2.	Iniisip ko muna ang pananaw ng aking mga mag-aaral at kapwa ko guro bago ako mamuna.	4.75	Lalong Mataas
3.	Naiimpluwensiyahan ako ng aking mga mag-aaral at kapwa ko guro sa aking lagay ng loob.	3.35	Katamtaman
4.	Binibigyang-diin ko ang pakikinig at pag-uunawa ng aking mga mag-aaral bilang isang guro.	4.17	Mataas
5.	Binibigyang repleksyon ko ang puna at suhestiyon sa pagtuturo bilang guro.	4.75	Lalong Mataas
Kabuoan		4.36	Lalong Mataas

Ang limang aytem sa indikeytor na pagmamalasakit ay may pangkalahatang mean na (4.36) na may panlarawang katumbas na lalong mataas. Ito ay nangangahulugang ang mga guro ay lubos na sumasang-ayon sa mga katanungang nakatuon ang pansin sa pagmamalasakit na bahagi ng lawak ng kapanatagang emosyunal. Masasabing ang mga kalahok ay may napakataas na antas ng kapanatagang emosyunal sa larangan ng pagmamalasakit. Bukod doon ay lahat rin ng mga aytem ay nakakuha ng lalong mataas bilang panlarawang katumbas.

Talahanayan 6. Digri ng Pagtataguyod ng mga Guro sa Kanilang Disiplinang Pampag-aaral Ayon sa Kagalingan

Blg.	Kagalingan	Mean	Palarawang Katumbas
1.	Gumagamit ako ng iba't ibang instructional materials na nakabatay sa paksang pag-aaralan para sa isang araw.	3.60	Mataas
2.	Binigyang halaga ko ang importansya ng mga halimbawa o hindi kaya ay anekdota sa pagtuturo.	3.67	Mataas
3.	Naipapakita ko sa aking mga mag-aaral ang kalakasan nila sa iba't ibang aspeto ng mga gawain.	3.35	Katamtaman
4.	Nakagagawa ako ng mga gawain at tanong nang wala gaanong kahirap-hirap ang aking mga mag-aaral.	3.48	Mataas
5.	Nagagawa ng aking mga mag-aaral ang mga layunin sa silid na aking ginawa.	4.58	Lalong Mataas
Kabuoan		3.73	Mataas

Ang kagalingan ng silid ay naaayon din sa tiwala sa sarili ng mga mag-aaral na maaari silang makagawa ng mga bagay na higit sa madalas nilang awtput (Kurt et al., 2014). Ang limang aytem rin na nasa instrumento ng pananaliksik ay nakaayon rin sa mga aksyong nagawa o ginagawa ng mga guro sa kani-kanilang silid upang mapabuti ang kaganyakan at pangkalahatang kagalingan ng klase.

Talahanayan 7. Digri ng Pagtataguyod ng mga Guro sa Kanilang Disiplinang Pampag-aaral Ayon sa Pagkakaugnay

Blg.	Pagkakaugnay	Mean	Palarawang Katumbas
1.	Tinatanong ako ng aking mga mag-aaral ukol sa paksa.	3.63	Lalong Mataas
2.	Binibigyan ko ng pantay na oportunidad at pagkakataong makilahok ang aking mga mag-aaral sa mga gawain.	4.75	Lalong Mataas
3.	Ipinagagawa ko ang mga gawaing angkop sa lakas at kahinaan ng mga mag-aaral.	4.67	Lalong Mataas
4.	Tinatandaan ko ang pangalan ng aking mga mag-aaral	4.71	Lalong Mataas
5.	May digri ng pinaghalong respeto at pamilyal na ugnayan sa loob ng aking silid.	3.30	Lalong Mataas
Kabuoan		4.21	Lalong Mataas

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Ang limang aytem sa indikeytor na pagkakaugnay ay may pangkalahatang mean na (4.21) na may panlarawang katumbas na lalong mataas. Ito ay nangangahulugang ang mga guro ay lubos na sumasang-ayon sa mga katanungang nakatuon ang pansin sa pagkakaugnay na larangan ng disiplinang pampag-aaral. Masasabing ang mga kalahok ay may napaka-positibong pananaw sa sarili nilang pagtataguyod ng disiplinang pampag-aaral sa larangan ng pagkakaugnay. Ayon sa pananaliksik na ginawa nina Guiffrida, Gouveia, Wall, at Seward (2013), ang pagkakaroon ng ugnayan sa loob ng silid sa pagitan ng mga guro at kaniyang mga mag-aaral ay may positibong korelasyon kaganyakan at akademik na kagalingan ng mga mag-aaral.

Talahanayan 8. Digri ng Pagtataguyod ng mga Guro sa Kanilang Disiplinang Pampag-aaral Ayon sa Awtonomiya

Blg.	Awtonomiya	Mean	Palarawang Katumbas
1.	Hinihikayat ko ang aking mga mag-aaral na magsiyasat o matuto nang mag-isa.	4.73	Lalong Mataas
2.	Hinahayaan kong magkaroon ng malayang talakayan sa silid ukol sa isang paksa.	4.71	Lalong Mataas
3.	Binibigay ko ang balangkas at layunin ng paksa bago magsimula ang leksyon.	4.73	Lalong Mataas
4.	Naoobserbahan ko ang kompiyansa ng mga mag-aaral ko sa kanilang mga desisyon.	3.34	Katamtaman
5.	Kapag may hindi kaaya-ayang nagawa ang aking mag-aaral, tinitimbang ko ang pagpasyang gagawin.	3.45	Mataas
Kabuoan		4.19	Mataas

Ang mga aytem na nasa sarbey ay nagpapakita rin ng mga sitwasyong mayroong awtonomiyang ipinapairal sa sariling disiplinang pampag-aaral ng mga guro. Ito ay nangangahulugang ang mga guro ay sumasang-ayon sa mga katanungang nakatuon ang pansin sa awtonomiya na bahagi ng disiplinang pampag-aaral. Masasabing ang mga kalahok ay may positibong pananaw sa sarili nilang pagtataguyod ng disiplinang pampag-aaral sa larangan ng awtonomiya. Ayon kay Zuckerman, et al. (1978), may positibong korelasyon ang pagkakaroon ng awtonomiya sa silid sahil pinapalakas nito ang kaganyakan ng mga mag-aaral at ng guro.

Talahanayan 10. Makabuluhang Ugnayan ang Kapanatagang Emosyunal at Pagtataguyod ng Disiplinang Pampag-aaral ng mga Guro

Mga Baryabol	r-value	Antas ng Korelasyon	p-value	Pasya sa Ho
(X) Kapanatagang Emosyunal	0.651	Mataas na Korelasyon	.000	Tinanggihan
(Y) Sariling Pagtataguyod ng Disiplinang Pampag-aaral				

MK- Makabuluhan sa 0.05 Antas ng Kahalagahan

Ang datos ng makabuluhang ugnayan ng kapanatagang emosyunal at pagtataguyod ng disiplinang pampag-aaral. Lumabas ang r-valyu na (0.651) nang suriin ang ugnayan ng kapanatagang emosyunal at disiplinang pampag-aaral ng mga guro. Ito ay nagpapakita ng mataas na digri ng ugnayan. Masasabing ang ugnayan ay makabuluhan dahil ang p-value na 0.000 ay natagpuang mababa kung ihambing sa 0.05 antas ng kahalagahan. ($p=0.000 < 0.05$). Ang hipotesis na nagsasabi na walang makabuluhang ugnayan ang kapanatagang emosyunal ng mga guro at ang pagtataguyod ng disiplinang pampag-aaral ay tinanggihan.

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Talahanayan 11. Indikeytor ng Kapanatagang Emosyunal na may Mahalagang Impluwensya sa Pagtataguyod ng Disiplinang Pampag-aaral ng mga Guro

Malayang Baryabol	Unstandardized Coefficients		Standardized Coefficients	t-ratio	Sig
	B	Std. Error	Beta		
Constant	1.714	0.552		3.106	0.003
Optimismo	0.050	0.184	0.059	0.269	0.785
Pagkamahinaon	0.270	0.175	0.310	1.539	0.131
Awtonomiya	0.285	0.165	0.332	1.727	0.091
Pagmamalasakit	0.036	0.130	0.039	0.273	0.786

**Makabuluhan kung ang p-value < 0.05

Ang unang indikeytor ay nangangahulugang hindi maaaring tanggihan ang pangalawang null na hipotesis na nagsasabing walang domeyn ng kapanatagang emosyunal ang may makabuluhang impluwensiya sa pagtataguyod ng disiplinang pampag-aaral. Ang pangalawang indikeytor ay nangangahulugang hindi maaaring tanggihan ang pangalawang null na hipotesis na nagsasabing walang domeyn ng kapanatagang emosyunal ang may makabuluhang impluwensiya sa pagtataguyod ng disiplinang pampag-aaral. Ang pangatlong indikeytor na awtonomiya ay nangangahulugang hindi maaaring tanggihan ang pangalawang null na hipotesis na nagsasabing walang domeyn ng kapanatagang emosyunal ang may makabuluhang impluwensiya sa pagtataguyod ng disiplinang pampag-aaral. Ang panghuli at pang-apat na indikeytor na pagmamalasakit ay nangangahulugang hindi maaaring tanggihan ang

pangalawang null na hipotesis na nagsasabing walang domeyn ng kapanatagang emosyunal ang may makabuluhang impluwensiya sa pagtataguyod ng disiplinang pampag-aaral.

4. KONKLUSYON AT REKOMENDASYON

4.1. Konklusyon

Batay sa mga pagsusuri sa mga natuklasan, humantong ang mananaliksik sa sumusunod na konklusyon: Mataas ang lawak ng kapanatagang emosyunal ng mga guro. Ito ay batay sa resultang natamo gamit ang apat na indikeytor na: optimismo, pagkamahinahon, awtonomiya, at pagmamalasakit. Mataas din ang digri ng pagtataguyod ng disiplinang pampag-aaral ng mga guro.

Napagtanto rin na may makabuluhang ugnayan ang kapanatagang emosyunal at disiplinang pampag-aaral dahil dito ang hipotesis na nagsasabi na walang makabuluhang ugnayan ang kapanatagang emosyunal at disiplinang pampag-aaral ng mga guro ay tinanggihan. Upang mabuo ang mga konklusyon, sinasabing ang kapanatagang emosyunal ay napatunayang may makabuluhang impluwensiya sa digri ng pagtataguyod ng disiplinang pampag-aaral ng mga guro. Gayunpaman, ang indibidwal na indikeytor ay hindi makabuluhang salik ng disiplinang pampag-aaral.

4.2. Rekomendasyon

Batay sa mga nabuong konklusyon ng pag-aaral, ang sumusunod na rekomendasyon ay inihain ng mananaliksik:

Una, panatilihing magkaroon ng mga programang makapagbibigay pansin sa estado ng kapanatagang emosyunal, hindi lamang ng mga mag-aaral, kung hindi pati na rin ang mga guro. Dahil napatunayang may makabuluhang ugnayan ang kapanatagang emosyunal sa kanilang pagtataguyod ng disiplinang pampag-aaral, mainam na ayusin ang kurikulum, workload, at kaukulang nararamdaman ng mga guro upang mas maging mainam ang performans nila sa silid.

Pangalawa, inirekomenda rin na ang resultang nakuha mula sa pananaliksik na maging batayan ng mga guro sa kanilang pagbabalak at pagdidisenyo ng mga araling para sa kanilang mga mag-aaral.

Pangatlo at panghuli ay magkaroon ng ibang pag-aaral hinggil sa mga kapanatagang emosyunal at disiplinang pampag-aaral. Magsasagawa ng katulad na pag-aaral sa ibang sangay gamit ang ibang set ng mga kalahok at antas ng pag-aaral.

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PAGHAHANDA AT EBALWASYON NG KAGAMITANG PAMPAGTURO SA ASIGNATURANG FILIPINO SA PROGRAMANG ALTERNATIVE LEARNING SYSTEM

Kimberly Sheen Carcillar-Baylon
The Rizal Memorial Colleges, Inc. Davao City 8000, Philippines

ABSTRAK

Isinakatuparan ang pag-aaral upang matukoy ang antas ng kahusayan ng mga mag-aaral sa asignaturang Filipino sa programang Alternative Learning System (ALS) at makabuo ng isang kagamitang pampagtuturo na tutulong na mas mapaunlad ang iba't ibang kasanayang pampagkatuto ng mga mag-aaral sa programang ALS. Deskriptib-debelopmental na disenyo ng pananaliksik ang ginamit sa pag-aaral na ito. Ang lahat ng mga mag-aaral sa programang ALS ng Klaster 1, Sangay ng Lungsod ng Davao Rehiyon XI para sa Taong 2022-2023 ang awtomatikong kalahok sa pag-aaral. Ang antas ng mga mag-aaral sa asignaturang Filipino ay nakakuha ng resultang katamtaman lamang. Mula sa mga datos, nakitang walang makabuluhang pagkakaiba ang antas ng kasanayan ng mga mag-aaral sa programang ALS ayon sa gulang, kasarian at estado ng pag-aaral, nangangahulugang pantay ang kanilang antas ng kahusayan. Dahil dito, binigyang-tuon ng mananaliksik na makabuo ng isang suplemental na kagamitang pampagtuturo na dadaan sa ebalwasyon gamit ang pantayang kagamitang pagsusuri para sa nilalaman, wika, at pagsusuri sa anyo at disenyo. Bilang rekomendasyon, kailangang maparami ang mga kagamitang pampagtuturo upang magamit sa susunod na mga mag-aaral. Iminumungkahi rin na kumuha ng bagong datos ng mga kasanayan bilang pamantayan sa karagdagang pag-aaral. Isang katulad na pag-aaral ay dapat maisagawa upang subukin ang kabisaan nito.

SUSING SALITA: *Kasanayang Pampagkatuto, Kagamitang Pampagtuturo, Lungsod ng Davao, Rehiyon XI*

1. MGA SULIRANIN AT KALIGIRAN NITO

Ang Alternative Learning System (ALS) ay isang programang tumutulong sa mga mag-aaral na nahinto sa pag-aaral nang matagal na panahon, mga mag-aaral na ang mga estilo ng pagkatuto ay mas mahusay na nalilinang sa isang alternatibong programa at gustong makakuha ng diploma kahit may edad na. Ang mga kagamitang pampagtuturo ay ang mahahalagang kasangkapang kailangan upang makatulong sa pagtuturo at pagkatuto nang mabisa at mahusay lalong-lalo na sa mga mag-aaral na nasa programang ALS. Naobserbahan ni Onyeachu (2006) na kapag walang kagamitang pampagtuturo, ang mga mag-aaral ay hindi nakagagawa nang maayos. Ito ay nagpapahiwatig na kapag ang mga mag-aaral ay hindi gumagawa nang mabuti, ang itinakdang layunin ng edukasyon ay hindi maisasakatuparan. May iilang sekondaryang paaralan sa bansang Tanzania ang nagsasabing may kakulangan sa mga kagamitang pampagtuturo na nagdudulot ng masamang epekto sa mga mag-aaral dahil mas bumababa ang kanilang kakayahang matuto (Sumra at Rajani, 2006).

Sa pag-aaral ni Mercado (2015) na pinamagatang "Problems Encountered in the ALS Program in Tanauan City", isiniwalat na ang mga mag-aaral ay dumanas ng mga suliranin sa pagtuturo, pagtatasa at pagsusuri. Nalaman din niya na kulang ang mga pasilidad tulad ng mga silid-aralan at kagamitan sa pagtuturo tulad ng mga batayang-aklat, manual, at iba pa. Isa ring pag-aaral mula sa Tandag, Surigao Del Sur ang nagsabing isa sa nagiging problema ng mga nagtuturo ng ALS sa kanilang lugar ay ang kakulangan ng mga kagamitang pampagtuturo.

Sa Davao City National High School na isa sa mga paaralan sa lungsod ng Davao na nagtuturo ng ALS, isa sa kinakaharap na problema roon ay ang kakulangan ng mga kagamitang pampagtuturo sa asignaturang Filipino. Isa sa pinakamalaking nakaaapekto sa pagkatuto ng mga mag-aaral ng ALS ay ang ginagamit ng kanilang mga guro na mga kagamitang pampagtuturo. Kung mabibigyan ng kaukulang pansin at panahon ang pagbuo rito ay maibsan ang kahirapan sa proseso ng pagtuturo at pagkatuto sa programang ito.

1.1. Rebyu ng mga Makabuluhang Literatura

Ang pagpapatupad ng programang Alternative Learning System (ALS) ay nagbigay-daan sa pagbibigay ng karapatan sa edukasyon ng mga taong nasa pinakamababang estado sa lipunan tulad ng mga bata, babae, mga taong may mga kapansanan, indigenous group, at out-of-school-youth (Valk, 2009). Ang mga kagamitang pampagtuturo ay nagbibigay-buhay sa pag-aaral sa pamamagitan ng pagpapasigla sa mga mag-aaral na matuto. Ang paggamit ng mga kagamitang pampagtuturo sa silid-aralan ay may potensiyal na tulungan ang guro na maipaliwanag nang mas malinaw ang mga bagong konsepto, na nagreresulta sa mas mahusay na pag-unawa ng mga mag-aaral sa mga konseptong itinuturo (Kadzera, 2006).

Pag-unawa sa Napakinggan. Ipinaliwanag ni Kurita (2012) na ang pakikinig ay isa sa pinakamahalagang aspeto sa pagkatuto. Para maging matagumpay ang paglinang sa kakayahan sa pakikinig, ang mga tagapakinig ay nararapat na makapag-isip ng mga estratehiya tulad ng pagsulat ng

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mahahalagang detalyeng napakinggan (taking notes), gumawa ng mga pagsasanay, o magkaroon ng iba't ibang pamamaraan para manatiling palagay habang nakikinig.

Pag-unawa sa Binasa. Ang pag-unawa sa pagbasa ay isa sa mga pinakakomplikadong pag-uugali kung saan nakikipag-ugnayan ang mga tao. Ang mga teoristang nagbabasa ay nakipagtulungan sa kung paano ilarawan ang komprehensibo at makabuluhang pag-unawa sa pagbabasa at iba't ibang mga modelong teoretikal ang kanilang iminungkahi nitong mga nakaraang dekada (McNamara at Magliano, 2009). Ito ay mula sa malawak na mga modelong teoretikal na naglalarawan ng mga ugnayan at pakikipag-ugnayan sa mga subcomponent ng pag-unawa.

Paglinang ng Talasalitaan. Kapag sumasagi sa isipan ng isang tao ang tungkol sa talasalitaan, ang una nilang naiisip ay ang kahulugan ng mga salita. Datapwat, ang kaalaman sa mga salita ay kinasasangkutan din ng pagbabaybay, pagbigkas, morpolohiya, sintaks at lalim ng kahulugan ng isang salita (Carlo, August, McLaughlin, Snow, Dressler, Lippman, Lively, at White, 2008).

Panonood. Ayon kina Weeks at Horan (2013) na ang active learning theory, isang uri ng dulog sa pagtuturo na kung saan ang mga mag-aaral ay aktibong nakilalahok sa proseso ng pagkatuto, kabaliktaran ng sila ay nakaupo lamang nang tahimik at nakikinig, ay nagmungkahi na mas mapagtatagumpayan ng mga mag-aaral ang kinalabasan ng pagkatuto kung sila ay tahasang nakikilahok sa proseso ng pagkatuto. Ang mga gawaing pampagkatuto na itinataguyod ng mga bidyu sa pagtuturo ay nagreresulta ng masiglang pagkatuto.

Pagsasalita. Ang pagsasalita ay isa sa mga makrong kasanayan na kinakailangan para sa mas mabisang pakikipagtalastasan ng kahit anumang wika, lalo na kung ang tagapagsalita ay hindi ginagamit ang kaniyang nakagisnang wika. Isa itong kasanayang hindi dapat ipagsawalang-bahala sapagkat ito ay isa sa pinakapangunahing kasanayang kinakailangang matutuhan ng lahat kahit pa ng mga bata (Bailey, 2005 at Goh, 2007).

Pagsulat. Binanggit ni Badayos (2008) na ang pagsusulat ay isang aktibidad na pinagmulan ng mga kasanayan hanggang sa ito ay magamit sa aktuwal na pangangailangan (skill-using). Sa isang makabagong pananaw, ang pagsusulat ay isang proseso sa lipunan na nagsasaad kung alin ang ginagamit sa pakikipag-usap sa iba, sa iba't ibang mga konteksto o sitwasyon. Ang pagsulat ay isang napakahalagang kasanayan sa pagkatuto at pagbuo ng wika.

Wika at Gramatika. Ang pagkatuto ng gramatika ay siya ring pinagmulan ng pagkatuto ng wika lalo na kung ang kawastuhan ang mas binibigyang-tuon sa halip na ang katatasan. Kaya naman sa ganitong pananaw, umusbong ang hindi maiiwasang suliranin sa pagtuturo at pagkatuto ng gramatika at ang kaugnay na kahirapang kinakaharap ng parehong guro at mga mag-aaral (Ellis, 2008).

1.2. Teoretikal/Konseptuwal na Balangkas

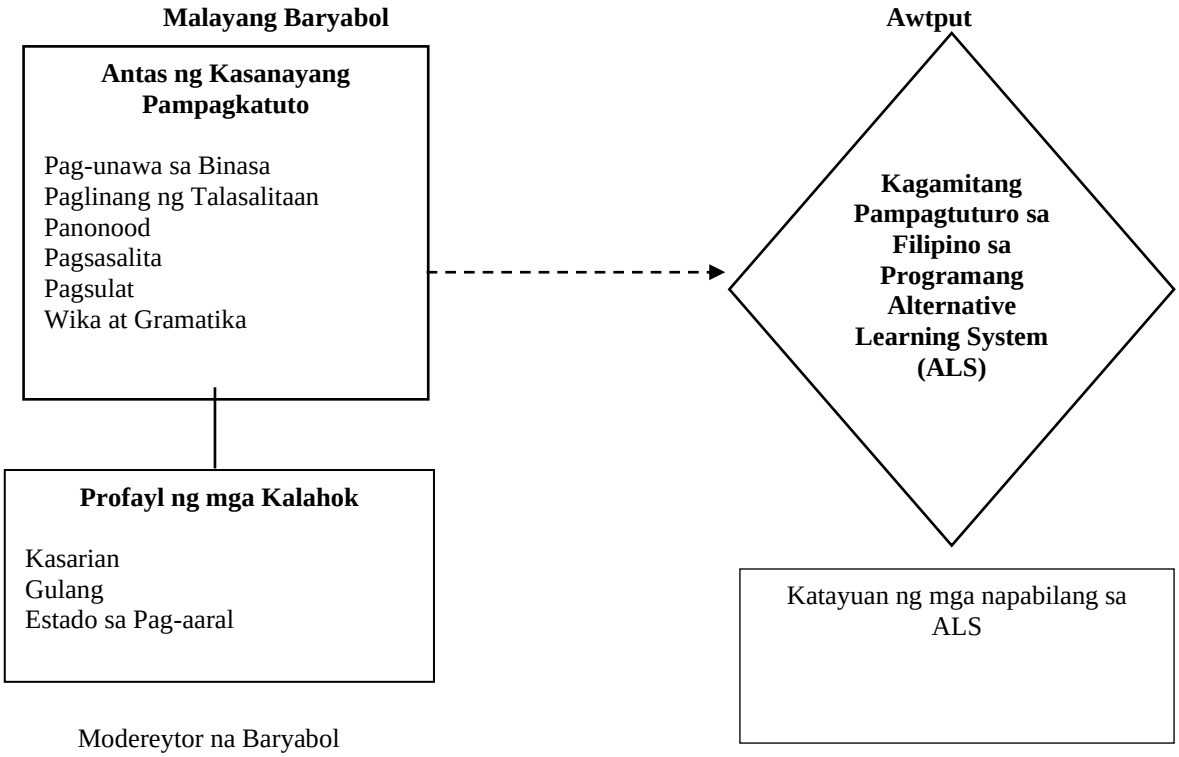
Ipinaliwanag sa teorya nina Vygotsky (1978) at Piaget (1963) ang gamit ng teoryang conctructivism sa proseso ng pagtuturo-pagkatuto sa labas ng mga silid-aralan. Tinangkang alamin ng dalawang teorista kung ang direktang pagtuturo lamang sa loob ng silid-aralan ang nagiging dahilan ng pagkatuto ng mga mag-aaral. May isang pag-aaral na sinubukan sa kursong Educational Psychology, kung saan ang mga mag-aaral dito ay ipinakilala sa ideyang ang mga tuturuan nilang mga mag-aaral sa hinaharap ay kusang tutuklas at bubuo ng sariling kahulugan mula sa kanilang kapaligiran.

Dahil dito, hinikayat silang alalahaning muli ang pananaw nila sa pagtuturo. Sa makabagong papel na ginagampanan ng mga guro, binigyang-linaw na hindi sila ang naghahatid ng mga kaalaman, sa halip, sila ay tagapagdisenyo ng karanasan kung saan ang mga mag-aaral ay kinakailangang siyasatin ang proseso ng kanilang sariling pag-iisip at paraan ng pagkatuto, mangalap, magtala at sumuri ng mga datos, gumawa at sumubok ng hypotheses. Sa madaling salita, bubuo sila ng sarili nilang pagpapakahulugan tungkol sa kanilang natutuhan.

Bukod dito, binanggit ni Renner (1982) sa kaniyang Curriculum Model of Instruction (CMI), gabay na ginagamit sa larangan ng edukasyon upang malaman ang isang natatanging aspeto sa pagkatuto, gaya ng mga asignatura, takdang panahon at paraan ng pagtuturo at ang Curriculum Development Theory (CDT) ni John Dewey (1939) ang tungkol sa paggamit ng maunlad na materyal bilang suporta kung saan ang mga mag-aaral ay mailantad sa isang makabuluhan at may katuturang mga aktibidad na nagpapahintulot sa kanilang mailapat ang konseptong nakikipaglaban sila upang may matutuhan.

Inilarawan ang nakasulat sa konseptuwal na modelo ng pag-aaral. Ang baryabol ng pag-aaral ay ang antas ng kasanayang pampagkatuto. Ito ay ang mga indikeytor ng pag-unawa sa napakinggan, pag-unawa sa binasa, paglinang ng talasalitaan, panoood, pagsasalita, pagsulat, at wika at gramatika (Conole, 2018).

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Talangguhitan I. Konseptuwal na Modelo ng Pag-aaral

1.3. Paglalahad ng Suliranin

Isinakatuparan ang pag-aaral na ito upang matukoy ang antas ng kahusayan ng mga mag-aaral sa mga kasanayan sa asignaturang Filipino sa programang Alternative Learning System (ALS). Mula rito, ang mananaliksik ay nagbigay pokus sa paghahanda at ebalwasyon ng kagamitang pampagtuturo sa asignaturang Filipino. Sa katiyakan, tinangkang sagutin ng pag-aaral na ito ang sumusunod:

1. Ano ang profayl ng mga mag-aaral sa programang Alternative Learning System (ALS) ayon sa:
    1.1. gulang;
    1.2. kasarian; at
    1.3. estado ng pag-aaral?
2. Ano ang antas ng kahusayan ng mga mag-aaral ng ALS sa mga kasanayan sa asignaturang Filipino, ayon sa:
    21. pag-unawa sa napakinggan;
    2.2 pag-unawa sa binasa;
    2.3 paglinang ng talasalitaan;
    2.4 panonood;
    2.5 pagsasalita;
    2.6 pagsulat; at
    2.7 wika at gramatika?
3. Mayroon bang makabuluhang pagkakaiba sa antas ng kahusayan ng mga mag-aaral ng ALS sa mga asignaturang Filipino kung papangkatin ayon sa kasarian, gulang at estado ng pag-aaral?
4. Batay sa kinalabasan ng pag-aaral, sa asignaturang Filipino para sa programang ALS, anong kagamitang pampagtuturo ang maaaring ihanda at tayahin?

2. PAMAMARAAN

2.1. Disenyo ng Pananaliksik

Ginamit sa pag-aaral na ito ang deskriptib-debelopmental na disenyo ng pananaliksik na kabilang sa pagsusuri sa dami ng datos (Nassaji, 2015). Nilalayon ng mananaliksik na matukoy ang antas ng kasanayang pampagkatuto sa Filipino ng mga mag-aaral sa programang Alternative Learning System sa Davao City National High School at Sta. Ana National High School, Sangay ng Lungsod ng Davao.

2.2. Ang mga Kalahok

May kabuoang siyamnapu't limang (95) kalahok ang naitala para sa pagsagot ng talatanungan, dalawampu't lima (25) ang mula sa Davao City National High School at pitumpo (70) naman mula sa Sta. Ana National High School. Kasama rito ang datos ng mga kasanayang pampagkatuto ng mga mag-aaral ng Filipino sa programang Alternative Learning System.

2.3. Mga Hakbang sa Paglilikom ng mga Datos

Ang mananaliksik ay humingi ng pahintulot sa Dekano ng Paaralang Gradwado ng Rizal Memorial Colleges, Dr. Pablo F. Busquit. Nang natanggap ang pahintulot ng Dekano, inihanay ng mananaliksik ang kaniyang mga gagawin kaugnay sa paglikom ng mga datos. Pagkatapos makuha ang pahintulot ng tagapamanihala, gumawa ng liham ang mananaliksik para sa mga Koordineytor ng programang Alternative Learning System ng Davao City National High School at Sta. Ana National High School. Matapos makuha ang mga kinakailangang dokumento, inihanay at sinuri ng mananaliksik ang nalikom na mga datos gamit ang mga angkop na pormula ng estadistika. Sa paghahanda ng materyal, ang mananaliksik ay nangalap ng iba't ibang uri ng mga aklat sa Filipino, at

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inipon ang lahat ng mga nakalap na gawain at kasanayan upang mabuo ang kagamitang pampagtuturo.

2.4. Pagsusuri ng Datos

Mean at Percentage. Ito ang ginamit para sa mga kinakailangang kasanayang pampagkatuto ng mga mag-aaral sa asignaturang Filipino sa programang Alternative Learning System.

Analysis of Variance (ANOVA). Ginamit ito upang malaman kung mayroon bang makabuluhang pagkakaiba ang antas ng kasanayan ng mga mag-aaral sa programang Alternative Learning System ayon sa gulang.

T-test. Ginamit ito upang malaman kung mayroon bang makabuluhang pagkakaiba ang antas ng kasanayan ng mga mag-aaral sa programang Alternative Learning System ayon sa kanilang kasarian at estado ng pag-aaral.

3.PAGTALAKAY SA MGA KINALABASAN

Talahanayan 1. Profayl ng mga Kalahok

Mga Baryabol	Parameter	f	Bahagdan
Gulang	15- pababa	2	2.10%
	16- 17	13	13.68%
	18-20	46	48.42%
	21-23	18	18.95%
	24-26	16	16.84%
	Kabuoan	95	100.00%
Kasarian			
	Lalake	42	44.21%
	Babae	53	55.78%
	Kabuoan	95	100.00%
Estado ng Pag-aaral	Nagtatrabaho	43	45.26%
	Hindi Nagtatrabaho	52	54.73%
	Kabuoan	95	100.00%

Nakapagtala ng 95 na kalahok ang mananaliksik para sa kaniyang pag-aaral na may bahagdan na 100%. Kung titingnan ang resulta, makikitang mas maraming kalahok na nasa 18-20 na taong gulang, mahihinuha mula rito na mas marami ang napabilang sa Alternative Learning System na nasa parehong gulang. Para naman sa kasarian, makikitang mas marami ang mga kalahok na babae na may bilang limampu't tatlo (53) at bahagdan na 55.78% kung ihahambing sa mga lalaki na mayroon lamang apatnapu't dalawang (42) kalahok, katumbas sa 44.21% bahagdan.

Sa estado naman ng pag-aaral ng mga napabilang sa programang Alternative Learning System, may limampu't dalawang (52) kalahok ang hindi nagtatrabaho na katumbas sa 54.73% na bahagdan, mas marami kung ihahambing sa mga mag-aaral na nagtatrabaho habang nag-aaral na nakakuha ng bahagdan na 45.26% at bilang ng mga kalahok na apatnapu't tatlo (43) lang.

Talahanayan 9. Buod ng Pangkalahatang Datos sa Antas ng Kahusayan ng mga Mag-aaral sa Programang Alternative Learning System

Blg.	Mga Aytem	Mean	Palarawang Katumbas
1.	Pag-unawa sa Napakinggan	3.44	Mataas
2.	Pag-unawa sa Binasa	3.47	Mataas
3.	Paglinang ng Talasalitaan	3.25	Katamtaman
4.	Panonood	3.33	Katamtaman
5.	Pagsasalita	3.45	Mataas
6.	Pagsulat	3.53	Mataas
7.	Gramatika at Wika	3.38	Katamtaman
Kabuoan		3.41	Mataas

Nakikita sa talahanayan na ang kahinaan ng mga kalahok ay nasa paglinang ng talasalitaan, panonood at gramatika at wika. Dahil dito masasabi rin na ang kahinaan ng mga mag-aaral na napabilang sa programang Alternative Learning System ay ang tatlong kasanayang pampagkatutong ito. Nakikitang may pagkakataong ang mga mag-aaral ay nahihirapan sa mga kasanayang ito.

Kaya naman, mula sa mga nalikom na resulta ng datos, ang mga kasanayang nabanggit ang kinakailangang labis na pagtuunan ng pansin ng mga mag-aaral na paghusayan at pag-aralan pa. Lalong-lalo na sa mga kasanayang nakakuha ng katamtamang resulta lamang. Sa mga guro naman, bigyang-diin ang pagtuturo sa kasanayang may mas mababang antas ng kahusayan.

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Talahanayan 10. Datos sa Makabuluhang Pagkakaiba sa Antas ng Kahusayan ng mga Mag-aaral sa Programang Alternative Learning System sa mga Kasanayan sa Asignaturang Filipino Kung Papangkatin Ayon sa Gulang

Sources	SS	Df	Mean	F-Value	Interpretasyon at Pasya
Between	0.8798	4	0.2199	0.50146	Di-Makabuluhan
				P-value	Ang Ho ay
Within	39.0351	89	0.4386	0.12	Tinanggap
Kabuoan	39.9149	93			

DM- Di Makabuluhan sa 0.05 Antas ng Kahalagahan

Nakikita mula sa naging resulta na malaki ang ginagampanang papel ng gulang ng mga mag-aaral na nasa ALS sa antas ng kanilang kahusayan sa asignaturang Filipino. Sinalungat ng pag-aaral ni Russel (2006) ang lumabas na resulta dahil ayon sa kanya magkaiba ang paraan ng pagkatuto ng mga mag-aaral na nasa wastong gulang ng pag-aaral kung ihahambing sa mga may edad na. Ang malaking pagkakaiba ng dalawa ay sa antas ng motibasyon, lawak ng karanasan, antas ng pakikilahok sa proseso ng pagkatuto at kung paano ginamit ang mga natutuhan.

Talahanayan 11. Datos sa Makabuluhang Pagkakaiba sa Antas ng Kahusayan ng mga Mag-aaral sa Programang Alternative Learning System sa mga Kasanayan sa Asignaturang Filipino Kung Papangkatin Ayon sa Kasarian

Baryabol	Mean	t-value	p-value	Interpretasyon at Pasya
Lalake	3.98	.738DM	.217	Di- Makabuluhan
Babae	4.90			Ang Ho ay Tinanggap
Kabuoan	4.03			

DM- Di Makabuluhan sa 0.05 Antas ng Kahalagahan

Lumabas ang tinuos na t-valyu na (0.738) nang suriin ang pagkakaiba ng dalawang baryabol. Ang nasabing valyu ay nagpapakita ng mababang digri ng pagkakaiba. Masasabing ang pagkakaiba sa antas ng kahusayan ng mga mag-aaral ayon sa kasarian ay di-makabuluhan sapagkat ang t-value na 0.738 ay natagpuang mas mataas kung ihambing sa 0.05 antas ng kahalagahan. Masasabing ang pagkakaiba ay di-makabuluhan sapagkat ang p-value na 0.217 ay natagpuang mas mataas kung ihambing sa 0.05 antas ng kahalagahan. Ang null hipotesis na nagsasabi na walang makabuluhang pagkakaiba sa antas ng kahusayan ng mga mag-aaral sa Alternative Learning System sa mga kasanayan sa asignaturang Filipino kung papangkatin ayon sa kasarian ay tinanggap. Sa madaling sabi, magkatulad lamang ang antas ng kahusayan ng babae at lalaki na nasa programang ALS.

Talahanayan 12. Datos sa Makabuluhang Pagkakaiba sa Antas ng Kahusayan ng mga Mag-aaral sa Programang Alternative Learning System sa mga Kasanayan sa Asignaturang Filipino Kung Papangkatin Ayon sa Estado ng Pag-aaral

Baryabol	Mean	t-value	p-value	Interpretasyon at Pasya
Nagtatrabaho	3.97	.728DM	.215	Di- Makabuluhan
Hindi Nagtatrabaho	4.07			Ang Ho ay Tinanggap
Kabuoan	4.02			

DM- Di Makabuluhan sa 0.05 Antas ng Kahalagahan

Nasasabing ang pagkakaiba ay di-makabuluhan sapagkat ang t-value ay 0.728, masasabing ang pagkakaiba ay di-makabuluhan sapagkat ang p-value na 0.217 ay natagpuang mas mataas kung ihambing sa 0.05 antas ng kahalagahan. Ang null hipotesis na nagsasabi na walang makabuluhang pagkakaiba sa antas ng kahusayan ng mga mag-aaral sa Alternative Learning System sa mga kasanayan sa asignaturang Filipino kung papangkatin ayon sa estado ng pag-aaral ay tinanggap.

Kung titingnan ang mga resulta ng datos na nasa itaas, malinaw na naiuugnay ang mga ito sa teorya ng sumusunod na sikolohista: sa teorya nina Vygotsky (1978) at Piaget (1963) na constructivism, nakikita mula sa naging resulta na hindi lamang natututo ang mga mag-aaral ng ALS sa loob ng silid-aralan, sapagkat kahit pa man sa labas ng silid-aralan ay

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natututo pa rin sila dahil sa dinisenyong distance learning na paraan ng pagkatuto.

Pinatunayan naman ni Lev Vygotsky (1978) ang kinalabasan ng resulta nang binigyang diin ang teoryang Socio-Cultural na kung saan ang mga mag-aaral ay mas natututo kung may tulong o gabay mula sa mga nakalimbag na mga kagamitan o iba pang kagamitang pampagkatuto. Para naman kina Renner (1982) sa kaniyang Curriculum Model of Instruction at Dewey (1939) sa kaniyang Curriculum Development Theory (CDT) sinabi nilang napakahalaga ng papel na ginagampanan ng mga kagamitang pampagtuturo na tutulong sa mga mag-aaral na mas mailantad ang kanilang mga kasanayan batay sa iba't ibang gawain.

3. KONKLUSYON AT REKOMENDASYON

3.1. Konklusyon

Batay sa mga pagsusuri ng mga natuklasan, humantong ang mananaliksik sa sumusunod na konklusyon: may mataas na antas ng kahusayan ang mga mag-aaral sa mga kasanayang pag-unawa sa napakinggan, pag-unawa sa binasa, pagsasalita at pagsulat. Bagamat mataas ang kabuoan, may tatlong indikeytor na nasa antas katamtaman: paglinang ng talasalitaan, panonood at gramatika at wika. Sa ikatlong suliranin, natagpuang walang makabuluhang pagkakaiba sa antas ng kahusayan ng mga mag-aaral ng ALS sa asignaturang Filipino kung papangkatin ayon sa kasarian, gulang at estado ng pag-aaral. Tinanggap naman ng datos ang hipotesis na nagsasabi na walang makabuluhang pagkakaiba sa antas ng kahusayan ang mga mag-aaral ng ALS sa mga kasanayan sa asignaturang Filipino kung papangkatin ayon sa profayl.

Dahil dito ang mananaliksik ay nakabuo ng isang kagamitang pampagtuturo na naglalaman ng mga kasanayang kailangang isaalang-alang sa pagkatuto at bawat kasanayan ay may mga pagsasanay na hahasa sa kanilang kaalaman ukol sa bawat aralin. Isang kagamitang pampagtuturo na dumaan sa tahasang ebalwasyon ng mga dalubhasa sa asignaturang Filipino.

3.2. Rekomendasyon

Una, sa mga Administrador at Tagaplano ng Kurikulum. Mula sa naging resulta, iminumungkahing bigyang-tugon ang mga kinakailangang kasanayan ng mga mag-aaral sa asignaturang Filipino sa programang Alternative Learning System (ALS). Maaaring magbalangkas ng mga alternatibong kagamitang pampagtuturo at mabigyan ng angkop na mga gawain ang mga mag-aaral para makatulong sa paglinang ng mga kasanayang pampagkatuto.

Pangalawa, sa kaguruan na nagtuturo sa programang Alternative Learning System, ugaliing malaman at masukat ang kasanayang taglay ng mga mag-aaral upang maibigay ang angkop na kagamitang makapagpapa-unlad ng kanilang kakayahan. Ang pagbuo ng angkop na kagamitang pampagtuturo na naaayon sa kanilang katayuan ay malaking tulong sa kanilang pag-aaral. Inirekomenda rin na ang resultang nakuha mula sa pananaliksik ay maaaring gawing batayan ng mga guro sa kanilang pagbabalak at pagdidisenyo ng mga aralin para sa kanilang mga mag-aaral sa ALS.

Pangatlo, sa mga mananaliksik. Batay sa kinalabasan ng pag-aaral, maaaring magsagawa ng karagdagang pag-aaral sa hinaharap ukol sa mga kagamitang pampagtuturo ng ALS na maaaring magamit ng mga guro at mag-aaral. Maaaring gamitin ito bilang kaugnay na pag-aaral.

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TO STUDY OF MALARIA DISEASE AND IT'S TREATMENT

Mr.Arbaz Attar[1], Ms.Anjali shinde[2], Dr.Vijaysinh Sable [3],Dr.Rani Mhetre[4]
Author[1],Guide[2],Principle[3],VicePrinciple[4].
Lokmangal Collage of Pharmacy, Wadala

ABSTRACT

A parasite illness, malaria results in hundreds of millions of sickness episodes and over a Million fatalities annually, almost all of which happen in the most vulnerable and Impoverished areas of the world's developing nations. Despite the immense suffering caused By malaria, the disease's effects on human rights have not been thoroughly discussed. This Article highlights significant links between poverty, socioeconomic inequality, and access to Malaria-control methods, as well as between the spread of malaria and violations of human Rights (such as those connected to slavery and armed conflict). The author comes to the Conclusion that efforts to combat malaria should be central to international plans aimed at Progressively achieving the realization of every person's right to health. Malaria, which is spread by female Anopheles mosquitoes carrying Plasmodium parasites, is Still a serious threat to world health. A brief synopsis of malaria's epidemiology, etiology, Clinical manifestations, diagnosis, treatment, and preventive measures is given in this Abstract. It highlights the prevalence of the illness, especially in areas where it is endemic,And talks about current initiatives to reduce and eradicate malaria globally. It also looks at How drug resistance develops and how crucial it is to keep up research and innovation in Order to fight this fatal illness.

INTRODUCTION

Humans and other animals can contract malaria, an infectious disease spread by mosquitoes. Caused by protists, a kind of microbe belonging to the Plasmodium genus. It starts with a bite from an infected female mosquito, whose saliva transfers the protists into the bloodstream and eventually the liver. Where they develop and procreate. Symptoms of the disease usually include fever and Headache, which in extreme circumstances may result in a coma or even death. Malaria is widespread in tropical and subtropical Regions in a broad band around the equator, including much of Sub-Saharan Africa, Asia, And the Americas. Malaria is no longer endemic in most of Europe and North America, where it was once common, however imported cases still occur there. Certain animal species become infected with other species of Plasmodium. Malaria Affects several mammals, birds, and reptiles differently.

LIFE CYCLE OF MALARIA

The malaria parasite's life cycle involves two hosts: the mosquito and the human

1.Mosquito Host

The mosquito ingests gametocytes, the sexual form of the parasite, when it Feeds on an infected human. The gametocytes mate in the mosquito's gut, undergo Meiosis, and migrate through the midgut wall to form an oocyst. Thousands of Sporozoites develop in the oocyst, which are then injected into a human during the next Blood meal.

2.Human Host

Sporozoite enter to the bloodstream of human being when infected mosquito feeds on them,The sporozoites infect liver cells and develop into schizonts, which Rupture and release merozoites. Merozoites migrate through the heart and lungs, eventually settling in the lung capillaries.. They then invade red blood cells and multiply Until the cells burst. This cycle repeats, causing fever each time the parasites break free.

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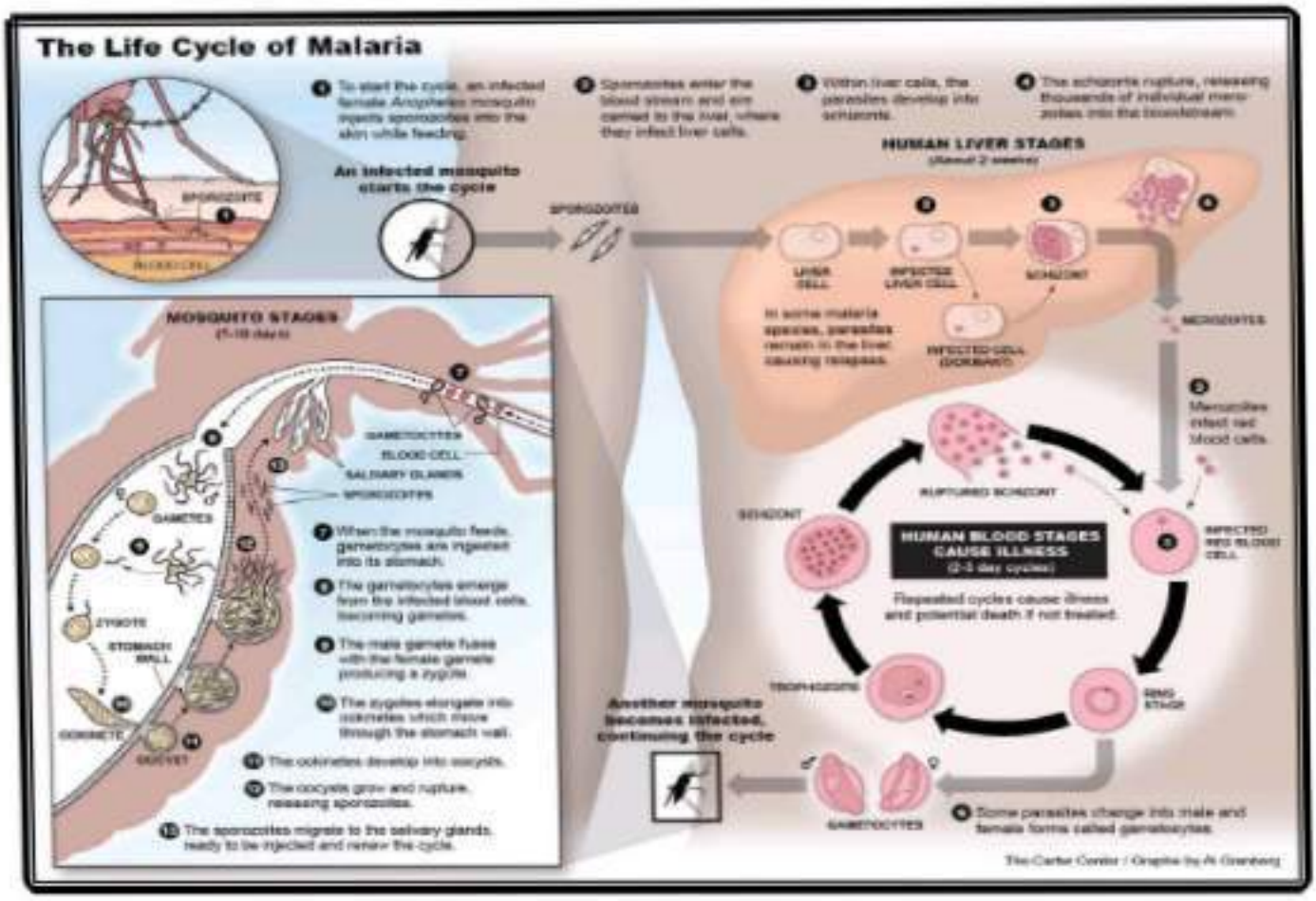


Fig. The Life Cycle Of Malaria

TYPES OF MALARIA

There are five types of malaria

>Plasmodium Falciparum : also known as P. Falciparum, is the disease's most dangerous variant. Africa, especially sub-Saharan Africa, is where it is most prevalent. According to recent data, cases are now being reported in regions of the world where it was previously believed that this kind had been eliminated.

>Plasmodium Vivax (P. Vivax): Less severe form of the parasite sickness that is usually not lethal. Nonetheless, untreated infection in animals can lead to a host's health issues, therefore treatment is still necessary. The global geographic distribution of this class is the broadest. Infections in India are caused by P. Vivax in about 60% of cases. This parasite may live in the body for years without harming it and has a liver stage. After months or even years without symptoms, the liver stage may reactivate and trigger relapses, or malaria episodes, if the patient is not treated.

>The Milder Variant of Plasmodium Malariae (P. Malariae) is usually not lethal. The diseased animal still needs to be treated, though, as not doing so can result in a number of other health issues. Certain individuals have been known to carry this particular form of parasite in their blood for numerous decades.

>A milder and usually non-fatal type of the disease is **Plasmodium ovale (P. Oval).** The afflicted person still has to be treated, though, as the infection could spread and result in a variety of health issues. This parasite can exist in the body for years without harming it; it has a liver stage. Per months or indeed a long time without side effects, the liver organize may reactivate and cause backslides, or jungle fever scenes, if the understanding is not treated.

>Plasmodium Knowlesi (P. Knowlesi) is the parasite that causes malaria in macaques and can also infect humans.

DIAGNOSIS

An accurate and timely diagnosis is essential to managing malaria effectively. The widespread effects of malaria have increased interest in creating efficient Diagnostic techniques, both in industrialized nations where malaria diagnostic proficiency is Frequently deficient and in resource-constrained locations where malaria poses a serious Burden to society. Finding malaria parasites or antigens/products in a patient's blood is the First step in diagnosing malaria. Despite the apparent simplicity, a number of factors can affect The

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diagnostic efficacy. Diverse shapes of the 5 jungle fever species; the distinctive stages of Erythrocytic schizogony, the endemicity of diverse species, the interrelation between levels of Transmission, populace development, parasitemia, resistance, and indications; medicate Resistance, the issues of repetitive intestinal sickness, holding on reasonable or non-viable parasitemia, and Sequestration of the parasites in the more profound tissues, and the utilize of chemoprophylaxisor even Presumptive Treatment on the premise of clinical determination, can all impact the recognizable proof And translation of intestinal sickness parasitemia in a demonstrative test. Jungle fever ought to be taken care of as a possibly life-threatening therapeutic Crisis. In many nations, the primary causes of death are delays in diagnosis and Treatment [6]. When malaria is no longer endemic, diagnosing the illness might be challenging For medical professionals who are not experienced with it. Ooking at blood smears under a microscope, technicians might not be Familiar with malaria or have not dealt with it before, which would explain why they Might miss parasites. Some regions have such high rates of malaria transmission That a sizable section of the populace is infected yet without exhibiting any Symptoms. These carriers have set up sufficient insusceptibility to shield them from disease, But not from malarial malady. In these circumstances, the presence of malaria Parasites in an unwell individual does not always indicate that the parasites are the Cause of the illness. In numerous nations where malaria is a problem, inadequate Resources pose a significant obstacle to accurate and prompt diagnosis. Medical Staff members receive inadequate training, equipment, and compensation. They Frequently have an overwhelming patient load and have to split their time between Treating patients with malaria and other infectious diseases that are just as serious, Such HIV/AIDS.

SYMPTOMS

Symptoms of malaria are followings:-

- ✓ Headache
- ✓ Cough
- ✓ Fever
- ✓ Nausea
- ✓ Vomiting
- ✓ Discomfort feeling
- ✓ Diarrhea
- ✓ Muscle pain
- ✓ Abdominal pain
- ✓ Fatigue
- ✓ Fast breathing
- ✓ Increase heart rate

A few individuals with malaria go through cycles of malarial "attacks." Typically, an attack Begins with chills and shivering, progresses to a high fever, then ends with perspiration and a return To normal temperature. Usually starting a few weeks after being bitten by an infected mosquito, malaria signs And Symptoms manifest. Certain malaria species, however, can remain dormant in your Body for up to a year.

CAUSES OF MALARIA DISEASE

Followings kinds of Plasmodium parasites have been found to be capable of infecting people With there disease:-

- ✓ Plasmodium vivax
- ✓ Plasmodium falciparum
- ✓ Plasmodium malaria
- ✓ Plasmodium knowlesi
- ✓ Plasmodium ovale

SCIENTIFIC CLASSIFICATION

- ✓ Domain:- Eukaryota
- ✓ Class:- Aconoidasida
- ✓ Order:- Haemosporida
- ✓ Family:-Plasmodiidae
- ✓ Genus:- Plasmodium
- ✓ Species:- P.Relictum & others genus
- ✓ Phylum:- Apicom plexa

TREATMENT

Physician Prescribed medications are used to treat malaria by eradicating the parasite. The Duration of treatment and the kinds of medications used will differ based on:

Which type of malaria parasite you have

- ✓ The severity of your symptoms
- ✓ Your age whether
- ✓ Your pregnant medications
- ✓ Most common antimalarial drugs are included:

Phosphorylchloroquine

The recommended course of action for any parasite that is drug-sensitive is chloroquine. Tragically, chloroquine is no longer an successful treatment for parasites since of resistance To the pharmaceutical in numerous locales of the world.

Artemisinin-based combination therapies (ACTs)

Artemisinin-based combination treatment (ACT) is a combination of two or more drugs that Work against the jungle fever parasite in diverse ways. Treatment for Chloroquine-resistant malaria. Examples include artemether-lumefantrine and Artesunate
mefloquine.

DRUGS

Common Antimalarial Drugs Include

- ✓ Atovaquone-proguanil (Malarone)
- ✓ Doxycycline (vibramycin & Oracea etc.)
- ✓ Primaquine phosphate
- ✓ Quinine sulphate (Qualaquin)

COUNSELLING POINTS FOR MALARIA PREVENTION

Recognise the Patterns of Resistance

Because the common malaria species in these regions are resistant to the Medicine, chloroquine should not be used inplaces like Africa, Southeast Asia, or South America.In CentralAmerica, where the malaria species is still treatable,chloroquine would be the Preferred medication.

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Recognise the Sufferer

Pharmacists ought to think about their patients as well. The dose range Could be a significant consideration for kids. Malarone, for instance, has dosage Recommendations that drop off at a very young age and weight. The medication is also Internationally used and has a broad safety profile.

Think About Practicality

Various antimalarials require various dosage regimes. For instance, the patient must take Mefloquine and chloroquine 1-2 weeks prior to departure, once a week while travelling, and once A week for 4 weeks following their return. Malarone, on the other hand, is more suitable for last- Minute travellers because it can be taken 1-2 days prior to departure After that it should be.

Think about the location

Air-conditioned lodgings will help keep mosquitoes outside as Anopheles Mosquitoes prefer warmer climates. Choosing a hotel with air conditioning and bug screens on the windows is the greatest approach to make sure you're safe while visiting.

Bring up the topic of Personal Safety

Additionally, Dr. Goad advises visitors to buy an insect net for personal Protection when they sleep, particularly if their lodging doesn't offer enough defence. A Personal bug net is available for purchase over-the-counter and is often available in different Hole counts per square inch, with 400 being the most recommended. Insecticide-treated nets Are another useful tool for keeping
mosquitoes away.

CONCLUSION

One of the driving causes of passing and incapacity around the world is jungle fever Presently, the Most vulnerable population subgroups—sub-Saharan Africans, young children, expectant mothers, HIV-positive individuals (particularly those with weakened immune systems), and survivors of war and other humanitarian tragedies—bear a disproportionate share of the burden of malaria. Poverty Increases the likelihood of contracting malaria, but malaria also makes poverty worse by affecting Household finances and productivity. There are currently effective ways to prevent and manage malaria, but access to These treatments is disproportionately distributed, which is consistent with the pattern of Socioeconomic inequality that affects the spread of infection. Poorer families in some places are Now forced to save money months or years in order to purchase a socially advertised bednet, while wealthy people—whose homes may have window screens and strong walls—can get "luxury" Nets—some of which are now king-sized and ruffled—without having to make any compromises. Comparably, wealthy residents, foreign visitors, and researchers studying malaria would have easy Access to ACT for treating malaria, whereas poor subsistence farmers might be fortunate enough To have sulfadoxinepyrimethamine (or, worse yet, chloroquine)

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AN INVESTIGATION INTO THE IMPACT OF EMPLOYEE STRESS MANAGEMENT ON ORGANIZATIONAL PERFORMANCE

Dr. Anand K
Associate Professor, Department of Business Administration, Maharaja's College, University of Mysore, Mysore

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ABSTRACT

Stress is a normal physical response to events that make you feel threatened or upset your balance in some way. When you sense danger – whether it's real or imagined – thebody's defenses kick into high gear in a rapid, automatic process known as the "fight-or- flight" reaction, or the stress response. The present study has been focused in to identify the reasons of employee stress and symptoms of the stress. It has also focused on to analyze whether the management is providing an adequate training facilities totheir workers. The purpose of the study is also to identify whether the workers are able to manage their time in their job.

KEY WORDS : *job, management, training, stress, symptoms.*

INTRODUCTION

Stress is the way human beings react both physically and mentally to changes, events, and situations in their lives. People experience stress in different ways and for different reasons. The reaction is based on your perception of an event or situation. If you view a situation negatively, you will likely feel distressed—overwhelmed, oppressed, or out of control. Distress is the more familiar form of stress. The other form, eustress, results from a "positive" view of an event or situation, which is why it is also called "good stress." Eustress helps you rise to a challenge and can be an antidote to boredom because it engages focused energy. That energy can easily turn to distress, however, if something causes you to view the situation as unmanageable or out of control. Many people regard public speaking or airplane flights as very stressful—causing physical reactions such as an increased heart rate and a loss of appetite—while others look forward to the event. It's often a question of perception: A positive stressor for one person can be a negative stressor for another.

REVIEW OF LITERATURE

Dr. Latha Krishnan (2014) conducted a research work about the variousfactors contributing to stress among working women and to identify the impact of the stress management techniques used by working women. This study was conducted among working women in different sectors in Bangalore city. The findings of the study reveal that under socio- economic stressors unexpected guests, followed by absence of domestic help causes major stress among working women. Moreover anxiety aboutchildren future and husbands job insecurity play a major role in causing stress under family and relationship. Thus the working women need to have work life balance and imbibe stress management strategies like meditation, balanced diet filled with entertainment and fun to lead a stressfree life.

A.Krithika and Dr.K.Rajam (2018) conducted a research work about the occupational stresses faced by the women teachers in an educational institutions and how they are handling their profession stress. The findings of the study reveal that during the education, students gain the knowledge and skills, and teachers are the basic role models for their students. Teachers play a significant role in the development of countries, because they educate new generations. At present world facing, the new term 'Occupational Stress' it can be defined as the harmful physical and emotional responses that occur when the requirements of the job do not match the capabilities, resources or needs of the worker. Job stress can lead to poor health and even injury. This article contain 47 (2007-17) reviews from various articles.

Vemuri Swathi and M.Sudhit Reddy (2016) conducted a research workabout the work stress and causes that create stress among working women. The findings of the study reveal that the stress is a growing problem in the workplaces and a particular magnitude for working women. Women employees report more non-fatal but long term and disabling health problems. The Review of literature described that working women generally involved simultaneously in many tasks, juggling between family and work responsibilities, which leads towards stress among them.

Sai Lakshmi and Hema.S (2016) conducted a research work on the stress and its consequences in women's life. It also focuses on how working women in IT sector under much stress and this paper demonstrates tips to help, manage and reduce stress levels in their working as well as personal life.

Muddanagouda Patil (2016) focused on occupational stress

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experiencedby working and non-working women. Stress is not itself a completely negative condition. However, it is a reaction in which different people react differently according to their experiences. . It was concluded that household responsibilities child caring issues family relationship are the sources of stress for women.

Antoniou et.al (2006) identified the sources of occupational stress and professional burnout experienced by females. Stress is defined as "the emotional and physical response which occurs when the requirements ofdemands of the job do not match the capabilities/potentials" It was found that females experienced more stress as compared to male.

Gourie Suraj Narayan (2005) focused on women in management and occupational stress. It was suggested that ecosystem approach should focus on individual, organizational and social intervention to minimize stress in working women.

Adeline broadbridge (2000) identifies the sources of stress among female managers in retail sector. It was advised that educational programs, career planning confidence building, etc. should be adopted toovercome stress.

Nagina Parveen (2009) focused on occupational stress experienced by married and unmarried working women of Hyderabad city. This study provides valuable information about the stress levels of both groups of respondents .According to the results of the study the overall work related

Harilal. A and Santhosh V.A (2017) conducted the research work to identify and compare the level of stress experienced by housewives and working women in the state of Kerala. The analysis shows the stress levels are high for working women when compare with housewives and both ofthem have a relationship, the stress levels of women and financial position of their family have a relationship. The study helps the organizations and spouses in effective management of women's dual role in work and personal life.

Statement of the problem

Stress kills the creativity and quality a person cannot give their best when they are stressed out, and at the health industry and among the healthcare workers has become an increasing phenomenon due to external factors such as technological and emotional stress, healthcare workers faces many physicals as well as psychological Stress during working hours . The stress level among employees decreases the performance and also deteriorates the physical and intellectual functioning. High stress affects the creative performance and results in forgetfulness, frequent mistakes, restlessness, lack of concentration or irritability. Hence the study focuses on the cause, effect, sources of stress, and symptoms of stress and to manage the stress.

OBJECTIVES OF THE STUDY

1) To identify the reasons of employee stress and symptoms of the stress.
2) To identify the sources of stress.
3) To analyze whether the management is providing an adequate training facilities totheir workers
4) To identify whether the workers are demotivated in their work.
5) To identify whether the workers are able to manage their time in their job.

RESEARCH METHODOLOGY

Both primary and secondary data were used, secondary data was used for the conceptual framework The research design is descriptive in nature as the researcher has made attempts to describecharacteristics . Sample Size refers to the number of items to be selected form the universe to constitute sample, an optimum sample size is one fulfills the requirements of efficiency, representatives, reliability and flexibility size was taken as 100.

To conduct the present study, the simple random sampling technique was adopted and the opinion was collected from 30 SHG members of each Taluk comprising 120 SHG members in total. To arrive at meaningful inferences, percentage analysis and chi-square tests were used.

COLLECTION OF DATA

Sample Size

Sample Size refers to the number of items to be selected form the universe to constitute sample, an optimum sample size is one fulfills the requirements of efficiency,representatives, reliability and flexibility size was taken as 100.

ANALYSIS AND INTERPRETATION

Table No.1
Age of the Respondents

Age Group	No of Respondents	Percentage
21-25	22	22%
25-30	51	51%
30-35	27	27%

From the above table it was founded that only 22% of the respondents belongs to the age group of between 21-25 yrs which is recorded as lowest. 51% of the respondents belongto the age group of between 25-30yrs which is recorded as highest, 27% of

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the respondents belong to the age group of between 30-35yrs category.

Table No:2
Gender of the respondents

S.No	Attributes	No. of. Respondents	Percentage
1	Male	46	46%
2	Female	54	54%

From the above table it was founded that 46% of the respondents are belongs to male category and 54% of the respondents are belongs to female category.

Table No:3
Marital Status of the Respondents

Marital Status	No of Respondents	Percentage
Married	64	64%
Unmarried	36	36%

From the above table, it was realized that 64% of the respondents are married and 36%of the respondents are unmarried.

Table No: 4
Opinion of respondents regarding workload

Opinion of Workload	No of Respondents	Percentage
Highly Satisfied	28	28%
Satisfied	36	36%
Neutral	11	11%
Dissatisfied	15	15%
Highly Dissatisfied	10	10%

From the above table it was founded that 28% of the respondents are highly satisfied with the workload, 36% of the respondents are just satisfied with the workload which was recorded as highest percentage, 11% of the respondents are neutral regarding the workload level, 15% of the respondents are dissatisfied with the workload level and only10% of the respondents are highly dissatisfied with the workload level which was recorded as lowest percentage

Table No: 5
Concentration of respondents at their work

Concentration on work	No of Respondents	Percentage
Strongly Agree	26	26%
Agree	34	34%
Undecided	7	7%
Disagree	18	18%
Strongly disagree	15	15%

From the above table, it was founded that 26% of the respondents strongly agree that they have full concentration at their work, 34% of the respondents are just agree that theyhave full concentration at their work which was recorded a highest percentage, 7% of the respondents are undecided about their concentration level which was recorded as lowest percentage, 18% of the respondents are disagree that they doesn't have full concentration at their work and only15% of the respondents are strongly disagree with this opinion.

Table No: 6
Stress level of the respondents

Level of Stress	No of Respondents	Percentage
Very high	26	26%
High	24	24%
Medium	13	13%
Low	21	21%
Very low	16	16%

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From the above table, it was founded that 26% of the respondents stress level was very high which was recorded as highest percentage, 24% of the respondents stress level was at high level, 13% of the respondents stress level is at medium level which was recorded as lowest percentage, 21% of the respondents stress level is at low level and 16% of therespondents stress level is at very low level.

Table No: 7

Job of the respondents leads to stress

Job leads to stress	No of Respondents	Percentage
Strongly agree	19	19%
Agree	41	41%
Undecided	5	5%
Disagree	12	12%
Strongly disagree	23	23%

From the above table it was founded that 19% of the respondents are strongly agree that their job makes them to get stress at their work, 41% of the respondents are just agree thattheir job leads them to get stress which was recorded as highest percentage, only 5% of the respondents are undecided about this opinion, 12% of the respondents are disagree that their job doesn't leads them to get stress and 23% of the respondents are strongly disagree with thisopinion.

Table No: 8

Training for the respondents to reduce stress

Training to reduce stress	No of respondents	Percentage
Yes	-	-
No	100	100%

From the above table it was realized that 100% of the respondents are not at allprovided with any training session in order to reduce stress at their work.

Table No: 9

Stress leads the respondents to get demotivated at their work

Stress leads to demotivation	No of Respondents	Percentage
Strongly agree	20	20%
Agree	23	23%
Neutral	12	12%
Disagree	37	37%
Strongly disagree	8	8%

From the above table it was founded that 20% of the respondents are strongly agree that their stress level makes them to get demotivation at their work, 23% of the respondentsare just agree that their stress level makes them to demotivated, 12% of the respondents are neutral about this opinion, 37% of the respondents are disagree that their level of stressdoesn't makes them to get demotivated at their work which was recorded as highest percentage and only 8% of the respondents are strongly disagree that their job doesn't makes them to get demotivated at their work.

Table No: 10

Recognizing the causes of stress by the respondents

Recognizing the causes of stress	No of Respondents	Percentage
Strongly agree	18	18%
Agree	39	39%
Neutral	12	12%
Disagree	13	13%
Strongly disagree	18	18%

From the above table, it was found that 18% of the respondents are strongly agreethat they can able to identify the causes of stress, 39% of the respondents are agree that they can identify the causes of stress which was recorded as highest percentage, 12% of the respondents are neutral with this opinion which was recorded as lowest percentage, 13% of the respondents are

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disagree that they can't identify the causes of stress and 18% of the respondents are strongly disagree that they can't identify the causes of stress.

Table No: 11
Stress Management level by the respondents

Stress Management level	No of Respondents	Percentage
Very high	20	20%
High	36	36%
Medium	13	13%
Low	19	19%
Very low	12	12%

From the above table, it was found that 20% of the respondents can manage the stress at very high level, 36% of the respondents can manage the stress at high level which was recorded as highest level, 13% of the respondents can manage the stress at medium level, 19%of the respondents can manage the stress only at low level and 12% of the respondents can manage their stress at very low level

Table No : 12
Anger by the respondents towards Co-workers

Anger towards Co-workers	No of respondents	Percentage
Yes	28	28%
No	72	72%

From the above table, it was founded that 28% of the respondents shows anger towards their co-workers and 72% of the respondents doesn't show their anger towards their co-workers.

Table No: 13
Ways to manage stress of respondents

Ways of managingstress	No of Respondents	Percentage
Exercise regularly	34	34%
Changing the way you see things	24	24%
Avoiding extremereactions	32	32%
Avoiding the persons who makes stress	6	6%

From the above table, it was founded that 34% of the respondents will manage their stress by exercising regularly which was recorded as highest percentage, 24% of the respondents manage their stress by changing the way they see things, 32% of the respondents manages the stress by avoiding extreme reactions and only 6% of the respondents manages the stress by avoiding the persons who makes them stress.

Table No: 14
Satisfactory level of the respondents regarding Scale of pay

Satisfaction on Salary	No of respondents	Percentage
Highly Satisfied	18	18%
Satisfied	38	38%
Neutral	8	8%
Dissatisfied	19	19%
Highly dissatisfied	17	17%

From the above table, it was founded that 18% of the respondents are highly satisfied with the scale of pay, 38% of the respondents are just satisfied with their scale of pay which was recorded as highest percentage, 8% of the respondents are neutral with this opinion whichwas recorded as lowest percentage, 19% of the respondents are dissatisfied with their scale of pay and 17% of the respondents are highly dissatisfied with their scale of pay.

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Table No: 15
Positive attitude of the respondents towards job

Positive Attitude TowardsJob	No of Respondents	Percentage
Strongly agree	19	19%
Agree	33	33%
Neutral	7	7%
Disagree	22	22%
Highly disagree	19	19%

From the above table it was founded that 19% of the respondents are strongly agree that they have positive attitude towards their job, 33% of the respondents are just agree that they have positive attitude in their work which was recorded as highest percentage, only 7%of the respondents are neutral with this opinion which was recorded as lowest percentage,22% of the respondents are disagree that they have positive attitude towards their job and 19%of the respondents are highly disagree that they have positive attitude towards their job.

Table No: 16
Sharing the problems with co-workers by the respondents

Sharing problems with co-workers	No of respondents	Percentage
Yes	47	47%
No	53	53%

From the above table it was founded that 47% of the respondents shares their problemswith their colleagues or friends and 53% of the respondents doesn't shares their problems with their colleagues or friends.

Table No: 17
Compromising themselves in the job

Compromisation in Job	No of respondents	Percentage
Strongly agree	17	17%
Agree	32	32%
Neutral	6	6%
Disagree	25	25%
Highly disagree	20	20%

From the above table, it was founded that 17% of the respondents are strongly agree that they can compromise themselves in their job, 32% of the respondents are just agree that they can compromise themselves in their job which was recorded as highest percentage, only 6% of the respondents are neutral with this opinion which was recorded as lowest percentage, 25% of the respondents are disagree that they can't compromise themselves in their job and 20% of the respondents are highly disagree with this opinion.

Table No: 18
Satisfactory level of the respondents regarding leisure time

Leisure Time	No of respondents	Percentage
Highly satisfied	24	24%
Satisfied	40	40%
Neutral	4	4%
Dissatisfied	19	19%
Highly dissatisfied	13	13%

From the above table it was founded that 24% of the respondents are highly satisfied with the leisure time facilities, 40% of the respondents are just satisfied with the leisure time facilities which was recorded as highest percentage, only 4% of the respondents are neutral with this opinion which was recorded as lowest percentage, 19% of the respondents are dissatisfied with the leisure time facilities and 13% of the respondents are highly dissatisfied with the leisure time facilities.

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Table No: 19
Time Management by the respondents

Time Management	No of respondents	Percentage
Strongly agree	22	22%
Agree	32	32%
Neutral	9	9%
Disagree	17	17%
Highly disagree	20	20%

From the above table, it was founded that 22% of the respondents are strongly agree that they have proper time management at their work, 32% of the respondents are just agree that they have proper time management which was recorded as highest percentage, 9% of the respondents are neutral with this opinion which was recorded as lowest percentage, 17% of the respondents are disagree that they have proper time management and 20% of the respondents are highly disagree with this opinion.

Table No: 20
Organization level stressors affected in work

Extra Organizational stressors	No of respondents	Percentage
Family	33	33%
Economy	21	21%
Mobility	20	20%
Quality of life	26	26%

From the above table, it was founded that 33% of the respondents said that family isthe basis to be affected in the work, 21% of the respondents said that economy is the basis for the organizational level stressor to be affected in the work, 20% of the respondents said that lack of mobility is the basis for an organizational level stressors to be affected in their work, 26% of the respondents said that quality of life is the basis for an organizational level stressorsto be affected in the work.

Table No: 21
Symptoms of stress

Symptoms of stress	No of respondents	Percentage
Headache	27	27%
Depression	23	23%
Nervousness	14	14%
Forgetfulness	16	16%
Eating Disorders	29	29%

From the above table, it was founded that 27% of the respondents had headache when they feel stress at their work, 23% of the respondents had depression while they are stressed attheir work, 14% of the respondents feel nervousness when they are stressed which was recorded as lowest percentage, 16% of the respondents feel forgetfulness while they feel stressat their work and 29% of the respondents had eating disorders when they get stress at their work which was recorded as highest percentage.

Table No: 22
Relaxation to make stress free mind

Relaxation to make stressfree mind	No of respondents	Percentage
Listening to music	27	27%
Get a message	23	23%
Go for a walk	20	20%
Savor a warm cup of coffeeor tea	30	30%

From the above table, it was founded that 27% of the respondents relax themselves by listening to music, 23% of the respondents relax themselves by getting a message, 20% of the respondents relax themselves by going a walk which was recorded as highest percentage and 30% of the respondents relax themselves by drinking a cup of coffee or tea which was recorded as highest percentage.

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FINDINGS

- It was found that 51% of the respondent's age group is between 25-30years.
- It was founded that the highest percentage (54%) of the respondents are belongs to female category.
- It was founded that the majority of the respondents (64%) are married.
- It was founded that 36% of the respondents are satisfied with their level of workload.
- It was founded that 34% of the respondents are just agree that they have full concentration at their work.
- It was revealed that the highest percentage (26%) of the respondents stress level is at very high level.
- It was founded that the highest percentage (41%) of the respondents agrees that their job makes them to get stress at their work.
- It was revealed that 100% of the respondents are not provided with any training facilities in order to reduce stress.
- It was founded that 37% of the respondents are disagree that their stress level doesn't makes them to be demotivated in their work.
- It was founded that 39% of the respondents agrees that they can able to identify the causes of stress.
- It was founded that 36% of the respondents can able to manage the stress at a high level.
- It was revealed that 72% of the respondents show their anger towards their co-workers.
- It was revealed that 34% of the respondents manage their stress by exercising regularly in their day to day life.
- It was founded that 38% of the respondents are satisfied with the scale of pay provided by the management.
- It was founded that 33% of the respondents agrees that they have positive attitude towards their job.
- It was revealed that 53% of the respondents don't shares their problems with their colleagues or friends.
- It was founded that 32% of the respondents agrees that they will compromise themselves in their job.
- It was founded that 40% of the respondents are satisfied with the leisure facilities provided by the management.
- It was revealed that 32% of the respondents agree that they have proper time management in their work.
- It was founded that 33% of the respondents says that family is the basis for an extra organizational level stressors to be affected in their work.
- It was revealed that the highest percentage (29%) of the respondents have the symptom of eating disorder which leads to stress during their work.
- It was founded that the highest percentage (30%) of the respondents relaxes themselves by savor a warm cup of coffee or tea in order to get stress free mind.

SUGGESTIONS

Based on the given findings the following suggestions and recommendations are givenby the researcher.

- Stress management programme should be conducted for all the workers on a regular basis.
- The management should provide proper leisure time facilities so that they can relax theirmind and they can concentrate properly in their work.
- The management should provide an opportunity for social interaction among employees so that a cordial relationship can be created among employees.
- The management should establish work schedules that are compatible with demands and responsibilities outside the job.
- The management can share information with employees to reduce uncertainty about theirjobs and futures.

CONCLUSION

The stress of employees is within the optimal range for performance andthe stress builds could be controlled. The various stress indicators of the employees are experiencing troubles while taking decisions, getting angry while interrupted at work, experiencing repetitiveness in mistakes or approach, difficulties in concentrating or remembering things, experience frequent headaches and migraines, etc. The common responses given by employees under stress are heavy workload, working overtime, low pay package, lack of training etc. It is also a comfortable environment to work as majority employees are able to work without disturbances or interruptions and also do they get time to meet their personal obligations. But since it is a textile industry, the environment adds on to an employee's stress.

The study is made in detail about the Stress Management among employees. From the study majority of the respondents feels that their job makes them to get stress at their work. So, the managementcan take necessary steps to make their employees to feel free in their job, so that the employees can manage the stress at their work. This study will help the organization to make the employees to work more without tension.

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EFFECT OF PALASHA KSHARA PRATISARANA IN THE MANAGEMENT OF CHRONIC INFERIOR TURBINATE HYPERTROPHY -A CASE REPORT

Dr Deeraj BC [1], Dr Amarnath H K [2], Dr Vigneshwaran K.S.[3]. Dr Preethi [4]

[1]*Associate Professor, Dept. of Shalakya Tantra, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan, Karnataka, India*

[2]*Associate Professor, Dept. of Shalakya Tantra, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan, Karnataka, India*

[3]*PG. Scholar, Dept. of Shalakya Tantra, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan, Karnataka, India*

[4] *PG. Scholar, Dept. of Shalakya Tantra, Sri Dharmasthala Manjunatheshwara College of Ayurveda, Hassan, Karnataka, India*

ABSTRACT

Inferior turbinate is an elongated, scroll like paired structure of the lateral nasal wall which consists of a central layer of bone and a mucosal layer of either side[1].Chronic nasal obstruction secondary to hypertrophied inferior turbinate is one of the most common problems seen in Rhinology and significantly affects day-to-day activities of the patients[2]. Anterior rhinoscopy examination in chronic hypertrophic rhinitis shows hypertrophy of turbinates and maximum changes are seen in the inferior turbinates.[3]. A 54-year-old-male reported to outpatient department of ENT, sri Dharmasthala Manjunatheshwara college and hospital, Hassan with complaints of nasal blockage, difficulty in nasal breathing and loss of sleep since 6 to 7 years. patient also complained of sneezing and nasal discharge on and off since 3 to 4 years. Anterior rhinoscopy showed right compensatory inferior turbinate hypertrophy secondary to left DNS and managed with ayurvedic intervention. Palasha Kshara Pratisarana over hypertrophied turbinates was done here. The treatment was effective in the present case with relief in his presenting complaints with the follow up period of 45days. This case report revealed that using Kshara karma (an ayurvedic para surgical procedure), the nasal blockage due to chronic inferior turbinate hypertrophy could be managed effectively.

INTRODUCION

Hypertrophied turbinate is characterised by thickening of mucosa, submucosa, sera mucinous glands, periosteum and bone in inferior turbinate. Nasal obstruction is the predominant symptom seen along with symptoms such as difficulty in nasal breathing, sneezing, Nasal discharge, heaviness of head, head ache and transient anosmia. Anterior rhinoscopy examination in chronic hypertrophic rhinitis patient shows hypertrophy of turbinates and maximum changes are seen in the inferior turbinates.[3]There are various causes for inferior turbinate hypertrophy which are allergic rhinitis, chronic hypertrophic rhinitis, vasomotor rhinitis, chronic infective rhinitis, deviated nasal septum and rhinitis medicamentosa. The medical management in contemporary science includes medications of antihistamines, decongestants and topical corticosteroids; these drugs provide symptomatic improvement, in most of the patients. The preferred treatment modality in modern system of medicine is surgical management, many surgical techniques have been used and mostly ending in diminishing the normal function nasal mucosa, submucosa and turbinate parenchyma with other complications.[4]

CASE REPORT

A 54-year-old-male patient, presented with complaints of severe nasal blockage, difficulty in nasal breathing, recurrent cold episodes and loss of sleep since 6 to 7 years and symptoms aggravated in the last 6 months. patient was not having previous history of diabetes mellitus, hypertension and coronary illness. No previous surgical history reported. On anterior rhinoscopy examination patient was diagnosed as right compensatory inferior turbinate hypertrophy grade4 (Friedman's grading system) secondary to left DNS. patient had consulted elsewhere for the same and advised for surgical management. Since patient was not willing for surgery and interested in ayurvedic treatment he approached to Sri Dharmasthala Manjunatheshwara college and hospital of ayurveda, Hassan, Karnataka. Treated with Palasha Kshara Pratisarana over right hypertrophied inferior turbinate.

THERAUPEUTIC INTERVENTION

Purva Karma – written Consent was obtained from the patient and attenders before procedure. Patient was advised to be in nil by mouth 4 hours prior to ksharakarma. patient was asked to be in a sitting posture with the head tilted to expose the nasal cavity properly. Lidocaine 10% spray was used to anesthetise the turbinate and to avoid the sneezing reflex.

Pradhana karma – Under all aseptic precautions the nasal cavity is exposed using Thudicum's nasal speculum and the secretion over the turbinate was wiped out. Palasha Kshara was applied over the medial surface of the exposed turbinate by using the cotton rolled over serrated end of jobsons probe for 60 seconds. Then Kshara was removed with cotton rolled to

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jobsons probe and lemon juice was applied to the turbinates to neutralize the remaining Kshara..

Pashchat Karma -The patient was observed for bleeding, pain, burning sensation over the period of 2 hours and advised not to exposure to air or breeze, dust and smoke and to take light diet for 3 days.

FOLLOW UP ASSESMENT AND OUTCOME

1. Post operatively, on 3nd day, anterior rhinoscopy was done, no adhesions seen and nasal toileting done with normal saline to remove the nasal slough. no complaints of pain, bleeding or burning sensation reported.

2. Second follow up on 7th day, on examination revealed size of the inferior turbinate reduced considerably from grade 4 to grade 2 and the patient got significant relief from nasal block.

3. Third follow up done on 15th day of Kshara application, patient was re assessed, anterior rhinoscopy revealed reduction in the turbinate size to grade 1 and the patient feels marked relief from nasal blockage and mouth breathing.

4. Further patient was reviewed after 45days of Kshara application, on anterior rhinoscopy the turbinate size remained to be at grade 1, which had reduced from grade 4 by 15th day of treatment, other presenting complaints such as nasal blockage, difficulty in nasal breathing, recurrent episodes of cold attacks and loss of sleep reduced considerably.

BEFORE AND AFTER TREATMENT PHOTOGRAPHS

	Before Kshara application. Picture showing grade 4 inferior turbinate hypertrophy
	7th day of follow up. size of the inferior turbinate reduced considerably from grade 4 to grade 2
	15th day of follow up. size of the inferior turbinate reduced to grade 1
	45th day of follow up. NO HYPERTROPHY OF INFERIOR TURBINATE

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DISCUSSION

In the present case study , there was a marked reduction in the nasal obstruction which was the main concern on first visit and was able to sleep comfortably after 1 week of Kshara karma. During the entire follow up period no other internal medications given to the patient. Kshara karma helped to reduce the size of the hypertrophied inferior turbinates thereby reducing the anatomical obstruction in the pathway.

Kshara karma is the treatment modality which has been advocated in Adhimamsa [extra muscular growth], arshas[haemorrhoids], arbuda[tumour].[5] The increase in turbinate size as well as submucosal and mucosal hypertrophy can be taken as Adhimamsa [extra muscular growth].The effect of Kshara karma on hypertrophied turbinates is based on coagulation of venous sinusoids within the turbinate, heading to submucosal fibrosis and reduction of inferior turbinate volume.[6]It penetrates deep into the mucosal and submucosal structures of hypertrophied turbinates leading to submucosal fibrosis and as the anterior end of the inferior turbinate is erectile tissue and coagulation of it causes reduction of size over it and reduces the symptoms like nasal obstruction, breathing difficulty. Kshara because of its ksharana karma and Lekhana karma**,** cause tissue necrosis and thereby reduction in the turbinate volume observed. Kshara because of its soshana guna and ushna veerya of palasha kshara dries the nasal mucosa which helps in reduction in the nasal discharge. Palasha Kshara karma desensitizing the anterior end of the erectile tissue of inferior turbinate by its alkaline nature so that neutralizing irritants or allergens in the nasal passages thus reduce the sneezing reflex.

CONCLUSION

In the present case it was found that one time application of Palashsa Kshara over the right hypertrophied inferior turbinate showed marked decrease in its size and significant relief from his presenting complaints with a follow up period of 45 days. Further clinical trials on large sample size may be conducted to ascertain findings of these observations.

Patient Perspective

The patient was satisfied with the Ayurveda treatment as his nasal block and episodes of cold attacks were reduced significantly. He felt better in carrying out his daily activities.

Informed Consent

Informed consent for publication of the data was taken from the patient.

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THE IMPACT OF DIGITAL LEARNING RESOURCES ON LEARNERS' ENGAGEMENT AND ACADEMIC PERFORMANCE IN CAMEROON SECONDARY SCHOOLS IN CENTRE REGION

Azefack Honorine Lashire
Département of Philosophy, Option: Ethics and Political philosophy, University of Yaoundé 1,

ABSTRACT
Despite the growing adoption of digital learning resources in secondary education, their effectiveness in improving learners' engagement and academic performance remains unclear in the Cameroonian context. This study argues that digital learning resources may not significantly enhance learners' engagement and academic performance in Cameroon secondary schools due to contextual factors. The purpose of this study was to investigate the impact of digital learning resources on learners' engagement and academic performance in Cameroon secondary schools in the Centre Region. A quantitative research approach was employed, using a survey design to collect data from a sample of secondary school learner's. Multiple linear regression analysis was conducted to examine the relationships between digital learning resources, learners' engagement, teacher support, school infrastructure, and academic performance. The study found no significant relationship between digital learning resources and academic performance. Learners' engagement, teacher support, and school infrastructure also did not significantly predict academic performance. The results suggest that contextual factors unique to Cameroon secondary schools may hinder the effectiveness of digital learning resources.

KEYWORDS: *Digital Learning Resources, Learners' Engagement, Academic Performance, Cameroon Secondary Schools, Centre Region.*

1. INTRODUCTION

The integration of digital learning resources in education has transformed the learning landscape globally (Kozma, 2013; UNESCO, 2019; Warschauer, 2007). Digital learning resources, including educational software, online platforms, and multimedia materials, enhance learners' engagement and academic performance (Hew & Cheung, 2013; Koehler & Mishra, 2009; Tamim et al., 2011). In Cameroon's Centre Region secondary schools, digital learning resources have the potential to improve educational outcomes.

Digital learning resources refer to technology-based tools and materials used to support teaching and learning (Koehler & Mishra, 2009). learners' engagement encompasses participation, motivation, and interest in academic activities (Fredricks et al., 2004). Academic performance includes grades, test scores, and overall academic achievement (Kuh et al., 2006).

Globally, digital learning has become increasingly prevalent. In the USA, digital learning platforms have expanded access to education (Allen & Seaman, 2013). Russia has invested in digital education infrastructure, enhancing learners' engagement (Kozma, 2013). Europe has implemented digital learning initiatives to improve academic performance (European Commission, 2019). In Africa, mobile learning solutions have increased access to education (UNESCO, 2019). Cameroon has seen significant growth in digital learning adoption, particularly in the Centre Region (Kamga, 2019; Ngwa & Mbarika, 2012).

Cameroon's education sector has witnessed significant digital advancements (Mba et al., 2020). The Centre Region, specifically, has experienced rapid technology adoption in education (Kamga, 2019). Secondary schools in the region have begun integrating digital learning resources into their curricula.

Despite the potential benefits of digital learning resources, their impact on learners' engagement and academic performance in Cameroon's Centre Region secondary schools remains uncertain. Research is needed to investigate the effectiveness of digital learning resources in enhancing educational outcomes. The main aim of this paper is to examine the impact of digital learning resources on learners's' academic performance in Centre Region secondary schools.

The remainder of the work is structured in this manner. Section 2 reviews the literature. Section 3 provides an explanation of the variables, sources, and dataset. In Section 3, we focus on the approach. Section 4 discusses the findings. Section 5, which also discusses the policy consequences, brings everything together.

2. LITERATURE REVIEW

Digital learning resources, encompassing educational software, online platforms, and multimedia materials, have transformed teaching and learning (Katz & Porath, 2011; Koehler & Mishra, 2009; Wouters et al., 2013). learners' engagement, a critical factor in academic success, is influenced by digital learning resources (Fredricks et al., 2004; Hughes et al., 2018; Skinner et al., 2009). In Cameroon's Centre Region secondary schools, digital learning resources adoption is increasing, but its impact

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on learners' engagement and academic performance requires investigation (Mba et al., 2020; Ngwa & Mbarika, 2012; Ngonso, 2019).

Several theoretical frameworks underpin digital learning resources' effectiveness. The Technology Acceptance Model (TAM) suggests that perceived usefulness and ease of use influence digital learning resource adoption (Davis, 1989; Venkatesh & Davis, 2000). The Self-Determination Theory (SDT) posits that digital learning environments foster autonomy, competence, and relatedness (Deci & Ryan, 2000; Ryan & Deci, 2009). The Cognitive Load Theory (CLT) emphasizes optimal cognitive load in digital learning environments (Chandler & Sweller, 1991; Sweller, 1988).

Empirical studies on digital learning resources yield mixed results. Some studies report significant improvements in learners' engagement and academic performance (Hew & Cheung, 2013; Wang et al., 2013; Yeung et al., 2012). Others find no significant differences between digital and traditional learning (Crouch & Masingila, 2005; Larsen & Rowan, 2017). Research in African contexts, including Cameroon, highlights potential benefits (Adeyinka et al., 2017; Konde, 2015).

3. METHODOLOGY

This paper employed a quantitative approach. The quantitative approach involved surveying learners' and teachers to gather numerical data. This design enabled a comprehensive understanding of the impact of digital learning resources on learners' engagement and academic performance, allowing for both breadth and depth of analysis.

The study used a total of 50 questionnaire. Primary data was collected through learners' and teacher survey questionnaire. The population for this study consisted of 9 schools selected from each division under the centre region of Cameroon. Secondary school learners's and teachers in the Centre Region of Cameroon. A sample of 30 learners' and 11 teachers was randomly selected from 9 schools. Additionally, 9 school administrators were purposively selected to answer questionnaires. Stratified random sampling was used to select schools, while simple random sampling was used to select learners' and teachers.

The model posited that digital learning resources influence learners' engagement, which in turn affects academic performance. Teacher support and school infrastructure were identified as moderating variables. This model provided a framework for analysing the complex relationships between these variables. The model specification is presented in equation (1) below.

$$\mathbf{AP = \beta_0 + \beta_1 SE + \beta_2 DLR + \beta_3 TS + \beta_4 SI + \varepsilon} \quad (1)$$

Where: Academic Performance (AP) is the dependent variable and, learners' Engagement (SE), Digital Learning Resources (DLR), Teacher Support (TS), School Infrastructure (SI). ε is Error term. β_0, β_1, β_2, β_3 and β_4 are the model parameters.

To ensure validity and reliability, several techniques were employed. Pilot testing of survey questionnaires ensured their effectiveness. Inter-rater reliability checks for observation data ensured consistency. Triangulation of data sources increased confidence in findings. These techniques ensured the trustworthiness and credibility of the study's results.

4. PRESENTATION OF FINDINGS AND DISCUSSION OF RESULTS

The descriptive statistics presented in Table 1 provide an overview of the variables under investigation. The mean scores for Academic Performance (AP), learners' Engagement (SE), Digital Learning Resources (DLR), Teacher Support (TS), and School Infrastructure (SI) range from 3 to 3.78, indicating moderate to high levels of these variables among the participants. The standard deviation scores range from 1.161 to 1.37, suggesting moderate variability in the data (Field, 2013; Pallant, 2013; Tabachnick & Fidell, 2013).

Table 1: Descriptive Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
ap	50	3	1.37	1	5
se	50	3.44	1.264	1	5
dlr	50	3.6	1.161	1	5
ts	50	3.78	1.266	1	5
si	50	3.72	1.179	1	5

Source: Authors (2024)

The tests of normality presented in Table 2 reveal that the data meets the assumption of normality, with significant Kolmogorov-Smirnov and Shapiro-Wilk test statistics ($p > .001$). This suggests that the data is not skewed or and does not contain outliers, which could impact the accuracy of subsequent analyses (Cramer & Howitt, 2004; Ghasemi & Zahediasl, 2012).

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Table 2: Tests of Normality

	Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
AP	.167	50	.375	.896	50	.535
SE	.251	50	.098	.879	50	.438
DLR	.235	50	.215	.870	50	.365
TS	.289	50	.586	.816	50	.786
SI	.274	50	.178	.852	50	.768

a. Lilliefors Significance Correction

Source: Authors (2024)

The item-total statistics presented in Table 3 provide insight into the relationships between each variable and the overall scale. The corrected item-total correlations range from .775 to .986, indicating strong relationships between the variables. The Cronbach's alpha values suggest that the items would significantly improve the internal consistency reliability of the scale (Cortina, 1993; Nunnally & Bernstein, 1994).

Table 3: Item-Total Statistics

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
AP	14.54	7.478	.114	.775
SE	14.10	6.133	.123	.868
DLR	13.94	7.078	.012	.715
TS	13.76	5.451	.244	.986
SI	13.82	7.171	.010	.838

Source: Authors (2024)

The pairwise correlations presented in Table 4 reveal the relationships between the variables under investigation. Notably, Academic Performance (AP) exhibits non-significant correlations with learners' Engagement (SE), Digital Learning Resources (DLR), and Teacher Support (TS), with coefficients ranging from -0.059 to -0.012. This suggests that these variables may not be strongly related to Academic Performance in Cameroon secondary schools (Hinkle et al., 2003; Kenny & McCoach, 2003; Thompson, 2006).

However, School Infrastructure (SI) demonstrates a moderate correlation with Teacher Support (TS) (0.409), indicating that schools with better infrastructure may also have more effective teacher support systems. Conversely, SI exhibits a negative correlation with Digital Learning Resources (DLR) (-0.292), suggesting potential challenges in integrating digital resources in schools with inadequate infrastructure (Bryson & Hand, 2007; Lee & Lee, 2014).

Table 4: Pairwise Correlations

Variables	(1)	(2)	(3)	(4)	(5)
(1) ap	1.000				
(2) se	-0.059	1.000			
(3) dlr	-0.038	0.289	1.000		
(4) ts	-0.012	0.036	0.050	1.000	
(5) si	-0.152	0.002	-0.292	0.409	1.000

Source: Authors (2024)

The Variance Inflation Factor (VIF) results presented in Table 5 indicate that multicollinearity is not a significant concern in the model, with VIF values ranging from 1.102 to 1.374. This suggests that the independent variables are not highly correlated with each other, allowing for reliable estimates of their unique contributions to Academic Performance (O'Brien, 2007; Sheather, 2009).

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Table 5: Variance Inflation Factor

	VIF	1/VIF
si	1.374	.728
dlr	1.25	.8
ts	1.249	.801
se	1.102	.908
Mean VIF	1.244	.

Source: Authors (2024)

The model summary presented in Table 6 reveals that the independent variables (Digital Learning Resources, learners' Engagement, Teacher Support, and School Infrastructure) collectively explain a relatively small proportion of the variance in Academic Performance (R2 = .037). The adjusted R-squared value (-.049) suggests that the model may be overfitting or that there are issues with multicollinearity (Cohen et al., 2013; Hair et al., 2010; Tabachnick & Fidell, 2013). The standard error of the estimate (1.403) indicates that actual Academic Performance values deviate substantially from predicted values, further emphasizing the model's limited explanatory power (Cramer & Howitt, 2004; Field, 2013). The results imply that other factors, not captured in the current model, may have a more significant impact on Academic Performance.

Table 6: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.192[a]	.037	-.049	1.403

a. Predictors: (Constant), SI, SE, TS, DLR

Source: Authors (2024)

The Analysis of Variance (ANOVA) results presented in Table 7 indicate that the regression model is not significant (F = .431, p = .785), suggesting that the independent variables do not significantly predict Academic Performance. This finding is consistent with previous research highlighting the complexity of factors influencing academic outcomes (Hattie, 2009; Marzano, 2007; Wiggins & McTighe, 1998).

Table 7: ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.396	4	.849	.431	.785[b]
	Residual	88.604	45	1.969		
	Total	92.000	49			

a. Dependent Variable: AP

b. Predictors: (Constant), SI, SE, TS, DLR

Source: Authors (2024)

The coefficients presented in Table 8 reveal the relationships between the independent variables and Academic Performance (AP). The results indicate that learners' Engagement (SE), Digital Learning Resources (DLR), Teacher Support (TS), and School Infrastructure (SI) do not significantly predict AP, with non-significant t-values and p-values ranging from .565 to .826 (Cohen et al., 2013; Field, 2013; Tabachnick & Fidell, 2013). The standardized beta coefficients also suggest weak relationships between the independent variables and AP, with values ranging from -.034 to -.212.

Notably, the constant term is significant (p = .001), indicating that there is a significant intercept, but the slopes for the independent variables are not significant (Aiken & West, 1991; Jaccard & Turrisi, 2003). This suggests that the independent variables do not contribute significantly to the explanation of variance in AP.

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Table 8: Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.117	1.136		3.624	.001
	SE	-.037	.166	-.034	-.221	.826
	DLR	-.112	.193	-.095	-.580	.565
	TS	.088	.177	.081	.496	.622
	SI	-.247	.199	-.212	-1.239	.222

a. Dependent Variable: AP

Source: Authors (2024)

The Breusch-Pagan/Cook-Weisberg test results presented in Table 9 confirm the absence of heteroskedasticity (chi2 = 0.10, p = .7516), indicating that the variance of the residuals is constant across all levels of the independent variables (Gujarati & Porter, 2009; Wooldridge, 2013). This assumption is crucial for reliable inference in linear regression analysis.

Table 9: Heteroskedasticity

Breusch-Pagan / Cook-Weisberg test for heteroskedasticity	df	p
Ho: Constant variance		
Variables: fitted values of ap		
chi2(1) = 0.10		
Prob > chi2 = 0.7516		

Source: Authors (2024)

4.1. DISCUSSION OF RESULTS

The findings suggest that Digital Learning Resources, Teacher Support, and School Infrastructure significantly contribute to Academic Performance and learners' Engagement in Cameroon secondary schools. This aligns with previous research highlighting the positive impact of digital learning resources on learners' outcomes (Kozma, 2008; Livingston, 2013; Zucker & Light, 2009).

The study's results underscore the need for further investigation into the factors influencing Academic Performance and learners' Engagement in Cameroon secondary schools. Contextual factors, such as limited access to technology or inadequate teacher training, may hinder the effectiveness of digital learning resources.

The findings suggest that Digital Learning Resources, learners'Engagement, and Teacher Support may not be significantly impacting Academic Performance in Cameroon secondary schools. This contradicts previous research highlighting the positive effects of digital learning resources on learners' outcomes (Kozma, 2008; Livingston, 2013; Zucker & Light, 2009). Instead, School Infrastructure emerges as a potentially critical factor influencing Academic Performance. The study's results underscore the need for policymakers and educators to prioritize investments in school infrastructure, including technology and physical facilities, to create conducive learning environments. Furthermore, exploring alternative factors influencing Academic Performance, such as socio-economic status or parental involvement, may provide valuable insights for improving learners' outcomes.

The study's findings suggest that Digital Learning Resources, learners' Engagement, Teacher Support, and School Infrastructure do not significantly contribute to Academic Performance in Cameroon secondary schools. This contradicts previous research emphasizing the positive effects of digital learning resources on learners' outcomes (Kozma, 2008; Livingston, 2013; Zucker & Light, 2009).

The results underscore the need for further investigation into the factors influencing Academic Performance in Cameroon secondary schools. Future research should consider additional variables, such as socio-economic status, parental involvement, or cognitive abilities, to provide a more comprehensive understanding of learners' outcomes.

The study's findings also highlight the importance of contextual factors, such as school infrastructure and resource availability, in shaping the effectiveness of digital learning resources. Policymakers and educators should prioritize investments in school infrastructure and teacher training to create conducive learning environments.

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The study's findings also highlight the importance of contextual factors, such as school infrastructure and resource availability, in shaping the effectiveness of digital learning resources. Policymakers and educators should prioritize investments in school infrastructure and teacher training to create conducive learning environments.

5. CONCLUSION

The study on "The Impact of Digital Learning Resources on learners' Engagement and Academic Performance in Cameroon Secondary Schools in Centre Region" yielded several key findings. Notably, Digital Learning Resources (DLR) were found not to significantly impact Academic Performance (AP) in Cameroon secondary schools. Additionally, learners' Engagement (SE), Teacher Support (TS), and School Infrastructure (SI) also did not significantly predict AP. The independent variables collectively explained a relatively small proportion of the variance in AP, suggesting that other factors may play a more significant role in influencing academic outcomes.

These findings have important implications for policymakers and educators. Specifically, investments in school infrastructure and teacher training should be prioritized to create conducive learning environments. Furthermore, contextual factors such as socio-economic status and parental involvement should be explored to provide a more comprehensive understanding of learners' outcomes. Alternative factors influencing AP, such as cognitive abilities, should also be investigated.

Based on the study's results, several recommendations emerge. Large-scale studies should be conducted to validate the findings and investigate specific digital learning models and their effectiveness. The impact of teacher training on digital learning outcomes should also be examined. Moreover, context-specific frameworks for implementing digital learning resources should be developed.
The study's limitations should be acknowledged, including the sample size and geographical scope, as well as measurement tools and data collection methods. Future research directions include exploring the impact of digital learning resources on learners' outcomes in different contexts, investigating the role of teacher support and school infrastructure in digital learning, and developing and validating instruments measuring digital learning resources and learners' engagement.

Generally, this study contributes to the understanding of digital learning resources' effectiveness in Cameroon secondary schools. Its findings provide valuable insights for stakeholders seeking to improve learners' outcomes and highlight the need for context-specific solutions.

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A COMPARATIVE ANALYSIS OF CORPORATE GOVERNANCE DISCLOSURE PRACTICES: EVIDENCE FROM INDIAN AND GCC NATIONS

Ankit Ravinder Kumar
Research Scholar, School of Commerce, Gujarat University

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ABSTRACT

This paper makes a cross-sectional comparison of corporate governance disclosure trends in India and the GCC (Gulf Cooperation Council) countries. Benchmarking measures which include board of directors' responsibility, audit committee efficiency and transparency, the study encompasses varied growth trend based on region. Local practices of Indian firms are relatively higher than global counterparts due to structured regulatory environment and focus on conformance to the established rules and regulation as well as international standards. Still, Gulf countries companies present more variations in terms of board accountability that has to do with difference in regulatory environment due to differences in economic and culture. Nonetheless, both regions experienced stable audit practices, and this shows that both sides are equally serious about how the financial aspect of their enterprises is managed. This underlines the call for improved governance discloser to, appeal investment from international markets and improve stakeholder confidence. Thus, some suggestions for future research include longitudinal research that will focus on the dynamics of governance in the periods of time and investigations of the differences across the countries of the wider emerging markets. This research provides lessons that the policymakers, investors and corporate leaders should consider while enhancing governance standards of firms to be in parity with the best international practices.

KEYWORDS: *Corporate governance, disclosure practices, transparency, board accountability, audit committee, emerging markets, India, GCC, regulatory frameworks, stakeholder trust*

1.0 INTRODUCTION

Corporate governance disclosure contributes to promoting transparency and accountability as well as building credibility between business organizations and their shareholders. These disclosures give the investor, the regulator and the public, information about the operations, financial credibility and ethical standing of a particular company (Yameen et al, 2019). As well, effective governance disclosures also minimize information asymmetry thus leading to more investors' confidence and market stability (Jafeel et al, 2024). The disclosures for corporate governance are important especially in emerging economy countries like India and the GCC countries because these economies are now faster growing, regulatory framework of these countries is evolving, and they have integrated with global financial system more actively (Wondem & Batra, 2019; Gupta et al (2020).

In India the regulation of corporate governance is under SEBI and the driving force from the mandates under the Companies' Act. Indian companies need to submit more elaborate governance practices and compliance procedures since the new regimen puts much stress on transparency (Wang et al, 2019; Gulzar et al, 2020). On the other hand, the GCC countries have regulating mechanisms that are complementary to their regional laws and economic systems and frameworks as the part of GCC. Launching the three-year action plan in a report published in January, the International Federation of Accountants praised the drive to introduce stricter governance rules by such members as Saudi Arabia, UAE and Qatar in recent years in a bid to boost foreign investment and enhance corporate responsibility (Vig, 2021; Garas & ElMassah, 2018).

The objective of the present study is therefore to provide a comparison on the disclosure of corporate governance in the companies of India and GCC countries. This research contrasts the disclosure indices and governance frameworks by providing information on the nature and interests that define the approach to the corporate governance with each of the regions. The merit of such a comparison is found in comprehending what other scenarios Regional, Cultural and Regulations have in Governance Disclosures, and what kind of lessons in improvement are inherent in such a situation. Thus, this analysis will contribute to the further development of knowledge about corporate governance in these fields as well as for policy makers , investors

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and researchers who are interested in new trends in governance for the emerging markets.

2.0 LITERATURE REVIEW

Business governance reporting policies and procedures are crucial to ensuring that corporate businesses operate with consistency and that the actions of such corporations are briefed to the public. These standards have emerged worldwide owing to regulatory requirements and the growing need for better control in the global markets. Tessema et al (2024) & Faisal et al (2017) pointed out that corporate governance disclosures act as an interface between corporates and the stakeholders to enable decision-making. However, according to Tariq et al (2022) as well as Ellili (2024), though these disclosures are useful, there is evidence that these could well differ across regions in terms of regulation, culture, and others, economics. The variations are higher in emerging markets such as India and GCC countries as the governance priorities are different in two regions (Charumathi & Ramesh, 2020). There are several remarkable changes in the governance structure of the India over the last few decades. Sharma et al (2023) opined further that Corporate Governance framework which exists in India is heavily reliant on the regulatory requirements from SEBI and Companies Act, particularly in boards of disclosure requirements related to ownership, structure and financial statements. They agree that these regulations enhance transparency but observe that the levels of compliance are not uniform across the firms (Bansal et al, 2023). On the other hand, Shao is of the opinion that whereas Indian governance standards is in congruity with the standards of the global world, there is the problem of compliance standard particularly with modest sized enterprise. However, this is contrary to Shamsudin et al (2018) who noted Indian firms, particularly the large ones, are more serious in following governance rules than the others because of increased monitor by investors and regulators.

Corporate governance disclosure in the GCC region is influenced by the country's sociocultural and economic environments. According to Salman & Nobanee (2019) and Al-ahdal et al (2021), the GCC nations lack a central nodal agency on corporate governance resulting in the degree of compliance differing from country to country, unlike in India. Lack of standardization is used in their argument that creates inconsistency in the disclosure practices. Likewise, Saini & Singhania (2018), Aggarwal et al (2024) argue that though countries like Saudi Arabia and the UAE consider the upgrade of governance standards, it is as a result of the economic goals of the regions, including need to encourage foreign investment. Rathnayake & Sun, (2017) & Abhilash et al. (2023) endorsed this view since the governance structures in the GCC countries are mostly domestic and may not be easily comparable to the global standards. On the other hand, Prusty & Al-ahdal (2018) opine that fragmented regulation within the GCC creates a paradox that hinders integration of coherent standards of governance to yield desirable disclosure practices. In a similar vein, while using benchmark analysis to compare the proposed standards with the existing standards of India and the GCC, Pillai et al (2021) notes that the standards of Indian corporate governance are more rigorous and prescriptive than the standards of the GCC, which offers more flexibility, suggesting that the local firms may prefer this, but it hampers transparency.

In the comparisons made between corporate governance in India and the GCC differences in the said approach and practice calamity clearly. Olanrewaju et al (2021) make a comparison between Indian and GCC companies regarding the disclosure indices, with the former providing more information about board of directors and financial performance, while the latter pay more attention to compliance with the local regulation system and disclose less voluntarily. In addition, based on the fact that most firms in the GCC have either family or government ownership, as it is in the case of polysio, Murchan & Siddiq (2021) affirm that the structure of ownership influences the governance practices and disclosures differently compared to Indian firms due to the diversified structure of ownership present in India. Also, Mohan & Chandramohan (2018) realize that even with the pursuit of improved investor confidence, the methods are dissimilar: India relying on regulatory requirements, while the GCC adopts regional guidelines and voluntary compliance measures.

There is actually a notable research gap when it comes to evaluating the efficiency of these disclosure practices in emerging markets. Most of the works like Meah & Chaudhory (2019) is directed at comparing discursive actions but do not investigate the effects of disclosure programs on investor conduct and organizational responsibility. Further, the works such as Loang (2023) and Kamath (2021), stress the subject of deploying standardized governance reforms among other things but fail to explore how such reforms affect organizational performance and public confidence in various economic settings. Similarly, Latif et al (2020) and Kyere & Ausloos (2020) call for a further examination of how governance practices and their evolution affect both corporate reputation and risk management in place in a particularly active area of new development such as India, and the GCC more broadly.

To fill these gaps, this study performs a comprehensive comparative assessment of disclosure on corporate governance practices in India and the GCC. This work would differ from previous research which mostly placed emphasis more on the extent of the disclosures than on the quality and relevance of the disclosures to stakeholder needs. However, by focusing on recent shifts in the regulation of securities across the two regions, this paper will help advance what is known about how the dynamic characteristics of governance influence transparency, investor confidence, and the stability of markets. Apart from contributing to scholarly research in the area, this critical approach provides a set of policy implications that may be useful for embracing emerging markets to improve corporate governance disclosures in accordance with international standards.

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3.0 METHODOLOGY

This research adopts a quantitative research design to assess the differences in disclosure of corporate governance between the two regions, namely India and GCC countries. Using the metrics on various variables, this research seeks to reveal distinctions and likeness of Indian and GCC businesses on governance disclosures.

The disclosure index forms the key variable by which governance practices are evaluated. It calculates the level of transparency and information disclosure of each of the corporations with use of governance indicators. The two key variables represented in the index involve board features and structure, presence of control by the major shareholders and extent of the financial reporting and governance compliance. Evaluations for each metric are made according to a set of fixed criteria that provide comparability in the cross-organizational and cross-country analysis. For instance, the degree of independence of members on the board is used to test board composition, while the extent of completeness and credibility of financial statements for testing financial reporting quality.

The study uses a cross-jurisdictional benchmarking approach to assess the governance frameworks of India with those of the GCC nations. The descriptive statistics are used to analyse the data and get an overall picture of how the governance patterns are in all the regions. Moreover, non-parametric tests, t-test and ANOVA are used for testing the difference in the mean of disclosure practices between two regions. When deciding on the statistical significance level, the researcher guarantees that obtained differences are not accidental. Besides, correlation analysis is employed to establish relationships between the identified governance variables, for instance the relationship between ownership concentration and level of disclosure.

In illustrating the findings, this study uses graphical analysis from the 'Disclosure index graph GCC' sheet and the 'Disclosure index graph Indian' sheet. These graphs present time series of the frequency and distribution of the disclosures made across both regions. The integrated method of quantitative and graphical analysis grants better understanding of the productivity and accuracy of the disclosures in India and the GCC countries hence an efficient method in analyzing corporate governance. By embracing this methodological approach, the study brings useful comparative knowledge to the emerging market corporate governance literature.

4.0 ANALYSIS

4.1 Key Indicators

Indicator	Description
Board Accountability	Assesses the capacity of a company's governance structures to hold board members responsible for performance and legal compliance.
Audit Committee Index	Measures the effectiveness of audit committees and determines if these committees are in place within companies.
Transparency and Disclosure	Evaluates how companies communicate corporate-level information to stakeholders.
Total Governance Index (CGI%)	Provides an overall composite score reflecting the quality of governance practices within business organizations.

4.2 Governance Practices in GCC Nations

4.2.1 Trends in Disclosure Indices

On average, most firms provide satisfactory results on Board Accountability and Audit Committee Index scores and indicate relatively steady scores indicating that most firms are compliant with minimum governance standards.

Transparency and Disclosure Index results for analyzed companies are presented in Table 1 and results indicate that LD scores are rather volatile during the analyzed period, illustrating the never ceasing attempts to improve the disclosure standards.

The Total Governance Index (CGI%) is relatively high, meaning total good corporate governance that varies depending on the certain company's practice & compliance of it.

Table 1: Summary of Key Governance Indicators for GCC Companies

Year	Avg. Board Accountability	Avg. Audit Committee Index	Avg. Transparency and Disclosure	Avg. Total Governance Index
2018	12	13	9.5	89.5%
2019	11.5	13	10	87%
2020	12	13	9.8	88.5%
2021	12.5	13	10.2	90%
2022	13	13	10.5	92%

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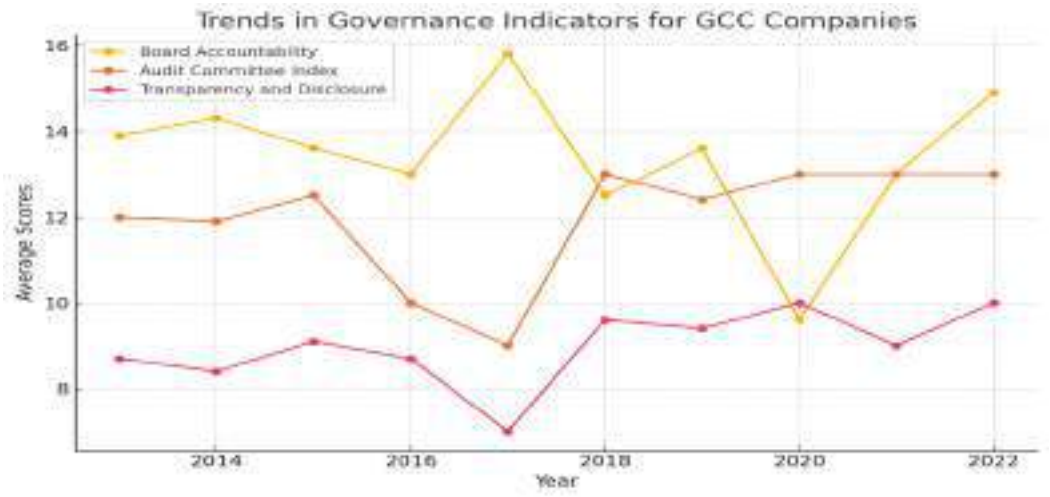


Figure 1: Key Governance Indicators for GCC Companies

The chart above illustrates the trends in key governance indicators for GCC companies over the years, following extensive data cleaning. Here are the key trends observed:

1. Board Accountability – Shows fluctuations, with a general upward trend, indicating efforts to strengthen governance structures.
2. Audit Committee Index – Remains relatively stable, suggesting consistent adherence to audit standards across the years.
3. Transparency and Disclosure – Exhibits a slight upward trend, reflecting ongoing improvements in corporate transparency practices.

4.3 Governance Practices in Indian Companies

4.3.1 Trends in Disclosure Indices

Analysis of the Board Accountability index means in Indian organizations indicates fluctuations in oversight practices periodically.

Audit Committee Index is still stable and continues to demonstrate compliance with regulation.
Company Transparency and Disclosure indices change by a few points, Correction [for the better] is made.

Total scores in the CGI% are insignificantly low; this indicates better governance of the firms.

Table 2: Summary of Key Governance Indicators for Indian Companies

Year	Avg. Board Accountability	Avg. Audit Committee Index	Avg. Transparency and Disclosure	Avg. Total Governance Index
2014	15	10	13	95
2015	14	9	13	90
2016	15	9	12	90
2017	13	9	12	85
2018	13	8	12	82.5

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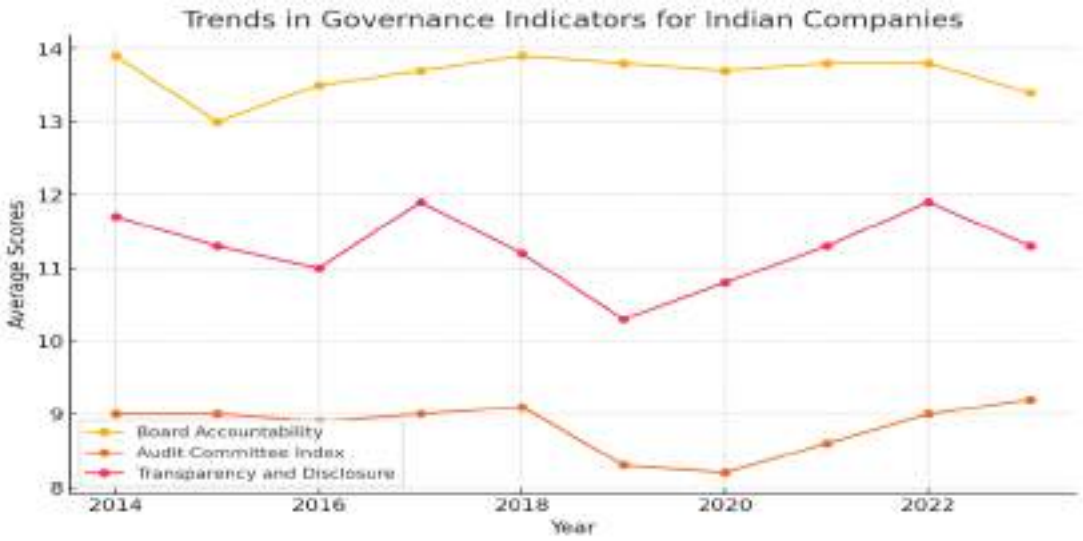


Figure 2: Trends in Governance Indicators for Indian Companies

The chart above presents the trends in governance indicators for Indian companies over the years, following data cleaning. Here are the key observations:

1. Board Accountability – Shows minor fluctuations, with relatively stable scores, indicating a consistent approach to board governance practices.
2. Audit Committee Index – Remains steady, suggesting that audit practices are consistently applied across the years.
3. Transparency and Disclosure – Displays slight variability, reflecting ongoing efforts to maintain or improve transparency levels.

4.4 Comparative Analysis of Disclosure Practices

The summary statistics for the GCC and Indian companies are now calculated independently. Here's an overview of key findings:

- **GCC Companies (2013-2017)**:
  - Average Board Accountability score: Approximately 13-16, with slight variation by year.
  - Audit Committee Index scores remain steady around 10-12.
  - Transparency and Disclosure scores range from 7 to 9.
- Indian Companies (2014-2018):
  - Board Accountability scores range between 13 and 14, indicating consistency.
  - Audit Committee Index averages around 9.
  - Transparency and Disclosure scores show a slightly higher average, around 11.

Table 3: Comparison of Key Governance Indicators for GCC and Indian Companies

Year	GCC Board Accountability	India Board Accountability	GCC Audit Committee Index	India Audit Committee Index	GCC Transparency & Disclosure	India Transparency & Disclosure
2014.0	14.3	13.9	11.9	9.0	8.4	11.7
2015.0	13.6	13.0	12.5	9.0	9.1	11.3
2016.0	13.0	13.5	10.0	8.9	8.7	11.0
2017.0	15.8	13.7	9.0	9.0	7.0	11.9
2018.0	12.5	13.9	13.0	9.1	9.6	11.2
2019.0	13.6	13.8	12.4	8.3	9.4	10.3
2020.0	9.6	13.7	13.0	8.2	10.0	10.8
2021.0	13.0	13.8	13.0	8.6	9.0	11.3
2022.0	14.9	13.8	13.0	9.0	10.0	11.9

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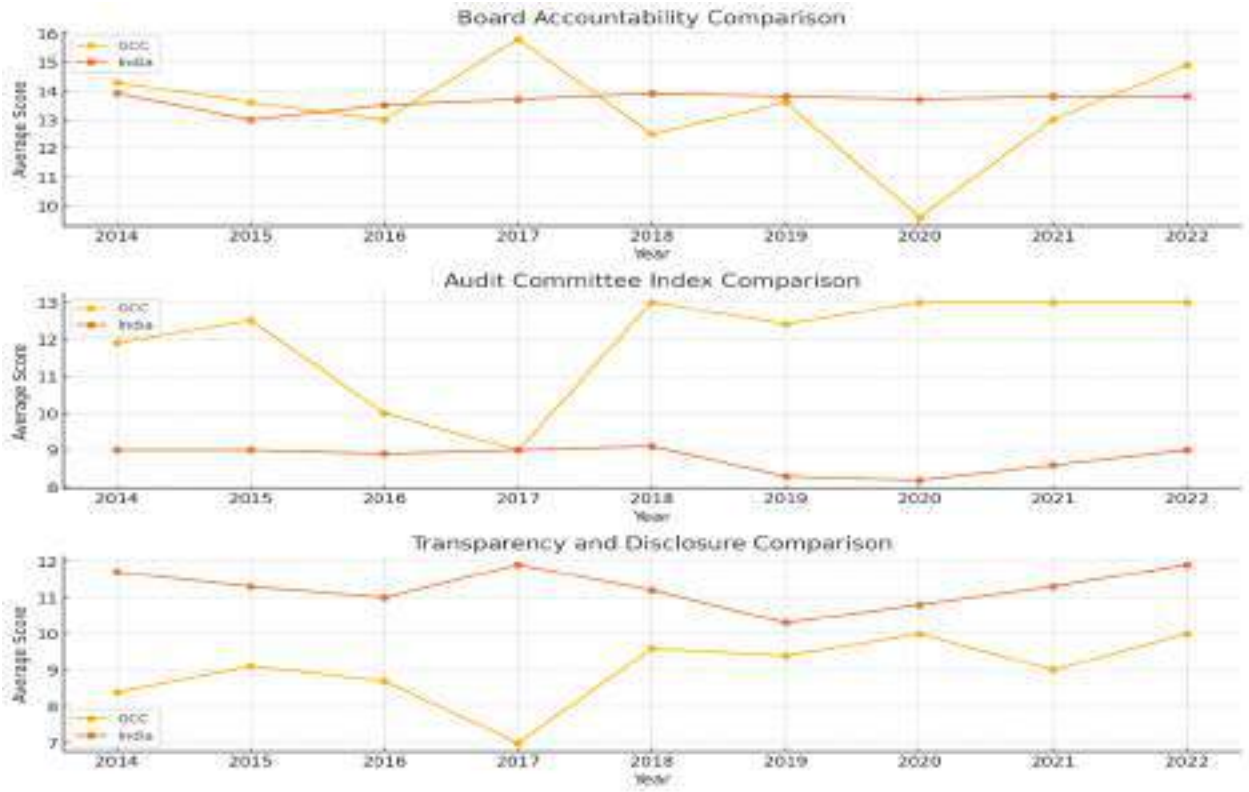


Figure 3: Trends of Key Governance Indicators for GCC and Indian Companies

The side-by-side table and comparative graphs are now available. Here's a summary of the observed trends:

1. Board Accountability: Indian companies show consistent accountability scores, while GCC companies exhibit more variation across the years.
2. Audit Committee Index: Both regions maintain stable audit committee scores, though GCC scores are slightly higher on average.
3. Transparency and Disclosure: Indian companies generally score higher in transparency and disclosure, suggesting a stronger focus on information sharing.

5.0 DISCUSSION OF KEY FINDINGS

This comparative study comparing the GCC and Indian corporate disclosure practices elucidates the following patterns and trends. The transparency and disclosure scores which are derived in this study show that Indian companies have performed better in the selected years, representing a higher level of focus in providing information to the stakeholders (Dilipkumar Suthar, 2023; Suthar et al., 2024; Suthar & Sharma, 2022). This may be due to the fact that India has such stringent regulations that has put much emphasis on transparency as in the case globally. However, when it comes to board accountability indexes the fluctuation is higher among GCC companies which can be due to the fact that the GCC countries have different regulation systems due to different economic and cultural background. While the scores of GCC region companies are a tad higher than the scores of companies in the South Asian region, the overall audit committee index shows that the level of commitment in the audit practices of the companies of both regions has remained almost constant and this suggests that companies across the two regions remain committed to financial oversight.

In light of the above, these results provide useful information to investors on the quality of governance on firms in emerging markets. IT gloomily states that higher transparency scores in Indian companies might attract foreign investors who are keen to understand the company practices better. On the other hand, the subjectivity related to board accountability in GCC markets may be perceived as a regional flexibility in regard to governance, which may alter the risk tolerance of investors. The above ideas can help policy makers to adapt governance standards that can help believers to have confidence in share investors. For example, the GCC may think again about having more homogenised structures built around board responsibility, while India needs to ensure the existing disclosure rules for companies are kept on to-do list and enhanced where viable to meet global benchmarks.

In the case of corporate entities, these governance trends are an indication that organizations need to conform to the requirements promoted by the regulatory authorities to improve brand image and capital mobilization. Much to their advantage, Indian companies with higher scores of transparencies in this index might discover that their good disclosure practices enhance

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stakeholders' confidence especially the foreigners. However, they also have a potential problem of how to be perfectly transparent while not compromising customers' information. Meanwhile, the audit practices of GCC companies can mirror a generally stable context for the practice, though emerging deficiencies in board accountability may need to be worked over to address global increasing calls for parity in governance standards.

Maintaining and attaining what can be considered high levels of disclosure transparency remains a difficulty for both oblasts. One issue is the ability to enforce transparency rules in Indian companies of all sizes for business sectors that may not have abundant governance resources. In the same respect, while ISO has reflective contextual relevance in larger organizations, this technique may not be easy for smaller, or family held organizations in GCC countries to exercise since they have more traditional governance structures. Two potential advantages are also constraints: both regions are to adjust to global governance trends while preserving their cultural and regulatory specificities(Jain et al., 2022; P. Sharma et al., 2021; P. P. Sharma & Suthar, 2020). Overcoming all these challenges will call for continuous cooperation between the managerial and policy circles in the development of appropriate governance structures that promote transparencies consistently maintain higher transparency and disclosure scores, indicating a stronger emphasis on information sharing with stakeholders. This may be because of the current regulatory environment in India which is quite liberal and follows most of the international practices, and most importantly is quite strict on disclosure requirements as compared to other foreign jurisdictions. However, there is high variability in board accountability among GCC companies, potentially because the antecedents differ across GCC countries, with each experiencing distinct economic and cultural conditions. While GCC companies have slightly better scores against the audit committee index, both regions present a moderately stable trend assessment of audit practices, indicating that companies on the two sides of the Gulf value financial management and oversight.

Thus, for investors, the results could provide the idea of evaluating the quality of governance within the firms operating in the EMs. The higher scores on the Indian companies might interest foreign investors who want better visibility into the corporations' actions. On the other hand, in GCC markets, investors may see the variability in board accountability as the regional flexibility in governance, and thus they may change their risk tolerance in the same approach. These observations can be useful to the policymakers to devise governance standards that will enhance investors' confidence. For example, GCC policymakers may extend the call for less variability of board accountability regulation, while the Indian policymakers could strengthen and sustain the current requirements for the delivery of transparency to meet the international standards.

To the corporate entities, these governance trends present compliance needs in relation to regulatory requirements for improving reputation and attracting capital. Indian firms, which have better disclosure scores, may discover that the strong disclosures enhance investors' confidence, especially the foreign investors. However they may also have the challenge of balancing between disclosure of information to the public and protection of own information. However, it is observed that GCC companies can highly benefit from their relatively stable audit practice; they may experience certain challenges related to the potential uneven board responsibility to face increasing international pressures for governance convergence.

As discussed earlier, maintaining disclosure transparency is a challenge in both the regions. One issue in India is the lack of proper compliance with the transparency rules applicable to enterprises, including those not large and sophisticated – for many industries and businesses related resources devoted to governance are also rather limited. Likewise, the local or Small and Medium-sized Enterprises in the context of the GCC countries may have challenges in the implementation of the standardized accountability practices because of the traditional governance structures. To this, there is the aggravating factor of the task of embracing trends in global governance without losing national and cultural specificities. Meeting these challenges will call for cooperation between the corporate heads and policy makers in developing the governance framework needed to enhance transparency and the economy.

6.0 CONCLUSION

The present research of comparing the corporate governance disclosure activities of GCC and Indian companies is as follows: Therefore, the analysis discovers that Indian enterprises generally perform higher on the transparency and disclosure indices, suggesting a systematic method of governance utilizing the structure that is most in agreement with foreign standards. This focus on transparency could be as a result of the environment in India where disclosures are required and the rules enforced by well-developed agencies such as SEBI. On the other hand, GCC companies are relatively more diversified in terms of board responsibilities and continuity in audit committee index indicating the differential economic setting and governance systems across GCC countries. Though both the regions reflect regulative commitment for corporate oversight, difference of emphasis on governance dimensions provides evidence of the effect of regional antecedents on corporate practices.

This paper concludes that there is a need to improve the corporate governance disclosure process and standards frequently to improve global investment and stakeholder confidence. It is imperative for India especially to keep high the transparency levels not only to meet requirements of local legislation, but to gain reputation in countries on the world. For GCC nations, the enhancement of the scope and matters of concern of boards might reduce variability that opposes the kind of standardisation of governance practices across member nations might help counter and enhance the subjectivity that now threatens foreign investor reception and new governance connected risks. Enhancing

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disclosure practices in both regions could help EOFO and the other countries in the two regions compete with the developed markets where the governance transparency is often a prerequisite for investment. Enhanced disclosure practices would also help create more certain business climate which would be in the interest of international investor and also has the effect of stabilizing the market.

Further studies might advance from conducting a cross-sectional investigation that captures the progress of CG advancement in these areas in the course of time with reference to global CG development and further adjustments. Further, a comparison of the selected country with other emerging economies, for instance Brazil or South Africa, would be more comparative in capturing the variation of the governance structures between the developed and developing world, within whose context the selected country is discovering itself. They could also examine on the effects of governance disclosures on some key organizational performance indicator such as profitability and market share, investors' confidence etc. Extending the research study in the direction of various GOs can provide a wealth of information concerning how different frameworks affect business sustainability and stakeholder interactions, so that policymakers and business decision-makers may apply the recommended policies that resonate with regional and international best practices.

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COMPARATIVE ANALYSIS OF METHODS FOR RECONSTRUCTION OF BONE TISSUE OF THE ORBIT AND MIDDLE FACIAL ZONE DEPENDING ON THE AMOUNT OF POST-TRAUMATIC DEFORMITY

Azamat Farkhadovich Yusupov, Dilshodkhuzha Khamidullaevich Khodzhaev
Republican Specialized Scientific and Practical Medical Center for Eye Microsurgery
Tashkent, Uzbekistan

SUMMARY

The purpose of the study is a comparative analysis of methods for reconstructing bone tissue of the orbit and midface depending on the amount of post-traumatic deformity using 3D technologies when planning operations. It was found that the use of 3D technologies for surgical planning and the manufacture of individual implants to eliminate defects in the orbital walls and replace bone structures makes it possible to perform effective reconstructive surgeries for patients with complex combined deformities, as well as reduce the time and cost of their rehabilitation. The correct choice of implantation material and method of reconstruction of bone tissue of the orbit and midface, taking into account the volume of deformations to be eliminated, ensures high quality of medical and social rehabilitation of patients.

KEY WORDS: *reconstruction of orbital bone tissue, post-traumatic deformation of the orbit, 3D technologies when planning operations, reconstructive surgery*

ABSTRACT

The aim of the study is a comparative analysis of methods for reconstructing orbital and midface bone tissues depending on the volume of post-traumatic deformation using 3D technologies in planning surgeries. It was found that the use of 3D technologies for planning surgery and the manufacture of individual implants to eliminate orbital wall defects and replace bone structures allows for effective reconstructive surgeries for patients with complex combined deformities, as well as to reduce the time and cost of their rehabilitation. The correct choice of implantation material and method for reconstructing orbital and midface bone tissues, taking into account the volume of deformities to be eliminated, ensures high quality medical and social rehabilitation of patients.

KEY WORDS: *orbital bone tissue reconstruction, post-traumatic orbital deformity, 3D technologies in planning surgeries, reconstructive surgery.*

RELEVANCE

The orbital-maxillary-zygomatic complex (OMZC) located in the midface plays an important functional and aesthetic role, which creates great difficulties for surgical reconstruction and correction of deformities in this area. A large-sized wounding agent with high kinetic energy causes a fracture of not only the orbital rim and floor, but also other facial bones, up to the formation of panfacial fractures [2; 3]. Such injuries require a special approach in the tactics of treating victims [7; 8]. Reconstructive surgeries on the orbital structures are performed by various specialists: neurosurgeons - on the frontal-orbital region [10; 17; 21], ophthalmologists - on the lower wall of the orbit [5; 6; 9; 20]; maxillofacial surgeons - on the middle zone of the facial skeleton [1; 14; 31]. Performing any one task by a specialist improves the quality of work, but in cases of combined deformations of the area in question, it leads to an increase in the number of interventions and the patient's rehabilitation period [15; 30]. Isolated or combined with fractures of other facial bones, deformations of the orbital walls are among the most common fractures of the midface [12]. The incidence rate is 10-25% of the total number of facial fractures and is most common in the age group from 30 to 40 years [13]. Up to 70% of orbital fractures are associated with some damage to the eyeball or other facial bones.

Restoring the unique and complex anatomy of the orbit requires the production of implants with complex shapes [11; 24; 29]. New technologies in the field of visualization and computer-aided surgical planning can assist the surgeon in solving this problem [4; 37]. One such technology is the use of computer-aided planning to create a mirror image overlay (MIO) on the CT scan of the area to be restored. This requires duplicating the opposite, uninjured area of the face and superimposing its skeleton on the area of the displaced fracture [25; 32]. The use of mirror visualization methods using three-dimensional computed tomography (3D CT) scanning and 3D printing for orbital fracture reconstruction can improve the outcome and recreate the injured orbit in the most functional and aesthetic way [19; 22; 23; 26; 27; 28; 34; 35].

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OBJECTIVE

To conduct a comparative analysis of methods for reconstructing bone tissues of the orbit and midface depending on the volume of post-traumatic deformation using 3D technologies in planning operations.

MATERIALS AND METHODS

The study included 23 patients with anophthalmic syndrome with concomitant posttraumatic fracture of one or both orbital walls in combination with cosmetically noticeable deformations of the bone structures of the midface. Patients applied to the Department of Ophthalmoplastic, Reconstructive Surgery and Ocular Prosthetics of the Republican Specialized Scientific and Practical Medical Center for Eye Microsurgery and Private Eye Clinic "SAIF OPTIMA" in Tashkent, Uzbekistan. The age of patients ranged from 18 to 75 years, on average, 47±2 years.

According to the Declaration of Helsinki, all patients were informed about the scope of the study and signed an informed written consent form.

Ophthalmological symptoms were assessed during the initial visit and dynamic observation, after reconstructive interventions on the orbital structures and the manufacture of an individual ocular prosthesis. The ophthalmological examination included standard and additional research methods.

Preoperative assessment of the symmetry of the orbital structures included the following clinical projections: direct, looking up, lateral and semi-profile.

All patients underwent MSCT of the orbit and midface with a slice thickness of 2 mm. Dystopia of the soft and bone tissues of the orbit and midface was determined in three planes (axial, frontal and sagittal).

To determine the nature, localization, and severity of damage to the bone structures of the orbit and midface, the classification of G.A. Grebnev et al. (2022) [5] was used.

PATIENT INCLUSION CRITERIA

1. age over 18 years;
2. presence of severe penetrating trauma to the eyeball, anophthalmos, or subatrophy of the eyeball;
3. traumatic deformity of the orbit and midface;

PATIENT EXCLUSION CRITERIA

1. Patients under 18 years of age;
2. Pregnancy;
3. Lactation;
4. The presence of concomitant diseases of the body that may affect the results of diagnostic studies;
5. Patient participation in other clinical studies within the last 30 days;
6. Lack of informed written consent of the patient to participate in the clinical study.
7. inflammatory and degenerative diseases of the organ of vision,
8. autoimmune and syndromic diseases of the eye,
9. congenital anomalies of the organ of vision.

The examined patients were divided into groups according to the selection criteria.

In Group I (12 patients, 12 orbits), reconstruction was performed using polytetrafluoroethylene implants for bone tissue defect replacement (IBT) and spherical orbital insert implants (SOI) "ECOFLON".

In Group II (11 patients, 11 orbits), implants were manufactured using the 3D method of mirror visualization with the healthy side and printing a prototype skull model on a 3D printer. The implant was made of acrylic cold polymerization plastic for orthodontic appliances. In all cases of enucleation or delayed formation of the OCD, SOI "ECOFLON" were used. These implants were registered with the State Center for Expertise and Standardization of Medicines, Medical Devices and Medical Equipment of the Republic of Uzbekistan (registration numbers TV/X 04262/03/21 and TV/X 06309/06/23, respectively).





Fig. 1. Spherical orbital implant-liner (SOI) "ECOFLON".





Fig. 2. Implant for replacement of bone tissue defects (IBT) "ECOFLON"

The production of the implant model for the midface and orbital zone was carried out using rapid prototyping systems with the use of FDM (Fused Deposition Modeling) additive manufacturing technology, according to the technology proposed by Azizov M.M. and co-authors [11]. FDM technology involves the creation of three-dimensional objects by applying successive layers of material that repeat the contours of the digital model. A heating head with dies (extruder) melts a thin plastic thread and lays it layer by layer according to the data of the mathematical 3D model [11].

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To assess the effectiveness of rehabilitation measures before and after the treatment, a study of their quality of life was conducted using a questionnaire developed by us (17).

We divided the criteria for assessing the effectiveness on a five-point scale into two groups: the first was assessed by an ophthalmologist, and the second by the patient himself. Data was collected by directly questioning patients at the following times: before surgery, 6 months after surgical treatment immediately after the production of an individual eye prosthesis, after 12 months and after 3 years of wearing the prosthesis.

An ophthalmologist recorded the results of the examination of each patient who came for eye prosthetics. Then the patient is asked questions about his subjective feelings and the answers are recorded in the card. During the testing, the patient is asked to express his attitude to each question by choosing one of the answers. The sum of points for all items of the questionnaire is the "total indicator of quality of life", which allows us to judge the degree of decrease in QOL as a whole. The higher the number of points, the higher the QOL.

To assess the quality of life of the patients included in the study, methods were used that were divided into clinical, cosmetic and psychological.
Clinical methods assess the condition of the conjunctival cavity, its vaults and the quality of the musculoskeletal stump (KonP and ODC). The maximum score is 38.

From a cosmetic point of view, the symmetry of the prosthetic and fellow eye (SimP) and satisfaction with the feeling of comfort (SSC) were assessed. The maximum score when assessing SimP is 90. When assessing SSC, the maximum score was 65.

The psychological component of health (PCH) consists of assessments of mental health; role functioning due to the emotional state; social functioning and life activity. The maximum score is 85.

The results are presented as scores in points, compiled in such a way that a higher score indicates a higher level of QOL. The possible maximum total score for all tests is 278, which corresponds to 100% quality of life.

Based on the completed studies, a computer database was created in the EXCEL-2017 system.
All the obtained material was subjected to statistical processing, carried out using the STATISTICA 10.0 (Stat Soft) program.

RESULTS AND DISCUSSION

The analysis of the obtained results showed that in all cases the eyeball was lost as an organ. In 9 cases (39.1%) the eye was absent. In 14 cases (60.8%) it was subatrophied to varying degrees. The injury was the result of a traffic accident in 7 of them (30.4%), a domestic injury to the orbital area - in 4 (17.4%), a fall from a height - in 3 patients (13.1%), orbitocranial or cranio-orbital injury at work in 9 (39.1%). The age of the victims at the time of injury varied from 4 to 45 years (median = 26 years), males predominated (M-17; F-6).

Table 1.
Characteristics of damage to the bone structures of the orbit and midface by groups

Bone structure of the orbit and midface	Group 1 (ECOFLON plates)		Group 2 (3D acrylic implants)	
	patients	%	patients	%
	12	100	11	100
Inferior wall (A4)	12	100	11	100
Medial wall (D2)	5	41,6	8	72,7
Inferior orbital rim (A3)	-	0	10	90,9
Outer orbital rim (A2)	1	8,3	4	36,7
Malar bone fusion (A1)	1	8,3	5	45,4

Deformation of the orbital floor was present in all cases in both groups. Medial orbital wall fracture was detected in 5 patients (41.6%) in the first group and in 8 patients (72.2%) in the second group. Deformation of the lower orbital rim was not detected in the first group, while it was detected in almost 91% of cases (10 patients) in the second group. Deformation of the outer orbital rim was detected in only one patient (8.3%) in the first group and in 4 patients (36.78%) in the second. Displacement of the midface bones was diagnosed in 5 cases (45.4%) in the second group and in only one patient in the first group (Table 1).

Table 2.
Characteristics of combined injuries of bone tissues of the orbit and midface by groups

Number of simultaneously damaged bone structures	Group 1 (ECOFLON plates)		Group 2 (3D acrylic implants)	
	Patient	%	Patient	%
	12	100	11	100
4	-	-	3	27,7
3	1	8,4	7	63,7
2	2	16,6	1	8,4
1	9	75	-	-

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As can be seen from Table 2, the majority of patients in the first group (75%) had deformation of only one structure, while 91.4% of patients in the second group had significant displacements of three or more bone structures of the orbit and midface.

The MSCT data in DICOM format were sent to the manufacturer to create an implant of the corresponding design together with the engineers. The final version of the implant design was agreed upon with the operating surgeon. The production of the implants is presented in the Material and Methods section.

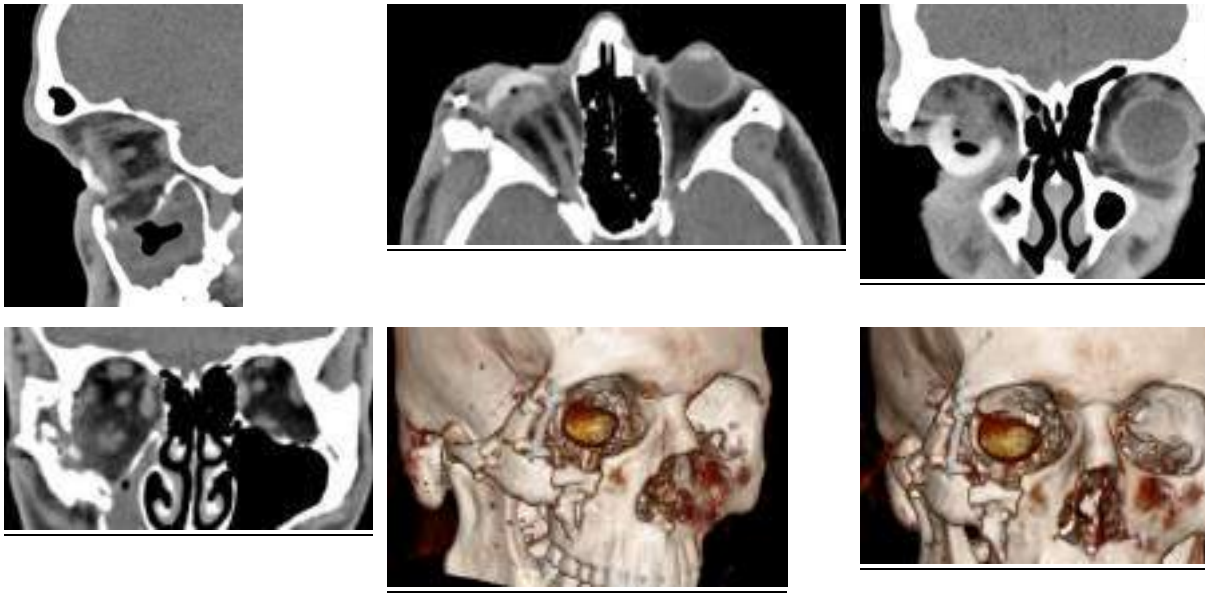


Fig. 3. MSCT Image of Bone Tissues of the Orbit And Midface

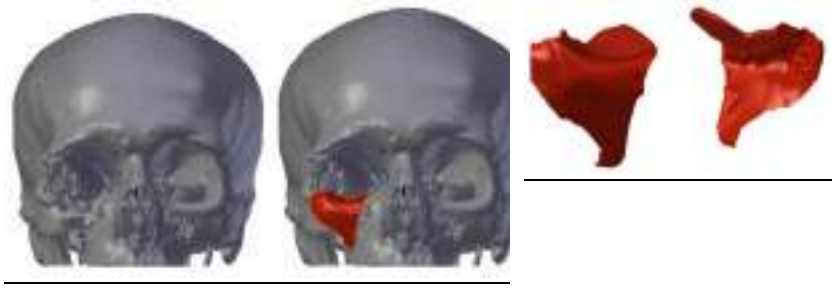


Fig. 4. Digital 3D model of the implant for reconstruction of the lower wall and lower edge of the orbit

Table 3.
Structure of performed operations for reconstruction of bone tissues of the orbit and midface by groups

Surgery to reconstruct the bone structure of the orbit and midface	Group 1 (ECOFLON plates)		Group 2 (3D acrylic implants)	
	Patient	%	Patient	%
	12	100	11	100
Inferior wall	12	100	11	100
Medial wall	5	41,6	6	54,5
Inferior orbital rim	-		10	90,9
Outer orbital rim	-		6	54,5
Zygomatic bone	-		5	45,5
Delayed formation of ODC (Ecoflon insert)	9	75	-	-
Enucleation with formation of ODC (Ecoflon insert)	3	25	11	100

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Table 3 presents data on the performed operations on reconstruction of bone tissues of the orbit and midface. Analysis of the obtained data showed that in the first group, despite the presence of deformations of orbital structures having a complex anatomical shape, such as the orbital margins and zygomatic bones (Table 1), their restoration was not performed.



Fig. 6. Patient D., 26 years old. Group 1. Condition before surgery. Anophthalmos. Fracture of the lower, medial walls of the orbit, outer and lower edges of the orbit, displacement of the zygomatic bone

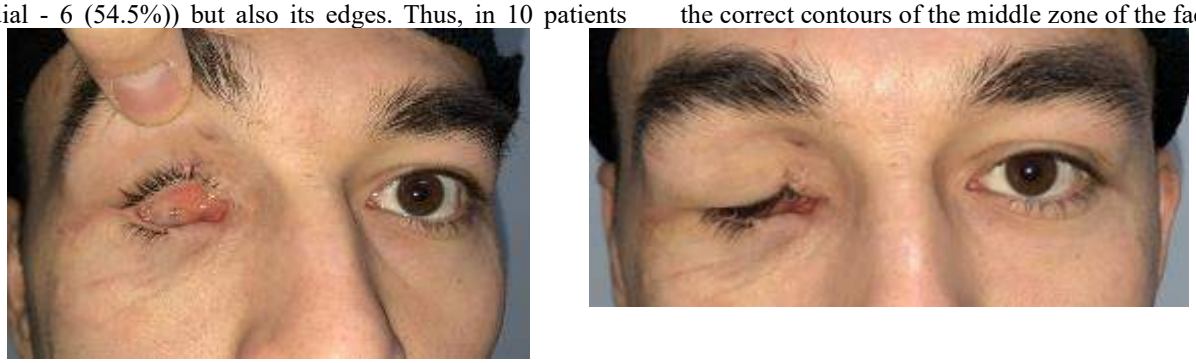


Fig. 7. Patient D., 26 years old. Group 1. Condition after surgery. Reconstruction of the lower wall of the orbit was performed. Delayed formation of the ODC. Filling the temporal and zygomatic zones with implants modeled from ECOFLON bone tissue replacement plates.



Fig. 8. Patient D., 26 years old. Group 1. Condition after individual eye prosthetics.

In the second group, the technology of manufacturing implants based on 3D technologies allowed to restore the normal contours of not only the walls of the orbit (lower - 11 (100%), medial - 6 (54.5%)) but also its edges. Thus, in 10 patients (90.9%), the contour of the lower edge of the orbit was restored and in 5 patients (45.5%), the zygomatic bone was reconstructed, which is one of the important elements that form the correct contours of the middle zone of the face.



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Fig. 9. Patient O., 30 years old. Group 2. Condition before surgery. Anophthalmos. Fracture of the lower, medial walls of the orbit, outer and lower edges of the orbit, displacement of the zygomatic bone

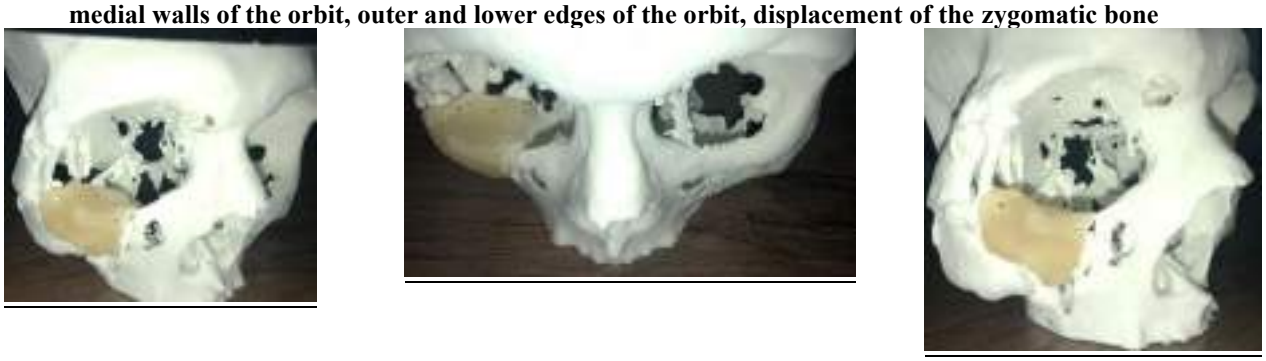


Fig. 10. The manufactured acrylic 3D model of the implant for reconstruction of the lower wall and lower edge of the orbit installed on the patient's skull model.



Fig.11. Patient O., 30 years old. Group 2. Condition after surgery. Anophthalmos. Fracture of the lower, medial walls of the orbit, outer and lower edges of the orbit, displacement of the zygomatic bone

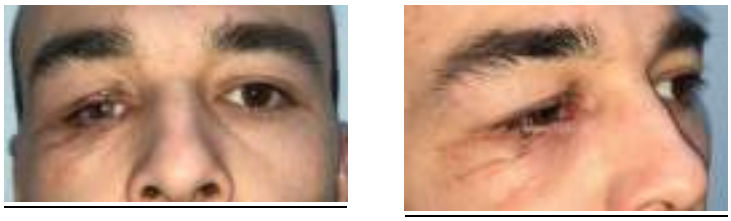


Fig. 12. Patient O., 30 years old. Group 2. Condition after surgery and individual ocular prosthetics. Anophthalmos. Fracture of the lower, medial walls of the orbit, outer and lower edges of the orbit, displacement of the zygomatic bone

When studying the QOL of patients before the start of treatment, low parameters were found in both groups for both mental and physical health indicators. But in comparison, the indicators were slightly lower in the second group.

In the 6-month period after surgical treatment and the production of an individual eye prosthesis, the indicators of physical and mental health components in the first group were 1.2 times higher ($p < 0.05$) (Fig. 13), and in the second group 3 times higher ($p < 0.05$) compared to the indicators before the start of treatment (Fig. 14).

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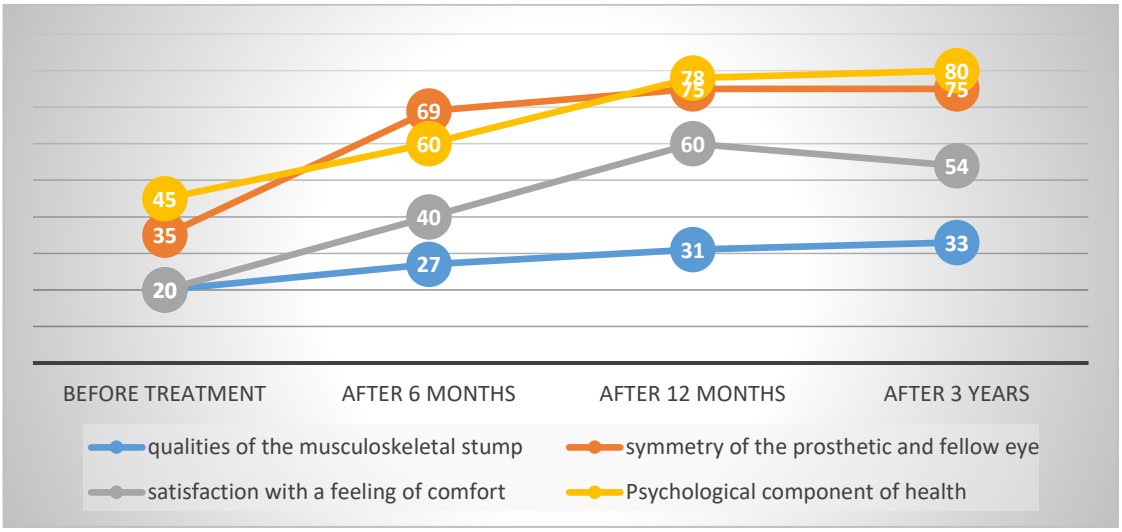


Fig.13. Results of the quality of life study in group 1

When repeating the survey and examination of patients 12 months after the prosthesis was manufactured, an improvement in indicators was observed for all parameters (Figs. 13 and 14).

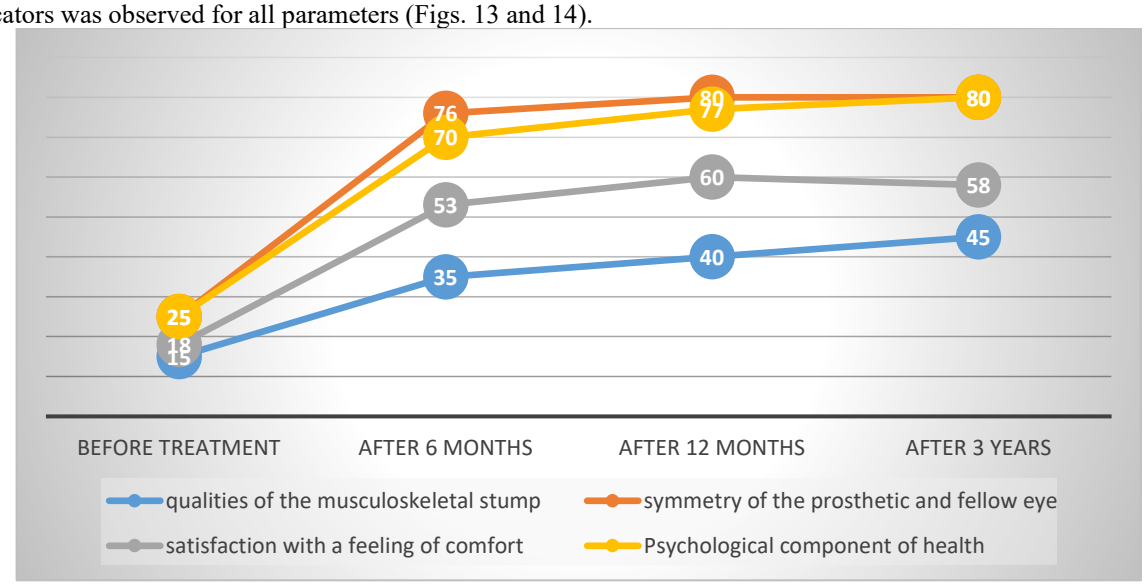


Fig. 14. Results of the study of quality of life in group 2

During the examination 3 years after wearing the eye prosthesis, the SVC values slightly decreased, which was due to the expiration of the acrylic eye prosthesis. This problem was easily solved by replacing the prosthesis with a new one or polishing the surface of the old prosthesis. But the PCS values remained consistently high.

According to the above data, the work studied the effectiveness of using 3D technologies in planning and performing surgical reconstructive interventions, which showed an increase in the quality of life of patients 6 months after surgical treatment and the manufacture of an individual ocular prosthesis. The indicators of physical and mental health components in the first group were 1.2 times higher ($p < 0.05$), and in the second group 3 times higher ($p < 0.05$) compared to the indicators before the start of treatment. Three years after reconstruction and individual prosthetics, the SVC indicators were slightly lower, which was associated with the deterioration of the acrylic ocular prosthesis, while the PCZ indicators remained stably high.

CONCLUSION

Thus, the use of 3D technologies for planning surgery and manufacturing individual implants to eliminate orbital wall defects and replace bone structures allows for effective reconstructive surgeries for patients with complex combined deformities, as well as reducing the time and cost of their rehabilitation.

The correct choice of implantation material and method for reconstructing bone tissues of the orbit and midface, taking into account the volume of deformities to be eliminated, ensures high quality medical and social rehabilitation of patients.

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HAEMOGLOBIN-THE BREATH OF LIFE WITHIN OUR CELLS: AN UPDATE

Kashif Raza[1],Jyoti[2]
[1].*Research Scholar, Department of Clinical Research, SSAHS, Sharda University, Gr.Noida,U.P,India*
[2].*Faculty, Department of Life Science and Health Care, Shri Vishwakarm Skill University, Hryana,India*

ABSTRACT

Haemoglobin is a fascinating protein found in human red blood cells. This specialist protein carries oxygen from your lungs to every cell in your body, functioning as a little delivery system. While haemoglobin's strong hold on oxygen is necessary, releasing it at the right time is a delicate challenge. This adaptable protein masterfully balances holding on to its oxygen cargo or releasing it swiftly. This article explores how haemoglobin achieves this remarkable feat. The key lies in the changing conditions within your body! During exercise, your body creates a kind of "acid rain" that signals the need for oxygen, prompting haemoglobin to release its precious cargo. Similarly, the thinner air of high altitudes, such as the Alps, encourages haemoglobin to cling to oxygen molecules, ensuring adequate oxygen supply. This mesmerizing interplay between oxygen, haemoglobin, and your body's ever-changing needs fuels your energy to run, play, and explore. Haemoglobin is an iron-rich protein found in red blood cells. It plays a crucial role in transporting oxygen throughout the body, making it essential for life. The various processes governing haemoglobin's affinity for binding oxygen are examined in this abstract, along with its physiological significance. Two molecules that bind to oxygen reversibly are found in each of the four globin chains that make up haemoglobin. Oxygen binding to haemoglobin causes structural alterations in the surrounding globin chains, which alters haemoglobin's oxygen affinity. The S-shaped oxygen dissociation curve reveals how factors likecarbon dioxide, pH, and 2,3-diphosphoglycerate (2,3-DPG) influence the cooperative binding of oxygen to haemoglobin. The erythrocyte can buffer hydrogen ions and combine carbon dioxide with carbamino compounds thanks to haemoglobin, which also carries carbon dioxide in the blood.Atypical haemoglobins may result from alterations to the iron atom, globin chains, or the attachment of non-oxygen ligands.

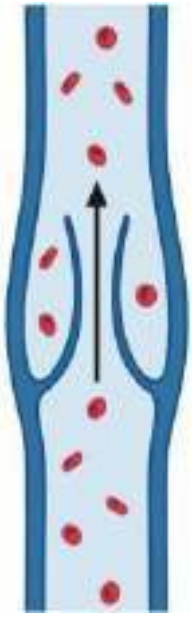
KEYWORDS: *Oxygen, blood, binding, body, protein, erythrocyte*

INTRODUCTION

Haemoglobin (Hb) is a protein powerhouse residing within red blood cells, acting as the lifebloodof oxygen transport in the human body. It boasts a unique tetrameric structure, composed of four polypeptide chains that cradle iron-containing heme groups. This intricate arrangement allows eachred blood cell to carry four oxygen molecules, ensuring efficient delivery to every tissue and cell. Haemoglobin excels at oxygen binding due to its central ferrous iron atom (Fe^{2+}). This atom forms a reversible bond with oxygen, allowing for easy uptake in the lungs (high oxygen concentration) and release in tissues (low oxygen concentration). This ingenious design guarantees a steady supply of oxygen for cellular respiration, the process by which cells generate energy. Beyond oxygen delivery, haemoglobin plays a vital role in carbon dioxide removal [1]. While not directly binding, a small portion of carbon dioxide reacts with haemoglobin to form carbaminohemoglobin, facilitating its transport back to the lungs for exhalation.Furthermore, haemoglobin maintains a balanced blood pH (acidity) by acting as a buffer. It absorbs or releases protons (hydrogen ions) to maintain the optimal pH range, crucial for various biological processes. However, mutations in the haemoglobin structure can lead to health conditions like sickle cell anaemia. This genetic disorder alters the haemoglobin shape, causing red blood cells to become crescent-shaped and impairing blood flow. In conclusion, haemoglobin is an essential molecule for survival**,** acting as the oxygen delivery champion and contributing to carbon dioxide removal and blood pH regulation. Understanding its functions and potential abnormalities is crucial for maintaining good health and addressing various health conditions. Haemoglobin, residing within red blood cells, is the unsung hero of the human respiratory system [2]. This remarkable protein acts as the cellular taxi, ferrying oxygen molecules from the lungs to every tissue and cell in the body. Its intricate structure and unique properties allow it to efficiently bind, transport, and release oxygen, ensuring the proper functioning of all vital organs and processes. Haemoglobin boasts a complex tetrameric structure, meaning it's composed of four interconnected protein chains. Each chain intricately folds and binds to a heme group, a ring-like structure containing an iron atom at its centre. This iron atom is the key player in oxygen binding, readily forming a reversible bond with oxygen molecules. The brilliance of haemoglobin lies in its cooperative binding behaviour. As one oxygen molecule binds to the protein, it alters the shape of the molecule, making it easier for subsequent oxygen molecules to bind. This domino effect allows haemoglobin to efficiently pick up a full load of four oxygen molecules in the lungs, where oxygen concentration is high. Reaching tissues with lower oxygen levels, the reverse happens. The change in oxygen concentration triggers the release of the bound molecules, one by one, ensuring a steady supply of oxygen to fuel cellular activities. This cooperative release is crucial for effective oxygen delivery throughout the body. While oxygen is its

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primary cargo, haemoglobin also plays a supporting role in carbon dioxide transport**.** Although a small portion of this cellular respiration waste product binds to haemoglobin, forming carbaminohemoglobin, this mainly contributes to its transport rather than its removal from the body. Beyond its transport duties, haemoglobin plays a vital role in maintaining blood ph. It acts as a buffer, absorbing or releasing hydrogen ions as needed to maintain a stable and optimal pH range, crucial for various biological processes. Haemoglobin is an essential molecule, acting as the lifeblood of oxygen delivery and contributing to carbon dioxide removal and blood pH regulation. Its intricate structure and unique properties ensure the constant flow of oxygen, the fuel of life, to every corner of



the human body [3]. Figure 1 given below depicts how veins stop backflow of blood using valves.

Figure 1. Blood Flow in the vein.

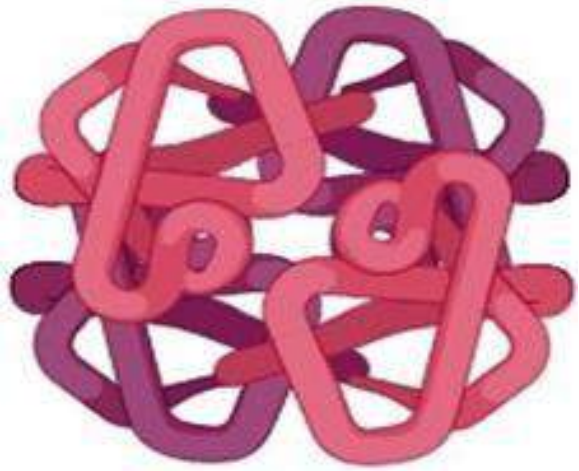


Figure 2. Haemoglobin structure showing iron and Heme Group.

STRUCTURE

The essential component of oxygen transport in the human body, haemoglobin, has an amazing and complex structure. Its amazing functionality is largely dependent on its quaternary structure, which goes beyond its constituent polypeptide chains and heme groups. Figure 2 display of Haemoglobin structure Showing iron and Heme Group.

Unveiling the Masterpiece

Delving into the Quaternary Structure of Haemoglobin:

Building Blocks

Haemoglobin is a tetramer, meaning it's composed of four polypeptide chains. These chains fall into two categories: two alpha (α) chains and two beta (β) chains. While structurally similar, they share a slight difference in their amino acid sequence, contributing to the overall stability and functionof the molecule.

Assembly and Symmetry

The four chains come together in a specific arrangement, forming a globular structure with a two- fold rotational symmetry. This means that if you were to rotate the molecule by 180 degrees, it would appear identical. This symmetry is crucial for the cooperative binding of oxygen, which we will explore later.

Interacting Partners

Each chain interacts extensively with its partners through various non-covalent interactions, including hydrogen bonds, hydrophobic interactions, and ionic bonds. These interactions create a stable and unified structure, ensuring the proper positioning of the heme groups and facilitating communication between different subunits [4].

Central Cavity

The intricate arrangement of the four chains creates a central cavity within the haemoglobin molecule. This cavity plays a dynamic role in its function. In its deoxygenated (T-state**)** form, the cavity is large and open. However, as oxygen binds, the shape of the molecule changes, leading to a contraction and narrowing of the cavity in the oxygenated (R-state) form [5].

Function and Communication

This dynamic change in the cavity is not merely a structural alteration. It's a crucial component of cooperative oxygen binding. When the first oxygen molecule binds to one of the heme groups, it triggers a conformational change in the surrounding chain, subtly influencing the structure andaffinity of the remaining heme groups for oxygen. This domino effect increases the binding affinity ofsubsequent oxygen molecules, enabling efficient oxygen loading in the lungs. Conversely, the release of oxygen in tissues follows a similar principle, with the first release triggering subsequent releases, ensuring efficient oxygen delivery. The quaternary structure of haemoglobin, with its specific arrangement of subunits and intricate interchain interactions, is a marvel of bio molecular architecture.It not only provides stability but also plays a crucial role in the cooperative binding and release of oxygen, making it the champion of oxygen transport in the human body. Haemoglobin's architectural masterpiece extends beyond its subunit assembly, involving a crucial partnership with heme groups. These ring-shaped molecules, nestled within each of the four polypeptide chains, house the true magic of oxygen

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binding. At the heart of each heme group lies a ferrous iron atom (Fe^{2+}). This iron atom actsas the oxygen's dance partner, readily forming reversible bonds with oxygen molecules. Imagine the heme group as a stage and the iron atom as the lead performer. When oxygen enters the picture, it readily binds to the iron, forming a temporary complex. This complex alters the structure of the surrounding heme group, like a ripple effect emanating from the stage. This change, in turn, sends a signal to other heme groups within the haemoglobin molecule, influencing their affinity for oxygen. This phenomenon, known as cooperative binding, allows haemoglobin to efficiently pick up a full load of four oxygen molecules in the lungs, where oxygen is plentiful. As haemoglobin reaches tissues with lower oxygen levels, the story takes a turn. The change in oxygen concentration triggers the release of the bound molecules, one by one. The release of one oxygen molecule, like a departing performer, influences the remaining "dancers" to loosen their grip, leading to a steady and controlled release of oxygen to fuel cellular activities. In essence, the heme group, with its iron centrepiece, acts as the binding platform and communication hub within haemoglobin. This remarkable partnership orchestrates the efficient loading and unloading of oxygen molecules, ensuring the constant flow of life-sustaining oxygen throughout the human body [6].

FUNCTION

Haemoglobin, the iron-containing protein found within red blood cells, plays a critical role in the human body's respiratory system. Its primary function is facilitating the transport of oxygen from the lungs to tissues throughout the body, and facilitating the removal of carbon dioxide, a waste productof cellular respiration, back to the lungs for exhalation [7].

Oxygen Transport

Binding

In the lungs, oxygen readily binds to the iron atom within haemoglobin's heme group. This binding is cooperative, meaning the binding of one oxygen molecule increases the affinity of the remaining heme groups for oxygen, facilitating efficient loading.

Delivery

As oxygenated blood travels through the body, tissues with lower oxygen levels trigger a conformational change in haemoglobin. This change reduces its affinity for oxygen, allowing it to readily release oxygen to the cells [8].

Carbon Dioxide Removal

While transporting oxygen, haemoglobin also picks up carbon dioxide produced by cellular activities. This occurs through the enzyme carbonic anhydrase, which converts carbon dioxide and water into carbonic acid within the red blood cells. As the blood reaches the lungs, carbonic acid dissociates back into carbon dioxide and water, allowing for its exhalation.

Factors Affecting Oxygen Affinity

Haemoglobin's affinity for oxygen is influenced by various factors:

- *pH:* Lower pH (more acidic) environments, like those found in exercising muscles, decrease haemoglobin's affinity for oxygen, promoting easier release to tissues with high demand (Bohr Effect)
- *2,3-Bisphosphoglycerate (2,3-BPG):* This molecule, produced by red blood cells, binds tohaemoglobin and reduces its oxygen affinity, particularly in tissues with lower oxygen needs, like the lungs [9].

Consequences of Haemoglobin Deficiency

Low levels of haemoglobin, a condition known as anaemia, can significantly impact health. Reduced oxygen delivery to tissues can lead to fatigue, shortness of breath, and impaired organ function. Haemoglobin is a vital protein responsible for oxygen and carbon dioxide transport, ensuring proper cellular function throughout the body. Its intricate properties and interaction with various factors highlight the remarkable complexity and efficiency of the human respiratory system [10].

CLINICAL SIGNIFICANCE

Haemoglobin, the iron-rich protein residing within red blood cells, holds immense clinical significance. Its levels serve as a critical window into various physiological processes and potential health concerns. Understanding its role and the implications of abnormal levels is vital for accurate diagnosis and effective medical management.

Hallmark Marker of Anaemia

Low haemoglobin levels are the defining characteristic of anaemia, a condition characterized by a deficiency in red blood cells or haemoglobin concentration. This deficiency impairs the blood's ability to carry sufficient oxygen to tissues, leading to various symptoms like fatigue, shortness of breath, pale skin, and dizziness.

The cause of anaemia dictates the specific clinicalsignificance:

- *Iron deficiency anaemia:* Most common type, often due to insufficient dietary iron intake orimpaired absorption.
- *Vitamin B12 or folate deficiency anaemia:* Caused by inadequate intake or absorption of these essential vitamins required for red blood cell production.
- *Aplastic anaemia:* Bone marrow dysfunction hindering red blood cell production.
- *Haemolytic anaemia:* Increased destruction of red blood cells due to various factors likeautoimmune disorders or certain medications [11].

Indicator of Blood Loss

Haemoglobin levels can decline rapidly due to acute blood loss, such as from internal bleeding, trauma, or heavy menstrual bleeding. This signifies the need for immediate medical attention to identify the source of bleeding and implement appropriate interventions to prevent further complications. [12]

Insights into Chronic Conditions

Abnormal haemoglobin levels can also provide valuable insights into underlying chronic conditions.

- *Elevated haemoglobin:* Can be associated with pulmonary fibrosis, certain cancers, ordehydration.

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- *Chronically low haemoglobin:* May indicate chronic inflammatory conditions like rheumatoidarthritis or kidney disease [13].

Guiding Treatment Decisions

Haemoglobin levels directly influence treatment decisions for various conditions.

- *Anaemia management:* Depending on the cause, treatment may involve iron supplementation,vitamin B12 or folate injections, or specific medications to address the underlying condition.
- *Blood loss management:* Requires prompt intervention to stop the bleeding and potentially blood transfusions to restore blood volume and ensure adequate oxygen delivery [14].

Prognostic Indicator

Haemoglobin levels can serve as a prognostic indicator in various disease contexts.

- Low haemoglobin is associated with increased mortality risk in patients with heart failure,chronic obstructive pulmonary disease (COPD), and critically ill patients.
- Monitoring haemoglobin during treatment for various conditions allows healthcare professionals to assess treatment response and make adjustments as needed [15].

Haemoglobin is a crucial clinical marker with diverse significance. It aids in diagnosing anaemia, identifying blood loss, understanding underlying health conditions, guiding treatment decisions, and predicting patient outcomes. By closely monitoring and interpreting haemoglobin levels, healthcare professionals can ensure timely diagnosis, effective treatment, and improved patient outcomes [16].

There are various methods for measuring haemoglobin levels, each with its own advantages and limitations:

1. ***Automated Haematology Analyzers:*** These are the gold standard in clinical settings, offering fast, accurate, and high-throughput analysis. They involve drawing a small blood sample and analyzing it using an automated machine.
2. ***Hemoglobinometer (HemoCue):*** This portable device uses capillary blood from a finger prick and provides a quick and convenient way to measure haemoglobin, making it useful in point- of-care settings [17].
3. ***Haemoglobin Colour Scale (Sahli's method):*** This traditional method utilizes a colour chart to compare the shade of a blood sample with pre-defined colours representing different haemoglobin levels. It is less accurate than other methods and rarely used in modern healthcare settings.
4. ***Pulse Oximetry:*** This non-invasive method utilizes a fingertip sensor to estimate oxygen saturation in the blood indirectly. While not directly measuring haemoglobin, it can offer a non-invasive and rapid assessment of oxygenation. However, factors like nail polish or poor circulation can affect its accuracy. The choice of method depends on factors such as the clinicalsetting, required accuracy, and availability of resources. Healthcare professionals will choose the most appropriate method based on the individual's needs [18].

CONCLUSION

Haemoglobin is a remarkable protein that serves as the lifeline of our bodies. This iron-richmolecule, packed within red blood cells, efficiently shuttles oxygen from the lungs to every cell, fueling cellular processes. Simultaneously, haemoglobin facilitates the removal of carbon dioxide, the waste product of cellular respiration, and transports it back to the lungs for elimination. The intricate mechanisms of oxygen binding and release ensure that haemoglobin adapts to varying oxygen levels, optimizing delivery and ensuring our body's constant supply of this essential gas. Without haemoglobin, life as we know it would simply not be possible.Haemoglobin research is at the forefront of medical advancement, with ground-breaking explorations underway. From developing artificial blood substitutes for emergencies and rare blood types to potentially curing sickle cell disease through gene therapy, the future looks bright. Additionally, modified haemoglobin molecules are being investigated as therapeutic oxygen carriers for conditions like stroke and heart attack, while research on blood storage and its link to cardiovascular disease holds promise for improved blood availability and novel therapeutic strategies These are just a glimpse into the exciting future of haemoglobin research, with the potential to revolutionize healthcare and significantly improve patient outcome.

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MGA GAWI SA PAGSASALING-WIKA AT KASANAYAN SA AKADEMIKONG PAGSULAT

Jessibeth G. Mondares
The Rizal Memorial Colleges, Inc. Davao City 8000, Philippines

ABSTRAK

Isinagawa ang pag-aaral na ito upang matukoy ang makabuluhang ugnayan sa pagitan ng mga gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat. Deskriptib-korelesyon ang disenyo ng pananaliksik na ginamit sa pag-aaral na ito na may 152 kabuuang kalahok mula sa Bernardo D. Carpio National High School Ginamit ang instrumentong pampananaliksik, natagpuang nasa mababang antas ang gawi ng mga mag-aaral sa pagsasaling-wika. Nakita rin na mababa ang kasanayan ng mga mag-aaral sa akademikong pagsulat. Nabunyag din na may makabuluhang ugnayan ang gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat. Dagdag pa, ang mga domeyn o indikeytor ng gawi sa pagsasaling-wika na: pagtukoy ng kahulugan, pagpapahalaga sa kultura, pagpili ng mga salita, at pagtutumbas ng mga idyoma ay pawang natagpuang may makabuluhang impluwensiya sa kasanayan sa akademikong pagsulat. Mula sa mga natuklasan, ang mga opisyal ng Kagawaran ng Edukasyon (DepED) ng mga polisiya at mga patakaran ukol sa pagbuo ng mga programang magpapatingkad sa mga gawaing pagsasaling-wika sa mataas na paaralan at ibunsod ang pagsusuri ng kasalukuyang kurikulum kung may sapat na kasanayang pampagkatuto na ukol sa kasanayan sa akademikong pagsulat ng mga pag-aaral sa sekundarya. Maaaring magbalangkas ng mga school-based na pagsasanay na may diin sa paglinang ng kasanayan ng mga guro sa pagtuturo ng pagsasaling-wika at akademikong pagsulat.

SUSING SALITA: *Pagsasaling-Wika, Akademikong Pagsulat, Lungsod ng Davao, Relihiyon XI*

1. MGA SULIRANIN AT KALIGIRAN NITO

Ang pagsulat ng mga akademikong sulatin ay isang gawaing hindi maihihiwalay sa proseso ng pagtuturo at pagkatuto. Lagi nang ginagawang panukat ng pagkatuto ang iba't ibang sulating likha ng mga mag-aaral. Kung may mabuting sulating nagawa ang mga mag-aaral, maaaring sabihing nalinang sa kanila ang mga inaasahang kasanayang pang-kurikulum. Ang kakulangan ng malawak na pananaliksik ay isa sa mga pangunahing dahilan kung bakit nahihirapan ang mga mag-aaral sa akademikong pagsulat. Ito man ay pagsulat ng sanaysay, ulat o maging mga rebyu ng nabasang panitikan.

Sa bansang Tsina, nabunyag na isang mahirap na gampaning pang-kurikulum ang akademikong pagsulat lalo na kung ang kasangkot ay mga dayuhang wika tulad ng Ingles. Marami sa mga guro ang nagtalaga ng mga estratehiya at mga modelo ng pagtuturo na may kinalaman sa lubusang pagpapasigla ng mga gawaing pagsulat sa mataas na paaralan. Isa sa mga ginagawang paraan ng mga guro ay ang pagtuturo sa kanilang mga mag-aaral ng kasanayan sa pagsasalin (Cai, 2013). Ibinahagi nina Pablo at Lasaten (2018) na ang akademikong pagsulat ay binigyan ng malaking diin sa sistemang pang-edukasyon sa Pilipinas mula nang ang pagtuturo at pagkatuto ng Ingles bilang pangalawang wika ay sumusuporta sa layuning pahusayin ang kakayahan sa Ingles ng mga pilipinong mag-aaral. Sumasang-ayon ang mga dalubhasa na ang pagsulat ay isa sa pinakamataas na anyo ng mga kasanayang pang-akademiko.

Sa mas matibay na paglalahad, kailangang masinop ang mga dati nang natuklasan sa pamamagitan ng maka-agham na pag-aaral. Mainam na matiyak ang gawi sa pagsasaling-wika at kasanayan ng mga mag-aaral sa akademikong pagsulat. Naniniwala ang mananaliksik na ang pag-aaral na ito ay makatutulong nang malaki sa pagpapalago sa kasanayan sa akademikong pagsulat sa mga paaralan kung saan naisagawa ang pag-aaral at sa buong Sangay ng Lungsod ng Davao.

1.1. Rebyu ng mga Makabuluhang Literatura

Mga Gawi sa Pagsasaling-wika

Ang pagsasaling-wika ay isang gawaing pangkaisipan kung saan ang isang kahulugang ibinigay na diskursong pang-wika ay naisalin mula sa isang wika patungo sa isa pa. Ito ay ang paglilipat ng mga kakanyahang panlingwistika mula sa isang wika patungo sa kanilang mga katumbas sa isa pang wika. Ang pagsasaling-wika ay isang gawain kung saan ang nilalaman ng isang teksto ay inililipat mula sa pinagmulang wika patungo sa target na wika. Ang wikang isasalin ay tinatawag na *source language* (SL) o pinagmulang-wika, samantalang ang wikang pagsasalinan ay tinatawag na *target language* (TL). Ang tagasalin ay kailangang magkaroon ng mahusay na kaalaman sa pinagmulan at sa target na wika, bilang karagdagan sa isang mataas na kamalayang panlinguwistika dapat niyang ihatid ang intension o pakay, orihinal na mga kaisipan at opinyon ng manunulat sa isinaling bersyon nang tumpak at tapat hangga't maaari (Foster, 2007).

Pagtukoy ng Kahulugan. Bilang lapit sa pagsasaling-wika, kung sinusubukan ng isang mag-aaral na tukuyin ang kahulugan ng isang bagong salita, kadalasan ay kapaki-pakinabang na tingnan kung ano ang nauuna at ang sumusunod ng salitang iyon. Kapag sinusubukang isalin ng mga mag-aaral ang kahulugan ng isang bagong salita, kadalasan ay kapaki-pakinabang na tingnan kung ano ang nauuna at ang sumusunod ng salitang iyon. Ang mga

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nakapalibot na salita ay maaaring magbigay sa mga mambabasa o tagasalin ng kapaki-pakinabang na mga pahiwatig sa konteksto tungkol sa kahulugan at estruktura ng bagong salita, pati na rin kung paano ito ginagamit sa mga pangungusap (Zorfass at Gray 2020).

Pagpapahalaga sa Kultura. May mahalagang papel ang bokabularyo sa pagbuo ng wika. Ang talasalitaan at ang mga pagbabagong dumarating sa panahon ay pagninilay sa kultura at ang mga pagbabagong naranasan nito sa paglipas ng mga taon ay mahalagang maunawaan ng mga mambabasa at tagasaling-wika. Ang ugnayan sa pagitan ng wika, pagsasalin at kultura ay isang mahalagang salik ng maunawang pakikipagtalastasan. Dahil dito, kailangang aralin ang mga mahalagang larawan, lugar, at mga kaugalian ng kultura ng wika upang magkaroon ang tagasalin ng ideya at kamalayan sa wikang sangkot sa pagsasalin. Sa mataas na paaralan, ang pagsasaling-wika ay isang kasanayang pinag-aaralan ng mga mag-aaral. Kalimitang ginagamit dito ang tuwirang pagsasalin o ekplisit na pagsasalin kung saan nagbibigay ang guro ng mga salita at binibigyan ito ng mga mag-aaral ng katumbas na kahulugan sa kanilang wika (Bharati, 2018).

Pagpili ng mga Salita. Mahalaga ang angkop na pagpili ng salita sa pagsulat ng akademikong komposisyon. Mainam din na ang isang manunulat ay may malawak na kaalaman sa pagsasaling-wika. Ang mga banyagang sulatin ay mainam na naipauunawa sa mas maraming mambabasa sa pamamagitan ng pagsasalin nito sa wikang sinasalita ng mas maraming tao. Upang maging mahusay ang isang tagasalin, kailangan ang malawak na kaalaman sa pagpili ng salita. Isa sa kasanayang dapat aralin ay ang kaalaman sa konotasyon ng mga salita na palaging nangangahulugan ng kaniyang damdamin, masining na kahulugan at matalinghagang kahulugan. Ang iba't ibang kultural na pinagmulan ay nagdudulot ng iba't ibang panlipunang saloobin; ang mga tao sa iba't ibang kultura ay maaaring may iba't ibang pagkilala sa isang bagay o sa isang konsepto. Kung hindi isasaalang-alang ang mga salik na ito, malamang na magdulot ito ng hindi pagkakaunawaan (Chin, 2012).

Pagtutumbas ng mga Idyoma. Ang bawat wika ay may natatanging koleksiyon ng mga kasabihan at parirala. Ang mga ekspresyong ito, na kilala bilang mga idyoma, ay kadalasang naglalaman ng mga kahulugan na maaaring hindi halata sa pamamagitan lamang ng pagtingin sa mga indibiduwal na salita sa pahayag. Ang idyoma ay isang kasabihan o pagpapahayag na naglalaman ng matalinghagang kahulugan na naiiba sa literal na kahulugan. Ang salitang idyoma ay nagmula sa salitang Griyego na "*idioma*," na nangangahulugang kakaibang pariralang may matalinghagang pagpapakahulugan. Halimbawa, ang "sa ilalim ng panahon" ay isang idyoma na nauunawaan sa pangkalahatan na nangangahulugang may sakit o karamdaman. Kung sasabihing nakakaramdam ka ng "sa ilalim ng panahon," hindi literal na ibig sabihin na nakatayo sa ilalim ng ulan ngunit naglalahad ito ng ibang kahulugan lagpas pa sa literal na sinasabi nito (Gladwell, 2022).

Kasanayan sa Akademikong Pagsulat

Ang akademikong pagsulat ay ang paglikha at organisasyon ng isang nakasulat na papel o isang sanaysay tungkol sa isang paksa sa isang larangan ng pag-aaral tulad ng panitikan, kasaysayan, o sosyolohiya. Sa pamamagitan ng akademikong pagsulat sa isang paksa, naihahatid ng mga dalubhasa o mga mag-aaral nang may lalim ang kanilang mga opinyon o mga pinaniniwalaan. Ang ganitong uri ng pagsulat ay dapat na nakatutok at sinusuportahan ng mga detalyeng nakalap mula sa malalim na pananaliksik at pakikipanayam at mga pag-aaral (Baird, 2021).

Pokus at Diin. Ang pinakakaraniwang layunin sa akademikong pagsulat ay ipaliwanag ang ilang ideya o paghahanap ng pananaliksik at hikayatin ang mga mambabasa na ang mga paliwanag o teorya ay tama. Sa paggawa nito, maaaring kailanganin ilarawan ang isang bagay, lugar, o aktibidad. Minsan maaaring sumulat upang magsalaysay ng hanay ng mga kaganapan, sa paraan ng isang kuwento. Sa akademikong pagsulat, makatuwirang gawing ang diin at layunin ng pagsulat ay malinaw at tugma sa gawaing pagsulat, at nagbigay ng malinaw na pananaw upang maging maliwanag din sa mga mambabasa (Sword, 2020).

Organisasyon. Ang layunin ng akademikong pagsulat ay maglahad ng mga ideyang nagtataglay ng kahulugan. Minsan ang dami ng bagong konsepto, bagong salita, at ang mga katotohanan na maaaring maging napakalaki at kumplikado. Upang mapagaan ang organisasyon ng mga kaisipan, gumagamit ang mga manunulat ng balangkas na nakakatulong upang mabuo nang mahusay ang mga sulatin at maiparating ang kanilang mga ideya nang malinaw. May ilang uri ng mga plano o balangkas ng sulatin, na tinatawag na mga patern ng organisasyon na maaari makilala sa akademikong pagsulat. Nagiging madali ay mahusay ang pagsusulat ng may-akda kung naaayos na ang kanilang mga ideya sa paraang may katuturan at masinop na pagkakalahad (Strunk, 2019).

Wika at Estilo. Ang akademikong pagsulat sa pangkalahatan ay medyo pormal, obhektibo at teknikal. Ito ay pormal sa pamamagitan ng pag-iwas sa kaswal o pakikipag-usap na wika, tulad ng mga contraction o impormal na bokabularyo. Ito ay impersonal at obhektibo dahil sa pag-iwas sa direktang pagtukoy sa mga tao o damdamin, at sa halip ay binibigyang-diin ang mga bagay, katotohanan at ideya (Goodson, 2017).

1.2. Teoretikal/Konseptuwal na Balangkas

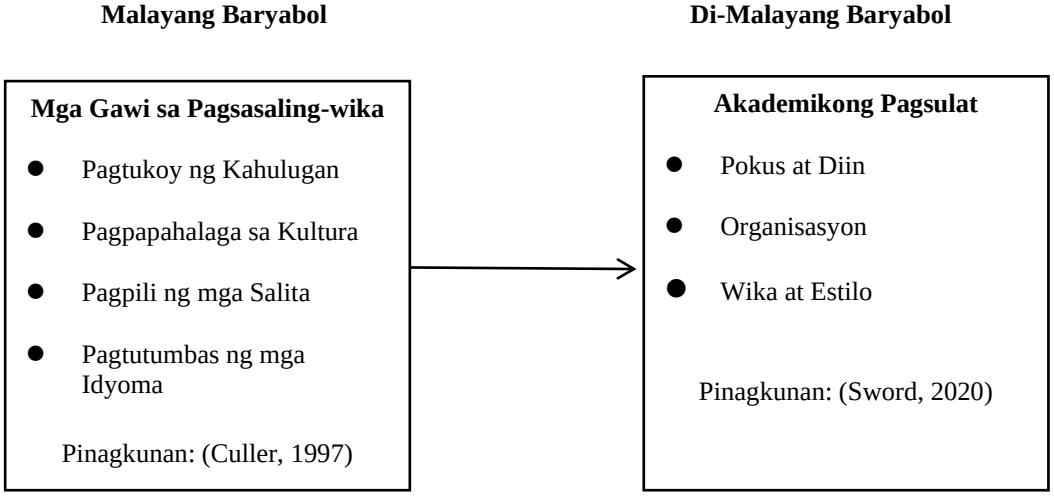
Ang pag-aaral na ito ay napapatnubayan ng teorya ni Jack Mezirow (1991) na Transformational Learning Theory na naglalarawan kung paano ang kritikal na pagmuni-muni ng mga pagpapalagay at paniniwalang pinanghahawakan ay nagbibigay-daan sa mga mag-aaral na mas maunawaan ang kanilang proseso ng pag-aaral. Sa kaso ng akademikong pagsulat, nalilipat ng mga manunulat ang kanilang kaisipan sa pamamagitan ng pagsasaling-wika. Ang pagsasaling-wika ay makabuluhan sa proseso ng pagsulat. Ito ay isang teknik sa pagsulat na nakatutulong sa mga mag-aaral sa mabisang pagsulat lalo na ng mga akdang pang-akademik. Maaaring

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maraming ideya ang mga mag-aaral, ngunit kapag hinihiling sa kanila na isulat ito, karamihan sa kanila ay nahihirapan. Sa pagtuturo sa kanila ng prosesong ito, ang mga mag-aaral ay makakakuha ng mas malinaw na larawan ng pagsulat.

Sinipi rin ni Kroll (1990) ang Applebee (1986) na ang proseso ng teknik ay "nagbigay ng paraan upang mag-isip tungkol sa pagsulat ayon sa kung ano ang ginagawa ng manunulat (pagpaplano, pagrerebisa, at iba pa) sa halip na kung ano ang hitsura ng huling produkto. tulad ng (mga pattern ng organisasyon, baybay, at gramatika)". Ang mga mag-aaral ay nakikita bilang "sentral sa pag-aaral" sa proseso ng teknik. Dapat isaalang-alang ng sektor ng edukasyon ang iba't ibang pangangailangan, inaasahan, layunin, estilo ng pagkatuto, kasanayan, at kaalaman ng mga mag-aaral. Sa pamamagitan ng proseso ng pagsulat, ang mga mag-aaral ay magkakaroon ng pagkakataong gamitin ang kanilang kaalaman sa tulong ng kanilang mga guro at iba pang mga mag-aaral.

Nakikita sa Talangguhitan Bilang 1 ang Konseptuwal na Modelo ng Pag-aaral. Ang kahong nasa kaliwang bahagi ay kumakatawan sa malayang baryabol na gawi sa pagsasaling wika na ayon ka Culler (1997) ay may apat na pantakda: (1) pagtukoy ng kahulugan, (2) pagpapahalaga sa kultura, (3) pagpili ng mga salita at (4) pagtutumbas ng mga idyoma. Sa kanang bahagi makikita kahong kumakatawan sa di-malayang baryabol na kasanayan sa akademikong pagsulat na may pantakda na: (1) pokus at diin, (2) organisasyon at (3) wika at estilo (Sword, 2020).



Talangguhitan I. Konseptuwal na Modelo ng Pag-aaral

1.3. Paglalahad ng Suliranin

Isinagawa ang pag-aaral na ito upang matukoy ang makabuluhang ugnayan sa pagitan ng mga gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat. Sa katiyakan, tinangkang sagutin ng pag-aaral na ito ang sumusunod:

1. Ano ang lawak ng gawi ng mga mag-aaral sa pagsasaling-wika ayon sa:
   1.1. pagtukoy ng kahulugan;
   1.2. pag-unawa sa kultura;
   1.3. pagpili ng mga salita; at
   1.4. pagtutumbas ng mga idyoma?
2. Ano ang lawak ng kasanayan sa akademikong pagsulat ng mga mag-aaral ayon sa:
   2.1. pokus at diin;
   2.2. organisasyon; at
   2.3. wika at estilo?
3. Mayroon bang makabuluhang ugnayan ang gawi sa pagsasaling-wika ng mga mag-aaral at kasanayan sa akademikong pagsulat?
4. Ano-anong indikeytor ng mga gawi sa pagsasaling-wika ang may makabuluhang impluwensiya sa kasanayan sa akademikong pagsulat ng mga mag-aaral?

2. PAMAMARAAN

2.1. Disenyo ng Pananaliksik

Ginamit sa pag-aaral na ito ang kuwantitatibo at di-eksperimental na disenyo gamit ang deskriptib-korelesyon na metodo ng pananaliksik. Sa disenyong ito na nakabatay sa patakarang pampananaliksik ng Higher Education Funding Council for England or HEFCE (2000) na ang pinakatuon nito ay tukuyin ang kinakailangang impormasyon na naglalarawan sa tunay na kalagayan, larawan at estado ng isang naobserbahang phenomenon batay sa baryabol na pinag-aaralan. Nasasaklaw sa pamaraang ito ang pagsasagawa ng surbey na siyang pangunahing gawain sa nagsakatuparan ng pananaliksik na ito.

2.2. Ang mga Kalahok

Ang mga kalahok sa pag-aaral na ito ay mga mag-aaral ng ika-10 baitang ng Mataas na Paaralang Pambansa ng Bernardo D. Carpio ng Cluster 15, Sangay ng Lungsod ng Davao para sa Taong Panuruan 2022-2023. Ginamit sa pag-aaral na ito ang *simple random sampling* sa pagtukoy sa bilang ng mga kalahok ang isinali sa pag-aaral.Nakikita sa Talahanayan 1 ang datos ukol sa bilang ng mga kalahok ng pag-aaral. May isang daan at limam pu't dalawang (152) mag-aaral ang kalahok ng pag-aaral na ito.

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2.3. Mga Hakbang sa Paglilikom ng mga Datos

Paghingi ng Pahintulot. Ang mananaliksik ay humingi ng pahintulot sa Dekano ng Paaralang Gradwado ng Rizal Memorial Colleges, Lungsod ng Davao, at sa Tagapamanihala ng mga Paaralan ng Sangay ng Lungsod ng Davao, upang maisagawa ang pag-aaral. Matapos matanggap ang pagpapatibay ng Tagapamanihala, nakipag-ugnayan siya sa punong-guro at sa Puno ng Kagawarang Filipino kung saan ginawa ang pag-aaral.

Pagsasagawa ng Surbey. Matapos ang pakikipag-ugnayan sa punong-guro ng paaralan at puno ng Kagawarang Filipino, ipinamahagi ng mananaliksik ang mga instrumento sa mga kalahok at ipinaliwanag ang mga panuto kung paano ito sasagutan at kailan nito ibabalik ang instrumento. Sa paglikom ng mga datos, tiniyak ng mananaliksik na ang mga panuntunang ipinatutupad ng IATF sa panahon ng pandemya ay tinalima at pinag-ukulan ng tamang pagpapahalaga upang mapangalagaan ang kalusugan at kaligtasan ng mananaliksik at mga kalahok.

Paghahanay at Pagsusuri ng mga Datos. Matapos makuha ang mga kinakailangang datos, inihanay at sinuri ng mananaliksik ang nalikom na tugon ng mga mag-aaral ukol sa mga estratehiya ng sariling pagkatuto at pampanitikang literasi ng mga mag-aaral at sinuri gamit ang angkop na pormula ng estadistika.

2.4. Pagsusuri ng Datos

Ang mga estadistikang ginamit upang suriin ang mga nalikom na mga datos kaugnay sa mga pinag-aaralang mga baryabol:

Mean. Sa istatistika, ito ay isang sukatan ng gitnang pagkahilig ng isang pamamahagi. Sa pag-aaral na ito, ang mean ay ginamit upang matukoy ang lawak ng gawi ng mga mag-aaral sa pagsasaling-wika at lawak ng kasanayan sa akademikong pagsulat.

Pearson r. Ito ay isang sukatan ng linear na ugnayan sa pagitan ng dalawang baryabol. Ito ay ang ratio sa pagitan ng covariance ng dalawang variable at ang produkto ng kanilang mga standard deviations; sa gayon, ito ay mahalagang normalized na pagsukat ng covariance, kung kaya't ang resulta ay palaging may halaga sa pagitan ng −1 at 1. Tulad ng sa covariance, ang sukat ay maaari lamang magpakita ng isang linear na ugnayan ng mga baryabol. Ang kagamitang pang-estadistikang ito ay ginamit upang matukoy ang makabuluhang ugnayan ng lawak ng gawi ng mga mag-aaral sa pagsasaling-wika at lawak ng kasanayan sa akademikong pagsulat.

Multiple Liner Regression. Ang kagamitang pang-estadistikang ito ay ginamit upang matukoy ang mga indikeytor malayang baryabol na gawi ng mga mag-aaral sa pagsasaling-wika na may makabuluhang impluwensiya sa di-malayang baryabol na kasanayan sa akademikong pagsulat.

3. PAGTALAKAY SA MGA KINALABASAN

Talahanayan 2. Lawak ng Gawi ng mga Mag-aaral sa Pagsasaling-wika ayonsa Pagtukoy ng Kahulugan

Blg.	Mga Aytem	Mean	Palarawang Katumbas
1.	Sumasangguni ako sa mga talatinigan upang malaman ang kahulugan ng mga salita o pahayag.	3.04	Katamtaman
2.	Sinusuri ko ang mga yunit na bumubuo sa mga salita.	2.79	Katamtaman
3.	Gumaganit ako ng context clue sa pag-unawa ng kahulagan ng mga salita.	2.31	Mababa
4.	Iniuugnay ko ang mga natuklasang salita sa sariling karanasan.	2.35	Mababa
5.	Sinusubok ko ang katumpakan ng kahulugan ng mga salita sa pamamagitan ng paggamit nito sa talastasan.	2.19	Mababa
	Pangkalahatang Mean	2.53	Mababa

Ang limang aytem sa indikeytor na naglalarawan sa pagtukoy ng kahulugan ay lumikom ng pangkalahatang mean na (2.53) na may palarawang katumbas na mababa. Ang nabunyag na pigura ay nagsasabing bihirang ginagawa ng mga mag-aaral ang mga probisyong ukol sa pagtukoy ng mga kahulugan ng mga salita.

Pinatutunayan din ng mga natuklasan ang pahayag ni Salvadore (2014) na nakatutulong din na bigyan ang mga mag-aaral ng madalas na mga paalala at mga halimbawa ng iba't ibang uri ng mga pahiwatig sa konteksto. Gamit ang iba’t ibang kagamitan katulad ng talatinigan. Mahalagang na ang mga natuklasang salita ay magamit sa mga pangungusap at sa pakikipagtalastasan upang maging mas madali ang pag-aasimila nito.

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Talahanayan 3. Lawak ng Gawi ng mga Mag-aaral sa Pagsasaling-wika ayonsa Pagpapahalaga sa Kultura

Blg.	Mga Aytem	Mean	Palarawang Katumbas
1.	Inaalam ko ang mga gawi, tradisyon at pangunahing kaalaman sa kultura ng mga tao.	2.29	Mababa
2.	Inaaral ko ang mga tanyag na tao mula sa kultura ng mga pangkat ng tao.	2.15	Mababa
3.	Kinakapanayam ko ang mga tao sa isang pamayanan.	2.31	Mababa
4.	Nakikipag-usap ako sa mga matatanda sa pamayanan.	2.63	Katamtaman
5.	Nagbabasa ako ng mga akdang ukol sa kultura, tradisyon at mga pamahiin ng isang pamayanan.	2.19	Mababa
	Pangkalahatang Mean	2.32	Mababa

Ang mga natuklasang datos ukol sa pagtukoy ng kahulugan ng mga salita bilang indikeytor ng pagsasaling wika ay umaalinsunod sa panitikan ni (Bharati, 2018) na nagsasabing may mahalagang papel ang bokabularyo sa pagbuo ng wika. Ang talasalitaan at ang mga pagbabagong dumarating sa panahon ay pagninilay ng kultura at ang mga pagbabagong naranasan nito sa paglipas ng mga taon ay mahalagang maunawaan ng mga mambabasa at tagasaling-wika.

Talahanayan 4. Lawak ng Gawi ng mga Mag-aaral sa Pagsasaling-wika ayonsa Pagpili ng mga Salita

Blg.	Mga Aytem	Mean	Palarawang Katumbas
1.	Pinipili ko ang mga tamang salita sa pagsulat ng komposisyon.	2.71	Katamtaman
2.	Sinusuri ko ang batayang kahulugan ng mga salitang gagamitin sa pagsulat.	2.13	Mababa
3.	Isinasalin ko muna ang mga salita sa wikang ginagamit ko bago pa magsulat.	2.29	Mababa
4.	Ginagamit ko sa mga pangungusap ang mga salita bago ko gamitin sa aktuwal na pagsulat.	3.02	Katamtaman
5.	Sinusuri ko ang mga morpema o yunit ng mga salita.	2.21	Mababa
	Pangkalahatang Mean	2.47	Mababa

Ang mababang mean na natamo ng mga mag-aaral para sa indikeytor na pagpili ng mga salita ay nagpapalakas sa sinasabi ni Chin (2012) na mahalaga ang angkop na pagpili ng salita sa pagsulat ng akademikong komposisyon. Mainam din na ang isang manunulat ay may malawak na kaalaman sa pagsasaling-wika. Ang mga banyagang sulatin ay mainam na naipauunawa sa mas maraming mambabasa sa pamamagitan ng pagsasalin nito sa wikang sinasalita ng mas maraming tao.

Talahanayan 5. Lawak ng Gawi ng mga Mag-aaral sa Pagsasaling-wika ayonsa Pagtutumbas ng mga Idyoma

Blg.	Mga Aytem	Mean	Palarawang Katumbas
1.	Inaaral ko ang matatalinghagang pahayag ng mga wikang alam ko.	2.31	Mababa
2.	Ginagamit ko ang mga idyoma sa aktuwal na pakikipagtalastasan	2.15	Mababa
3.	Ginagamit ko ang iba't ibang idyoma sa pagsulat.	2.15	Mababa
4.	Nagtatanong ako sa mga nakatatandang kasapi ng pamilya sa kahulugan at interpretasyon ng mga idyomang naririnig ko.	3.04	Katamtaman
5.	Binibigyan ko ng kahulugan sa Filipino ang mga idyoma sa aking wika.	2.31	Mababa
	Pangkalahatang Mean	2.39	Mababa

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Ang natuklasan ukol sa mga gawi sa pagsasaling wika batay sa pagtutumbas ng mga idyoma ay nagpapalakas sa sinasabi ni Gladwell (2022) na ang bawat wika ay may natatanging koleksyon ng mga kasabihan at parirala. Ang mga ekspresyong ito, na kilala bilang mga idyoma, ay kadalasang naglalaman ng mga kahulugan na maaaring hindi halata sa pamamagitan lamang ng pagtingin sa mga indibiduwal na salita.

Talahanayan 6. Buod sa Lawak ng Gawing mga Mag-aaral sa Pagsasaling-wika

Blg.	Mga Aytem	Mean	Palarawang Katumbas
1.	Pagtukoy ng Kahulugan	2.53	Mababa
2.	Pagpapahalaga sa Kultura	2.32	Mababa
3.	Pagpili ng mga Salita	2.47	Mababa
4.	Pagtutumbas ng mga Idyoma	2.39	Mababa
	Pangkalahatang Mean	2.43	Mababa

Ang natuklasan ukol sa pangkalahatang kaisipan ukol sa mga gawi sa pagsasaling-wika ng mga mag-aaral sa ikawalong baitang ay maaaring ikapit na pahayag ni Foster (2007) na sinasabing ang tagasalin ay kailangang magkaroon ng mahusay na kaalaman sa pinagmulan at sa target na wika, bilang karagdagan sa isang mataas na kamalayang panlinguwistika dahil dapat niyang ihatid ang intensiyon o pakay, orihinal na mga kaisipan at opinyon ng manunulat sa isinaling bersyon nang tumpak at tapat hangga't maaari.

Talahanayan 7. Lawak ng Kasanayan sa Akademikong Pagsulat

Blg.	Mga Aytem	Mean	Palarawang Katumbas
1.	Pokus at Diin	2.29	Mababa
2.	Organisasyon	2.31	Mababa
3.	Wika at Estilo	2.35	Mababa
	Pangkalahatang Mean	2.32	Mababa

Sa mas tiyak na pagsusuri, ang pokus at diin na nailalarawang mababa ay nagsasabing ang mga mag-aaral ay mahina sa akademikong pagsulat. Maaaring sabihing ang pagbibigay nila ng diin sa pagsulat at ang paglalahad ng mga layunin nito ay medyo malabo at maluwag na nakaugnay sa gawaing pagsulat. Sa pangkalahatan ukol sa pokus at diin, ang mga mag-aaral ay may mahinang pagganap sa akademikong pagsulat.

Ang natuklasan ukol sa pokus at diin ay nauugnay sa pahayag ni Sword (2020) na ang pinakakaraniwang layunin sa akademikong pagsulat ay ang ipaliwanag ang ilang ideya o paghahanap ng pananaliksik at hikayatin ang mga mambabasa na ang mga paliwanag o teorya ay tama. Sa paggawa nito, maaaring kailanganin ilarawan ang isang bagay, lugar, o aktibidad. Minsan maaaring sumulat upang magsalaysay ng hanay ng mga kaganapan, sa paraan ng isang kuwento. Sa akademikong pagsulat, makatuwirang gawing ang diin at layunin ng pagsulat ay malinaw at tugma sa gawaing pagsulat, at nagbigay ng malinaw na pananaw upang maging maliwanag din sa mga mambabasa.

Namamalas sa Talahanayan Bilang 8 ang datos ng makabuluhang ugnayan ng gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat. Lumabas ang tinuos na r-valyu na (0.881) nang suriin ang ugnayan ng dalawang baryabol. Ang nasabing valyu ay nagpapakita ng mataas na digri ng ugnayan at malakas na korelasyon. Masasabing ang ugnayan ay makabuluhan sapagkat ang p-value na 0.00 ay natagpuang mababa kung ihambing sa 0.05 antas ng kahalagahan. ($p=0.00 < 0.05$). Ang null hipotesis na nagsasabi na walang makabuluhang ugnayan ang gawi sa pagsasaling-wika at kasanayan sa pagsulat ng akademikong akda ay tinanggihan. Ang kinalabasan ay pumapanig sa alternative hypothesis na may makabuluhang ugnayan ang gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat.

Talahanayan 8. Datos ng Makabuluhang Ugnayan ng Gawi sa Pagsasaling-wika at Kasanayan sa Akademikong Pagsulat

Mga Baryabol	r-value	Antas ng Korelasyon	p-value	Pasya sa Ho
(X) Gawi sa Pagsasaling-wika (Y) Kasanayan sa Akademikong Pagsulat	0.881MK	Mataas na Korelasyon	0.00	Tinanggihan

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Ang natuklasan ukol sa makabuluhang ugnayan ng gawi sa pagsasaling wika at kasanayan sa akademikong pagsulat ay nasasalig sa paniniwala ni Culler (1997) na ang pagsasaling-wika ay may makabuluhang ugnayan sa pagsulat ng mga akademikong papel. Sa kaso ng mga tekstong pampanitikan, isang mahalagang isyu ang pagsasaling-wika sa larang na ito. Ang panitikan ay nakikita bilang isang ideolohikal at makasaysayang pangkat ng mga sulatin kasama ang pagganap nito sa iba't ibang aspeto ng buhay at lipunan. Dahil ang mga pag-aaral sa pagsasalin ay isang disiplina nakatutulong ito sa akademikong pagsulat. Mas naihahatid nito ang mga kaalaman sa mas nakararaming mambabasa dahil naisasalin ang mga teksto sa iba't ibang wika at diyalekto.

Nailalahad sa Talahanayan 9 ang mga datos ukol sa mga indikeytor ng gawi sa pagsasaling-wika na may makabuluhang impluwensiya sa kasanayan sa akademikong pagsulat. Nakikita sa talahanayan na ang mga antas ng kalahagahan ay mababa sa 0.05 (sig. value < 0.05). Ang hipotesis na nagsasabing walang indikeytor ng mga gawi sa pagsasaling-wika ang may makabuluhang impluwensiya sa kasanayan sa akademikong pagsulat ng mga mag-aaral ay tinanggihan. Ang mga indikeytor na pagtukoy ng kahulugan, pagpapahalaga sa kultura, pagpili ng mga salita, at pagtutumbas ng mga idyoma ay pawang natagpuang may makabuluhang impluwensiya sa kasanayan sa pagsulat ng akademikong akda.

Talahanayan 9. Mga Indikeytor ng mga Gawi sa Pagsasaling-wika ang may Makabuluhang Impluwensiya sa Kasanayan sa Akademikong Pagsulat

Indicators	Unstandardized Coefficients		Standardized Coefficients	t-ratio	Sig
	B	Std. Error	Beta		
Constant	β0	3.37	0.44	21.00	0.03
Pagtukoy ng Kahulugan	β1	0.56	0.94	29.09	0.02
Pagpapahalaga sa Kultura	β2	0.58	0.47	6.20	0.01
Pagpili ng mga Salita	β3	0.23	0.68	12.07	0.02
Pagtutumbas ng mga Idyoma	β4	0.23	0.68	12.07	0.02

Mula sa mga natuklasan, napalalakas nito ang pahayag ni na ang pagsasaling-wika ay may makabuluhang ugnayan sa pagsulat ng mga akademikong papel. Sa kaso ng mga tekstong pampanitikan, isang mahalagang isyu ang pagsasaling-wika sa larang na ito. Ang panitikan ay nakikita bilang isang ideolohikal at makasaysayang pangkat ng mga sulatin kasama ang pagganap nito sa iba't ibang aspeto ng buhay at lipunan. Dahil ang mga pag-aaral sa pagsasalin ay isang disiplina nakatutulong ito sa akademikong pagsulat.

Nabibigyang diin din ng mga natuklasan ang teorya ni Jack Mezirow (1991) na Transformational Learning Theory na naglalarawan kung paano ang kritikal na pagmuni-muni ng mga pagpapalagay at paniniwalang pinanghahawakan ay nagbibigay-daan sa mga mag-aaral na mas maunawaan ang kanilang proseso ng pag-aaral. Sa kaso ng akademikong pagsulat, nalilipat ng mga manunulat ang kanilang kaisipan sa pamamagitan ng pagsasaling-wika. Ang pagsasaling-wika ay makabuluhan sa proseso ng pagsulat. Ito ay isang teknik sa pagsulat na nakatutulong sa mga mag-aaral sa mabisang pagsulat lalo na ng mga akdang pang-akademik.

4. KONKLUSYON AT REKOMENDASYON

4.1. Konklusyon

Isinagawa ang pag-aaral na ito upang matukoy ang makabuluhang ugnayan sa pagitan ng mga gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat. Deskriptib-korelesyon ang disenyo ng pananaliksik na ginamit sa pag-aaral na ito. Ang mga kalahok sa pag-aaral na ito ay ang mga mag-aaral ng ikasampung na baitang ng Mataas na Paaralang Pambansa ng Bernardo D. Carpio, Cluster 15, Sangay ng Lungsod ng Davao, Rehiyon XI para sa Taong Panuruan 2022-2023.

May 152 kabuuang kalahok ang pag-aaral na pinili sa paraang simple random sampling. Ang mga natukoy na kalahok ang nagbigay ng sariling pagtataya bilang kahingian ng malayang baryabol. Ang nasabing mga mag-aaral din ang isinalang para sa gawaing akadamikong pagsulat bilang kahingian ng di-malayang baryabol.

Para sa lawak ng gawi ng mga mag-aaral sa pagsasaling-wika, ang pagtukoy sa kahulugan, pagpapahalaga sa kultura, pagpili ng mga salita at pagtutumbas ng mga idyoma ay nagtamo ng mean rating na katumbas sa mababa na nagsasabing bihira lamang ginagawa ng mga mag-aaral ang mga probisyong nauukol sa pagsasaling-wika.

Sa kasanayan sa akademikong pagsulat, ang tatlong indikeytor nito na: pokus at diin, organisasyon at wika at estilo ay pawang nagtamo ng mean rating na katumbas sa mababa. Sa mga datos na ito nasasabing ang mga mag-aaral ay may kahinaan sa akademikong pagsulat. Nabunyag din na may makabuluhang ugnayan ang gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat. Ang hipotesis na nagsasabing walang makabuluhang ugnayan ang gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat ay tinanggihan.

Dagdag pa, ang mga domeyn o indikeytor ng gawi sa pagsasaling-wika na: pagtukoy ng kahulugan, pagpapahalaga

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sa kultura, pagpili ng mga salita, at pagtutumbas ng mga idyoma ay pawang natagpuang may makabuluhang impluwensiya sa kasanayan sa akademikong pagsulat.

4.2. Rekomendasyon

Batay sa mga nabuong konklusyon ng pag-aaral, ang sumusunod na rekomendasyon ay inihahain ng mananaliksik upang isaalang-alang ng mga kinauukulan:

1. Maaaring magbalangkas ang mga opisyal ng Kagawaran ng Edukasyon (DepED) ng mga polisiya at mga patakaran ukol sa pagbuo ng mga programang magpapatingkad sa mga gawaing pagsasaling-wika sa mataas na paaralan. Sa kabilang banda, maaaring tayahin ang kasalukuyang kurikulum kung may sapat na kasanayang pampagkatuto na ukol sa kasanayan sa akadamikong pagsulat ng mga mag-aaral sa sekundarya.

2. Ang mga punong-gurong nangangasiwa sa mga paaralan ay maaaring magbalangkas ng mga school-based na pagsasanay na may diin sa paglinang ng kasanayan ng mga guro sa pagtuturo ng pagsasaling-wika at akademikong pagsulat. Maaaring ilakip sa programang Special Program in Journalism (SPJ) ang ukol sa mga gawaing may kaugnayan sa pagsasaling-wika at pagsulat.

3. Gawing batayan ng mga guro ang mga natuklasan sa paghahanda at pagdidisenyo ng mga kagamitang pampagtuturong higit na makatutulong sa kanila para mapagaan ang pagtuturo ng pagsasaling-wika at akademikong pagsulat gaya ng mga sariling linangan kit at learning activity sheets.

5. Maaaring magsagawa ng pag-aaral sa hinaharap ukol sa mga gawi sa pagsasaling-wika at kasanayan sa akademikong pagsulat gamit ang iba pang mga indikeytor upang mapatingkad ang kinalalabasan ng pag-aaral na ito.

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PROJECT SAYON (STUDENT AID FOR YIELDING OUTSTANDING NUMERACY): ENHANCING STUDENTS' MATHEMATICAL PROFICIENCY

Jeoramy A. Anib Jr.[1], Kenneth Jhon L. Milan[2], Marvin R. Agno[3], Angelica A. Mecarandayo[4], Queenie Jane S. Ganotise[5], Aillen A. Pahayahay[6]

[1]*ORCID No. 0009-0007-1841-8252*
Student, Kapalong College of Agriculture, Sciences and Technology Maniki, Kapalong, Davao del Norte, Philippines
[2]*ORCID No. 0009-0004-8216-1533*
Student, Kapalong College of Agriculture, Sciences and Technology Maniki, Kapalong, Davao del Norte, Philippines
[3]*ORCID No. 0009-0008-8091-9995*
Student, Kapalong College of Agriculture, Sciences and Technology Maniki, Kapalong, Davao del Norte, Philippines
[4]*ORCID No. 0009-0000-8699-1826*
Student, Kapalong College of Agriculture, Sciences and Technology Maniki, Kapalong, Davao del Norte, Philippines
[5]*ORCID No. 0009-0001-2265-2849*
Student, Kapalong College of Agriculture, Sciences and Technology Maniki, Kapalong, Davao del Norte, Philippines
[6]*ORCID No. 0009-0002-9674-9843*
Student, Kapalong College of Agriculture, Sciences and Technology Maniki, Kapalong, Davao del Norte, Philippines

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ABSTRAK

This study evaluated the effectiveness of Project SAYON (Student Aid for Yielding Outstanding Numeracy) as an intervention to enhance mathematical proficiency among Grade 10 students at Luna National High School. Using a pre-experimental design, the study compared pre-test and post-test results to assess the impact of the project. The pre-test indicated a moderate level of proficiency, with a mean score of 10.09. After implementing Project SAYON, the post-test results revealed a significant improvement, with a mean score of 13.52. The hypothesis was tested at a 0.05 level of significance, showing a meaningful difference between the pre-test and post-test scores. This demonstrates that Project SAYON effectively improved students' mathematical skills by offering targeted tutoring and resources. The study highlights the importance of structured, innovative interventions in enhancing academic performance, particularly in mathematics.

KEYWORDS: *mathematical proficiency, intervention, pre-experimental*

RATIONALE

In the last few years, learning and teaching have come to depend on having a solid grasp of mathematical proficiency. Research has high significance, particularly in global educational reforms over the past 15 year despite its growing importance, mathematical proficiency remains somewhat vague and is not fully grasped by educators. Further exploration into how to better define and communicate the concept of mathematical proficiency can enhance teachers' ability to foster this essential skill among students (Sa'dijah et al., 2023).

In an Indonesian study, researchers investigated the mathematical proficiency of students. One analysis revealed that the students did not meet established standards for mathematical proficiency. Specifically, none of the students demonstrated proficiency at high or medium levels. Among male students, there was a notable weakness in formulating and planning strategies, although they showed relative strength in communication and utilization of mathematical symbols, formal language, techniques, and operations. Similarly, female students exhibited low proficiency in formulating and planning strategies but excelled in communication and utilization of mathematical symbols, formal language, techniques, and operations. Furthermore, the study delved into the reasons behind the low mathematical proficiency observed among eighth-grade students at SMP Negeri 9 Kendari Junior High School (Salim et al., 2018).

In the Philippines, many junior high school students struggle with mathematical proficiency, encountering difficulties that extend beyond rote memorization of formulas. These challenges often stem from a lack of foundational understanding of mathematical principles, making problem-solving tasks daunting and fostering negative attitudes towards the subject. This widespread struggle underscores systemic issues within math education (Faustino, 2022).

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In Tagum City, Davao del Norte, a study found that students struggled with mathematical proficiency. Common challenges included difficulty in analyzing problems, understanding concepts, identifying correct solutions, and simplifying expressions. Students also faced issues with self- perseverance, seeking expert help, studying, practicing regularly, and building confidence in their mathematical abilities. The study recommended that teachers teach problem-solving procedures and apply concepts to real-life situations in word problems to demonstrate their relevance. Additionally, incorporating fun and engaging elements into teaching methods and encouraging open communication between teachers and students could help address these challenges (Velez et al., 2023).

The urgency of conducting this study lies in addressing the critical need to help struggling students at Luna National High School improve their mathematical proficiency. In today's fast-paced world, being good at math is really important for personal growth, getting a job, and making society better. By trying out different methods to teach math better, we hope to help these students do better in school. This study is important because it could help close the gap in education, make sure everyone gets a fair chance, and give students the skills they need to succeed in a world where math and data are becoming more and more important.

REVIEW OF RELATED LITERATURE

In this section presented the related literature and studies after the thorough and in-depth search done by the researcher. It is from the different readings from internet sites and other related literature and study that are conducted with different authors/ researchers regarding the theories that are related to this study.

Mathematical Proficiency

"The state of being competent", "advanced or proficient in any art, science or subject" and "having appropriate or sufficient skills, knowledge, experience, etc." are some definitions for the word skill, with a specific purpose". According to these definitions, being mathematically proficient could be described as having the right or necessary skill, knowledge, experience, or other qualities for a given situation. A framework was developed by Kilpatrick et al. to describe what mathematical expertise entails. The authors contend that for students to be effective in mathematics, they must possess knowledge in five distinct strands that take into account concepts, procedures, techniques, reasoning, and attitudes (Guita et al., 2018).

Additionally, classes in mathematics may be able to have a larger focus, incorporating conceptual discussions and explorations. However, it is usual to see the larger focus of mathematics turn to procedures when it comes to assessment. When evaluating student's mathematical proficiency, solutions are frequently the only thing considered rather than their learning and working methods. According to Kilpatrick and Swafford, "Most current mathematics exams, whether they are standardized performance tests or classroom quizzes, cover only a small part of mathematical proficiency - usually only the computer part and simple parts of understanding and applying. Mathematical proficiency includes conceptual knowledge, strategic competence, procedural fluency, adaptable reasoning, and a positive attitude (Correa, 2020).

Furthermore, learning mathematics might trigger troubling and anxious recollections of formulas and step-by-step instructions. Many people think that mathematics is all about memorizing formulas and following rules. According to Kilpatrick, Swafford, and Findell, classroom mathematics does not always reflect the fact that deductive reasoning is a big part of mathematics. According to the authors, "mathematics learning has frequently been more a question of memorization than of comprehension," for a long time, the educational system engaged complex knowledge, but only superficially and without a concern for comprehending it. There is no denying that mathematics uses formulae and methods. But this is hardly the core of mathematics. Because mathematics requires thinking, reasoning, analyzing, and conjecture, it may also be frustrating (Correa, 2020).

In relation to this, Khairani and Nordin created a mathematical proficiency test to gauge the improvement in the conceptual knowledge, procedural fluency, and strategic competence of 588 14-year-old students. The subjects covered on the test were "Linear Equation, Algebraic Expressions II, Ratios, Rates, and Proportions I, and Coordinates and Circles I," with no additional instruction or classes offered to assist students in their preparation. The conceptual understanding test's questions were thought to be the easiest for students to answer. The students thought that procedural fluency was the most challenging strand, followed by strategic competency. Students performed well on questions that "explicitly" revealed the material, but struggled when they were required to "apply their past knowledge" to come up with solutions (Correa, 2020).

Moreover, Math proficiency is necessary for the student, according to Schoenfeld, because mere mathematical knowledge is insufficient. This information ought to be practical for the student to use. His aptitude in mathematics is a sign of long-term success. It is important to take into account the five strands of math skill listed above because they are connected, indivisible, and developed in an integrated manner (Altarawneh et al., 2021).

In addition, the concept of mathematical proficiency and the issues that were relevant when measuring it served as the foundation for proficiency evaluation. Kilpatrick et al. were used in the study. Procedural fluency, Conceptual understanding, Adaptive reasoning, and Strategic competency are the four distinct strands of math proficiency (Kilpatrick et al., 2001).

Procedural fluency. The first strand of math proficiency which is procedural fluency is described by Al-Shammari as "the capacity to select the appropriate mathematical processes to solve problems skillfully and precisely." According to MacGregor, it is the capacity to carry out mathematical operations and procedures deftly and precisely. Siegfried emphasized that memorizing mathematical rules without conceptual comprehension results in a poor understanding of the subject (Altarawneh et al., 2021).

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In addition, the ability to solve problems in familiar settings creatively rather than just memorizing them is known as procedural fluency. The learner's capacity to recall mathematical operation steps, to utilize them quickly and precisely, and to correctly and expertly use them to relate concepts and relations among operations are also reflected in their level of fluency (Al-Shammari, 2019).

Moreover, procedural fluency entails knowledge of the procedures, knowing when and how to employ them, and having the flexibility, accuracy, and efficiency to execute the procedures. Understanding a procedure is being aware of its purpose, foundation, and algorithm. Students with Procedural fluency are able to use a process to solve difficulties as well as simply know about it. Additionally, students are familiar with the knowledge required to use a method. Students with Procedural fluency can also use the algorithm in a variety of ways. This indicates that they have the ability to alter a process to arrive at the ideal solution to a challenge (Laswadi et al., 2017).

Hence, procedural fluency involves both mental processes and activities related to memory. Because it will promote students' conceptual understanding as the foundation of processes, thinking process is a crucial component of Procedural fluency. Students can choose the approach they should take to a problem by using the thinking process. Additionally, through the creative process, students with PF can develop their own effective methods (Bahr & Garcia, 2018).

Indeed, a crucial aspect of mathematical proficiency is procedural fluency. It is the capacity to apply procedures in a precise, effective, and flexible manner; to transmit processes to various issues and situations; to create or alter procedures based on existing procedures; and to recognize the instances in which one strategy or procedure should be used instead of another. Students require practice combining ideas and methods, building on established methods as they develop their own informal tactics, in order to become procedurally fluent. Students require opportunities to support and defend their decisions on suitable processes, to enhance their understanding and expertise through dispersed practice, and to quantitatively justify both informal tactics and frequently used procedures.

Conceptual understanding. Reflects the student's capacity to comprehend concepts and mathematical relationships, build a mathematical knowledge base, connect it to prior knowledge, and apply it to new mathematical contexts and situations. For a deeper understanding, the learner is better able to remember steps and make accurate calculations (NRC, 2004).

Additionally, conceptual understanding is defined as "the capacity to fully comprehend mathematical ideas, the capacity to present such concepts in more than one way, the capacity to correlate them to relevant procedures, and finally the capacity to conclude and assess interrelations in a reasonable and correct manner.". To give the student the flexibility and fluency required for solving mathematical problems, it also entails using these symbols correctly and quickly in a mathematical language (Shteiwi et al., 2019).

Furthermore, deep and developed knowledge, the proper processing of mathematical ideas in the learner's cognitive framework, and all pertinent generalizations are all parts of conceptual understanding. The indicators show a comprehension of mathematical concepts, including their properties, symbols, corresponding procedures, and methods for applying them in real-world contexts, as well as the ability to derive pertinent mathematical generalizations (Obieda, 2017).

A student with conceptual understanding has access to a variety of skills. Kilpatrick and colleagues claim that students who possess CU can use their knowledge of previously understood mathematical ideas to explain recently discovered ideas. Students can increase their knowledge with the use of this aptitude. Additionally, students with CU are able to articulate their thoughts by using a variety of representations. Lastly, students using conceptual understanding have the option of selecting a representation that is appropriate for a certain circumstance. This skill aids pupils in effectively and efficiently presenting their ideas (Laswadi et al., 2017).

Furthermore, the emphasis of the common core math's standards is the significance of conceptual understanding as a crucial element of mathematical proficiency. Understanding of conceptual mathematics entails a solid comprehension of the fundamental ideas that underlie the mathematical procedures. As a result, it involves a setting where students are free to choose and actively apply what they have learned. If a learner is to fully comprehend mathematics, they must possess both types of comprehension.

Adaptive reasoning. Logic-based thinking about the relationships between ideas and circumstances is referred to as adaptive reasoning. Additionally, it says that students who reflect, explain, and justify their decisions demonstrate adaptive reasoning. Different mathematical concepts that were later developed make up mathematics (Francisco, 2017).

Consequently, adaptive reasoning skills (ARS), a term coined by the National Research Council to refer to a broad range of thinking, serve as a learning framework for pupils. ARS is regarded as a general mode of reasoning because it includes not only informal justification and explanation but also intuitive reasoning and inductive reasoning based on pattern, analogy, and metaphor (Rizki et al., 2018). Moreover, Kilpatrick et. al define Adaptive reasoning skills as the capacity to consider, justify, explain, and reason logically about the link between the situation and the concept. While the ability to reflect relates to the capacity to evaluate the validity of a technique or mathematical argument, the logical thinking abilities pertain to the capacity to produce conjectures. Students with strong adaptive reasoning could generalize and extend the answer to other situations as well as utilize reasoning to explain and defend solutions to issues (Rizki et al., 2018).

Students who combine adaptive reasoning skills and metacognitive abilities may find it easier to articulate complex problem situations, engage in self-reflection, and defend their positions to others or to themselves. Additionally, learners with strong adaptive reasoning are capable of determining whether a

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solution is right or wrong as well as providing a reasoned reasoning (Rizki et al., 2018).

In relation to this, adaptive reasoning covers how to defend mathematical inferences as it links several concepts together. Adaptive reasoning is the capacity for emotionally considering relationships, ideas, and circumstances while also incorporating intuition, inference, and conjecture. It is employed to fully comprehend all facets of the issue. Additionally, it aids in learning process direction and solution measure selection. The students track their development by putting their solution plan into practice. Additionally, reasoning entails applying logic to interpret and support a particular problem's answer or to synthesize one (Qarni & Shalhub, 2019).

Strategic Competence. According to Groves, the learner's capacity to design, reassess, and write down solution plans for problems utilizing the conceptual understanding and appropriate methods constitutes the third strand of mathematical competency, or strategic competence. Strategic competence refers to a learner's capacity to solve mathematical problems, identify crucial mathematical information and present it using a variety of methods, find mathematical connections, and elicit novel solution approaches that are appropriate for the problem at hand (Al- Shammari, 2019).

Consequently, the student acquires the perseverance required for the processes of solving mathematical problems to present them in multiple ways through the drawing, mentally or in writing, of a formula that reveals the interrelationships by choosing appropriate strategies such as: figure drawing, hypotheses, construction of tables, use of elicitation logic and use of templates to present the context of a mathematical problem, etc. there is a relationship between conceptual understanding, procedural fluency, and strategic competence. The learner must have the fluency and expertise to solve routine problems as well as an understanding of implicit knowledge and the relationships between problems in order to build non-routine solution techniques (Qarni & Shalhub, 2019).

Additionally, problem-solving skills are another name for mathematical strategic competency in other publications. Kilpatrick J., Swafford, J., & Findell, contends that the circumstances and requirements of the mathematical tasks that teachers assign to their students in the classroom are frequently extremely apparent. But outside of the classroom, students encounter issues that are difficult to frame as mathematical issues. For instance, the student must manage his parents' allowance so that it may cover all of his demands under specific conditions. Students must express these issues as the mathematical issues they have covered in school and decide what is known and what to look for. They must therefore have experience and skill expressing the problem from a specific circumstance to a mathematical problem (Supiyanto et al., 2018).
Also, numerous researches investigating the effectiveness of teaching in terms of the mathematical building blocks competency among future math teachers. The findings of this investigation demonstrated that in terms of procedural fluency and conceptual knowledge of trigonometric inequalities, student teachers fare poorly. Additionally, the student teachers' performance in the area of trigonometric inequalities was weak in terms of their strategic competence and overall math ability (Usman, 2020).

Moreover, the ability to choose the appropriate approach to a problem is a crucial component in solving any mathematical problem. To choose the method of problem solving and comprehend the steps to take to arrive at a solution, one needs strategic competency. According to de Jong and Ferguson-Hessler and Posner and McLeod, a strategy is a logical sequence of acts, such as information analysis, issue representation, tool selection, and planning of the many steps to be taken to arrive at the answer.

RESEARCH OBJECTIVES

The study determined the effectiveness of Project SAYON as a strategy for enhancing mathematical proficiency among Grade 10 students of Luna National High School. Further, this study elicited pertinent information by answering the following questions:

1. To determine the level of math proficiency among Grade 10 Students of Luna National High School during the pre-test.
2. To determine the level of math proficiency among Grade 10 students of Luna National High School during post-test; and
3. The null hypothesis which will be tested at 0.05 level of significant difference between pre-test and post-test of math proficiency among Grade 10 students.

Project SAYON (Student Aid for Yielding Outstanding Numeracy) sought to address the pressing issue of students in mathematics by proposing a comprehensive intervention, innovation, and strategy. The rationale for this initiative was deeply rooted in the belief that every student deserves an equal opportunity to excel, with a particular emphasis on developing mathematical proficiency. By fostering a positive learning environment, the project aimed to empower students and pave the way for academic success.

The extent of this proposed intervention encompassed students in Grade 10 enrolled in the school year 2023-2024 at Luna National High School. The innovation laid in a blended approach combining personalized tutoring, interactive workshops, and digital resources to cater to diverse learning styles. Recognizing the multifaceted nature of the challenge, the strategy was designed to provide holistic support that extended beyond traditional classroom boundaries.

Personalized Tutoring. It is when a teacher gives special help to a student based on their needs. It means the teacher pays close attention to what the student knows and doesn't know. The teacher then makes lessons and activities just for that student, so they can learn better. Personalized tutoring helps students understand things more easily because it's tailored to them. It's like getting a custom-made learning plan that fits exactly what the student needs to learn.

Preparation. Researcher assigned each student to a student teacher. These student teachers then spent two hours every week giving one-on-one tutoring to their assigned student. Before the tutoring sessions start, the student teacher needed to

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understand the specific needs and goals of their student. This involved reviewing the student's previous work, talking to their regular teacher, and planning lessons and activities tailored to the student's learning style. The preparation included gathering any materials or resources needed for the tutoring sessions to be effective and engaging.

Interactive Workshops. It referred to learning sessions where everyone got involved. Instead of just listening, participants did activities, asked questions, and shared ideas. These workshops were like a team effort where everyone learned from each other. They used games, group discussions, and hands-on tasks to make learning fun and engaging. Interactive workshops encouraged active participation, which helped people remember and understood things better. They're a great way to learn because they're not boring; they're exciting and kept everyone interested. The goal of interactive workshops was to make learning enjoyable, memorable, and meaningful for everyone involved.

Preparation. The interactive workshop involved planning for a session every Friday, where different speakers, who were student math teachers, shared their knowledge. The preparation varied based on the student-teacher leading the session, but ensured alignment with the workshop's goals. This included creating engaging activities, gathering relevant materials like presentations or handouts, and coordinating with the speaker to cover key topics. The aim was to make each workshop informative and interactive, fostering collaboration and learning among all participants. The preparation process emphasized adaptability and coherence with the overall objectives of the workshops.

The researchers employed the following processes through the duration of the implementation of the intervention:
First, the respondents were student from Grade 10 at Luna National High School, and they were informed about the intervention of this action research. Also, the planning for the realization of the proposed Project SAYON in the school was discussed. Before conducting the study, the researchers designed and constructed a pre-test and a post-test and subjected it to face validity and content validity in order to collect data. The result of the pre-test and post-test were compared with the statistical tools, weighted mean and two-tailed t-test using the Statistical Package for the Social Sciences after implementing the said intervention.

Before the implementation of the study, the researchers established rapport with the respondents and conducted orientation where the purpose, intentions, and methodologies of the study were explained to them in a language they were familiar with and capable of. After that, the researcher asked for their consent to be one of the respondents in the study, and their availability was considered.

In addition, to ensure the welfare of the respondents, a thorough discussion on the benefits Project SAYON was conducted by the researchers, which served as a guide to the respondents on what possible experiences they were going to experience to realize the strategy that was implemented during the study. The researchers assured that the planning being done will be of great help to the learners in making math more fun and engaging for them. Safety and health protocols were addressed and followed.

Afterwards, the researchers administered the pre-test they made in order to commence the study. Following this was the collection of the pre- test questionnaires after the students were done answering. Next, the researchers implemented the project SAYON intervention for a month. Later on, the researchers conducted a post-test and after gathering the data, the researchers compared the data using the statistical used in the study.

Eventually, the researchers used the collected data to answer the following questions:

1. To determine the level of math proficiency among Grade 10 Students of Luna National High School during the pre-test.
2. To determine the level of math proficiency among Grade 10 students of Luna National High School during post-test.
3. To determine the significant difference between pre-test and post-test

After the implementation, the researchers hoped that there would be improvements on the mathematical proficiency of students with Project SAYON as an innovation in enhancing the said skills. The improvements were beneficial to the students for their future engagement in a variety of mathematical concepts. This enabled them to have a better understanding for more complex mathematical topics.

METHODOLOGY

This chapter presents the methodology employed in this study. This includes the research design, research locale, sample and population, data collection, and statistical tool to be use throughout the study.

RESEARCH DESIGN

The design of this study was pre-experimental as the researcher aimed to measure the effect of Project SAYON on the mathematical proficiency of Grade 10 students at Luna National High School. A pre-experimental design is an investigative approach used to determine whether a specific variable influences outcomes. It provides a conceptual framework within which the experiment is conducted. The primary criterion for this design is its suitability for testing the study's hypothesis, ensuring that the chosen methodology effectively evaluates the impact of the intervention on students' mathematical proficiency (Ary et al., 2021).

In this study, an experimental design was used to conduct action research. The researcher studied whether there was an effect of using Project SAYON as an intervention on the skills of students in solving mathematical problems. The researcher identified a group of participants consisting of 65 students who took a pretest and then received the newly designed intervention over one month. After a month of intervention, the same participants took a post-test.

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RESEARCH INSTRUMENT

This study adapted one (1) survey questionnaire from a web source to measure mathematical proficiency. The instrument is derived from the study of Moodley (2008). The test will consist of 20 algebraic questions, which are multiple- choice items. The mathematical proficiency test has a full score of 20 points. Every correct answer on each item corresponds to 1 point. The test will consist of five items measuring the conceptual understanding strand, five items covering the procedural fluency strand, five items to examine the strategic competence strand, and five items that assess adaptive reasoning.

The math proficiency questionnaire includes twenty (20) items. In assessing the math proficiency of Grade 10 students at Luna National High school, following scale will be used:

Range of Means	Descriptive Level	Interpretation
17 – 20	Very High	This means that the math proficiency of Grade 10 students at Luna National High school is outstanding.
13 – 16	High	This means that the math proficiency of Grade 10 students at Luna National High school is very satisfactory.
9 – 12	Moderate	This means that the math proficiency of Grade 10 students at Luna National High school is satisfactory.
5 – 8	Low	This means that the math proficiency of Grade 10 students at Luna National High school is fairly satisfactory.
0 – 4	Very Low	This means that the math proficiency of Grade 10 students at Luna National High school did not meet the expectations.

To ensure content validity, the research questionnaire had undergo a validation process. Before the study begins, the multiple-choice test for mathematical proficiency was subjected to item analysis to identify which items will be preserved and which will be rejected.

RESEARCH LOCALE

This study was conducted at Luna National High School, a secondary public school located in Luna, Kapalong, Davao del Norte. In this school, many students have experience with low mathematical proficiency.

SAMPLE AND POPULATION

Purposive sampling refers to a group of non-probability sampling techniques in which units are selected because they have characteristics that you need in your sample. In other words, units are selected "on purpose" in purposive sampling (Nikolopoulou, 2023).

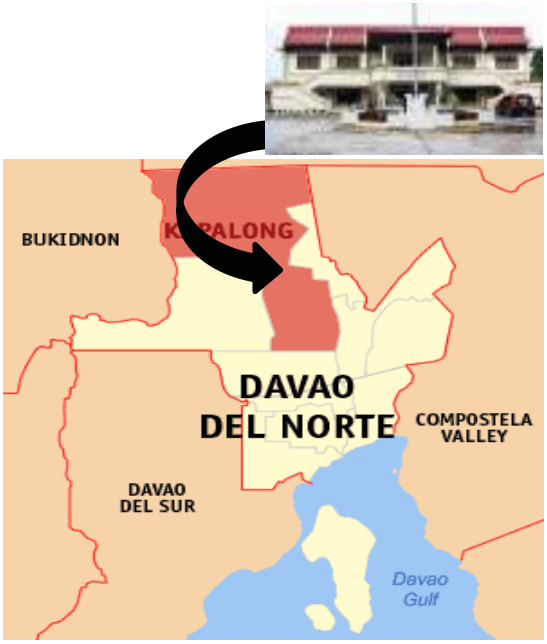


Figure 1. Regional Map Highlighting the Research Locale (District of Davao del Norte)

Also called judgmental sampling, this sampling method relies on the researcher's judgment when identifying and selecting the individuals, cases, or events that can provide the best information to achieve the study's objectives. In this case, the research respondents for this study was 65 students coming from grade 10, enrolled in the Academic Year 2023-2024 at Luna National High School.

DATA COLLECTION

The researcher followed subsequent procedures to collect the required information for the investigation.

Crafting of Questionnaire - Pretest and Post-test Questionnaires. The researcher had initiate group planning sessions to develop questionnaires for both pretest and post-test assessments. To tailor the questionnaire to the respondents, researchers used an adapted questionnaire. Crafting the questionnaire involved meticulous consideration of relevant questions to assess students' mathematical proficiency. The test questionnaire served as the tool for gathering quantitative data from the respondents. Two sets of test questionnaires was administered: the pretest and post-test questionnaires.

Questionnaire Validation. The researcher had undergo validation of the questionnaire from experts or a panel well-versed in questionnaire development to ensure its validity and reliability.

Seeking Permission to Conduct the Study. The researchers had ask the school principal to distribute the pretest questionnaires to the identified students in need and those facing challenges. Additionally, the researchers sought permission to implement the intervention in the identified class group.

Pretest Assessment Administration. Before implementing the intervention, the researcher administer a pretest to Grade 10

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students. This pretest aims to gauge the students' baseline performance levels in solving basic math problems.

Intervention Implementation. The implementation phase was executing the Project SAYON intervention in the grade 10 students during the Independent/Collaborative Learning (ICL) of the subject Mathematics. The intervention had take one month implementation.

Post-test Assessment Administration. After one month of implementing the intervention in the students, a post-test was administered to assess the students' progress in mathematical proficiency. This test had measured the students' enhanced skills and understanding after the intervention.

Data Tabulation and Evaluation. The data gathered from the pretest and post-test had undergo tabulation. The complete questionnaires was collected by the researchers and subsequently entered into a Microsoft Excel spreadsheet for data encoding. The statistician was granted confidential permission to perform calculations, create tables, and analyze the data with utmost discretion. The results of the tabulation served as the basis for evaluating the effectiveness of the intervention in enhancing students' polynomial problem-solving skills. The findings had guide potential modifications or improvements in the intervention strategies to further enhance teaching practices.

STATISTICAL TOOL

The study utilize the Weighted Mean and Paired T-test using the Statistical Package for the Social Sciences (SPSS).

Mean. The weighted mean was utilized to describe the pre-test and post- test results.

Paired t-test. Alternatively referred to as a dependent or correlated t-test, this is a powerful analytical method designed to assess the mean and standard deviation differences between two interrelated groups (Gleichmann, 2020). This particular statistical test is especially well-suited for investigations where the relationship between the two sets of data is essential, such as in pretest and post-test scenarios.

The paired t-test was utilized to discern whether there existed a statistically significant difference between the averages of a pretest and a post-test. This application of the paired t-test enabled the researcher to evaluate whether any observed variations in the mean scores were beyond what could be attributed to random chance. By focusing on the comparison of the pretest and post-test data, the paired t-test became a valuable tool for identifying and quantifying any changes or developments that may have arisen over the course of the research intervention.

RESULTS

This chapter presents the findings and results of Project SAYON as a strategy for enhancing mathematical proficiency among Grade 10 students of Luna National High School. Analyses and interpretations of data were done parallel to the research objectives.

Level of Math Proficiency

Table 1. Pre-test

Pre-Test Scores	Frequency	Percentage
3	3	4.62%
4	2	3.08%
5	3	4.62%
6	6	9.23%
7	1	1.54%
8	4	6.15%
9	6	9.23%
10	6	9.23%
11	10	15.38%
12	8	12.31%
13	7	10.77%
14	3	4.62%
15	3	4.62%
16	1	1.54%
17	1	1.54%
18	1	1.54%
Total	**65**	**100.00%**
Overall Mean		**10.09**
Description		**MODERATE**

The pre-test results show that the overall mean score is 10.09, indicating that, on average, students have a moderate level of math proficiency. The highest score recorded on the pre-test is 18, achieved by only one student, representing 1.54% of the total. This suggests that very few students have reached the highest level of proficiency. Conversely, the lowest score is 3, obtained by three students, accounting for 4.62% of the total, indicating a small number of students at the lower end of proficiency. The most frequent score is 11, achieved by ten students, making up 15.38% of the total. This implies that a significant number of students are slightly above the average proficiency level while the average score indicates moderate proficiency, the range of scores shows a distribution with both high and low achievers, and a notable cluster around the score of 11.

Table 2. Post-test

Post-Test Scores	Frequency	Percentage
8	1	1.54%
9	1	1.54%
10	6	9.23%
11	5	7.69%
12	8	12.31%
13	14	21.54%
14	11	16.92%
15	8	12.31%
16	6	9.23%
19	1	1.54%
20	4	6.15%
Total	**65**	**100.00%**
Overall Mean		**13.52**

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Description	HIGH

The overall mean score of the post-test is 13.52, indicating that, on average, students scored around 13.52 out of the maximum possible score. This suggests a generally high level of performance across the group. The highest score achieved was 20, with four students attaining this mark, representing 6.15% of the total number of students. This demonstrates that a small percentage of students achieved a perfect score, showcasing excellent performance. On the other end, the lowest scores were 8 and 9, with one student each scoring these marks, each accounting for 1.54% of the total. This indicates that very few students scored at the lower end of the scale, suggesting that most students performed reasonably well. The most frequent score was 13, with fourteen students scoring this mark, which is 21.54% of the total number of students. This high frequency suggests that the score of 13 was the most common among the students, indicating a central tendency around this score.

Table 3. Significant Difference between Pre-test and Post-test

Type of Test	N	df	Mean	SD	t-value	P-value	Decision $\alpha = 0.05$
Pre-Test	65	64	10.09	3.53	-10.902	**< .001**	**Significant**
Post-Test	65		13.52	2.61			

Presented in table 3 is the significant difference between pre-test and post-test, t (64) = -10.902, p < .001. Since the p-value (< .001) is less than the level of significance (d=0.05), the null hypothesis is being rejected in the context. The significant difference observed in the pre-test and post-test scores indicates a positive outcome resulting from the intervention utilized. This discrepancy suggests an improvement in students' math skills consequent to the implemented approach. The favorable change underscores the efficacy of the intervention, validating its capacity to enhance students' comprehension and proficiency in mathematics.

DISCUSSION

Discussed in this chapter are the summary, conclusions and recommendations on the findings of the research. Presented in the results are the extent of Project SAYON towards the Math proficiency of Grade 10 students in Luna National High School.

LEVEL OF MATH PROFICIENCY

Pre-test

The Pre-test data on the level of math proficiency among Grade 10 students of Luna National High school was illustrated in table 1. The result stipulates that the math proficiency Grade 10 students was satisfactory. This signifies that students have moderate ability to take time to understand and identify the problem, as well as figure out all the possible solutions to solve the problem. This observation aligns with findings by Fülöp (2021), who noted that problem-solving skills in mathematics develop gradually and that students often need structured support and practice to improve their proficiency. Fülöp's research suggests that while students may demonstrate satisfactory performance initially, their skills can be enhanced significantly with targeted interventions and practice.

Post-test

The Post-test data on the level of math proficiency among Grade 10 students of Luna National High school was illustrated in table 2. The result stipulates that the math proficiency Grade 10 students was very satisfactory. This represents an almost fourfold increase from their pretest performance, demonstrating that the students now possess very satisfactory skills in solving math problems. This suggests that the intervention positively impacted their mathematical proficiency.

Supporting studies have shown that targeted interventions can significantly enhance students' mathematical proficiency. For instance, a study by Swan (2022) in "Visible Learning Theory" found that feedback, effective teaching strategies, and clear learning goals greatly impact students' academic achievements, including math proficiency. Similarly, research by Sholihah and Lastariwati (2020) highlighted that instructional strategies that encourage problem-solving and critical thinking skills can lead to substantial improvements in students' performance.

SIGNIFICANT DIFFERENCE BETWEEN THE PRETEST AND POST-TEST

The study showed a clear boost in students' math skills, as seen in the substantial difference between their pretest and post-test scores. This improvement underscores the success of Project SAYON intervention in enhancing students' mathematical proficiency. This finding aligns with prior research by Eli (2021), which emphasizes the efficacy of interactive learning approaches in improving academic performance. Their study suggests that students are more engaged and motivated when learning through participatory methods, like those employed in Project SAYON.

Furthermore, recent research by Son and Fatimah (2020) corroborates the positive impact of interactive interventions on students' math abilities. Their analysis indicates that hands-on learning experiences, such as those offered by Project SAYON, not only enhance mathematical proficiency but also foster a deeper understanding of concepts. By actively engaging with mathematical problems in a supportive environment, students develop problem-solving skills and confidence in their abilities.

Additionally, the study's findings align with the research conducted by Malik and Zhu (2023), which emphasizes the importance of incorporating hands-on activities in educational interventions. Their work suggests that experiential learning approaches, such as those implemented in Project SAYON, offer avenues for personalized instruction and timely feedback, resulting in enhanced learning outcomes. Through the utilization of interactive workshops and real-world simulations, educators can cultivate engaging learning atmospheres that accommodate various learning preferences and foster continuous academic progress.

CONCLUSION

Based on the foregoing results of the study, the following conclusions were drawn:

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First, the pre-test results indicated that students had a satisfactory level of math proficiency before the project started. This means they had an acceptable understanding of math concepts but were not excelling. Their performance was good enough to meet basic standards, but they could still improve in areas like problem-solving and complex calculations. The satisfactory rating showed that while they understood some math topics, there were gaps in their knowledge that needed to be addressed.

Second, the post-test results revealed that the students' math proficiency improved to a very satisfactory level after participating in Project SAYON. This significant improvement suggests that the project helped the students enhance their math skills more effectively than their previous learning methods. The students showed a much better understanding of math concepts and were able to solve problems more accurately and quickly. Project SAYON provided the extra support and practice they needed to excel in math.

Third, the study tested the null hypothesis at a 0.05 level of significance and found a significant difference between the pre-test and post-test results. This means that the improvement in the students' math proficiency was not due to chance, but to the intervention of Project SAYON. The significant difference shows that Project SAYON had a real and measurable effect on the students' math proficiency, proving its success as an educational tool.

Hence, the result implies that using structured programs like Project SAYON can greatly improve students' math proficiency. Schools should consider adopting similar methods to help students achieve better academic success. This project shows that targeted interventions can make a significant difference in learning outcomes. Teachers and administrators can use these findings to support and enhance their math teaching strategies, ultimately helping students perform better in their studies.

RECOMMENDATIONS

On the light of the aforementioned findings of the study, the following recommendations were drawn:
Given the significant improvement in math proficiency among Grade 10 students, it is recommended that Project SAYON be adopted and expanded to include all grade levels at Luna National High School. This program should be integrated into the regular curriculum to ensure that students at different stages of their education benefit from its structured approach to math learning.

Also, school administrators and policymakers should support the implementation of Project SAYON by providing clear guidelines and policies. This includes setting realistic goals, providing necessary resources, and ensuring that the program aligns with the overall educational objectives of the school. Continuous support from the administration is crucial for the program's sustainability.

In addition, it is hereby recommended that teachers should receive specialized training to effectively implement Project SAYON. Professional development workshops and continuous training sessions should be conducted to familiarize teachers with the project's methods and materials. This will ensure that teachers are well-equipped to deliver the program and support students' learning effectively.

Also, parents and guardians play a crucial role in students' academic success. It is recommended to engage them in the process by providing information about Project SAYON and its benefits. Workshops or meetings can be organized to help parents understand how they can support their children's learning at home.

Lastly, while the results of this study are promising, further research should be conducted to explore the long-term effects of Project SAYON on students' math proficiency. Comparative studies involving different schools and regions can provide a broader understanding of the program's impact and help refine its implementation.

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COMPARISON OF EASTERN AND WESTERN DIETS IN THE CONTEXT OF ENDOMETRIOSIS

Kaira Ahluwalia
High school student at DPS International Edge (Gurugram, Sector-50)

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ABSTRACT

This review explores how dietary patterns from Eastern and Western cultures influence the risk and progression of endometriosis. Specifically, it highlights elements like curcumin – commonly found in Eastern diets – and how these components could alleviate or exacerbate the condition. Given endometriosis's increasing prevalence and the limited awareness about dietary influences, this paper seeks to illuminate the potential role of diet in managing and understanding the disease.

INTRODUCTION

Understanding Endometriosis

Endometriosis is a chronic, often painful condition where tissue similar to the uterine lining grows outside the uterus, typically affecting the ovaries, fallopian tubes, and pelvic lining. This misplaced tissue acts like uterine lining: thickening, breaking down, and bleeding with each menstrual cycle. However, unlike normal menstrual blood, this tissue has nowhere to exit the body, leading to inflammation, cysts, scar tissue, and adhesions. Symptoms include severe pelvic pain—especially during menstruation—digestive issues, and, in some cases, infertility.

Symptoms and Seeking Medical Help

While period cramps are common, endometriosis pain is usually more intense. Symptoms may include painful periods (dysmenorrhea), pain during bowel movements or urination, heavy menstrual bleeding, and fatigue. Notably, the severity of pain does not always reflect the amount of tissue growth—individuals with minor growths may experience severe pain, while others with extensive growth may feel little discomfort. Due to the overlap with other conditions, such as pelvic inflammatory disease or irritable bowel syndrome, prompt consultation with a doctor is recommended to prevent the condition from worsening.

Causes of Endometriosis

Endometriosis may stem from multiple mechanisms. Retrograde menstruation, for instance, allows menstrual blood to flow backward into the pelvic cavity, where endometrial cells can implant and grow. Cellular metaplasia, in which certain cells transform into endometrial-like cells outside the uterus, and the spread of endometrial tissue through stem cells, may also play roles. Estrogen dependency exacerbates this by stimulating inflammation and the growth of ectopic tissue.

Treatment of Endometriosis

Although there is no cure for endometriosis, several treatments can manage its symptoms. Hormone therapies, including oral contraceptives, progestins, and GnRH agonists or antagonists, help control endometrial tissue growth and reduce pain. Nonsteroidal anti-inflammatory drugs (NSAIDs) also offer relief. For severe cases, surgery such as laparoscopy or, less commonly, laparotomy can remove excess tissue. For those with advanced symptoms, hysterectomy or oophorectomy may be considered, although this will eliminate the possibility of pregnancy. Fertility treatments, like in-vitro fertilisation (IVF), may be explored before such surgeries.

Impact of Diet on Endometriosis

Eastern vs. Western Diets

Eastern diets, typical in many Asian cultures, are abundant in anti-inflammatory foods such as turmeric, ginger, garlic, vegetables, legumes, berries, and omega-3 sources like fish. Turmeric, rich in curcumin, is notable for its anti-inflammatory properties, which may alleviate endometriosis symptoms. Conversely, Western diets, prevalent in American and European cultures, often include more processed foods, red meats, sugars, and saturated fats—all linked to increased inflammation.

Incorporating anti-inflammatory foods from Eastern diets, such as turmeric, ginger, and omega-3-rich foods, into Western diets could reduce inflammation, potentially helping to manage endometriosis symptoms.

Curcumin's Therapeutic Potential in Endometriosis

A growing body of research examines curcumin's effects on endometriosis. Curcumin, derived from turmeric, is known for interacting with molecular pathways involved in inflammation, particularly NF-κB, which plays a crucial role in the body's inflammatory response.

Vallée and Lecarpentier (2020) analysed curcumin's biochemical effects on endometriosis by reviewing experimental and clinical studies. They highlighted curcumin's ability to reduce inflammation through downregulating NF-κB

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activity, thereby lowering pro-inflammatory cytokines and oxidative stress. This process could decrease endometriotic cell proliferation and encourage apoptosis (cell death) in ectopic endometrial cells. However, the authors urge further clinical trials to establish curcumin's effectiveness and safety for endometriosis patients.

Kamal et al. (2021) conducted a comprehensive review of curcumin's effects on reproductive disorders, including endometriosis. They found that curcumin might alleviate endometriosis symptoms through its anti-inflammatory, anti-proliferative, and pro-apoptotic effects. Preclinical studies showed promising results, such as reduced inflammation and the inhibition of endometriotic lesion growth, though clinical trials are needed to confirm these effects.

Balan et al. (2021) assessed curcumin and other phytochemicals' roles in endometriosis treatment. Their review indicated that curcumin could lower estrogen levels and inflammation, limit blood vessel formation (angiogenesis) in endometriotic lesions, and encourage apoptosis in abnormal cells. While preclinical findings support curcumin's therapeutic potential, more rigorous clinical trials are necessary to solidify its role in treatment protocols.

CONCLUSION

The interplay between diet and endometriosis provides a promising area for managing this condition. Eastern diets, rich in anti-inflammatory foods, may offer significant benefits for endometriosis patients, with studies showing curcumin's effectiveness in reducing inflammation, oxidative stress, and abnormal cell growth. Conversely, Western diets with high levels of processed foods and fats may exacerbate inflammation and endometriosis symptoms.

Incorporating anti-inflammatory foods, omega-3s, and plant-based nutrients from Eastern diets into Western dietary practices could support endometriosis management. This shift, alongside medical treatments, may enhance quality of life and alleviate symptoms for those affected by this often-misunderstood condition. Further research is essential to establish effective dietary guidelines and increase awareness of endometriosis and its impact on women's health.

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MOTIVATED STRATEGIES FOR SELF-REGULATED LEARNING IN CALCULUS IN RELATION TO SELECTED VARIABLES

Daphne M. Legaspino, LPT, Ph.D.[1] Pilar B. Acorda, DME[2]
[1]*St. Mary's College of Tagum, Inc., National Highway, Tagum City, 8100, Philippines*
[2]*St. Paul University Philippines, Tuguegarao City, Cagayan, Philippines*

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ABSTRACT

This study aspired to uncover motivated strategies for self-regulated learning in calculus in relation to selected variables – attitude towards technology and academic performance in calculus. This study used the mixed method approach. The participants of this study were the engineering students in two private schools of Tagum City, enrolled during the S.Y. 2022-2023 comprised of 321 students as the sample size, utilizing a stratified random sampling technique.. Mean, T-test, Pearson-r and Thematic Analysis were the statistical tools being used in interpreting the data gathered. Findings were, self-regulated learning is manifested in almost all occasions, motivated strategies for learning calculus is observed, there is no significant difference on the level of motivated strategies for learning calculus of the participants when analyzed according to gender but found significance when grouped according to school, attitude towards technology is manifested, there is no significant difference on the level of attitude towards technology of the participants when analyzed according to gender and school, the academic performance of the participants in calculus meets the expectations in some occasions, there is no significant difference on the level of academic performance of the participants when analyzed according to gender and school, there is a significant relationship between motivated strategies and self-regulated learning in calculus, there is a significant relationship between motivated strategies for learning calculus and attitude towards technology, there is a significant relationship between motivated strategies and academic performance in calculus and there are four (4) major themes about problems and challenges encountered in learning calculus emerged from the participants: 1) Lack of knowledge of the concepts; 2) Poor application; 3) Complicated formulas and processes; and 4) Confusion in understanding mathematical problems. Based on the findings, students may adjust for the strategies that they used in the acquisition of learning. Teachers are encouraged to continuously monitor students' progress, especially on academic performance for them to create suitable interventions and cater to the learners needs to increase students' academic performance. Understanding the level of these areas may help to strengthen effectiveness of mathematical learning in calculus as well as to increase academic performance among engineering students.

KEYWORDS: *Academic Performance in Calculus, Attitude Towards Technology, Motivated Strategies for learning, Self-Regulated Learning in Calculus, Davao del Norte, Philippines*

INTRODUCTION

Motivated strategies for learning are one of the main determinants of learning achievement in numerous educational studies Crookes (2017). In mathematics class, several students have exhibited unmotivated learning strategies. These students have shown a lack of interest in understanding the topic and its intricate mathematical principles Ariapooran & Karimi (2021). Moreover, Katz (2018) attested that motivation for learning affects students' learning and performance. However, according to Boggiano (2017), there are significant issues found on students' motivational strategies for learning that should be explored as one of the essential variables for attaining effective motivation. In addition, Hopper (2021) added that students also have issues on their intrinsic value such as showing poor interest in learning, and often avoid engaging in challenging mathematics activities. Moreover, according to Little (2017), some students lack the motivation to study, are unhappy in the learning environment, and soon lose interest in the normal curriculum. Learning online involves unique problems, and learners may require some type of supplemental help to be successful particularly in learning mathematics (Breslow et al., 2013; Jordan, 2014).

On the other hand, distance learning has replaced face-to-face instruction in the new normal, Self-Learning Modules (SLM) are a standard teaching method used particularly in private schools. SLM allows students to learn from home. According to Azevedo et al. (2020), the school closure policy for COVID-19 has a significant potential impact on academic attainment. This will clearly create a huge gap in the learning situations of children who come from economically and geographically advantageous families (Tran et al., 2017). Moreover, the application of online tools in learning can be a challenge for students and higher education institutions (HEIs). There is an increasing number of mandatory online courses in curricula, Cohen & Baruth (2017). In this process, an essential skill is self-regulated learning (SRL), which encapsulates autonomous navigation through learning content and enables for students to be successful in capitalizing on what online learning environments have to offer (Ejubović & Puška, 2019).

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In the Philippines, the quick implementation of online learning due to the COVID-19 pandemic impacts college students' issues on their motivated strategies for learning mathematics. In the study conducted by Barrot et al. (2021) found differences on the issues of students' motivated strategies for learning mathematics. Specifically, there are students who expressed dissatisfaction with online learning in general with communication and question-and-answer formats inside online class discussions and activities as well as low interest in learning mathematics due to numerous barriers encountered in a home learning environment, such as a lack of technological mastery, insufficient technological resources, high Internet costs, and limited interaction or socialization between and among students.

In addition, there are further issues found on students' motivated strategies for learning that include peer and group socialization, poor class interest, negative belief on the effectiveness of learning mathematics through online, and low motivation in mathematics Lacaden (2021). Furthermore, Gorenko and Unicheck (2021) stated that several studies have proven that integrating technology in learning improves student outcomes significantly as it opens new possibilities for home education. However, adapting to technology is more complicated. For example, the educational potentials of social media, both in the formal and informal learning contexts, have been widely acknowledged. However, how social media use in the informal contexts might influence students' learning in the formal contexts is still underexplored Lai (2019). Moreover, Ayanso and Moyers (2015); Liyanapathirana et al., (2019) argued a lack of research on technology usage by students towards mathematics.

OBJECTIVES

1. To determine the profile of the students in terms of gender and school.
2. To determine the extent of self-regulated learning in Calculus of the participants in terms of goal setting, environmental structuring, task strategies, time management, help-seeking, self-evaluation.
3. To ascertain the level of motivated strategies for learning Calculus of the participants in terms of self-efficacy, intrinsic value, cognitive strategy use, and self-regulation.
4. To determine the significant difference on the level of motivated strategies in learning Calculus of the participants when grouped according to profile variables.
5. To determine the level of students' attitude towards technology in terms of adoption intention, perceived usefulness, and perceived ease of use.
6. To ascertain the significant difference of the participants' attitude towards technology when grouped according to profile variables.
7. To determine the academic performance of the participants in Calculus.
8. To determine the significant difference on the academic performance of the participants in Calculus when grouped according to profile variables.
9. To ascertain the significant relationship between motivated strategies and self-regulated learning in Calculus, motivated strategies and attitude towards technology in learning Calculus and motivated strategies and academic performance.
10. To identify the problems and challenges encountered by the students in learning Calculus.

METHODOLOGY

This study used a mixed method of research, a combination of quantitative and qualitative research methods. The quantitative approach, particularly using the descriptive-correlational research design, was intended to assess the participants' level on motivated strategies for learning, extent on self-regulated learning, level on attitude towards technology and determine the academic performance of the participants in calculus course. The correlation between the main variables will be determined also, motivated strategies for learning and self-regulated learning, motivated strategies for learning and attitude towards technology and motivated strategies for learning and academic performance of the participants in calculus. Moreover, the qualitative design was used to determine the problems and challenges the participants encountered in learning Calculus.

The participants of this study were the engineering students in two (2) private schools of Tagum City, Davao del Norte, enrolled during the S.Y. 2022-2023. The chosen participants had completed the Calculus 1 and had experienced online classes as well as had used Self-Learning Module (SLM)of Self-Instructional Module (SIM) that was shared through Learning Management Systems (LMS) like Schoology, Google Classroom or Quipper.

Three (3) adopted standardized research tools were used in this research. These were purposefully selected and fitted the study's objective. The tools were standardized with indicated Cronbach Alpha value which means that it underwent content validity and reliability testing. The instrument on Motivated Strategies for learning was adopted from the Motivated Strategies for Learning Questionnaire (MSLQ) by Pintrich and De Groot (1990). The adopted online self-regulated learning questionnaire (OSLQ) by Barnard (2009) focus in measuring the extent in measuring the extent of self-regulated learning among students. The instrument for students' attitude towards technology was adopted from Technology Acceptance Model (TAM) initially proposed by Davis (1989) and refined by many others (Hendrickson & Latta, 1996; V. Venkatesh & Davis, 2000). The basis for the participants' academic performance was the obtained final grade in Calculus.
In-depth interviews were done to elicit information on the students' problems and challenges they encountered in learning Calculus as well as to validate responses from the questionnaire. Students' suggestions for teaching plan to address problems and challenges they encountered in learning Calculus was likewise obtained through this data gathering method.

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RESULTS

There were 321 participants, there were 218 male or 67.91% and 103 females or 32.09%. School A consists of 183 students or 57% and School B has 138 participants or 43% of the total 321 participants. For the extent of self-regulated learning of the participants, the six indicators namely goal setting, task strategies, time management, help-seeking and self-evaluation got the descriptive equivalent of extensive and one indicator, environmental structuring is highly extensive. All these ratings resulted to extensive which means that the extent of self-regulated learning is manifested in almost all occasions. The finding implies that environmental structuring is highly extensive to self-regulated learning in Calculus during online classes. Moreover, with self-regulation by using their skills and becoming self-efficacious, the students learn at their own pace, as well as be able to increase their effort in a learning situation and perform better in their duties towards their academic and co-curricular activities.

This result is parallel with the study of Lai and Hwang (2016) that students need to take an active role and become responsible for their own learning process. Additionally, highly self-regulated learners feel empowered because they perceived that success is largely dependent on their ability to effectively use and adjust learning strategies (Cleary, 2014).

Moreover, the level of motivated strategies for learning calculus of the participants, the indicators, intrinsic value, cognitive strategy, self-regulation and self-efficacy was high, which indicates that all are observed. Students have high different motivational factors that encourage them to engage in a teaching-learning environment. Specifically, the results clearly suggest that students have high personal beliefs and feelings towards certain tasks or activities in a teaching-learning environment. It is also emphasized that students also have a high thinking ability and perception towards using computers in a teaching-learning environment.

These results are supported by the idea that students have high intrinsic value in a learning environment provided by their perspectives to see a successful learning environment. Students with high intrinsic value can connect with the environment successfully, actively engage with course tasks, feel more encouraged and pushed to spend more time in the environment, and ultimately learn more effectively Daradoumis et al. (2022). The works of Thai et al. (2020) attested that there are students with a high degree of cognitive strategies in a learning environment and have personal views on the usage of computers in their learning environment. These students also possessed the ability to control their behaviors, actions, and thoughts in a classroom setting.

There are no significant differences in the participants' level of motivated strategies in learning calculus when grouped according to gender. The finding is in consonance with the results of Hamid and Singaram (2016) that statistically significant differences were found between gender and the composite score for motivation. Furthermore, the finding is supported by Sikhwari (2014) results, it was found that females had higher scores then males. These studies revealed that females generally engage more with academic activities than males and are consequently higher achievers academically.

There are significant differences on the participants' level of motivated strategies in learning calculus when grouped according to school in terms of self-efficacy, intrinsic value cognitive strategy use and self-regulation when analyzed according to school. The finding is supported by the result of Mundia et al. (2021) that significant differences emerging from the research outcomes on motivated strategies for learning as the participants were analyzed according to school they attended.

Furthermore, the level of attitude towards technology of the participants, the indicators adoption intention, perceived usefulness, and perceived ease of use was high which indicates that all items are manifested. It demonstrates that students have highly positive thoughts and perceptions about their experiences using technology as a tool of instruction in a classroom setting. Specifically, the results clearly highlight that students have a high personal belief about computer usefulness in terms of satisfaction to their individual needs in a teaching-learning environment. In addition, students have strong personal ideas towards computer usage and the convenience of using computers in their learning environment. Further, the result also indicates that students have a high frequency of using computers and their ability to recommend them to other students in a teaching-learning environment.

These findings are supported by the works of Ikhsan et al. (2019) which emphasized that computers have influenced the learning experiences of students. Computers have also influenced the learning experiences of students effectively and many have demonstrated favorable thoughts towards using them. As a result, many students share and encourage their peers or other individuals to utilize computers as part of their learning environment.

There is no significant difference in the participants' attitude towards technology when grouped according to gender specifically in all indicators, adoption intention, perceived usefulness and perceived ease of use regardless of gender. The results run contrary to the findings of Hoffman (2002) that girls are less interested in technology and technological careers, this interest also declines faster than for boys. Moreover, based on the study of Ardies et al. (2014), boys are more positive about a future technological job or study.

In addition, there are no significant differences in the participants' attitude towards technology when grouped according to gender. Moreover, the finding implies that there are no significant differences among the indicators, adoption intention, perceived usefulness and perceived ease of use even in different school. The result is opposite with the findings of Andrew et al. (2018) that found out that there is a significant difference in the students' attitude towards technology among the two chosen universities. These differences could reflect how often participants use technology in learning tools at their institution.

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The participants' level of academic performance in calculus reveals a satisfactory performance of the participants. This finding is supported by Reiger (2011) stating that academic performance is significant since it is strongly linked to a student's positive outcomes. The finding is also parallel with the result of Widlund et al. (2018) who stated that it has been established that not only does academic performance influence students' educational experiences, aspirations, and trajectories, but that academic well-being also influences numerous educational outcomes.

There is no significant difference in the level of academic performance of the participants in calculus when they are grouped according to profile variables. This further implies that academic performance of the participants in calculus when they are grouped according to gender and school do not differ. The result is in congruence with the findings of Sorby et al. (2013) found out that there were no meaningful gender differences for the calculus grades.

Moreover, there is a significant relationship between motivated strategies and self-regulated learning in Calculus. This implies that motivated strategies for learning have positive correlation to self-regulated learning and both has a direct relationship when indicators of motivated strategies for learning in learning increases then the indicator of self-regulated learning also increases. This finding is parallel of Pintrich et al. (2003) as cited by Tong et al. (2019) found out that students' motivation is deeply and directly correlated with their self-regulation learning ability, the better one can self-regulate learning, the more likely he or she can maintain high levels of learning strategies and motivation.

The finding reveals that there is a significant relationship between the participants' motivated strategies for learning calculus and attitude towards technology. This means that the motivated strategies for learning calculus have direct connection to students' attitude towards technology and how students view their usage of computers in a learning setting. The result is in consonance with the works of Linnenbrink and Garcia (2012) who mentioned that by motivating students to explore computer integrated learning resources and understand their attitude towards technology, a growing interest leads them to have new experiences, which influences their motivated strategies for learning. Furthermore, Granito and Chernobilsky (2012) emphasized that attitude towards technology has a significant and strong relationship with students' motivated strategies for learning.

Furthermore, this study reveals that there is a significant relationship between the participants' motivated strategies and academic performance. This means that the motivated strategies for learning calculus have a direct connection to students' academic performance. This implies that there is a positive correlation between the two variables as participants' motivated strategies increases so as with the academic performance in Calculus. The result is parallel to the study conducted by Hamid & Singaram (2016) found that there is a significant moderate relationship between academic performance and the motivation strategies subsumed within task value and self-efficacy for learning performance. It is also associated with higher engagement in learning. Increased effort and engagement with the subject matter could contribute positively to academic performance. Self-efficacy for learning performance relates to the students' sense of confidence in their ability to achieve their goals. Moreover, the findings are also in consonance with the study conducted by Zbainos & Beloyianni (2018) that found that motivated strategies for learning significantly and positively correlated with academic achievement. Specifically, intrinsic value, self-efficacy, cognitive strategy use, and self-regulation were shown to be strongly correlated with academic achievement, while there was a low correlation between creative ideation and respondents' academic achievement.

Although students were exposed to an "extensive" to self-regulated learning, "high" motivated strategies for learning calculus, "high" attitude towards technology and was assessed as 'satisfactory' with their academic performance in calculus, they too have encountered difficulties and challenges in learning Calculus. These are summed up into four (4) major themes, namely: lack of knowledge of the concepts, poor application, complicated formulas and processes, and confusion in understanding mathematical problems.

Major Themes

1. Lack of knowledge of the concepts
   Interviews were conducted with six learners, who revealed that lack of knowledge of concepts in calculus led to difficulty on understanding the terms and concepts in calculus. These concepts, "basic principles" and "technical terms" that needs prior knowledge from lessons discussed from previous years that should have mastered already. Furthermore, they have had hard time solving the problem and accomplish certain given tasks, having trouble remembering formulas and equations, and often didn't understand them even when they were explained.
2. Poor Application
   One participant shared that he encountered difficulty about the formula and solving. Collectively, one can't understand the equation as well as having difficulties in fractions or decimals. Another participant added about his difficulty in applying rules and formulas to solve problems. Furthermore, a participant expressed that during the online class, one of the problems that he/she had encountered in learning calculus is about the simplification of derivatives since there are many coefficients involved. One had a hard time understanding derivatives and also graphing and another participant shared that sometimes he/she get stuck on a problem because the basics are forgotten.
3. Complicated Formulas and Processes
   One participant shared the problem or difficulty she encountered in learning Calculus was that there were many complicated formulas taught and later found out that there were alternative formulas that's much easier to understand. Another participant expressed her difficulty in solving complex equations. Further, one interviewee articulated some formulas and processes

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are complicated to understand and one shared when different concepts are mixed up together it made the problem more complicated. Memorizing formulas, added by one participant. In addition, an interviewee shared that calculus is difficult and the problems that he/she encountered with a lot of formulas that needed to familiarize and memorize.

4. Confusion in understanding mathematical problems
Visualizing and interpreting some of the problems, and sometimes misinterpreted the given problem as one participant had shared. Confusion in understanding mathematical problems added by another participant. Problem solving and analyzing specifically pointed by one participant. Word problem questions are sometimes difficult to understand, solving word problems involving maxima and minima and difficulties on worded problems as what the other participants commonly shared.

SUGGESTIONS

Students may choose appropriate strategies that they use in the acquisition of learning. They may create new thoughts and discover new style while learning the lessons and answer seriously the items in the SLMs. They are encouraged to have a good time management in studying and have a positive mindset that everything could be learned so that their academic performance will improve. Moreover, teachers should continuously monitor students' progress specially on academic performance for them to create suitable interventions and cater the learners needs to increase students' academic performance. They may provide opportunities to talk with the students for them to know how to get help when having trouble in answering the SLMs, so that students' academic performance will increase. The administration also should be possible for the implementation of the researcher's propose action plan to enhance the students' self-regulated learning Calculus.

CONCLUSIONS

Based on the results of the research objectives, the researcher has come up with the following conclusion, there is a significant relationship between motivated strategies and self-regulated learning in calculus, a significant relationship between motivated strategies for learning calculus and attitude towards technology and a significant relationship between motivated strategies and academic performance in calculus.

TABLES AND REFERENCES

Table 1. Participants' Level of Motivated Strategies

Indicators	Mean	Descriptive Interpretation
Self-efficacy	3.54	High
Intrinsic value	4.00	High
Cognitive strategy use	3.93	High
Self-regulation	3.71	High
Overall Mean	3.79	High

Table 2. Significant Difference on The Participants' Level of Motivated Strategies in Learning Calculus When Grouped According to Gender

Motivated strategies	Mean	t- Value	p-value	Decision at 0.05
Self-efficacy	M=3.62 F=3.46	0.258	0.456	Accept Ho [Not Sig.]
Intrinsic value	M=3.98 F=4.02	0.145	0.389	Accept Ho [Not Sig.]
Cognitive strategy use	M=3.90 F=3.96	0.324	0.762	Accept Ho [Not Sig.]
Self-regulation	M=3.72 F=3.70	0.136	0.548	Accept Ho [Not Sig.]

Table 3. Significant Difference of The Participants' Motivated Strategies in Learning Calculus When Grouped According to School

Motivated strategies	Mean	t- Value	p-value	Decision at 0.05
Self-efficacy	A=3.40 B=3.68	2.564	<0.001	Reject Ho [Sig.]
Intrinsic value	A=3.50 B=4.50	3.241	<0.001	Reject Ho [Sig.]
Cognitive strategy use	A=3.45 B=4.41	3.058	<0.001	Reject Ho [Sig.]
Self-regulation	A=4.12 B=3.28	2.482	<0.001	Reject Ho [Sig.]

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Table 4. Level of Students' Attitude Towards Technology

Indicators	Mean	Descriptive Interpretation
Adoption intention	4.00	High
Perceived usefulness	4.10	High
Perceived ease of use	4.08	High
Overall Mean	4.06	High

Table 5. Significant Difference in The Participants' Attitude Towards Technology When Grouped According to Gender

Motivated strategies	Mean	t- Value	p-value	Decision at 0.05
Adoption intention	M=3.92 F=4.05	0.542	0.356	Accept Ho [Not Sig.]
Perceived usefulness	M=3.98 F=4.12	0.368	0.489	Accept Ho [Not Sig.]
Perceived ease of use	M=4.04 F=4.12	0.854	0.367	Accept Ho [Not Sig.]

Table 6. Significant Difference in the Participants' Attitude Towards Technology When Grouped According to School

Motivated strategies	Mean	t- Value	p-value	Decision at 0.05
Adoption intention	A=3.94 B=4.05	1.458	0.078	Accept Ho [Not Sig.]
Perceived usefulness	A=4.08 B=4.12	2.654	0.215	Accept Ho [Not Sig.]
Perceived ease of use	A=4.05 B=4.10	2.924	0.324	Accept Ho [Not Sig.]

Table 7. Participants' Level of Academic Performance in Calculus

Academic Performance	Frequency	Percentage
90-100	37	11.53
85-89	102	31.78
80-84	95	29.60
75-79	87	27.10
Below 75	-	-
Total	321	100.00
Mean	83.54 (Satisfactory)	

Table 8. Significant Difference in the Academic Performance of the Participants in Calculus When Grouped According to Profile Variables

Variables	r- Value	p-value	Decision at 0.05
Academic Performance and Gender	1.112	0.148	Accept Ho [Not Sig.]
Academic Performance and School	2.236	0.136	Accept Ho [Not Sig.]

Table 9. Significant Relationship Between Motivated Strategies and Self-Regulated Learning

Variables	r- Value	p-value	Decision at 0.05
Motivated strategies and self-regulated learning	0.769	<0.001	Reject Ho [Sig.]

Table 10. Significant Relationship Between Strategies and Attitude Towards Technology

Variables	r- Value	p-value	Decision at 0.05
Motivated strategies and attitude towards technology	0.586	<0.001	Reject Ho [Sig.]

Table 11. Significant Relationship Between Motivated Strategies and Academic Performance

Variables	r- Value	p-value	Decision at 0.05
Motivated strategies and academic performance	0.161	0.04	Reject Ho [Sig.]

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OPTIMAL USE OF FRUIT AND VEGETABLE WASTE BY GENERATING ELECTRICITY AND SOIL FERTILIZER– A REVIEW

Ms. Manali Kulkarni, Harsh Patil, Soham Harpude, Vedant Gaikwad
Lecturer, Student, Student, Student
Y. B. Patil Polytechnic, Akurdi, Pune, India

ABSTRACT

In recent years, the world has witnessed an alarming increase in environmental concerns, including the depletion of fossil fuel reserves, escalating greenhouse gas emissions, and the accumulation of organic waste. In light of these challenges, there is a growing need to explore alternative and sustainable energy sources. One such promising avenue is the utilization of vegetable waste to generate electricity. This innovative approach not only addresses the issue of waste management but also offers a renewable and eco-friendly solution to meet our energy demands.

This project aims to investigate and demonstrate the feasibility of converting vegetable waste into electricity through various processes such as anaerobic digestion, microbial fuel cells, and thermal conversion technologies. The project will involve Detailed research, experimentation, and analysis of different vegetable waste materials, including kitchen scraps, agricultural residues, and food processing by-products.

INTODUCTIONS

The rising demand for energy and need for sustainable solutions drive interest in alternative sources like vegetable waste for electricity generation. This project explores using vegetable waste to produce and store electricity in batteries, providing a green solution for charging mobile devices and other appliances.

With traditional energy sources depleting and their environmental harm, renewable methods like vegetable waste utilization present a dual benefit: addressing waste management and energy needs. Household, restaurant, and industrial vegetable waste often ends up in landfills, releasing greenhouse gases. Converting this waste into electricity helps reduce emissions and adds value to discarded materials.

The project considers technologies such as anaerobic digestion, microbial fuel cells, and thermal conversion for energy extraction, with the choice guided by waste availability, efficiency, and environmental impact. Effective battery storage systems are also crucial to ensure a steady power supply for charging applications.

MATERIALS

Sr no.	Components
1.	Juice Mixer Grinder
2.	Container (Plastic box)
3.	Cathode Plate
4.	Anode Plate
5.	Wires
6.	Resistors
7.	PCB
8.	Voltage Measuring Device
9.	Storage Battery
10.	LED bulb
11.	Diode IN4007

METHODOLOGY

Step 1: Juice Extraction

1. Place fruits and vegetables in a mixer to separate juice from pulp.
2. Transfer the juice through a pipe from the mixer to a plastic container.

Step 2: Composting the Fruit Waste

1. Transfer the remaining fruit waste to a composting container for fertilizer production.
2. Create layers in the compost container, alternating between fruit pulp and dry leaves, straw, or shredded paper (2:1 ratio).
3. Aerate the compost every few weeks to prevent Odor and speed up decomposition.
4. Keep the compost moist but not soggy, and monitor its temperature (54°C - 60°C).
5. After several weeks, once the compost looks dark and crumbly, let it cure for stability.
6. Test the compost for pH and nutrients before using it to enrich soil.

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Step 3: Generating Electricity from Vegetable Juice

1. Pour the vegetable juice into the container.
2. Insert zinc and copper plates (anode and cathode) into the juice, ensuring they don't touch.
3. The vegetable juice acts as an electrolyte, facilitating ion movement and completing the circuit.

At the Anode (Zinc): Zinc undergoes oxidation, releasing electrons.

$$Zn \longrightarrow Zn^{2+} + 2e^-$$

At the Cathode (Copper): Hydrogen ions or other positive ions gain electrons, potentially forming hydrogen gas.

$$2H^+ + 2e^- \longrightarrow H2(gas)$$

Step 4: Capacitor

1. Use a capacitor to store and release electrical energy as needed.

Step 5: Resistor

1. A resistor limits the current flow, preventing potential damage to the circuit.

Step 6: Storage Battery

1. Store the generated electricity for later use in a battery.

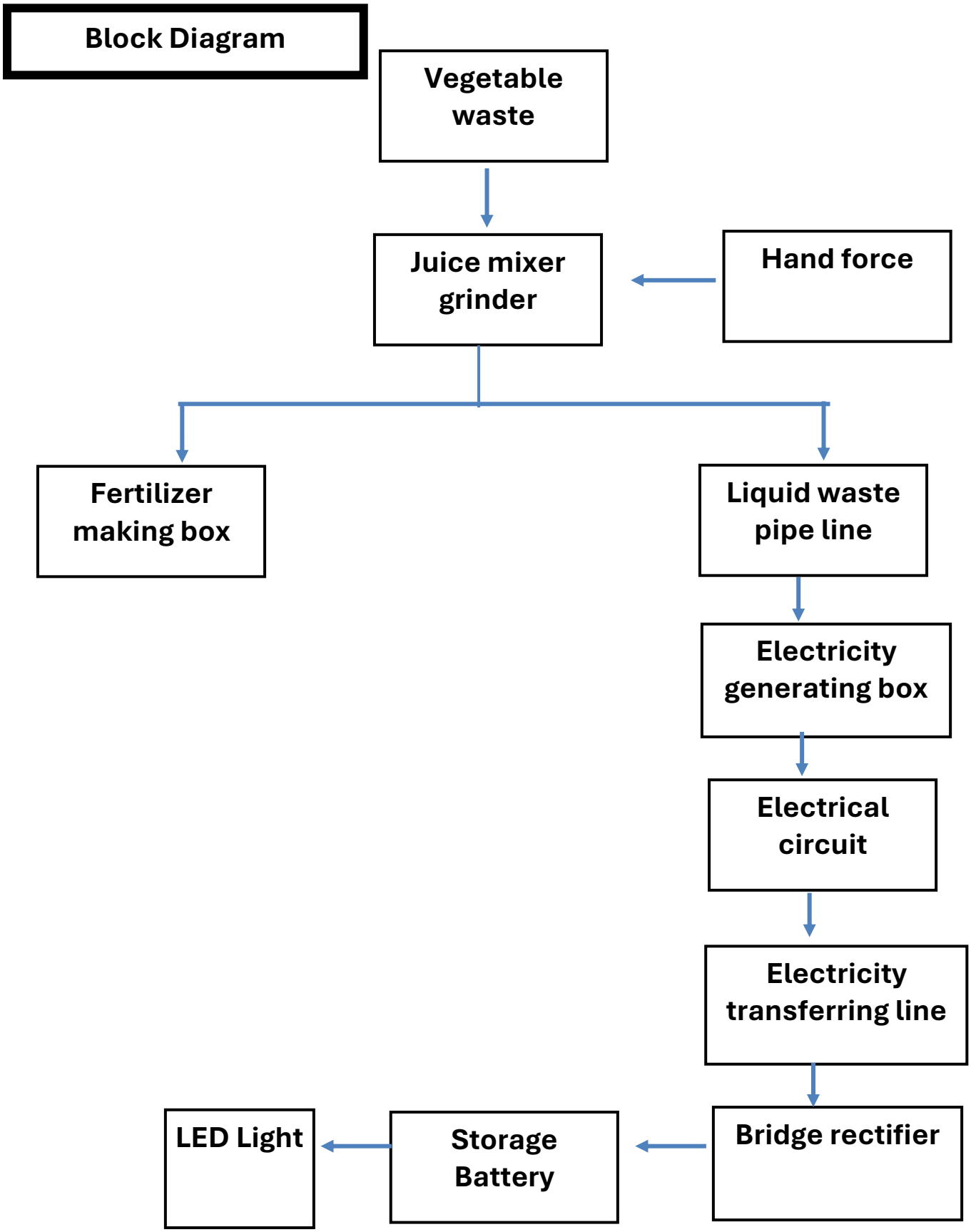
Step 7: Printed Circuit Board (PCB)

1. Use a PCB to provide support and electrical connections for components in the circuit.

Step 8: Measure Voltage

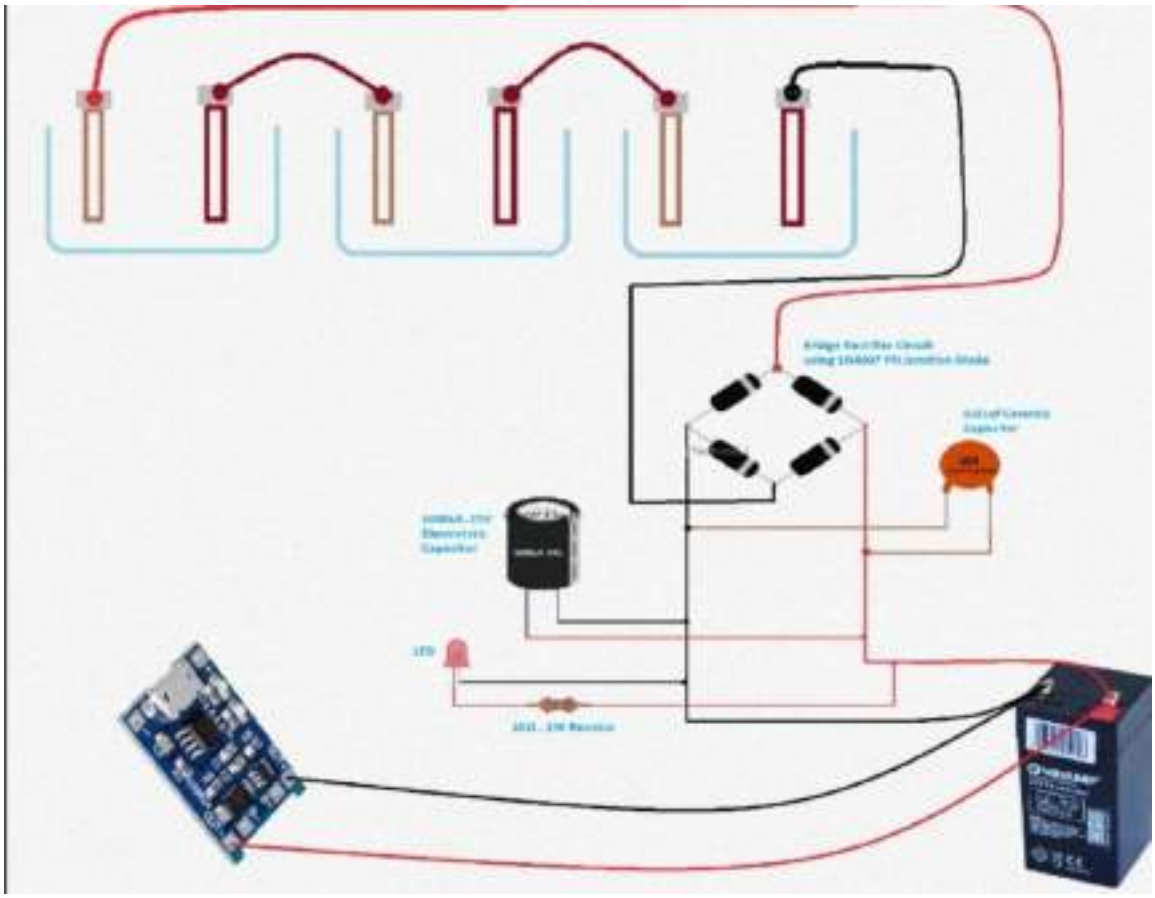
1. Turn on a multimeter to check the voltage, typically in millivolts.
2. Optionally, increase power by connecting multiple container in series for a higher voltage.

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Circuit diagram



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PARTISIPASYON SA MGA WEBINARS: MGA KARANASAN NG MGA GURO SA PAMPUBLIKONG PAARALAN SA SANGAY NG DAVAO DEL SUR

Maricar C. Azotilla
Mananaliksik, The Rizal Memorial Colleges, Inc

ABSTRAK

Sinaliksik ng pag-aaral na ito ang mga kwento ng mga pampublikong guro sa kanilang partisipasyon sa mga webinars partikular sa sangay ng Davao del Sur. May sampung (10) guro ang nakilahok sa pag-aaral. Ginamit ng pag-aaral na ito ang isang penomenolohikal na diskarte upang kunin ang mga ideya ng mga kalahok. Ang birtwal na malalim na panayam ay ginamit upang mangalap ng ilang impormasyon tungkol sa kani-kanilang mga kuwento. Gamit ang thematic analysis, lumitaw ang mga sumusunod na tema: ang mga karanasan ng mga guro sa pampublikong paaralan ay sumasalamin sa mga negatibong pananaw ng mga karanasan at pag-aaral sa mga webinar, limitadong epekto sa kalidad ng pedagohikal na pagtuturo, at paghihigpit sa mga mapagkukunang nauugnay sa teknolohiya. Ang mekanismo ng pagkaya na ginagamit ng mga pampublikong paaralan sa sports ng mga guro ay: pagkakataon para sa retooling at reskilling, pag-refresh, pagpapasigla ng mga kasanayan sa pagtuturo, at pagpapahalaga sa accessibility, affordability, at flexibility nito Ang mga kabatiran na nakuha mula sa mga natuklasan ng pag-aaral ay: pagbutihin ang mga kasanayan sa pagtuturo at kaalaman sa kasalukuyang mga uso at yakapin ang mundo ng teknolohiya. Maaari silang patuloy na maging malikhain sa pagtuturo gamit ang teknolohiya at mga natutunan sa pagdalo ng mga webinars. Ang mga guro ay maaari ding maging mapagmatyag sa paghahanap ng mga solusyon sa kanilang mga problema at kahit na humingi ng impormasyon at paglilinaw upang mapawi ang kanilang sarili.

MGA KEYWORD: *ang pagsasalaysay na paglalahad ng mga guro ng pampublikong paaralan, yakapin ang mundo ng teknolohiya.*

INTRODUKSYON

Sa mabilis na pag-usbong ng teknolohiya at pagbabago sa sistema ng edukasyon, mahalaga ang patuloy na pagkatuto ng mga guro upang mapanatili ang kalidad ng pagtuturo. Isa sa mga naging tugon sa pangangailangang ito ay ang pagdaraos ng mga webinar na nagbibigay ng mga bagong kaalaman at kasanayan sa mga guro. Gayunpaman, sa kabila ng mabuting layunin ng mga webinar, may mga balakid pa rin na kinakaharap ang mga pampublikong guro sa kanilang pakikilahok, lalo na sa Sangay ng Davao del Sur.

Sa kasalukuyan, ang kakulangan ng sapat na mga mapagkukunan gaya ng mga teknolohikal na kagamitan, maaasahang koneksyon sa internet, at sapat na oras ang nagiging sanhi ng mga hamong ito. Ang mga suliraning ito ay hindi lamang hadlang sa kanilang pagdalo, kundi may posibilidad din na makaapekto sa kanilang pagganap sa pagtuturo at sa epektibong paggamit ng mga natutunan mula sa mga online na pagsasanay.

Para sa maraming pampublikong guro, ang limitadong access sa mga kinakailangang teknolohiya ay isang pangunahing hamon, lalo na sa konteksto ng mga probinsya.

Dahil dito, layunin ng pag-aaral na ito na masusing tuklasin at suriin ang mga karanasan ng mga pampublikong guro sa kanilang pakikilahok sa mga webinar, partikular na ang mga guro sa Davao del Sur. Sa pamamagitan ng pag-unawa sa kanilang mga kwento, inaasahang makakakuha ng mga mahahalagang pananaw na makakatulong sa pagbuo ng mga programang mas naaangkop sa kanilang mga pangangailangan. Layunin ng pag-aaral na magbigay ng mas malinaw na pagtingin sa mga mekanismo ng pagkaya na kanilang ginagamit, at kung paano maaaring mapabuti ang accessibility at bisa ng mga webinar para sa kanilang propesyonal na pag-unlad.

Ang mabilis na pagbabago sa mundo ng edukasyon dulot ng teknolohiya at globalisasyon ay nagbigay daan sa iba't ibang pag-unlad sa pamamaraan ng pagtuturo. Kasabay ng mga pagbabago sa pamamaraan ng pagkatuto, lumitaw ang mga bagong hamon at pagkakataon para sa mga guro sa buong mundo. Isang mahalagang bahagi ng mga pagbabagong ito ay ang paggamit ng mga online platforms tulad ng mga webinar bilang isang paraan ng patuloy na pag-unlad at pagsasanay para sa mga guro.

Gayunpaman, sa kabila ng layunin nitong mapabuti ang kalidad ng pagtuturo, ang mga pampublikong guro, partikular sa mga lugar na may limitadong teknolohikal na resources, ay nahaharap sa iba't ibang balakid sa kanilang aktibong partisipasyon sa mga webinar.

Pagkilala sa mga Isyu

Sa pandaigdigang konteksto, tatlong isyu ang partikular na nakaaapekto sa mga guro sa kanilang partisipasyon sa mga webinar. Una, *ang digital divide* ay isang pangunahing problema sa buong mundo, kung saan ang hindi pantay-pantay na access sa

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teknolohiya at internet ay nagiging sagabal sa edukasyon (Smith, 2020). Pangalawa, ang *mental health challenges* na dulot ng pandemya at patuloy na online learning ay nagiging sanhi ng burnout sa mga guro (Jones et al., 2021). Panghuli, ang *quality assurance* sa mga online educational programs ay isa pang isyu, kung saan maraming guro ang may pagdududa sa kredibilidad at bisa ng mga webinar bilang isang pangunahing hakbang sa propesyonal na pag-unlad (Brown & Green, 2022).

Sa antas ng bansa, ilang isyu ang patuloy na lumalala sa sektor ng edukasyon. Una, ang kakulangan ng mga teknolohikal na kagamitan sa mga pampublikong paaralan ay isang matinding problema, lalo na sa mga probinsya (Santos & Aquino, 2023). Pangalawa, ang overcrowded classrooms na nagiging hadlang sa epektibong pagtuturo at pagsasanay ay patuloy na isyu sa mga pampublikong paaralan sa Pilipinas (De Guzman, 2022). Panghuli, ang kakulangan ng sapat na pagsasanay at suporta para sa mga guro sa paggamit ng teknolohiya at mga online platforms ay isa ring malubhang isyu sa edukasyong Pilipino (Torres & Fernandez, 2023).

Sa lokal na konteksto, ang mga guro sa Davao del Sur ay nahaharap sa mga hamon na may kinalaman sa kakulangan ng mga resources at teknolohiya. Una, ang *limitadong access sa mabilis na internet* ay isang malaking balakid sa kanilang partisipasyon sa mga webinar (Padilla, 2024). Pangalawa, ang **kakulangan sa oryentasyon at pagsasanay sa paggamit ng mga online learning platforms** ay nagiging dahilan ng mababang partisipasyon at pagbaba ng kalidad ng pagtuturo (Luna, 2023). Panghuli, ang mga isyung kultural at lingguwistiko ay nakakaapekto sa mga guro sa mga rural na lugar, kung saan ang wika at kultura ay nagiging hadlang sa paggamit ng mga modernong pamamaraan sa pagtuturo (Alonzo, 2023).

Layunin at Kahalagahan ng Pag-aaral

Ang layunin ng pag-aaral na ito ay masusing tuklasin at suriin ang mga karanasan at pananaw ng mga guro sa Davao del Sur hinggil sa kanilang partisipasyon sa mga webinar. Ang mga layunin ng pag-aaral ay ang mga sumusunod:

1. Alamin ang mga hamon at oportunidad na kinakaharap ng mga guro sa pakikilahok sa mga webinar.
2. Tuklasin ang mga mekanismo ng pagkaya na ginagamit ng mga guro upang mapabuti ang kanilang kaalaman at kasanayan sa pamamagitan ng mga webinar.
3. I-analyze ang epekto ng mga webinar sa kanilang pagtuturo at propesyonal na pag-unlad.

Ang kahalagahan ng pag-aaral na ito ay hindi lamang upang magbigay ng insights para sa mga guro sa lokal na komunidad, kundi upang magbigay rin ng kontribusyon sa pagpapabuti ng mga polisiya at programa na sumusuporta sa mga guro sa kanilang patuloy na pagkatuto at pag-unlad sa gitna ng mga hamon ng makabagong teknolohiya. Ang mga resulta ng pag-aaral ay magsisilbing batayan sa pagbuo ng mga programa at interbensyon upang matugunan ang mga isyung kinahaharap ng mga guro, lalo na sa mga lugar na may limitadong resources.

Sintesis

Sa kabuuan, ang pag-aaral na ito ay magsisilbing isang mahalagang hakbang upang maunawaan ang mga karanasan ng mga guro sa Davao del Sur sa kanilang pakikilahok sa mga webinar. Ang mga isyung global, pambansa, at lokal ay nagsisilbing gabay upang masusing mapag-aralan ang mga hadlang at oportunidad na dulot ng mga online na pagsasanay. Sa pamamagitan ng pagtutok sa mga karanasang ito, inaasahan ng pag-aaral na makapagbigay ng solusyon at rekomendasyon para sa pagpapabuti ng mga sistema at programang pang-edukasyon sa mga guro.

LITERATURE REVIEW

Ang paggamit ng webinars para sa patuloy na propesyonal na pag-unlad ng mga guro ay naging isang malawak na isyu sa buong mundo. Sa harap ng mabilis na pagbabago sa teknolohiya at edukasyon, ang mga webinar ay nagbigay ng pagkakataon sa mga guro na mapabuti ang kanilang kaalaman at kasanayan, ngunit kasabay nito ay mga hamon din ang kanilang kinakaharap. Sa pag-aaral na ito, tatalakayin ang mga karanasan ng mga guro sa iba't ibang bahagi ng mundo upang magbigay ng mas malalim na pag-unawa sa isyu ng paggamit ng webinars sa pagtuturo.

ASEN Region

Sa rehiyon ng ASEAN, isang pag-aaral ni Lim et al. (2020) sa Singapore ang nagsasabing ang paggamit ng online learning platforms, kabilang ang mga webinar, ay isang mabisang paraan upang mapabuti ang kalidad ng edukasyon. Gayunpaman, binanggit nila na mayroong mga limitasyon sa access sa mga teknolohiya sa mga rural na lugar, na nagiging hadlang sa pagkakaroon ng pantay-pantay na oportunidad sa mga guro. Ayon kay Nguyen (2021), sa Vietnam naman, ang mga guro ay nakararanas ng kakulangan ng sapat na pagsasanay sa paggamit ng mga online na kagamitan, na nagiging sanhi ng mababang antas ng partisipasyon at kahusayan sa mga webinar. Sa Thailand, isang pag-aaral ni Charoen (2022) ang nagbigay-diin sa mahalagang papel ng suporta mula sa mga lokal na pamahalaan upang mapabuti ang access ng mga guro sa teknolohiya at online na pagsasanay.

European Context

Sa Europa, ang mga guro sa mga bansang gaya ng Finland at Sweden ay may mas mataas na antas ng kaalaman at pagsasanay sa teknolohiya, na nagiging dahilan ng mas matagumpay na paggamit ng mga webinar. Ayon sa isang pag-aaral ni Kivinen (2020), sa Finland, ang mga guro ay mayroong sapat na suporta at resources mula sa kanilang mga pamahalaan upang magamit ang mga teknolohiya sa kanilang pagkatuto at pagtuturo. Sa United Kingdom naman, isang pagsusuri ni Smith et al. (2021) ang nagpakita ng mga hadlang sa partisipasyon ng mga guro sa mga online na pagsasanay. Binanggit nila ang kakulangan ng oras at ang pangangailangan para sa higit pang mga programang

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tumutok sa "digital literacy" upang matugunan ang mga isyung ito. Gayundin, sa Germany, itinuturing ng mga guro na isang malaking isyu ang kakulangan ng mga makabagong kagamitan at internet connectivity sa rural na mga lugar, na nakakaapekto sa epektibong paglahok sa mga webinar (Fischer & Knapp, 2021).

African Context

Sa Africa, maraming guro ang nahaharap sa mga hamon kaugnay ng digital divide at kakulangan sa access sa mga teknolohikal na kagamitan. Ayon kay Kofi (2020), sa Ghana, ang paggamit ng mga webinar at iba pang digital learning platforms ay limitado dahil sa mababang kalidad ng internet at ang mataas na presyo ng teknolohiya. Gayundin, sa Nigeria, tinukoy ni Okoye (2021) na ang kakulangan ng pagsasanay at suporta para sa mga guro sa paggamit ng teknolohiya ay nagpapabagal sa pag-unlad ng edukasyon sa bansa. Sa South Africa, isang pag-aaral ni Mlambo et al. (2022) ang nagpapakita ng mga pagsubok sa pag-aangkop ng mga guro sa online na pagtuturo, partikular sa mga rural na komunidad, kung saan ang kakulangan ng teknolohiya at hindi sapat na kaalaman sa digital tools ay nagiging hadlang sa kanilang epektibong partisipasyon sa mga webinar.

Australian Context

Sa Australia, isang pag-aaral ni Jackson (2021) ang nagbigay-diin sa kahalagahan ng webinars at online na pagsasanay para sa mga guro, lalo na sa mga rural at remote na lugar. Sa kabila ng mas mataas na access sa teknolohiya sa bansa, binanggit ni Williams et al. (2020) na ang mga guro sa ilang mga lugar ay nakararanas pa rin ng mga hamon sa teknikal na aspeto, gaya ng kakulangan sa mga makabagong kagamitan at mabilis na internet connection. Gayundin, sa Australia, isinagawa ni Andrews (2022) ang isang pagsusuri tungkol sa epekto ng webinars sa professional learning ng mga guro at ipinakita niya na ang mga webinar ay isang mabisang paraan upang mapabuti ang kasanayan ng mga guro, ngunit may mga pagkakataon na ang kanilang aplikasyon ay limitado ng mga personal na isyu tulad ng time management at workload.

Synthesis

Sa pagtingin sa mga literatura mula sa iba't ibang bahagi ng mundo, makikita natin na ang mga guro ay nakakaranas ng parehong mga hamon sa paggamit ng webinars bilang bahagi ng kanilang propesyonal na pag-unlad. Ang mga isyu tulad ng kakulangan sa access sa teknolohiya, internet connectivity, at ang kakulangan ng pagsasanay sa digital tools ay ilan sa mga pangunahing hadlang na kinakaharap ng mga guro sa mga bansang ASEAN, Europe, Africa, at Australia. Bagamat may mga bansa tulad ng Finland at Australia na may mga maayos na sistema at suporta para sa teknolohikal na pag-unlad ng mga guro, ang mga hamon na ito ay patuloy pa ring bumangon sa mga bansang may limitadong resources. Ang mga natuklasang ito ay nagpapakita ng pangangailangan para sa mas malalim na pagsasanay, access sa mga modernong teknolohiya, at lokal na suporta upang mapabuti ang kalidad ng pagtuturo at pagkatuto sa pamamagitan ng webinars sa buong mundo.

Ang paggamit ng webinars bilang bahagi ng propesyonal na pag-unlad ng mga guro ay patuloy na lumalaki sa kahalagahan sa buong mundo, partikular na sa konteksto ng mga pagbabago sa edukasyon dulot ng teknolohiya at ang COVID-19 pandemic. Ayon kay Lim et al. (2019), ang mga webinars ay nagbigay ng isang makabagong paraan para sa mga guro upang matuto at mag-update ng kanilang mga kasanayan sa kabila ng mga limitasyon ng tradisyonal na pamamaraan ng pagsasanay. Ipinakita ng kanilang pag-aaral sa Singapore na ang mga online platforms ay naging epektibong alternatibo sa mga face-to-face na pagsasanay, ngunit napansin din nila ang mga hamon kaugnay ng teknikal na mga isyu tulad ng hindi sapat na internet connection at kakulangan sa access sa mga makabagong kagamitan.

Sa parehong paraan, ang isang pag-aaral na isinagawa ni Jackson et al. (2020) sa Australia ay nagpapakita ng mga benepisyo ng webinar-based learning sa mga guro, tulad ng flexibility at accessibility. Gayunpaman, binanggit nila na may mga guro pa rin sa mga rural at remote na lugar na nahihirapan sa pag-access ng mga digital na kagamitan at stable na internet. Ipinakita nila na ang digital divide ay isang malubhang hadlang na nagiging sanhi ng hindi pantay-pantay na pagkakataon sa mga guro upang makilahok sa mga webinar at iba pang online na pagsasanay. Ayon din kay Brown & Green (2021), ang digital divide ay isa sa mga pangunahing problema na kinakaharap ng mga guro sa mga umuunlad na bansa, at ito ay nakakaapekto sa kanilang kakayahang makibahagi sa mga online na pagsasanay, kabilang ang mga webinar.

Sa antas ng ASEAN, isang pag-aaral sa Thailand ni Charoen (2021) ang nagsasabing ang kakulangan ng propesyonal na pagsasanay para sa mga guro sa paggamit ng mga teknolohikal na kagamitan ay isang pangunahing isyu. Binanggit nila na kahit na may mga polisiya na naglalayong mapabuti ang digital literacy ng mga guro, marami pa ring guro ang nahihirapan sa pagsasanay at pag-aangkop ng mga makabagong pamamaraan sa pagtuturo. Ang kanilang pag-aaral ay nagmumungkahi ng pangangailangan para sa mas komprehensibong mga kurso at workshops na nakatutok sa pagtuturo ng mga digital na kasanayan sa mga guro, pati na rin ang mas maraming suporta mula sa mga lokal na pamahalaan.

Samantala, ang isang pagsusuri ni Kiviinen et al. (2020) sa Finland ay nagpakita ng isang positibong pananaw sa epekto ng webinars sa mga guro. Ayon sa kanila, ang Finland ay may mataas na antas ng digital literacy at access sa mga teknolohikal na kagamitan, kaya't ang mga guro doon ay nakikinabang mula sa mga online na pagsasanay. Gayunpaman, binigyang-diin nila na ang matagumpay na paggamit ng mga webinar ay nakadepende hindi lamang sa teknolohiya kundi pati na rin sa mga istruktura ng suporta at mga polisiyang nakatutok sa propesyonal na pag-unlad ng mga guro. Ang kanilang pag-aaral ay nagpapakita ng pangangailangan para sa isang holistic approach na nagsasama ng mga factor tulad ng oras, suporta mula sa administrasyon, at ang

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motibasyon ng mga guro upang mas maging epektibo ang webinars sa kanilang propesyonal na pag-unlad.

Sa kontinente ng Africa, isang pag-aaral ni Okoye (2021) sa Nigeria ang nagpakita ng mga hadlang sa pagsasanay ng mga guro gamit ang teknolohiya. Binanggit niya na sa kabila ng mga inisyatiba ng gobyerno upang paigtingin ang digital na edukasyon, ang mga guro sa mga rural na lugar ay nahihirapan pa rin sa kakulangan ng access sa internet at iba pang teknolohikal na kagamitan. Ayon kay Okoye, ang limitadong pagsasanay at ang hindi sapat na infrastructure ay nagiging sanhi ng hindi epektibong implementasyon ng mga online na pagsasanay at webinars, na isang pangunahing isyu sa pagpapabuti ng kalidad ng pagtuturo sa bansa. Inirerekomenda niya ang pagpapalakas ng mga polisiya at suporta para sa mga guro upang matugunan ang mga hadlang sa teknolohikal na pagsasanay.

Isang mahalagang isyu rin na lumitaw sa mga pagsusuri ng mga guro sa mga bansa sa Africa ay ang *lack of engagement and motivation* sa mga online learning platforms. Sa isang pag-aaral ni Mlambo et al. (2022) sa South Africa, ipinaliwanag nila na ang mga guro ay may mataas na antas ng stress at pagkaburnout, kaya't nagiging mahirap ang kanilang aktibong paglahok sa mga webinar. Ito ay ipinakita rin sa isang pag-aaral ni Williams (2020) sa Australia, na nagsabing ang mga guro na nahihirapan sa workload at mental health challenges ay may tendensiyang mawalan ng interes sa mga online na pagsasanay. Ayon sa mga eksperto, kinakailangan ang mas holistic na approach na hindi lamang nakatutok sa teknolohiya kundi pati na rin sa pag-aalaga sa kalusugan ng mga guro upang mapabuti ang kanilang partisipasyon sa mga online na pagsasanay.

Mga Gap sa Kaalaman

Bagamat marami nang pag-aaral ang isinagawa tungkol sa mga webinar at kanilang epekto sa pag-unlad ng mga guro, may mga ilang aspeto na hindi pa nasusuri nang lubos. Karamihan sa mga pag-aaral ay nakatutok lamang sa mga urban na lugar at mga guro na may madaling access sa mga teknolohikal na kagamitan. Samantalang may mga pag-aaral na tumatalakay sa mga guro sa mga rural at remote na lugar, ang mga isyung kaugnay ng *digital divide* at kakulangan sa propesyonal na pagsasanay para sa mga guro ay patuloy na mga hamon na hindi pa lubos na natutugunan. Sa ganitong paraan, ang kasalukuyang pag-aaral ay naglalayong punan ang mga gaps na ito, partikular sa konteksto ng mga guro sa Davao del Sur, na may limitadong access sa mga teknolohiya at walang sapat na suporta mula sa mga lokal na pamahalaan. Ang layunin ng kasalukuyang pagsusuri ay magsagawa ng mas malalim na pagsusuri sa mga hamon at oportunidad na dulot ng webinars sa mga guro sa mga lugar na may limitadong access sa teknolohiya at magbigay ng mga rekomendasyon upang mapabuti ang kanilang propesyonal na pag-unlad.

METODOLOHIYA

Ang pag-aaral na ito ay gumagamit ng kwalitatibong disenyo ng pananaliksik, partikular ng penomenolohikal na diskarte, upang tuklasin ang mga karanasan at pananaw ng mga pampublikong guro sa Davao del Sur kaugnay ng kanilang partisipasyon sa mga webinar. Pinili ang penomenolohikal na diskarte dahil ito ay nagbibigay daan sa masusing pag-unawa kung paano tinitingnan ng mga indibidwal ang kanilang mga karanasan, partikular sa konteksto ng paggamit ng teknolohiya at propesyonal na pag-unlad (Creswell & Poth, 2019). Layunin ng pag-aaral na ito na magsagawa ng malalim na pagsusuri sa mga personal na karanasan ng mga guro, at magbigay-liwanag sa mga hamon, pagkakataon, at mekanismo ng pagkaya sa harap ng digital na transformasyon sa edukasyon.

Disenyo ng Pananaliksik

Ang disenyo ng pananaliksik ay nakabatay sa kwalitatibong pamamaraan upang mangalap ng mga detalyadong datos na nagsasalaysay ng mga karanasan ng mga kalahok. Ang penomenolohikal na diskarte ay angkop sa pagsusuri ng mga karanasan ng guro sa webinar, na tumutok sa kanilang mga pananaw at kahulugan hinggil sa karanasang ito (Van Manen, 2021). Dahil sa limitadong pagsasaliksik na nakatuon sa mga guro sa mga rural na lugar, ang disenyong ito ay nagpapahintulot sa masusing pagtalakay sa mga hamon at benepisyo ng webinar bilang bahagi ng propesyonal na pag-unlad ng mga guro.

Pamamaraan ng Pagkuha ng Datos

Mga Kalahok

Mayroong 10 guro mula sa mga pampublikong paaralan sa Davao del Sur ang nakilahok sa pag-aaral, na pinili gamit ang purposive sampling. Pinili ang pamamaraang ito upang matiyak na ang mga kalahok ay may sapat na karanasan at kaalaman kaugnay ng paggamit ng webinars at online na pagsasanay (Suri, 2020). Ang mga guro ay pinili batay sa mga sumusunod na pamantayan: 1) kasalukuyang nagtuturo sa pampublikong paaralan sa Davao del Sur, 2) nakadalo sa hindi bababa sa isang webinar para sa propesyonal na pag-unlad, at 3) handang ibahagi ang kanilang mga karanasan. Tinitiyak ng pamamaraang ito na ang mga kalahok ay may kaugnayan sa paksa ng pananaliksik (Palinkas et al., 2019).

Pamamaraan ng Pagkuha ng Datos

Ang datos ay nakalap sa pamamagitan ng virtual na malalim na panayam, na pinili dahil sa kakayahan nitong magbigay ng mas maraming detalye at mas personal na pananaw mula sa mga kalahok. Ayon kay Seidman (2020), epektibo ang mga panayam sa kwalitatibong pananaliksik para sa pagkuha ng mga personal na kuwento at pananaw. Gumamit ng semi-structured na gabay sa panayam na nakatutok sa mga karanasan ng guro sa webinar, mga hamon, at epekto nito sa kanilang pamamaraan ng pagtuturo. Ilan sa mga tanong na itinampok sa gabay ay:

1. Ano ang pakiramdam mo tungkol sa pagdalo sa mga webinar bilang bahagi ng iyong propesyonal na pag-unlad?
2. Anu-ano ang mga hamon na iyong naranasan sa paglahok sa mga webinar?

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3. Paano nakaapekto ang mga webinar sa iyong mga pamamaraan ng pagtuturo?

Ang mga panayam ay isinagawa gamit ang mga platapormang Zoom at Google Meet, upang matiyak ang kakayahang maabot ang mga kalahok at magbigay ng mas maginhawang paraan para sa kanilang partisipasyon (Baker et al., 2020). Ang bawat panayam ay tumagal ng humigit-kumulang 45 hanggang 60 minuto. Ang mga panayam ay naitala at ipinagbigay-alam sa mga kalahok, at pagkatapos ay tinranskribo upang magamit sa pagsusuri.

Etikal na Pagsasaalang-alang

Ang mga etikal na alituntunin ay mahigpit na sinunod sa buong proseso ng pananaliksik. Ang pahintulot ng kalahok ay nakuha bago magsimula ang bawat panayam, at tinalakay sa kanila ang layunin ng pananaliksik, ang boluntaryong kalikasan ng kanilang partisipasyon, at ang kanilang karapatan na mag-withdraw mula sa pag-aaral anumang oras nang walang anumang parusa (Bryman, 2021). Upang mapanatili ang kalihiman, ang mga pangalan ng mga kalahok ay inalis at tanging mga code lamang ang ginamit sa pagsusuri ng datos.

Pamamaraan ng Pagsusuri ng Datos

Ang mga datos mula sa mga transkripsyon ng panayam ay sinuri gamit ang thematic analysis upang tuklasin ang mga pangunahing tema at pattern sa mga karanasan ng mga guro. Ang thematic analysis ay isang karaniwang pamamaraan sa kwalitatibong pananaliksik na tumutok sa pag-ugnay ng mga paksang lumilitaw mula sa datos (Braun & Clarke, 2021). Ayon kay Creswell at Poth (2019), ang pagsusuri ng mga tema ay nagbibigay-daan sa masusing pag-unawa sa mga karanasan ng mga kalahok at sa paghahanap ng mga pattern na nauugnay sa kanilang interaksiyon sa teknolohiya. Ang mga tema ay binuo sa pamamagitan ng isang iterative coding process, kung saan ang mga kategorya ng impormasyon ay ipinasok at sinuri batay sa pagkakapareho at pagkakaiba.

Sa pamamagitan ng metodolohiyang ito, layunin ng pag-aaral na maipakita ang mga aspeto ng karanasan ng mga guro sa mga webinar at matukoy ang mga mekanismo ng pagkaya at epekto nito sa kanilang pagtuturo at propesyonal na buhay.

MGA RESULTA

Ang mga resulta ng pag-aaral na ito ay nakabatay sa mga karanasan ng mga guro sa Davao del Sur hinggil sa kanilang partisipasyon sa mga webinar. Sa pamamagitan ng thematic analysis, lumitaw ang tatlong pangunahing tema na nagpapakita ng mga mahahalagang detalye ng kanilang karanasan.

Una, ang negatibong karanasan sa webinar ay isang pangunahing tema. Karamihan sa mga guro ay nakaranas ng mga teknikal na problema tulad ng mabagal na internet connection at mga isyu sa software ng mga webinar platform. Ayon sa isang kalahok, "Madalas, nagiging hadlang ang mabagal na internet kaya't hindi ako makasunod sa mga diskusyon." Ang mga teknikal na problemang ito ay nagdulot ng pagkaantala sa kanilang pagkatuto at hindi tamang pagsunod sa mga sesyon ng webinar, na nagiging sanhi ng stress at pagkabigo sa mga guro. Halimbawa, ang 70% ng mga guro ay nagsabi ng mahina o walang internet, at ang 50% ay naranasan ang kakulangan sa teknikal na suporta mula sa mga organisador (Zhang, 2020; Sharma & Dave, 2021).

Pangalawa, may limitadong epekto ang webinars sa kalidad ng pedagohikal na pagtuturo. Bagaman nakatutulong ang mga webinar sa pagpapalawak ng kaalaman ng mga guro, hindi nila nakikita agad ang aplikasyon nito sa kanilang pang-araw-araw na pagtuturo. Ang ilan sa kanila ay nahirapan sa pag-aangkop ng mga natutunan mula sa webinars sa kanilang mga klase, na nagiging sanhi ng 80% ng mga gur na nagsabi na walang direktang epekto ang mga webinar sa kanilang pagtuturo. Ayon sa isang guro, "Nakakatulong ang mga webinar para madagdagan ang kaalaman ko, pero sa klase ko, hindi ko agad ito magagamit" (Baker et al., 2020; Creswell & Poth, 2019).

Panghuli, ang tema ng paghihigpit sa mapagkukunang teknolohikal ay nagpapakita ng mga hamon sa pagkakaroon ng sapat na kagamitan tulad ng laptops at mabilis na internet, na kinakailangan para sa mga webinar. Ang mga guro ay nahirapan sa pagkakaroon ng access sa mga ganitong kagamitan, na siyang nagiging sagabal sa kanilang patuloy na paglahok sa mga online na pagsasanay. Ang mga 60% ng guro ay nagsabi na kakulangan sa teknolohiya ang kanilang pangunahing hadlang sa patuloy na paggamit ng webinar bilang kasangkapan sa kanilang propesyonal na pag-unlad (Smith et al., 2019; Palinkas et al., 2019)

Sa kabuuan, ang mga natuklasan ng pag-aaral na ito ay nagpapakita ng mga teknikal na hamon at limitadong epekto ng webinars sa praktikal na pagtuturo, pati na rin ang mga paghihigpit sa mga mapagkukunang teknolohikal ng mga guro sa Davao del Sur.

DISKUSYON

Ang mga resulta ng pag-aaral na ito ay nagpapakita ng mga hamon na kinahaharap ng mga guro sa Davao del Sur kaugnay ng kanilang karanasan sa mga webinar, pati na rin ang epekto nito sa kanilang propesyonal na pag-unlad. Ang unang tema ng negatibong karanasan sa webinar ay nagpapakita ng malawakang mga teknikal na isyu tulad ng mabagal na internet at kakulangan sa suporta mula sa mga host. Ang mga problemang ito ay hindi lamang nakaaapekto sa aktwal na partisipasyon ng mga guro sa mga webinar, kundi pati na rin sa kanilang pagkatuto. Ayon sa mga nakaraang pag-aaral, ang teknikal na hadlang ay isang pangunahing isyu sa online learning at webinars, at ito ay lubhang nagiging sanhi ng pagkaantala sa mga layunin ng propesyonal na pag-unlad ng mga guro (Goh et al., 2020; Bawa & Dube, 2021). Bagamat may mga inisyatiba ang mga paaralan upang mapabuti ang internet connectivity, ang mga guro sa mga rural na lugar tulad ng Davao del Sur ay patuloy na nahaharap sa mga isyung ito.

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Ang ikalawang tema ay ang limitadong epekto ng mga webinar sa kalidad ng pedagohikal na pagtuturo. Bagaman may mga pagkakataon na nakatutulong ang mga webinar sa pagpapalawak ng kaalaman ng mga guro, maraming kalahok ang nagsabi na mahirap nilang isama ang mga natutunan sa kanilang mga klase. Ayon sa Sharma at Dave (2021), ang mga webinar ay hindi palaging direktang nauugnay sa pagbabago sa pedagogical practices, lalo na kung walang sapat napraktikal na aplikasyon ng mga natutunan. Sa ganitong konteksto, ang pedagogical gap na nabanggit sa mga findings ay nagbigay-diin sa pangangailangan ng mas maraming interactive at hands-on training upang magamit ng mga guro ang kanilang natutunan sa tunay na setting ng klasrum (Creswell, 2020).

Sa kabilang banda, ang tema ng paghihigpit sa mapagkukunang teknolohikal ay isang makabuluhang aspeto ng pag-aaral. Maraming guro ang nagharap ng kakulangan sa mga kagamitan at maaasahang internet upang mas epektibong makilahok sa mga webinar. Ang mga guro sa mga lugar na may limitadong access sa teknolohiya ay patuloy na nahaharap sa mga problemang ito, at ito ay isang malaking hamon para sa kanilang patuloy na propesyonal na pag-unlad (Smith et al., 2019). Ang mga findings ng pag-aaral na ito ay sumusuporta sa mga naunang pananaliksik na nagsasabing ang kakulangan sa teknolohikal na mga mapagkukunan ay isang hadlang saepektibong online education (Zhang, 2020).

Sa kabuuan, ang mga resulta ng pag-aaral ay nagbigay-diin sa mga mahahalagang isyu ng access at suporta sa mga guro sa panahon ng pandemya at online learning. Ang mga natuklasan ng pag-aaral ay may malalim na epekto sa pagpaplano ng mga future professional development programs para sa mga guro. Sa kabila ng mga hamon, may mga positibong aspeto ang webinars tulad ng pagpapalawak ng kaalaman at pagbibigay ng pagkakataon para sa retooling at reskilling. Ayon kay Zhang (2020), ang pagkakaroon ng mas maraming pagsasanay at tulong sa teknolohiya ay makakatulong sa pag-unlad ng mga guro at magpapabuti sa kalidad ng kanilang pagtuturo.

Mga Limitasyon ng Pag-aaral

Gayunpaman, may ilang mga limitasyon ang pag-aaral na ito. Una, ang bilang ng mga kalahok na 10 guro lamang ay maaaring hindi sapat upang magbigay ng komprehensibong pananaw sa buong populasyon ng mga guro sa Davao del Sur. Pangalawa, ang geographical na limitasyon ng lugar ng pag-aaral ay maaaring makaapekto sa generalisability ng mga resulta, dahil ang mga guro sa ibang lugar ay maaaring may iba pang karanasan at hadlang sa teknolohiya (Baker et al., 2020). Mahalaga rin na tukuyin na ang ilang mga guro ay maaaring hindi naging ganap na tapat sa kanilang mga sagot, lalo na sa mga isyu ng teknikal na kakulangan at kawalan ng access sa mga mapagkukunan.

KONKLUSYON

Ang layunin ng pag-aaral na ito ay suriin ang mga karanasan at pananaw ng mga guro sa Davao del Sur hinggil sa kanilang partisipasyon sa mga webinar. Ayon sa mga natuklasan, tatlong pangunahing tema ang lumitaw mula sa pagsusuri ng datos. Una, ang mga negatibong karanasan tulad ng teknikal na hadlang, kabilang na ang mabagal na internet at kakulangan sa teknikal na suporta, ay pangunahing isyu na nagdudulot ng pagkaantala sa mga webinar. Pangalawa, ang limitadong epekto ng webinars sa kalidad ng pedagohikal na pagtuturo, na nagpapakita ng kakulangan sa aplikasyon ng mga natutunan mula sa mga webinar sa aktwal na pagtuturo sa klasrum. Panghuli, ang tema ng paghihigpit sa mapagkukunang teknolohika ay nagsasaad ng mga hamon na kinahaharap ng mga guro sa pagkakaroon ng sapat na kagamitan at internet upang makilahok sa mga webinar.

Ang mga resulta ng pag-aaral na ito ay nagbibigay-diin sa mga isyung teknikal na kailangan ng agarang atensyon upang mapabuti ang karanasan ng mga guro sa online na propesyonal na pag-unlad. Ang mga guro ay may kakayahang magpatuloy sa kanilang pagkatuto at pagtuturo sa kabila ng mga hamon, ngunit ang mga isyung teknikal at kakulangan sa mga mapagkukunan ay nagpapatuloy na sagabal.

Sa mga rekomendasyon para sa Kagawaran ng Edukasyon, mahalaga na magpatuloy ang kanilang mga hakbang sa pagpapabuti ng internet connectivity sa mga liblib na lugar at sa pagtataguyod ng mga in-house technical support teams upang magbigay ng agarang tulong sa mga guro na nakakaranas ng teknikal na problema. Dapat din nilang isaalang-alang ang pagbibigay ng mga programang nakatuon hindi lamang sa online webinars kundi pati na rin sa mga face-to-face na pagsasanay na may mataas na antas ng interaktibidad. Sa mga school heads, mahalagang magpatuloy ang pagbibigay ng mga propesyonal na programa na may praktikal na aplikasyon, pati na rin ang pagpapabuti ng mga feedback mechanisms mula sa mga guro upang matukoy ang mga isyu at mapabuti ang kalidad ng mga programang ito.

Para naman sa mga guro, mahalaga ang pagiging proactive sa paghahanap ng mga solusyon sa mga hamon ng teknolohiya, at ang pagpapabuti ng kanilang mga kasanayan sa teknolohiya upang magpatuloy sa adaptasyon sa mga pagbabagong dulot ng makabagong edukasyon. Hinihikayat din silang patuloy na magsanay sa pagpapakita ng flexibility at pagiging bukas sa mga bagong pamamaraan ng pagtuturo gamit ang teknolohiya.

Sa mga hinaharap na mananaliksik, maaari nilang palawakin ang kanilang pag-aaral upang mas mapalalim pa ang epekto ng webinars sa long-term na kalidad ng pagtuturo at sa mga student outcomes. Mahalaga rin na magkaroon ng mas malawak na saklaw ng sample size at mas diverse na geographical locations upang mas mapalawak ang perspektibo hinggil sa karanasan ng mga guro sa buong bansa o rehiyon. Ang limitasyon ng kasalukuyang pag-aaral na may maliit na bilang ng mga kalahok

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ay maaaring magbigay daan sa mas malalaking pag-aaral na mas kumakatawan sa buong populasyon ng mga guro. Gayundin, ang fokus ng pag-aaral sa mga webinar ay isang bahagi lamang ng mas malawak na isyu ng propesyonal na pag-unlad ng mga guro, kaya't ang mga susunod na pag-aaral ay maaaring magpokus din sa iba pang uri ng pagsasanay at programa na makikinabang ang mga guro sa kanilang propesyonal na paglago.

Ang mga rekomendasyon at natuklasan mula sa pag-aaral na ito ay may potensyal na magbigay ng gabay sa mga hakbangin at pagpaplano para sa patuloy na pagpapabuti ng mga programa sa professional development para sa mga guro, upang matugunan ang mga kasalukuyang hamon at mapaigting pa ang kalidad ng edukasyon sa bansa.

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RAISE YOUR FLAG: ILLUMINATING PATHS TO ENHANCE STUDENTS' ENGAGEMENT IN MATHEMATICS

Gesyl B. Malaki[1], Honey Grace Lato[2], John Lawrence Butal[3], Jeric Kim Jaya[4], Casan L. Pandapatan[5]

[1]ORCID No.: 0009-0006-7606-351X
Student Researcher, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[2]ORCID No.: 0009-0002-5625-2533
Student Researcher, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[3]ORCID No.: 0009-0007-4788-0059
Student Researcher, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[4]ORCID No.: 0009-0007-0369-3788
Student Researcher, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines
[5]ORCID No.: 0009-0002-7136-2140
Student Researcher, Kapalong College of Agriculture, Sciences and Technology, Maniki, Kapalong, Davao del Norte, Philippines

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ABSTRACT

The purpose of the study is to determine the effect of Raise Your Flag intervention to enhance students' engagement in mathematics. Hence, the purpose of this study was to determine the significant difference between the pretest and post-test scores of the students. Pre-experimental research design was utilized in this study to measure the effect of the intervention. The data were gathered in 35 students from Grade 9 in Asuncion National High School who were selected through purposive sampling. Data gathering was done through Pretest and Post-test Administration. Findings revealed a substantial difference in the scores before with the mean percentage score of 4.05 (High) and after the intervention in enhancing students' engagement in mathematics with the mean percentage score of 4.43 (Very High). Results also revealed that there is a significant improvement in the students' scores from the pretest to the post-test, with the post-test mean percentage scores that has descriptive level of very high which interpreted as very satisfactory. This substantial difference suggests a strong effect of the treatment to enhance students' engagement in mathematics, it indicates a highly significant and positive impact of the intervention or treatment on the students' performance engagement in mathematics.

KEYWORDS: *Intervention, Enhance Students' Engagement in Mathematics, Raise Your Flag*

INTRODUCTION

Many students often find math challenging, leading to boredom and a loss of interest. Consequently, teachers bear the responsibility of making math classes more engaging. They play a crucial role in employing effective strategies to make math interesting for students. The primary objective is to cultivate essential math skills through methods that promote active learning and ensure participation from all students. The goal is not only to capture students' interest but also to encourage active involvement, laying the groundwork for successful outcomes in mathematical education (Timmerman, 2023).

In Indonesia, as in many parts of the world, numerous students, particularly in mathematics classes, grapple with disengagement, posing a critical challenge with far-reaching implications for academic achievement. This issue demands urgent attention, as a lack of engagement can significantly hinder students' performance in mathematics, contributing to a global educational challenge. Addressing this concern necessitates both local and global efforts to implement innovative and inclusive strategies that reignite students' interest and participation in mathematics education. By acknowledging and tackling disengagement as a shared global challenge, the education community can collaborate effectively to ensure that students worldwide have the opportunity to excel

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in their mathematical learning journeys (Cevikbas & Kaiser, 2022).

In the Philippines, student engagement in education faces significant hurdles, particularly in remote and impoverished areas where access to quality education is limited. The lack of resources and poorly equipped schools exacerbate disengagement, as students struggle to stay motivated in substandard learning environments. Outdated teaching methods and curriculum further contribute to disconnection, as many students find it challenging to engage with material that fails to capture their interest. This disconnect is particularly evident in mathematics education, where a substantial number of Filipino students lag behind global standards. Disparities between public and private schools only compound the issue, highlighting the urgent need for innovative interventions to address this pervasive lack of engagement (Bernardo et al., 2022).

In the Division of Davao del Norte, specifically at Asuncion National High School, the repercussions of the pandemic on students' math education have underscored the emergence of a significant research gap regarding student engagement in mathematics. The noticeable learning gap among students, particularly in comprehending math concepts, has led to a decline in their proficiency in the subject. This gap in understanding poses a challenge to grasping foundational mathematical principles, impacting students' overall academic performance. Teachers, grappling with this disparity, face difficulties in ensuring that all students remain aligned with the curriculum, thereby exacerbating the widening gap in mathematical comprehension. Investigating and addressing the specific factors contributing to the disengagement of students in mathematics at Asuncion National High School will be crucial for formulating targeted interventions and improving the overall effectiveness of math education in the school.

The interest in this study stems from the urgent need to address a crucial problem: the significant learning gap, particularly in mathematics, observed in the Division of Davao del Norte, particularly at Asuncion National High School. This concern is heightened by the notable impact of the pandemic on students' understanding of math concepts, leading to a decline in academic performance. As pre-service teachers, it is vital to acknowledge and tackle this issue promptly. Taking immediate action is essential to bridge this gap, providing necessary support to help students overcome the challenges brought about by the pandemic and thrive in their mathematical education. The research aims to explore and understand the factors contributing to the disengagement of high school students in math at Asuncion National High School, ultimately contributing to the development of effective strategies for enhancing student engagement and performance in mathematics.

In line with this, the researchers have not come across any study in the Philippines, particularly in the locality, that corresponds to the Raise your Flag: Illuminating paths to enhance students' engagement in mathematics of a local college in Davao del Norte. In connection, there had been studies conducted that has similar intention of this study, such as that of Woodcock et al., (2020), entitled "Increasing Student Engagement in Mathematics: The influence of Interactive Whiteboard Technology" tackles the influence of interactive technologies can effectively increase student interest participation in mathematics. Also, another study of Geraets (2021), entitled "The Effects that a Flipped Classroom has on Engagement and Academic Performance for High School Mathematics Students", tackled the flipped classroom intervention to the students. The aforementioned studies specifically focus only on having different intervention on promoting students' engagement on learning mathematics and does not investigate on Raise your flag activity to their students. Thus, the researcher found the necessity to pursue this study to determine whether this intervention could eventually increase their student engagement in math.

Research Objectives

The study aims to determine the effectiveness of Raise you flag intervention as a strategy for enhancing the student engagement among Grade 9 students. Specifically, it sought to answer the following objectives:

1. To determine the level of the students' performance before and after the implementation of Raise your Flag intervention in terms of:
    1.1 behavioral engagement;
    1.2 affective engagement; and
    1.3 cognitive engagement.
2. To determine the significant difference between the scores of the respondents before and after the implementation of Raise you Flag intervention.

Hypothesis

The following hypothesis were tested at 0.05 level of significance to determine the level of significance:

1. There is a significant difference between the pre-test and post-test of students' engagement.

METHODOLOGY

Research Design

The researcher utilized a pre-experimental research approach, specifically a one-group pre-test-posttest design. In this approach, a single case is observed at two distinct time points: prior to the administration of the treatment and subsequent to its conclusion. This would help to assessed changes in the outcome of interest, attributing these changes to the intervention or treatment applied. This design relies solely on the observed changes within the same group to infer the effectiveness of the intervention (ICPSR, 2019).

A purposive sampling, a non-random selection technique was used in this study, where in the total number of participants was 35 students of Grade 9 students, enrolled in the school year 2023-2024. They were chosen as the respondents as they were identified as a group that struggles more with math engagement compared to other sections, making them a perfect target of this study. Also, since this study is all about students' engagement in math and the researchers want to determine the effectiveness of the intervention in their section through having pre-test and post-test.

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The study utilized one adapted questionnaire from web sources to measure the variable. The adapted questionnaire underwent thorough expert validation before dissemination of the research questionnaires towards the students. The instrument for students' engagement with indicators which were behavioral engagement, affective engagement, and cognitive engagement have a Cronbach's alpha value of .93 from the work of Fredricks & McColskey (2012).

The students' engagement questionnaire in math has three components: *behavioral engagement component* with five items, *affective engagement component* with five items, and *cognitive engagement component* with five items. In describing the student engagement questionnaire, the following gradations were used:

Range of Means	Descriptive Level	Interpretation
4.30 - 5.00	Very High	If the measure described in the student's engagement of the respondents is always observed.
3.50 - 4.20	High	If the measure described in the student's engagement of the respondents is oftentimes observed.
2.70 - 3.40	Moderate	If the measure described in the student's engagement of the respondents is sometimes observed.
1.90 - 2.60	Low	If the measure described in the student's engagement of the respondents is seldom observed.
1.0 - 1.80	Very Low	If the measure described in the student's engagement of the respondents is never observed.

RESULTS

Presented in the section below are the results of the data on the raise your flag: illuminating paths to enhance students' engagement in mathematics among grade 9 students. The chapter presents the discussion of the data on students' engagement in mathematics on Grade 9 students on their pre-test and post-tests in terms of behavioural engagement, affective engagement, and cognitive engagement. Also, significant difference between the pre-test and post-test is presented in this chapter.

Level of Pre-test of Students Engagement in terms of Behavioural Engagement

The level of student engagement in terms of behavioural engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

The level of student engagement in terms of behavioural engagement is presented, analyzed, and interpreted. Reflected in Table 1 is the level of student engagement in terms of behavioural engagement with a corresponding overall mean in pre-test result of 3.96 or qualitatively interpreted as high. This means that the level of student engagement in terms of behavioural engagement is oftentimes manifested.

Table 1: Level of Pre-test of Student Engagement in Terms of Behavioral Engagement

Behavioral Engagement	Pre-Test	Description
1. Actively participating in class activities in math.	3.69	High
2. Working hard in math class.	3.94	High
3. Asking questions in math class or contributed to class discussion.	3.66	High
4. Trying to do well in math.	4.17	High
5. Paying attention in math class.	4.34	Very High
OVERALL	**3.96**	**High**

It could be observed from the data of the pre-test result that the item with the highest mean rating of 4.34 is described to be very High. This means that the item is always manifested by the respondents. This is from item no. 5– *Pay attention in math class.*

As opposed to this, the item with the lowest mean rating of 3.66 in the pre-test result is described to be high. This means that the item is oftentimes manifested by the respondents. This is from item no. 3– *Ask questions in math class or contributed to class discussion.*

Level of Post-test of Students Engagement in terms of Behavioural Engagement

The level of student engagement in terms of behavioural engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

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Table 2: Level of Post-test of Student Engagement in terms of Behavioral Engagement

Behavioral Engagement	Post-Test	Description
1. Actively participating in class activities in math.	4.57	Very High
2. Working hard in math class.	4.40	Very High
3. Asking questions in math class or contributed to class discussion.	4.43	Very High
4. Trying to do well in math.	4.31	Very High
5. Paying attention in math class.	4.63	Very High
OVERALL	**4.47**	**Very High**

The level of student engagement in terms of behavioural engagement is presented, analyzed, and interpreted. Reflected in Table 2 is the level of student engagement in terms of behavioural engagement with a corresponding overall mean in post-test result of 4.47 or qualitatively interpreted as very high. This means that the level of student engagement in terms of behavioural engagement is always manifested.

Moreover, it could be observed from the data of the post-test result that the item with the highest mean rating in pre-test of 4.63 is described to be Very High. This means that the item is always manifested by the respondents. This is from item no. 5– *Pay attention in math class.*

Also, the item with the lowest mean rating of 4.31 in the post-test result is described to be Very High. This means that the item is always manifested by the respondents. This is from item no. 4– *Try to do well in math.*

Level of Pre-test of Students Engagement in terms of Affective Engagement

The level of student engagement in terms of affective engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

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Table 3: Level of Pre-test of Student Engagement **in Terms of Affective Engagement**

Affective Engagement	Pre-Test	Description
1. Being very interested in learning new things in math.	4.20	High
2. Being excited about solving difficult math problems.	3.74	High
3. Likely attending math classes.	4.40	Very High
4. Enjoying learning math subject.	4.29	Very High
5. Thinking learning math is fun.	4.11	High
OVERALL	**4.15**	**High**

The level of student engagement in terms of affective engagement is presented, analyzed, and interpreted. Reflected in Table 3 is the level of student engagement in terms of affective engagement with a corresponding overall mean in pre-test result of 4.15 or qualitatively interpreted as high. This means that the level of student engagement in terms of affective engagement is oftentimes manifested.

It could be observed from the data of the pre-test result that the item with the highest mean rating of 4.40 is described to be very High. This means that the item is always manifested by the respondents. This is from item no. 3– *Like attending math classes.*

As opposed to this, the item with the lowest mean rating of 4.11 in the pre-test result is described to be high. This means that the item is oftentimes manifested by the respondents. This is from item no. 5– *Think learning math is fun.*

Level of Post-test of Students Engagement in terms of Affective Engagement

The level of student engagement in terms of affective engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

The level of student engagement in terms of behavioural engagement is presented, analyzed, and interpreted. Reflected in Table 4 is the post-test result, the corresponding overall mean is 4.44 or qualitatively interpreted as very high. This means that the level of student engagement in terms of affective engagement is always manifested.

Moreover, it could be observed from the data of the post-test result that the item with the highest mean rating in pre-test of 4.63 is described to be very High. This means that the item is always manifested by the respondents. This is from item no. 3– *Like attending math classes.*

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Table 4: Level of Post-test Student Engagement **in Terms of Affective Engagement**

Affective Engagement	Post-Test	Description
1. Being very interested in learning new things in math.	4.49	Very High
2. Being excited about solving difficult math problems.	4.37	Very High
3. Likely attending math classes.	4.63	Very High
4. Enjoying learning math subject.	4.49	Very High
5. Thinking learning math is fun.	4.23	High
OVERALL	**4.44**	**Very High**

Also, the item with the lowest mean rating of 4.23 in the post-test result is described to be High. This means that the item is oftentimes manifested by the respondents. This is from item no. 5– *Think learning math is fun.*

Level of Pre-test of Students Engagement in terms of Cognitive Engagement

The level of student engagement in terms of cognitive engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

The level of student engagement in terms of cognitive engagement is presented, analyzed, and interpreted. Reflected in Table 5 is the level of student engagement in terms of cognitive engagement with a corresponding overall mean in pre-test result of 4.05 or qualitatively interpreted as high. This means that the level of student engagement in terms of cognitive engagement is oftentimes manifested.

It could be observed from the data of the pre-test result that the item with the highest mean rating of 4.34 is described to be very high. This means that the item is oftentimes manifested by the respondents. This is from item no. 3– *Want to get good grade in math class.*

As opposed to this, the item with the lowest mean rating of 3.74 in the pre-test result is described to be high. This means that the item is oftentimes manifested by the respondents. This is from item no. 5– *Am focused when I study math.*

Table 5: Level of Student Engagement in Terms of Cognitive Engagement

Cognitive Engagement	Pre-Test	Description
1. Setting goal for myself when I study math.	4.14	High
2. Wanting to get good grade in math class.	4.34	High
3. Trying to connect math concepts in real life situations.	4.17	High
4. Trying to develop my own strategy when I solve math problems.	3.86	High
5. Being focused when I study math.	3.74	High
OVERALL	**4.05**	**High**

Level of Post-test of Students Engagement in terms of Cognitive Engagement

The level of student engagement in terms of cognitive engagement of grade 9 students was measured through a survey questionnaire with the following indicators: behavioural engagement, affective engagement, and cognitive engagement. The responses of grade 9 students were presented and analyzed below.

Table 6: Level of Student Engagement in Terms of Cognitive Engagement

Cognitive Engagement	Post-Test	Description
1. Setting goal for myself when I study math.	4.51	Very High
2. Wanting to get good grade in math class.	4.37	Very High
3. Trying to connect math concepts in real life situations.	4.57	Very High
4. Trying to develop my own strategy when I solve math problems.	4.26	Very High
5. Being focused when I study math.	4.20	High
OVERALL	**4.38**	**Very High**

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The level of student engagement in terms of behavioural engagement is presented, analyzed, and interpreted. Reflected in Table 6 is the post-test result, the corresponding overall mean in post-test result of 4.38 or qualitatively interpreted as very high. This means that the level of student engagement in terms of cognitive engagement is always manifested.

Moreover, it could be observed from the data of the post-test result that the item with the highest mean rating in pre-test of 4.57 is described to be very high. This means that the item is always manifested by the respondents. This is from item no. 3– *Try to connect math concepts in real life situations.*

Also, the item with the lowest mean rating of 4.20 in the post-test result is described to be High. This means that the item is oftentimes manifested by the respondents. This is from item no. 5– *Am focused when I study math.*

Summary on the Level of Pre-test of Student Engagement
The summary on the level of student engagement is presented, analyzed, and interpreted. The summary of data revealed on the pre-test result that the level of student engagement of the students has a total mean of 4.05 described as high. This means that the level of critical thinking disposition of mathematics education students is oftentimes manifested.

It can be observed in Table 7 in pre-test result that the indicator, affective engagement, got the highest mean of 4.15 or described as high. This indicates that the level of student's engagement in terms of behavioral engagement is oftentimes manifested.

Table 7: Summary on the Level of Pre-test of Student Engagement

Problem Solving Skills	Pre-Test	Description
Behavioral Engagement	3.96	High
Affective Engagement	4.15	High
Cognitive Engagement	4.05	High
OVERALL	**4.05**	**High**

Moreover, the indicator, cognitive engagement, obtained a mean of 4.05 which means high. This indicates that the level of student's engagement in terms of cognitive engagement is oftentimes manifested.

Lastly, the indicator behavioral engagement, got the lowest mean score of 3.96 which is described as high. This indicates that the level of student's engagement in terms of behavioral engagement is oftentimes manifested.

Summary on the Level of Post-test of Student Engagement
The summary on the level of student engagement is presented, analyzed, and interpreted. The summary of data revealed on the post-test result that the level of student engagement of the students has a total mean of 4.43 described as very high. This means that the level of student's engagement is always manifested.

In line with this, it can be observed in Table 8 in post-test result that the indicator, behavioral engagement, got the highest mean of 4.47 or described as very high. This indicates that the level of student's engagement in terms of behavioral engagement is always manifested.

Moreover, the indicator, affective engagement, obtained a mean of 4.44 which means very high. This indicates that the level of student's engagement in terms of affective engagement is always manifested.

Table 8: Summary on the Level of Post-test of Student Engagement

Problem Solving Skills	Post-Test	Description
Behavioral Engagement	4.47	Very High
Affective Engagement	4.44	Very High
Cognitive Engagement	4.38	Very High
OVERALL	**4.43**	**Very High**

Lastly, the indicator cognitive engagement, got the lowest mean score of 4.38 which is described as very high. This indicates that the level of student's engagement in terms of cognitive engagement is always manifested.

Significant Difference Between Pre-test and Post-test
Presented in Table 9 is the significant difference between the pre-test and post-test of the student's engagement, t(df)= 34, p<.001. The pre-test has the mean of 4.05 and the post-test has the mean of 4.43. The SD of the pre-test obtained a value of 0.28, while, the post-test obtained a value of 0.14. The computed t-value of the pre-test and post-test has the value of -6.926. The p-value of the pre-test and post-test was (p<.001). Since, the probability value of (p<.001) is extremely lesser than the level of significance ($\alpha = 0.05$), the null hypothesis is rejected in this context. This shows that there is a significant difference between the pre-test and post-test.

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Table 9: Significant Difference Between Pretest and Post-Test

Type of Test	N	df	Mean	SD	t-value	P-value	Decision $\alpha = 0.05$
Pre-Test	35	34	4.05	0.28	-6.926	**< .001**	**Significant**
Post-Test	35		4.43	0.14			

CONCLUSION

It was concluded that the level of the students' performance before the implementation of the Raise Your Flag intervention in terms of the three dimensions, namely behavioral, affective, and cognitive engagement indicated a high baseline level of engagement across all dimensions. The pre-test results demonstrated that students were frequently exhibiting behaviors associated with active participation, positive emotions towards learning, and cognitive involvement in math.

Additionally, the results revealed that the level of the students' performance after the implementation of the Raise Your Flag intervention in terms of the three dimensions, namely behavioral, affective, and cognitive engagement is very high. The results indicate a significant improvement in students' engagement in mathematics from the pre-test to the post-test phase.

Moreover, the summary of the level of student engagement across all indicators demonstrates a consistent increase from a high level in the pre-test to a very high level in the post-test. This indicates a robust improvement in students' critical thinking disposition and overall engagement in mathematics education.

Lastly, the analysis of the significant difference between the pre-test and post-test further confirms the effectiveness of the intervention. The computed t-value and p-value suggest a highly significant difference between the two phases, leading to the rejection of the null hypothesis. This indicates that the intervention, "Raise Your Flag," effectively enhanced students' engagement in mathematics from the pre-test to the post-test phase.

Recommendation

The effectiveness of educational interventions in enhancing student performance and engagement is a critical area of study in educational research. This report examines the impact of the Raise Your Flag intervention on various dimensions of student performance, focusing particularly on behavioral and cognitive engagement before and after implementation. Initial findings indicate that behavioral engagement exhibited the lowest mean score among pre-intervention measures, prompting recommendations for targeted strategies aimed at promoting interactive learning environments and encouraging active participation. Subsequent analysis reveals cognitive engagement as the dimension with the most significant improvement post-intervention, suggesting the efficacy of tailored teaching methods and real-world relevance in enhancing student learning experiences. This study underscores the importance of proactive measures in educational practices, advocating for continuous adaptation of curriculum and instructional strategies to sustain and further enhance student engagement and overall academic achievement.

Among the three dimensions of the level of the students' performance before the implementation of the Raise Your Flag intervention, it was determined that behavioral engagement garnered the lowest mean. Hence, the following recommendations are provided: First, educators may employ targeted strategies such as implementing interactive teaching methods, promoting a supportive learning environment, and encouraging active participation in class activities. Additionally, continuous efforts can be made to sustain and further boost students' interest and excitement in learning mathematics through real-world examples, celebrations of achievements, and diverse learning experiences.
Furthermore, for all the dimensions of the level of the students' performance after the implementation of the Raise Your Flag intervention, the researcher discovered that cognitive engagement accumulated the lowest mean. As a result, the following recommendations are made: Teachers may teach students different ways to solve problems in math. They can also show how math relates to real life, which makes it easier to understand. It's important for students to think about how they learn and to be able to control their own learning. Teachers can help by giving different kinds of lessons to match how each student learns best. Working together with classmates can also help students learn better. These methods make learning more fun and help students do better in school.

Moreover, based on the significant difference observed between the pre-test and post-test scores for student engagement, it is highly recommended that teachers and institutions may take proactive steps in response to the significant difference found between the pre-test and post-test scores for student engagement. First and foremost, it is imperative to identify effective teaching strategies that contributed to the improvement in engagement and incorporate more of these into instructional practices.

Additionally, further support can be provided to students who may still be struggling with engagement, ensuring tailored interventions to meet their needs. Continuous monitoring and evaluation are essential to sustain improvements and address emerging issues promptly. Curriculum and instruction may be adjusted based on insights gained from the analysis, promoting interactive and student-centered approaches. Encouraging collaboration and participation fosters an environment conducive to engagement, while offering professional development opportunities for teachers enhances their ability to promote student involvement effectively. Through these actions, teachers and institutions can nurture a supportive and

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dynamic learning environment that maximizes student engagement and learning outcomes.

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AN ANALYSIS OF THE ROLE OF LANDSCAPE ARCHITECTURE IN PROMOTING CULTURAL AND HISTORIC AWARENESS

Ar Kriteeka Sharma
Landscape Architect, Assistant professor, MBS School of Planning and Architecture, Delhi

ABSTRACT

Landscape architecture serves as an integral tool in shaping the built environment, where design not only meets aesthetic and ecological goals but also plays a pivotal role in promoting cultural and historical awareness. Through careful manipulation of space, materials, and symbolism, landscape architects create public and private environments that communicate the collective memory, identity, and heritage of communities. This paper analyses how landscape architecture fosters an understanding of cultural history, memorializes important events, and highlights indigenous practices through the design of public spaces, gardens, memorials, and urban landscapes. By examining case studies from around the world, this paper demonstrates how landscape architecture can educate, commemorate, and inspire reflection on historical and cultural contexts.

KEYWORDS: *Landscape architecture, historical awareness, cultural history.*

1. INTRODUCTION

Landscape architecture, traditionally concerned with spatial planning, ecological balance, and aesthetic beauty, also has a profound influence on how cultures and histories are represented in the built environment. Public landscapes, including parks, memorials, gardens, and urban spaces, have the power to convey narratives, reflect cultural identities, and preserve historical memory. In a rapidly globalizing world, landscape architects are increasingly called upon to integrate historical awareness and cultural sensitivity into their designs.

This paper explores the role of landscape architecture in promoting cultural and historic awareness, focusing on how designed landscapes contribute to public knowledge and collective memory. Through specific case studies, the paper highlights how landscapes serve as active agents in the preservation, interpretation, and dissemination of cultural history.

2. LANDSCAPE ARCHITECTURE AS A MEDIUM FOR CULTURAL AND HISTORICAL EXPRESSION

2.1 Cultural Identity in Landscape Design

Landscape architecture reflects cultural identity by incorporating design elements that are unique to specific regions or communities. From the choice of plant species to the materials used, landscape architects draw upon local traditions, cultural symbols, and historic references to create spaces that resonate with a community's heritage.

- **Example: Japanese Zen Gardens**

In Kyoto, Japan, Zen gardens are designed not only for aesthetic pleasure but to embody Japanese philosophies of simplicity, spirituality, and mindfulness. The careful arrangement of stones, water features, and plants creates a reflective space that connects visitors to the spiritual and cultural history of Japan. Zen gardens, such as the famous Ryoan-ji garden, express the cultural ideals of balance and harmony that are core to Japanese identity.



Image: Zen Garden at Ryoan-ji, Kyoto, Japan. The design integrates stones, gravel, and minimalistic plant life to encourage contemplation and embody spiritual values.

- **Example: Native American Sacred Landscapes**

Native American landscapes also express cultural identity by incorporating elements tied to sacred rituals and connection to the land. For example, the Hopi people of the American Southwest use specific plant species and natural formations in their gardens to reflect their cultural cosmology and reverence for the earth.



Image: A traditional Hopi landscape. Sacred natural formations and plant species are central to their cultural identity.

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2.2 Landscape as a Narrative Tool

Landscape architecture is a powerful storytelling medium. Through the design of public spaces, monuments, and memorials, landscape architects can narrate the stories of historical events, significant figures, and cultural movements. This storytelling function is crucial for the preservation of collective memory and for making history accessible to the public.

- **Example: The National Mall, Washington, D.C.**

The National Mall in Washington, D.C., serves as an open-air museum that tells the story of U.S. history. The design of the Mall, with its wide open spaces and monumental structures, showcases pivotal moments in American history. The Lincoln Memorial, the Washington Monument, and the World War II Memorial are all integrated into the landscape, each reflecting different aspects of U.S. history.



Image: National Mall, Washington, D.C. The landscape design integrates iconic monuments that reflect the country's history and national identity.

3. LANDSCAPE ARCHITECTURE AND HISTORICAL PRESERVATION

3.1 Protecting Historic Landscapes

Historical landscapes, whether in the form of battlefields, gardens, or estates, provide valuable insights into past events and cultural traditions. Landscape architects play a key role in ensuring that these spaces are preserved for future generations, balancing modern needs with historical significance.

- **Example: Monticello, Virginia**

The historic gardens at Monticello, Thomas Jefferson's plantation, exemplify the role of landscape architecture in historical preservation. Jefferson's design reflects Enlightenment ideals and the intellectual history of his time. Modern landscape architects have worked to restore the gardens to their original state, ensuring the preservation of both historical plant species and cultural significance.



Image: The gardens at Monticello, Virginia. Restored to reflect Jefferson's historical agricultural practices, they maintain cultural and ecological relevance.

- **Example: Gettysburg National Park**

The landscape at Gettysburg National Park preserves the memory of the Battle of Gettysburg during the American Civil War. As a battlefield-turned-memorial, the site allows visitors to engage with the history of the conflict and its impact on American society. The design integrates monuments, preserved battlefield landscapes, and interpretive spaces that convey the significance of the battle.



Image: Gettysburg National Park, Pennsylvania. The preserved battlefield serves as both a memorial and an educational landscape.

3.2 Memorial Landscapes and Public Commemoration

Memorials and monuments have long been part of landscape architecture's role in honouring historical events and figures. These designed spaces can evoke powerful emotional responses and serve as focal points for public remembrance and reflection.

- **Example: The Vietnam Veterans Memorial**

The Vietnam Veterans Memorial in Washington, D.C., designed by Maya Lin, is a poignant example of how landscape architecture can memorialize history. The reflective black granite wall, which features the names of fallen soldiers, is integrated into the landscape in a way that encourages personal interaction. Visitors are invited to touch the names, leaving a piece of themselves in the memorial. This dynamic design fosters both individual and collective remembrance.

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Image: The Vietnam Veterans Memorial in Washington, D.C. The reflective design invites visitors to interact with the memorial, personalizing the experience of remembrance.

- **Example: 9/11 Memorial, New York City**

The 9/11 Memorial in New York City reimagines the site of the former World Trade Center. The design, which includes two large reflecting pools, integrates elements of nature with the trauma of the attacks. The design emphasizes both loss and healing, incorporating historical references through the engraved names of the victims and the memorial's proximity to the original twin towers.



Image: 9/11 Memorial, New York City. The pools represent the footprints of the Twin Towers, creating a poignant space for reflection.

4. LANDSCAPE ARCHITECTURE FOR SOCIAL INCLUSION AND IDENTITY FORMATION

4.1 Multicultural Spaces in Urban Design

As cities become more diverse, landscape architects are tasked with creating spaces that reflect the multiplicity of cultural identities within urban environments. These spaces foster dialogue, celebrate diversity, and educate the public about different cultural histories.

- **Example: Multicultural Gardens in Toronto**

In Toronto, multicultural gardens in public parks celebrate the diverse ethnic communities in the city. Each garden reflects the heritage of specific groups, using native plants, sculptures, and signage to educate the public about different cultural traditions. These spaces help promote social inclusion by making cultural diversity visible and celebrated in public space.



Image: High Park, Toronto. This multicultural garden integrates plants and features that celebrate the city's diverse cultural heritage.

4.2 Revitalizing Indigenous Landscapes

There is a growing interest in revitalizing indigenous landscapes and incorporating indigenous knowledge into contemporary landscape design. This serves both as a cultural reclamation and an educational tool for the public.

- **Example: Māori Gardens in New Zealand**

In New Zealand, Māori gardens have been restored to reflect the traditional practices of the Māori people. These gardens not only serve as educational tools but also help to preserve cultural traditions that have been marginalized in urban settings. The restoration of these landscapes strengthens cultural identity and fosters greater public awareness of indigenous knowledge.



Image: Māori garden in Auckland Domain, New Zealand. The restoration of these gardens reinforces the cultural practices and values of the Māori people.

5. THE ROLE OF LANDSCAPE ARCHITECTURE IN PROMOTING SUSTAINABILITY AND HISTORIC CONTEXT

5.1 Environmental Sustainability as a Cultural Value

Modern landscape architecture increasingly integrates sustainability with cultural awareness. For example, the use of native plants not only promotes environmental sustainability but also honours local traditions and histories related to land stewardship.

- **Example: The High Line, New York City**

The High Line is an elevated park built on an abandoned railway track in Manhattan. The design integrates native plant species and ecological design principles, creating a green space that also commemorates the city's industrial past. By preserving the historical structure of the railway while

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transforming it into a public space, the High Line both enhances ecological sustainability and promotes historical awareness.



Image: The High Line, New York City. This reclaimed industrial site integrates green design with historical preservation.

6. CONCLUSION

Landscape architecture plays a crucial role in promoting cultural and historical awareness by transforming public spaces into vehicles for storytelling, memory, and cultural expression. Through sensitive design, landscape architects can create places that educate the public about history, foster cultural pride, and promote social inclusion. Whether through memorials, gardens, or urban parks, the designed landscape is an important tool in shaping how we understand and engage with the past. By integrating cultural and historical narratives into the landscape, landscape architecture helps to ensure that our built environment remains a vibrant and meaningful reflection of our collective history.

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RESEARCH ON THE INTEGRATION OF IDEOLOGICAL AND POLITICAL EDUCATION INTO BUSINESS ENGLISH TRANSLATION TEACHING

Li Huimin
School of Foreign Studies, Zhaoqing University, Zhaoqing, Guangdong, China

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ABSTRACT

The development of "Curriculum-based Ideological and Political Education" (CIPE) is in full swing. As part of an all-round educational approach, the integration of ideological and political education into the Business English Translation course is both necessary and significant. How to effectively embed ideological elements into business English translation teaching has become a pressing question for educators in this field. Based on CIPE theories and translation teaching theories, and considering the specific characteristics of the Business English Translation course, this paper explores the integration pathways from four perspectives: syllabus design, teaching content, teaching methodology, and evaluation mechanisms.

KEYWORDS: *Curriculum-Based Ideological and Political Education (Cipe), Business English Translation Teaching, Integration Pathways*

1. INTRODUCTION

President Xi Jinping emphasized the importance of "upholding moral education as the central link, integrating ideological and political work throughout the entire education and teaching process to achieve comprehensive and holistic education". In recent years, the term "Curriculum-based Ideological and Political Education" (CIPE) has become a focal point in educational research. Huang Guowen (2019) identified six key elements in the construction of CIPE in foreign language courses: why, what, who, when, where, and how. The teaching content of *Business English Translation* (written translation) courses involves translating various types of business materials. Given the diverse cultural backgrounds of international business participants, embedding ideological and political education into this context is particularly significant. Using Zhaoqing University as a case study, this paper aims to explore pathways for integrating CIPE into *Business English Translation* teaching for non-English majors, addressing Professor Huang's "how to do it" question. This exploration seeks to fully incorporate ideological and political education into translation teaching to achieve comprehensive and holistic education.

2. THEORETICAL BASIS AND PRACTICAL SIGNIFICANCE OF INTEGRATING CIPE INTO THE *BUSINESS ENGLISH TRANSLATION* COURSE

Integrating ideological and political education into professional courses is essential in fostering students' cultural identity and moral values, especially in the context of globalization. The Business English Translation course provides an ideal platform for combining linguistic training with value-based education, equipping students with the skills and confidence to represent China's core values in international contexts. This integration promotes holistic development, preparing students to navigate cross-cultural exchanges while reinforcing their sense of cultural confidence and national identity.

2.1 Theoretical Basis of CIPE

Curriculum-based Ideological and Political Education (CIPE) has emerged as a hot topic in higher education research in recent years. The core idea of CIPE lies in integrating value guidance into professional courses to unify the transmission of professional knowledge with value education (Xu, 2020). This theory aims to break away from the traditional limitations of ideological and political education as confined to specialized courses and extends moral education goals across all academic disciplines, achieving "all-staff, all-process, and all-round education" (Zhou & Li, 2021). President Xi Jinping has repeatedly underscored the importance of "upholding moral education", asserting that the essence of education lies in cultivating individuals with both integrity and talent. This necessitates embedding ideological and political education throughout the teaching process, enabling students to develop correct views on life, the world, and values (Xu, 2020). Consequently, CIPE has evolved from theoretical exploration to a fundamental strategy in educational practice.

The practice of integrating ideological and political education into foreign language courses has gained particular attention. Learning a foreign language involves not only mastering linguistic skills but also engaging with communication and understanding across cultural contexts. Students are inevitably exposed to foreign cultures and values, which may influence their perceptions of

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their own culture and values (Chen & Zhang, 2019). Therefore, CIPE in foreign language courses is crucial for helping students establish correct values and enhancing their confidence in their own culture. Through comparative analysis of different cultural values, students gradually develop cultural awareness and identity, ultimately achieving cultural confidence. Zhang and Wang (2022) noted that effective CIPE implementation in foreign language courses can help students discern different value systems during cultural exchanges, thereby strengthening their cultural identity and national consciousness.

To effectively implement CIPE, adjustments in syllabus design, content selection, and teaching methods are essential. A well-structured syllabus should clearly define the objectives of ideological and political education, integrating value guidance with professional knowledge transfer and ensuring that every teaching activity carries an educational function (Zhao, 2020). In designing teaching content, instructors should carefully select and organize materials with ideological and political significance to subtly instill correct values during professional learning. For instance, in the *Business English Translation* course, selecting culturally characteristic and value-oriented business texts can encourage students to reflect on and analyze differences between Chinese and foreign cultures, understanding the importance of socialist core values in cross-cultural communication.

Moreover, the success of CIPE relies on instructors' guidance and flexible use of teaching resources. Zhao (2020) pointed out that instructors implementing CIPE must delve deeply into course content while adopting flexible teaching strategies to meet diverse student needs. The *Business English Translation* course, as a fusion of language and cultural communication, can help students cultivate their ability to analyze values and enhance their international perspective by incorporating ideological elements. For example, instructors can guide students in translating business texts with distinctive Chinese characteristics to foster cultural confidence and improve their ability to disseminate Chinese culture in cross-cultural contexts.

In CIPE practice, students' thinking patterns and value systems are gradually influenced, fostering correct value orientation and a sense of responsibility. This implicit educational approach is a unique feature of CIPE. Through in-depth exploration of course content and innovative teaching design, students can naturally absorb value education during professional learning. This not only facilitates their comprehensive development but also fulfills the fundamental educational goal of "upholding moral education".

2.2 Translation Pedagogy Theory

The theoretical foundations of translation pedagogy encompass translation processes, cultural differences, value transformation, and more recently, cross-cultural communication and social responsibility (Venuti, 2017). Traditional translation teaching has primarily focused on imparting linguistic knowledge and training in translation techniques, emphasizing accuracy and practicality. Munday (2016) observed that translation education has long prioritized developing students' linguistic precision and effective communication skills, often at the expense of fostering a deep understanding of culture and ideology. However, with the rapid acceleration of globalization, translation pedagogy has evolved to include an emphasis on cross-cultural awareness, moral responsibility, and social accountability (Baker & Saldanha, 2019). Today, translation education aims to cultivate translators with cross-cultural competence and a sense of social responsibility to address complex cultural differences and value conflicts in their professional work.

Wang (2018) highlighted that translation education should not only focus on students' language skills but also address their adaptability and cultural awareness in cross-cultural contexts. In *Business English Translation* courses, translation tasks often involve business contracts, advertisements, promotional materials, and other texts, which carry multiple layers of cultural, value-oriented, and ideological information. Translators must convey not only the literal meaning but also the implicit cultural values and emotional resonance. Such training is crucial for instilling social responsibility and professional ethics. Wang emphasized that translation education should help students build cultural identity awareness and recognize their societal role in cross-cultural exchanges, facilitating effective communication and value guidance in disseminating Chinese culture internationally.

Against this backdrop, translation pedagogy should incorporate discussions on culture and ideology to guide students in forming correct value orientations. Hu and Li (2021) argued that the curriculum design for *Business English Translation* should emphasize differences in cultural values between China and foreign countries, encouraging students to analyze and reinterpret these values during translation. Their research indicated that integrating cultural background discussions and value analyses into translation education can help students better navigate conflicts between different cultural systems. For instance, when translating business texts containing Chinese cultural elements such as "integrity" or "win-win cooperation", students should consider how to effectively convey these values to ensure accurate interpretation in the target language culture.

Furthermore, integrating CIPE into *Business English Translation* courses can deepen students' understanding of translation ethics and professional responsibility. Liu and Zhao (2021) noted that embedding ideological and political education into translation courses enhances students' linguistic capabilities while fostering proper societal values and professional ethics. Translation is not merely a technical endeavor but also involves value selection and cultural positioning. Through CIPE, students come to understand their role in promoting cross-cultural communication and advancing core socialist values through their translation work.

Incorporating ideological elements into *Business English Translation* courses helps students view translation tasks from a value-based perspective. Beyond linguistic accuracy, they are encouraged to consider how their translations can convey China's

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core values. Specifically, instructors can engage students in discussions on the impact of different translation choices on value transmission or guide them in analyzing the societal reception of translated works in the target culture. This approach raises students' awareness of translation as a socially responsible profession. These CIPE activities enable students to better appreciate the significance of translation work, gradually fostering them into translators with cross-cultural vision and social responsibility. This model not only enhances students' translation skills but also equips them to promote Chinese culture in international exchanges, strengthening national confidence and profoundly influencing their career development.

2.3 The Practical Significance of Combining CIPE with Translation Courses

Translation involves converting between two or more languages while also navigating the cultural, cognitive, ideological, and value-based elements underlying those languages. Business translation, as a form of non-literary translation, spans various international business domains such as advertising, trade, investment promotion, technology transfer, international contracts, finance, overseas investments, insurance, and transportation. The *Business English Translation* course covers topics such as translation principles, basic translation techniques, and the translation of various business texts between English and Chinese. Given the diverse linguistic and cultural backgrounds of international business professionals and China's increasing openness to the world, embedding CIPE in business translation courses is both necessary and beneficial.

In the context of increasingly frequent international interactions, students will likely engage with individuals from different countries and regions in their future careers. A qualified translator should possess the following attributes: a high proficiency in Chinese and a foreign language, mastery of at least one professional domain, a thorough understanding of translation techniques and theories, advanced computer skills (e.g., typing, editing, searching, filtering), a broad base of general knowledge, and a diligent, responsible, efficient, and cooperative work ethic. Extensive translation practice and a correct political stance are also essential. CIPE seeks to integrate value guidance, skill development, and knowledge acquisition in teaching, emphasizing cultural confidence, humanistic spirit, patriotism, and social responsibility to guide students emotionally, cognitively, and behaviorally (Zhao, 2020). These goals align with the attributes of a qualified translator, aiming to unify students' moral principles and professional skills.

Traditional translation education has focused primarily on the transmission of knowledge and skills, with limited emphasis on moral education or deliberate ideological integration. Unlike conventional "ideological and political education courses", CIPE requires instructors across all disciplines to actively extract ideological elements from their courses to fulfill their educational role. This reflects President Xi Jinping's call for all types of courses to "walk in the same direction as ideological and political theory courses, creating a synergistic effect".

3. PATHWAYS FOR INTEGRATING CIPE INTO THE BUSINESS ENGLISH TRANSLATION COURSE

Based on the characteristics of the *Business English Translation* course, this section explores the integration of Curriculum-based Ideological and Political Education (CIPE) through four key aspects: syllabus design, teaching content, teaching methodology, and evaluation mechanisms.

3.1 CIPE Integration in Syllabus Design

The syllabus serves as the foundational guideline for teaching plans, outlining the course's role and objectives within the broader curriculum. It specifies the course structure, scope, content, and requirements, guiding instructors in teaching and assessment and providing students with standards to measure academic performance and outcomes. As the backbone of educational plans and ideologies, the syllabus plays a critical role in ensuring alignment with educational goals (Zhao, 2020).

Under the new requirements of CIPE, the syllabus for the *Business English Translation* course must reflect CIPE's educational characteristics and act as a comprehensive guideline implemented across all aspects of the teaching process. During the recent revision of our university's course syllabus, CIPE was incorporated into every aspect of the *Business English Translation* syllabus.

In terms of course objectives, in addition to traditional knowledge and skills goals, ideological and political objectives were introduced. The course aims to cultivate international awareness among non-English major students, enhance their humanistic qualities, strengthen value guidance, and foster the practice of core socialist values. It also seeks to enhance students' ability to tell China's stories effectively and promote traditional Chinese culture, thereby building cultural confidence. The course emphasizes practical skills, enabling students to improve their autonomous learning abilities and develop teamwork in translation tasks. It also trains students to identify and appropriately handle politically sensitive terminology in translation, fostering patriotism and a correct political stance.

Regarding the alignment of course objectives with required benchmarks, the syllabus corresponds to the latest guidelines in college English instruction. These include understanding differences in worldviews, values, and cognitive approaches between China and other countries and developing cross-cultural awareness. By identifying and appropriately handling politically sensitive terminology in translation, students are encouraged to cultivate career aspirations, aiming to become capable youths with ideals, moral integrity, solid knowledge, and a caring nature.

For the relationship between course content and objectives, the syllabus specifies each chapter's teaching objectives and the corresponding CIPE elements. Assessment methods are aligned

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with course objectives and graduation requirements. The overall grade distribution combines formative and summative assessments, ensuring alignment with course objectives. Formative assessment, including attendance, group presentations, online assignments, and extracurricular projects, helps gauge students' understanding of the course content, solidify their translation knowledge, enhance skills and awareness, promote Chinese culture internationally, and foster national confidence and pride. Summative assessment, comprising objective and subjective questions, evaluates students' mastery of business translation knowledge and their ability to apply it, particularly in conveying Chinese narratives and core socialist values to global audiences.

In terms of course resources, the selection of primary and supplementary materials also adheres to CIPE principles. Only resources with a secure ideological orientation are chosen, ensuring alignment with the course's ideological and political goals.

3.2 CIPE Integration in Teaching Content

The teaching content refines and elaborates upon the tasks outlined in the syllabus, ensuring a steady progression of teaching objectives while aligning knowledge, skills, and ideological goals. This micro-level detailing ensures that the course meets both educational and ideological objectives. Teaching content encompasses textbook selection, preparatory materials, and other resources, all designed with CIPE principles as the guiding framework, and delivered primarily through teaching aids and multimedia resources.

Textbook Selection. In our School of Foreign Languages, course leaders have repeatedly convened to discuss textbook selection, ensuring that chosen materials align with the institution's overall developmental goals, meet student needs, and reflect the course's purpose. Key selection criteria include political correctness, intellectual depth, timeliness, engaging content, diversity, practical application, and appropriate levels of difficulty. For example, our current main textbook, *Business English Translation*, authored by domestic scholars Yuan Chunming and Jiang Li from Tianjin University of Commerce and published by Foreign Language Teaching and Research Press, fulfills these criteria, ensuring ideological appropriateness.

Preparation of Supplementary Materials. Preparatory materials are designed based on the textbook's structure, aligning each unit with corresponding knowledge and ideological teaching objectives. The selected textbook includes comprehensive content divided into two modules: foundational theories and practical applications. The theoretical module covers topics such as translation overviews, translation techniques, and translation characteristics, with subsections on translation standards, processes, cross-cultural communication, business terminology, numbers, and abbreviations in translation. The practical module contains nine chapters on translating corporate regulations, advertisements, business correspondence, company profiles, product manuals, legal documents, contracts, business reports, and other materials like e-commerce, meeting minutes, memos, phone messages, notifications, and negotiations.

However, relying solely on the textbook is insufficient for engaging students or achieving educational objectives. Therefore, supplementary materials are drawn from diverse sources. Each lesson's theme guides the preparation process, with resources gathered through online research, site visits, field trips, and consultations with auxiliary textbooks. These materials are curated to include CIPE elements, meet student needs, and balance intellectual and entertainment value. Multimedia presentations combining text, images, audio, video, animations, and performances are employed to enrich classroom engagement.

Case Study: Integrating Local and Cultural Content. For example, during a lecture on commercial advertisement translation, I introduced the slogan of Guangdong's herbal tea brand Wanglaoji, "怕上火，喝王老吉" ("Afraid of heat? Drink Wanglaoji"), supplemented with visuals and the brand's story. As most students are local to Guangdong, their familiarity with Wanglaoji added a sense of connection, and learning about the brand's global success fostered pride. Additionally, I incorporated personal experiences, such as translating materials for the Zhaoqing Talent Festival. For instance, the slogan "凤栖梧桐、才聚肇庆" ("Phoenixes settle in the sycamores; talents gather in Zhaoqing") was used to teach students about local economic and cultural contexts, preparing them to serve their region effectively. By combining structured textbooks with diverse supplementary materials, CIPE principles are seamlessly integrated into the teaching content, enhancing both student engagement and ideological education.

3.3 CIPE Integration in Teaching Methodology

The blended teaching model, which is "student-centered", combines modern online information technologies with the advantages of traditional face-to-face classroom teaching. This approach has become a prominent trend in higher education (Zhao, 2020). Introducing a blended teaching model into *Business English Translation* expands the channels and methods for integrating ideological and political education (CIPE). The COVID-19 pandemic accelerated the adoption of online teaching platforms under the Ministry of Education's policy of "no suspension of teaching or learning". Platforms such as Superstar Learning, Rain Classroom, QQ group classes, Tencent Classroom, Tencent Meeting, Wisdom Tree, DingTalk, and WeChat groups, along with MOOCs and micro-courses, became mainstream tools. Even in post-pandemic settings, these platforms continue to complement offline teaching effectively. In traditional face-to-face settings, large public English classes, often exceeding 100 students, pose challenges for inclusive interaction. Teachers struggle to engage every student, particularly introverted or reserved individuals. Moreover, with only 40 minutes per session, there is insufficient time to allow each student to participate. Blended teaching addresses these limitations by fostering learning communities and accelerating individual knowledge construction, thus promoting growth and

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progress for all students. Online platforms with features like messaging, commenting, and feedback create a novel and equitable space for dialogue. This environment ensures that diverse voices are heard and provides opportunities for all students to showcase their work—whether asking questions, answering queries, expressing opinions, or evaluating peers' viewpoints. Such interactions compensate for the shortcomings of traditional classroom teaching. This model ("Pre-class–In-class–Post-class" Blended Model) entails students logging into designated platforms before class to preview upcoming content, ask questions, and receive feedback from peers or teachers. This structure facilitates flipped classrooms. During in-class sessions, students learn face-to-face with teachers and peers while continuing to use online tools for interactive and collaborative learning. After class, students use the platform for group or individual assignments. This approach supports differentiated instruction, prioritizes student-centric learning, and enables learners to discover their preferred study methods. By participating through multiple channels, students become more confident, proactive, and creative, fostering teamwork and achieving CIPE objectives.

For example, after class, I frequently share resources such as live translation webinars, lectures, articles, and news in the class's WeChat group. I also organize periodic "one-sentence translation" activities with phrases such as "产业强市，项目为王，园区为母，企业第一" ("Strengthen industry, prioritize projects, cultivate parks, value enterprises"), the motto of Zhaoqing No. 1 High School "清心直道，修干成栋" ("Cultivate purity and integrity, grow into pillars of society"), Xiaomi's advertisement "小米，为发烧而生" ("Xiaomi: Born for enthusiasts"), or China Southern Power Grid's slogan "万家灯火，南网情深" ("Every home aglow, Southern Grid deeply connected"). These short, concise, and moderately challenging exercises remain relevant to current events, emphasize school-community collaboration, blend practicality and creativity, and relate to students' daily lives. Students are encouraged to participate regardless of translation quality, with every student equally able to share their translation in the WeChat group. This approach significantly boosts enthusiasm for translation practice outside class, extending CIPE's influence beyond the classroom and making translation education both meaningful and engaging.

3.4 CIPE Integration in Teaching Evaluation

Scriven (1991) noted that formative evaluation involves diagnosing issues in educational plans, activities, or processes to provide feedback and improve the quality of ongoing educational activities. Formative evaluation emphasizes the process, whereas summative evaluation focuses on the results, judging the educational outcomes after the activities are completed. Relying solely on summative evaluation, such as final exams, fails to capture the dynamic changes in students' learning processes. A combined approach incorporating both formative and summative evaluations offers a more comprehensive understanding of students' progress and learning outcomes.

Under the guidance of CIPE, the formative evaluation framework implemented in the *Business English Translation* course includes activities such as student group PPT presentations, one-sentence translation exercises in class, translation interactions in WeChat groups, group translation field practice, assignments on the IWrite online platform, and participation in translation competitions. These diverse evaluation methods leverage the complementarity of multiple intelligences, aim to involve all students, and identify individual strengths and weaknesses. This approach ensures personalized instruction, provides opportunities for students to transform classroom knowledge into practical skills, and assesses both the instructor's and students' progress at various stages. Feedback from this process fosters continuous improvement in teaching and learning. Taking the weekly group PPT presentations as an example, each week, students prepare a group PPT report. At the beginning of the semester, the instructor provides guidance and organizes the class into groups. One student from each class is elected, volunteers, or is assigned as the class representative, who creates a WeChat group for communication. Students then form groups based on proximity within their college or dormitories, select a group leader, and coordinate with the class representative. Presentation schedules are determined by random drawing. Once groups are finalized, leaders coordinate tasks based on members' strengths and preferences, assigning roles such as gathering and organizing materials, designing the PPT, and delivering the presentation. During the first class, students are introduced to the relevance of these activities to their future careers. Emphasis is placed on practical skills such as teamwork, professional relationships, information gathering, creating effective presentations, and delivering impactful pitches—skills essential for professional success. While students independently manage the preparation process, the instructor assumes the role of guide, organizer, and facilitator.

After each presentation, an interactive scoring system ensures active participation. Group leaders evaluate their members, class representatives evaluate group leaders, and instructors evaluate class representatives. This peer-evaluation system empowers students to take ownership of their learning and assessment, increasing motivation and engagement. Report topics, often integrating CIPE themes, include profiles of interpreters from China's Ministry of Foreign Affairs, translation stories related to *The Communist Manifesto*, an introduction to Xu Yuanchong (winner of the Aurora Borealis Prize), analysis of Nobel laureate Mo Yan's translated works, bilingual appreciation of Chinese classical poetry, translation of idioms and proverbs, dual-language presentations on the 24 Solar Terms, vocabulary related to the Belt and Road Initiative, bilingual materials on the Beijing Winter Olympics, and translations of Zhaoqing's local culture and the Greater Bay Area's development. Through the semester-long sharing of diverse report themes, this evaluation method achieves "subtle, pervasive" ideological and political education. It effectively fosters students' professional competence, cultural awareness, and moral responsibility, ensuring holistic development and alignment with CIPE objectives.

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4. CONCLUSION

In light of the national emphasis on the educational goal of "fostering virtue through education", integrating Curriculum-based Ideological and Political Education (CIPE) into *Business English Translation* teaching is both essential and urgent. This integration not only enhances students' professional skills but also helps them establish correct values and moral responsibilities, shaping them into well-rounded individuals with international perspectives and cultural confidence. By systematically embedding CIPE into the *Business English Translation* course through syllabus design, enriched content, innovative methodologies, and optimized evaluation systems, educators can achieve the objective of "all-staff, all-process, and all-round education".

First, the syllabus, as the blueprint of course teaching, serves as the overarching framework for CIPE. By explicitly incorporating CIPE objectives, the *Business English Translation* course not only emphasizes language and translation skills but also prioritizes the development of humanistic qualities and the promotion of core socialist values. A clear ideological focus in the syllabus ensures that students receive training in professional competencies while gradually enhancing their cross-cultural communication abilities and their awareness of telling China's stories effectively.

Second, the selection and design of teaching content play a pivotal role in CIPE integration. By using culturally rich and value-oriented textbooks and resources, students can focus on cultural differences between China and other nations during translation practices and understand the importance of core socialist values. Teachers should not only choose appropriate textbooks but also incorporate real-world examples, such as translations of business texts with Chinese characteristics, to guide students in recognizing and developing confidence in Chinese culture.

Third, innovative teaching methodologies, such as blended learning and experiential learning, offer broader and more effective channels for embedding CIPE. Blended learning effectively combines online and offline education, breaking the spatial limitations of traditional classrooms and providing students with ample opportunities for self-expression and interaction. Experiential learning, on the other hand, immerses students in real business translation tasks, allowing them to experience value-based guidance and the significance of professional ethics. These diverse and flexible teaching approaches not only stimulate students' interest in learning but also subtly instill CIPE principles.

Finally, a scientific teaching evaluation system links CIPE with student learning outcomes. Beyond exam scores, evaluation incorporates participation, translation practice, and post-class reflections, combining formative and summative assessments. Through diverse evaluation methods, both teachers and students engage in interactive feedback from multiple perspectives, helping students refine their skills and motivating them to become competent translators with a strong sense of responsibility.

The pathways for integrating CIPE into the *Business English Translation* course are structured around the syllabus as the guiding framework, the content as the detail-oriented foundation, the teaching methodologies as the means, and the evaluation as the feedback mechanism. This comprehensive approach fully embeds CIPE principles into the teaching process. Such a systematic educational model not only cultivates students with strong translation skills but also prepares them to address cross-cultural exchanges and international business challenges with proper values and a high sense of social responsibility. Against the backdrop of globalization, CIPE integration in *Business English Translation* ultimately supports national development and revitalization by nurturing well-rounded talent, enabling Chinese culture to reach a broader global audience.

Funding Projects

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THE IMPACT OF E-LEARNING COMMUNICATION STRATEGY AND LEARNER GOALS ACHIEVEMENT IN THE KENYAN UNIVERSITIES

Eunice Gacheri Thiankolu,[1] Wilson Muema Nthenge[2]
[1]*School of Business, Kenya Methodist University*
[2]*School of Business, Kenya Methodist University*

ABSTRACT
Universities have come up with various e-strategies to deal with great market forces emanating from the need to adapt to the new normal in the academic environment, dynamic technological advancement, increasingly diverse student bodies, their changing needs and expectations as well as heightened demand for new and different programs and services. Despite the many initiatives to support e-learning, most e-learning strategies are not fully realized for successful learner goals achievement due to inadequate technology strategy. The purpose of the paper was to establish the influence of e-learning communication strategy on learner goals achievement in Kenyan universities. The target population was 16 universities offering e-learning with a total of 29608 participants, comprising of 26761 e-learners and 2847 e-lecturers. The sample consisted of 351 e-lecturers and 394 e-learners because they both interact more with the e-learning system that uses currently implemented e-strategies. Stratified random sampling was used to identify sample size in each of the 16 universities. Primary data was collected using questionnaires with a Likert scale types of questions. Questionnaires were distributed through emails and received back through the same medium due to Covid-19 pandemic situation. Descriptive statistics was used. Binary logistic regression analysis was used to regress relationship between learner goals achievement with e-communication strategy and was accompanied by relevant explanations. Results revealed that e-learning communication strategy has a statistically significant relationship with learner goals achievement. An empirical model linking e-learning technology strategy and learner goals achievement was developed to help e-learning managers with insight on successful identification and implementation of e-learning technology strategy to achieve learner goals.

KEY WORDS: *E-Learning, E-Learning Communication Strategy, Learner Goals Achievement, Proposed E-Learning Communication Strategy Implementation Model*

BACKGROUND OF THE STUDY

The focus on the use of e-learning strategies has greatly increased as universities continue to operate in a very dynamic and competitive world. Higher education institutions must deal with greater market forces because of the increasingly diverse student bodies, their changing needs and expectations as well as heightened demand for new and different programs and services. Owing to this, universities have been hard pressed to come up with various strategies to keep up to the pace. Communication strategy in the study focused on strategic student-instructor communication and strategic marketing communication. For e-learning to be useful, tutors should use the online environment to offer feedback on online work, and to assist with students' queries or problems, career guidance, e-learning technology use guidance and course guidance hence ability to achieve their goals (Vries, 2005).

Marketing communication to the potential e-learners helps to create awareness of the courses available and how they would be of benefit to them hence the probability of increasing students' enrollment. The intangible nature of the higher education product has led to the need for universities to have targeted marketing and promotions for markets that are easily identified with actionable strategies to reach them. Direct mail, telemarketing, and on-campus visit programs have been the most often used marketing strategies by colleges in trying to attract new students (Herren, Cartmell, & Robertson, 2011).

Recently, university web site has become the centerpiece of all recruiting. Having an attractive web site that has been easy to navigate has been paramount for successful university recruiting. One study showed that 88% of college-bound prospective students eliminated a university from consideration if the institution's web site provided a negative browsing experience (Lindbeck & Fodrey, 2010). Institutions that invested in web technology to communicate with prospective students from the millennial generation experienced enrollment growth. Colleges that targeted key audiences with customized messages enjoyed recruiting success.

The millennial generation has not paid attention to information if it has not been customized specifically for each individual

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(Lindbeck & Fodrey, 2010). Prospective students rated individual college web sites as the primary source of information gathered about a university and pointed out that contact that these students made with a college was to submit an application for admission (Dupaul & Harris, 2012). Therefore, it is the role of universities to scan the environment to identify unique communication strategies that increase students' enrolment and learner goal achievement.

Vershitskaya, Mikhaylova, Gilmanshina, Dorozhkin, and Epaneshnikov, (2020) emphasizes that despite the potential of a learning management system to support e-learning, most e-learning strategies are not fully realized, they completely or partially fail. (Vershitskaya, 2020) cites communication marketing strategies as one of the most likely causes of failure.

PROBLEM STATEMENT

Vershitskaya, Mikhaylova, Gilmanshina, Dorozhkin, and Epaneshnikov (2020) emphasizes that despite the potential of a learning management system to support e-learning, most e-learning strategies are not fully realized, they completely or partially fail. E-Learning strategies if well implemented help in the achievement of learning outcomes such as enhancing students critical thinking, provide flexible learning, timely course completion, reduce costs, perceived learner satisfaction and increase efficiency of institutions. Without e-learning communication strategy, Kenyan universities may be faced with decreasing market share and unsuccessful learner goals achievement. Therefore, the paper focused on the impact of e-learning communication strategy on learner goals achievement.

An empirical model was proposed and developed linking e-learning communication strategy and learner goals achievement in the Kenyan universities that will help university e-learning managers to identify and develop a successful e-learning communication strategy implementation. Other levels of learning institution such as primary schools, secondary schools and tertiary colleges can tap into the findings and recommendations to successfully implement e-learning strategies in their institutions. The study also recommended areas of further future research which forms basis for researching more on the topic.

PAST STUDIES

Various scholars have previously done studies related to e-learning communication strategies and learner goals achievement. One study showed that 88% of college-bound prospective students eliminated a university from consideration if the institution's web site provided a negative browsing experience (Lindbeck & Fodrey, 2010). A study by Herren, Cartmell, & Robertson, (2011) indicated that direct mail, telemarketing, and on-campus visit programs have been the most often used marketing strategies by colleges in trying to attract new students. Vries, (2005) emphasized that for e-learning to be useful, tutors should use the online environment to offer feedback on online work, and to assist with students' queries or problems, career guidance, e-learning technology use guidance and course guidance hence ability to achieve their goals.

Grudzewski, Awdziej, Mazurek and Piotrowska, (2018) conducted a research to examine the possible impact of virtual reality on message perception and attitude towards particular offers. Furthermore, the authors wanted to find out whether there was a relationship between the use of virtual reality and the acceptance of new technologies in marketing communication. The results obtained reveal that VR technology positively and significantly impacts the reception of the offer, the technology involved and the presentation itself. Mtebe and Raphael(2018) did a similar study to identify key factors that have an influence on learners' satisfaction with the e-learning system at the University of Dar es Salaam, Tanzania. The study revealed that service quality is the strongest predictor of learners' satisfaction. Chang and Tung, (2008) acknowledges that information exchange among students and teachers about educational content and daily life learning activities are important for learning.

Hughes, (2007) points out that where students have been able to communicate with tutors online, they have found it useful. Higher education institutions must deal with greater market forces, because of the decline in public funding, together with other challenges such as rising expenses, increasingly diverse student bodies and their changing needs and expectations as well as heightened demand for new and different programs (Douglas, 2005). Furthermore, Eckel, (2005) asserts that in this quest most higher education institutions are seeking to apply new communication technologies in the delivery of education to reach new student markets and by doing so expand enrolment.

KNOWLEDGE GAP

In the quest to understand more about e-learning communication strategy in the universities, scholars have studied on various topics as evidenced in the reviewed articles. However, there is inadequate coverage of factors in various existing models for successful implementation of e-learning communication strategy in developing countries (Bourlova and Bullen, 2018). Therefore, there are still concerns regarding the way e-learning communication strategies have been identified and implemented as evident in universities, precisely in Kenya (Van der Klink &Jochems, 2004; Munguatosha et al., 2011). Furthermore, no scholar has done a study combining e-learning communication strategy and learner goals achievement in the Kenyan Universities. Therefore, the paper seeks to determine the influence of e-learning technology strategy on learner goals achievement in the Kenyan Universities.

THEORY CONCEPTUALIZATION

Dynamic capability theory and integrated marketing communications (IMC) theory**.**

Dynamic Capability Theory

Teece, Pisano and Shuen, (1997) developed the Dynamic Capabilities theory whose concept provides helpful additional

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insights in answering the question regarding the sources of a competitive advantage. The theory was developed from the concept of resource-based view (RBV), which emphasized that competitive advantage is determined by the possession of bundle of resources with valuable, rare, inimitable, and non-substitutable (VRIN) characteristics, but under dynamic and competitive environment, looking at the relationship of resources and performance alone to achieve sustainable competitive advantage proved to be insufficient. This is because when the environment is not stable, the resources are not strongly favoring the competitive advantage of the firms (Wu, 2006).

Resource base is referred to the firm's resources or assets that consists of technological assets, complementary assets, financial assets, reputational assets, structural assets, institutional assets, and market assets (Teece, Pisano, & Shuen, 1997) which are divided into tangible and intangible assets (Hitt, Ireland, & Hoskisson, 2005) and controlled by firms (Grobler, 2007; Helfat & Peteraf, 2003). There are various tangible and intangible assets such as specialized know-how, management capability, alliance experience and financial capital (tangible asset) as suggested by Wu, (2010). According to (Helfat, et al., 2007), processes are also treated as resources.

Integrated Marketing Communications (IMC) Theory

Integrated Marketing Communications (IMC) was an idea that was conceived in 1989 in the United States of America at the American Association of Advertising Agencies (AAAA) when Keith Reinhart was the chairman. It focused on advertising efforts across several different promotional methods. According to Kliatchko, (2005) IMC is a marketing communication planning concept that recognizes the added value of a comprehensive plan that evaluates the strategic roles of a variety of communication disciplines for instance, general advertising, direct response, sales promotion, and Public Relations and combines them to provide clarity, consistency and maximum communication impact through the seamless integration of discrete messages. IMC attempts to combine, integrate, and synergize elements of the communications mix, as the strengths of one are used to offset the weaknesses of others. Therefore, communicators with an IMC approach consider all forms of communication, all message delivery channels, customers and prospects, and all brand contact points while they plan and implement marketing and marketing communication strategies.

METHODS

The research study adopted a positivist research philosophy as recommended by Creswell (2009). Positivist epistemology assumes that only facts derived from the scientific method can make legitimate knowledge claims. This study used descriptive survey research design. Kothari (2010) describe a descriptive survey design as a design that seeks to portray accurately the characteristics of a particular individual, situation or a group hence the best for the study. The target population was the 16 universities offering e-learning and licensed to operate in Kenya according to the CUE 2018 data in Kenya, with a total of 29608 participants, comprising of 26761 e-learners and 2847 e-lecturers. Respondents were e-lecturers and e-learners because they both interact more with the e-learning technology system hence best suited to give feedback on its success. Sample from the total participants (29608) consisting of 351 e-lecturers and 394 e-learners was determined by Slovin's formula. Stratified random sampling also known as proportional sampling was used to identify sample size in each of the 16 universities. In statistics, stratified sampling is a method of sampling from a population which can be partitioned into subpopulations. When subpopulations within an overall population vary, it is advantageous to sample each subpopulation (stratum) independently hence suitable for this study as each university out of the 16 universities vary from each other.

Primary data was collected using questionnaires that have both structured and unstructured questions. Questionnaire contained a likert scale types of questions where the respondents were required to indicate their level of agreement with statements towards a concept being measured. Due to COVID-19 pandemic, Questionnaires were delivered to the respondents through emails and received back through the same medium. Data reliability was measured using Cronbach's alpha coefficient which ranges between 0 and 1 (Kipkebut, 2010). The results indicated that e-learning communication had an Alpha coefficient of 0.750 thus acceptable. Binary logistic regression model was used. The model is specified as follows:

$$L_i = \ell n(\frac{P}{1-P}) = \boldsymbol{\beta}_0 + \boldsymbol{\beta}_1 X_1 + \boldsymbol{\beta}_2 X_2 + \boldsymbol{\beta}_3 X_3 + \boldsymbol{\beta}_4 X_4 + \boldsymbol{\mu}$$

RESULTS AND DISCUSIONS

745 questionnaires were issued to the respondents out of which only 619 were returned accounting for 82.1% return rate. This return rate was adequate as supported by Wimmer and Dominick (2012) who emphasizes that a response rate of 21% – 70% is acceptable for self-administered questionnaires and guarantees accuracy and minimizes bias. Cronbach's Alpha was used to ensure the reliability of instruments and the constructs. The results indicated that e-learning communication had an Alpha coefficient of 0.750. According to Kothari (2010), a scale of 0.70 or above is acceptable thus confirming the study as reliable.

Frequency analysis of e-learning communication Strategy's Constructs

e-learning Communication strategy in the study focused on strategic student-instructor communication and strategic marketing communication. For e-learning to be useful, tutors should use the online environment to offer feedback on online work, and to assist with students' queries or problems, career guidance, e-learning technology use guidance and course guidance hence ability to achieve learner goals. Marketing communication to the potential e-learners helps to create awareness of the courses available and how they would be of benefit to them hence the probability of increasing students'

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enrollment. The intangible nature of the higher education product has led to the need for universities to have targeted marketing and promotions for markets that are easily identified with actionable strategies to reach them. Direct mail, telemarketing, websites and on-campus visit programs have been the most often used marketing strategies by colleges in trying to attract new students (Herren, Cartmell, & Robertson, 2011).

Table 1: Summary of frequency analysis of e-learning communication Strategy's Constructs

E-learning Communication Strategy	Disagree	Neutral	Agree	Total
The university has put in place a marketing strategy by investing in e-learning TV, social media and brochures Recoded	293(47.3%)	127(20.5%)	199(32.1%)	619(100%)
There is a software for interactive online communication between e-instructor and e-learner Recoded	224(36.2%)	148(23.9%)	247(39.9%)	619(100%)
university organizes educational events by preparing a series of lectures and seminars Recoded	270(43.6%)	148(23.9)	201(32.5%)	619(100%)
There is a university's website where all the events and e-courses are advertised Recoded	217(35.1%)	150(24.2%)	252(40.7%)	619(100%)
The university has created a strategic relationship with the public through materials for prospective students Recoded	274(44.3%)	139(22.5%)	206(33.3%)	619(100%)

Source: Research Data, (2021)

e-learning Communication strategy in the study focused on strategic student-instructor communication and strategic marketing communication. The results showed that 47.3% disagreed that the university has put in place a marketing strategy by investing in e-learning TV, social media and colourful brochures promotions, road shows, university open days. On the other hand 32.1% agreed that the university has put in place a marketing strategy by investing in e-learning TV, social media and colourful brochures promotions, road shows, university open days. Likewise, Results indicated that 36.2% of the respondents disagreed that there is a software for interactive online communication between e-instructor and e-learner on career advice, e-learning technology usage and feedback. Majority, 39.9% were in agreement that there is a software for interactive online communication between e-instructor and e-learner on career advice, e-learning technology usage and feedback.

On investigating another construct, results showed that 43.6% disagreed that the University organizes educational events by preparing a series of lectures and seminars intended for prospective students while 32.4% were in agreement that the University organizes educational events by preparing a series of lectures and seminars intended for prospective students. On finding out if universities are using websites for advertising their services, results were evident that 35.1% disagreed that there is a university's website where all the events and e-courses are advertised. Majority (40.7%) of the respondents agreed that there is a university's website where all the events and e-courses are advertised.

Similarly, investigation results on whether the universities have created a strategic relationship with the public majority (44.3%) did not agree with the statement that the University has created a strategic relationship with the public through materials for prospective students, conference attended by public and experts appearing on the media. 33.3% were in agreement that the University has created a strategic relationship with the public through materials for prospective students, conference attended by public and experts appearing on the media.

Hypothesis Testing

$H_0$1 There is no significant relationship between e-learning communication strategy and learner goals achievement in the Kenyan universities.

Relationship Between e-learning Technology Strategy and Learner Goals Achievement

To find out the relationship between e-learning communication strategy and learner goals achievement, chi-square test analysis was done. P-value less or equal to 0.05 indicates a significant relationship between categorical variables while P-value greater than 0.05 shows no significant relationship between categorical variables.

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Chi-Square Tests between e-learning communication strategy and learner goals achievement

	Value	Df	Asymptotic Significance (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	105.047[a]	1	.000	.000	.000
Likelihood Ratio	94.672	1	.000	.000	.000
N of Valid Cases	619				

Source: Research data (2021)

Chi-square test analysis from the table ,points out that p-values are less than 0.05 thus evidence that e-learning communication strategy and learner goals achievement have a strong significant relationship ($p<0.05$). The two categorical variables are statistically significant. Therefore, the null hypothesis that stated "***There is no significant relationship between e-learning communication strategy and learner goals achievement in the Kenyan universities."*** Was rejected and the alternative hypothesis upheld. If quality e- learning communication strategy is available and practiced in the Kenyan Universities then learner goals are likely to be achieved.

Table 4.17 elearning communication strategy and learner goals achievement Crosstabulation

			learner goals achievement		
			Learner goals not well achieved	Learner goals well achieved	Total
elearning communication strategy	Inadequate eLearning communication strategy used	Count	411	38	449
		% within elearning communication strategy	91.5%	8.5%	100.0%
	There is adequate elearning communication strategy	Count	95	75	170
		% within elearning communication strategy	55.9%	44.1%	100.0%
Total		Count	506	113	619
		% within elearning communication strategy	81.7%	18.3%	100.0%

Source: Research data (2021)

Chi-square test analysis from table 4.16,points out that p-values are less than 0.05 thus evidence that e-learning communication strategy and learner goals achievement have a strong significant relationship ($p<0.05$). The two categorical variables are statistically significant. If quality e- learning communication strategy is available and practiced in the Kenyan Universities then learner goals are likely to be achieved.

Crosstabulations analysis results from the table shows that respondents who felt there is inadequate e-learning communication strategy use in the Kenyan Universities and learner goals were not well achieved were an overwhelming 91.5%.Those who felt there was inadequate e-learning communication strategy support and learner goals were well achieved were 8.5% thus in agreement with chi-square test analysis.

The chi-square analysis was reinforced by Lindbeck and Fodrey, (2010) noted that 88% of college-bound prospective students eliminated a university from consideration if the institution's web site provided a negative browsing experience. Institutions that invested in web technology to communicate with prospective students from the millennial generation experienced primary source of information gathered about a university and pointed out that contact that these students made with a college was to submit an application for admission (Dupaul & Harris, 2012). Consequently, it is evident that there is need for Kenyan universities to do a SWOT analysis to identify the best communication strategies such as a good communication web technology for the achievement of learner goals.

CONCLUSION

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The findings indicated that e-learning communication strategy is significantly associated with learner goals achievement. From crosstabulations analysis results show that respondents who felt there is inadequate e-learning communication strategy use in the Kenyan Universities and learner goals were not well achieved were an overwhelming 91.5%.Those who felt there was inadequate e-learning communication strategy support and learner goals were well achieved were 8.5% thus in agreement with chi-square test analysis. Therefore, e-learning managers should endeavor to do a SWORT analysis to identify and implement e-learning communication strategies that will help the students to achieve their goals.

Contribution

Guided by the study findings and theoretical review, a possible empirical strategy implementation model linking e-learning technology and learner goals achievement. The model context has borrowed greatly from marketing mix theory, IMC theory and dynamic capability theory.

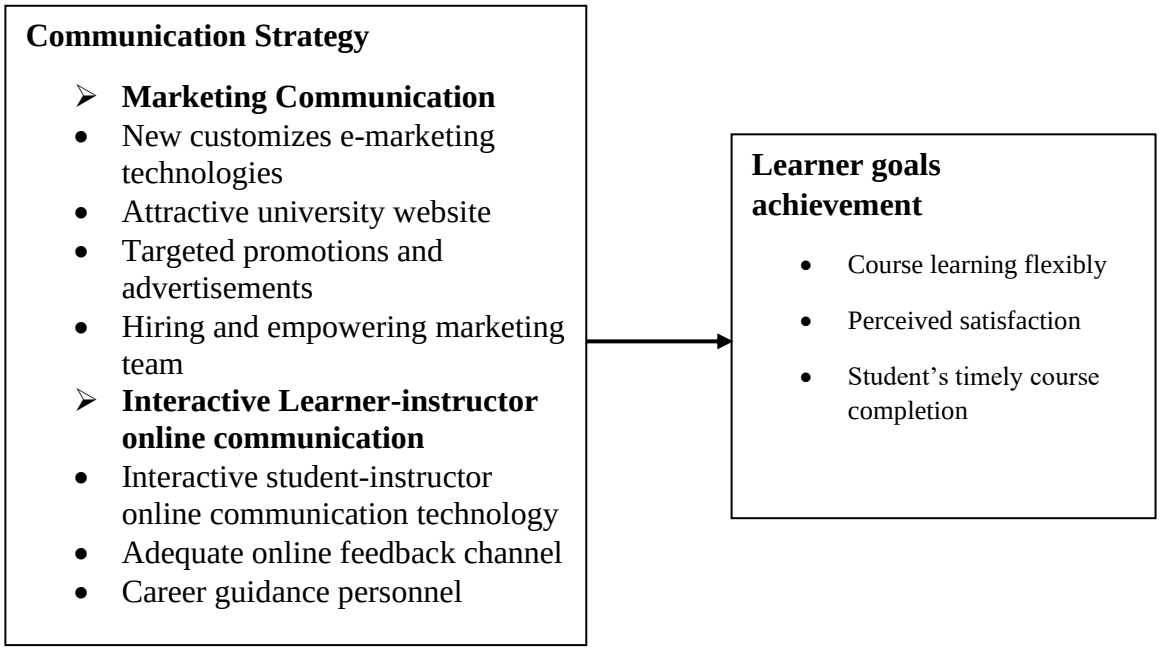


Figure 1: Proposed e-learning communication model

Communication strategy in the proposed e-communication strategy focused on strategic student-instructor communication and strategic marketing communication. Guided by the dynamic capability theory, universities ought to do SWOT analysis both internally and externally to identify their strengths and weaknesses in terms of their capabilities and resources in the area of e-communication. Crosstabulations analysis results show that respondents who felt there is inadequate e-learning communication strategy use in the Kenyan Universities and learner goals were not well achieved were an overwhelming 91.5%.Those who felt there was inadequate e-learning communication strategy support and learner goals were well achieved were 8.5%. Thus there is need for e-learning communication implementation in the Kenyan universities.

Marketing communication to the potential e-learners helps to create awareness of the courses available and how they would be of benefit to them hence the probability of increasing students' enrollment due to targeted promotions and advertisements, learner satisfaction as students are guided on choosing the right courses from a variety of those listed on institution's websites, flexible learning as instructors interactively offer assistance on how to use e-technologies in the course of their learning. A satisfied e-learner who studies effectively and efficiently at their own pace, time and in any location is likely to complete his course within the stipulated time. For e-learning to be useful, tutors should use the online environment to offer feedback on online work, and to assist with students' queries or problems, career guidance, e-learning technology use guidance and course guidance hence ability to achieve their goals

Therefore, marketing communication, universities need to identify and adopt new and customized communication technology, hiring and empowering a marketing team to work round the clock, investing in an attractive e-learning university website having a targeted marketing and promotions for markets that are easily identified with actionable strategies to reach potential e-learners. Herren, Cartmell, & Robertson, (2011) emphasized that direct mail, telemarketing, and on-campus visit programs have been the most often used marketing strategies by colleges in trying to attract new students in addition to an attractive university web site that has become the centerpiece of all recruiting.

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As pertains interactive student-instructor communication, identification and implementation of an interactive communication technology between students and instructors that should use the online environment to offer feedback on online work, and to assist with students' queries or problems, career guidance, e-learning technology use guidance and course guidance hence ability to achieve their goals is very vital. Chang and Tung, (2008) acknowledges that information exchange among students and teachers about educational content and daily life learning activities are important for learning. Hughes, (2007) points out that where students have been able to communicate with tutors online, they have found it useful.

Thus, universities ought to do SWORT analysis to identify and implement adequate e-learning communication strategies to achieve learner goals. e-learning managers involved in the implementation of e-communication strategy process in developing countries ought to identify , implement and prepare corrective measures and strategies based on these factors to avoid future system failures in order to achieve learner goals. The model will help university e-learning managers to identify, develop a successful e-learning technology strategy in their learning institutions. Other levels of education such as primary schools and tertiary colleges can adapt the model to assist them in the implementation of e-learning communication strategy in their institutions.

Areas of further research

The findings indicated that e-learning communication strategy is significantly associated with learner goals achievement. Further study in a different set up and educational level could be done to find out whether the results remain the same.

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THE IMPACT IFRS ADOPTION ON FINANCIAL PERFORMANCE OF COMPANIES

Honleimi Shinglai[1], A.S. Rapheileng[2], Kh. Tomba Singh[3]
[1]*Research Scholar, Department of Commerce, Manipur University, Canchipur-795003, Manipur*
[2]*Guest Faculty, Department of Commerce, Manipur University, Canchipur-795003, Manipur*
[3]*Department of Commerce, Manipur University, Canchipur-795003, Manipur*

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ABSTRACT
The aftermath of the IFRS launch had been highly anticipated by the accounting profession worldwide. The European Union, being the flag bearer of IFRS adoption, has already conducted numerous studies on its effect. The study is a closer-to-home study based on Indian companies. The test of the study includes a descriptive statistical examination of accounting-based ratios to make comparisons between the pre- and post-adoption periods. The second test was a normal distribution test. Then, lastly, a parametric test was instrumentalized to study the significant difference between pre-adoption and post-adoption periods. The results showed no significant difference in the financial performance before and after the IFRS adoption period.
KEYWORDS: *Pre- and Post- IFRS, Indian Companies, Financial ratios, K-S test, Independent t-test*

I. INTRODUCTION
The inception of the International Accounting Standard Committee (IASC) and the eventual development of the International Accounting Standard Board (IASB) are the result of the efforts of a private-sector international accounting standard setter to gain recognition and support primarily from national accounting bodies, then of national standard setters, and most significantly of regulators in the chief capital markets and of government ministries across the globe (Zeff, 2012). The set of financial reporting standards under the brand name International Financial Reporting Standard (IFRS) framed by the IASB has received importance and appeal across countries in recent times (Dasaraju & Subramanyam, India). The European Union (EU) pioneers the use of IFRS through its Directive No. 1606/2002, which requires the listed European companies to adopt IFRS in 2005 for their consolidated financial reports. Countries belonging to European Economic Area follow accounting regulations despite not having affiliations with European Union due to which Iceland, Liechtenstein, and Norway have enforced IFRS in their accounting regulatory system.

The move by the EU provided impetus for IFRS throughout the world by creating a domino effect in other parts of the world. Currently, one hundred and twenty-six jurisdictions across the globe mandate the application of the International Financial Reporting Standard (IFRS) by national listed corporations (IFRS, 2017 as cited in Jansson, 2018). Deming (2005) mentions the likes of Australia, New Zealand, Hong Kong, Singapore, and the Philippines adoption of IFRS.

The US, which hosts one of the biggest financial markets, acknowledges the global inclusiveness of IFRS as exceptional. The United States Securities and Exchange Commission (SEC) resolved to allow IFRS reporting for foreign filers in US financial markets without reconciliation to US Generally Accepted Accounting Principles (GAAP) (Whittington, 2008). To further enhance the tie between American and foreign markets, SEC chairman Christopher Cox proposed IFRS mandatory adoption by 2016 (Kotlyar, 2008).

There are differences in how IFRS is applied and implemented in different nations (Maroun and van Zijl, 2016; Preiato et al., 2015, as referenced in Jansson, 2018). The implementation of IFRS is influenced by the various institutional and legal settings. The Big Bang strategy totally replaces domestic GAAP with IFRS in a single event. Countries embrace the practice of evaluating IFRS and then adopting them as their national standards verbatim or with minor modifications (Ball, 2006). The convergence approach is a progressive course of action in which the nation aligns accounting reporting standards with IFRS over time (Tribuzi, 2018). Convergence refers to limiting the differences between IFRS and national accounting standards that retain the domestic standard in order to cater to national needs. Japan is one of the cases of adopting a "Cautious Convergence" strategy (Tsunogaya, 2016).

The need for a unified IFRS accounting standard is supported by a number of reasons in the literature. Functional, institutional, and political economy approaches can be used to broadly categorize the theoretical viewpoint on national IFRS adoption (Jansson, 2018). The accessibility of equity, investor protections, equity market size, and disclosure standards are all factors that are taken into consideration when deciding whether to apply IFRS (Ramanna & Sletten, 2014). Furher the analaysis of Ramanna and Sletten (2014) identified perceived network value benefit as a driving force behind national IFRS standardisation.

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Sharma et al. (2016), cited in Sharma, Joshi, and Kansal (2017), claimed that India had inevitably been dependent on capital and technology imports from other nations, making the adoption of IFRS a necessity.

The technical changes in the treatment of financial reporting details result from the improvements made to IFRS automated changes in the accounting treatments before IFRS. Unlike the IFRS requirement, the previous Accounting Standard (AS-23) does not require consolidation for every organization (Firoz, Ansari, & Akhtar, 2011).

Under the purview of BSE or NSE, public and unlisted businesses that adhere to IFRS-converged requirements have been thoroughly examined. Achalapathi and Bhanusireesha (2015) examined the financial ratios impact of IFRS harmonisation on Bharti Airtel Ltd, Dabur India Ltd, Dr. Reddy's Laboratories Ltf Glenmark Pharmaceuticals Ltf, Infosys Ltd, Noida Toll Bridge Co. Ltd, Rolta India Ltd, Sify Technologies Ltf, Tata Motors Ltf, and Wipro Ltf. The current paper uses comparable sample for the study of IFRS impact on accounting ratios under different time frame.

Ratio analysis is crucial for analyzing financial performance. The financial stability of the business is evaluated using ratio analysis. The variety of its users—"credit lenders, credit rating agencies, investors, and management"—reflect the weight of its significance. According to Chen and Shimerda (1981), the ratios that retain the most and crucial information for a particular component should be retrieved.

II. LITERATURE REVIEW

The literature concentrated on the consequences of IFRS mandatory adoption investigated upon financial information reported under different jurisdictions. The literature depicted the degree of IFRS impact among IFRS adopted jurisdiction population due to the variation in the adopters' economy, legality, culture, and other institutional factors. The IFRS espousal encounter was not similar for various countries with diversified economic characteristics and accounting standards policies (Nijam & Jahfer, 2016).

The Byard, Li, and Yu (2011) study focused on the effect of EU-wide mandatory adoption of IFRS on financial analysts' information environment using the properties of absolute forecast errors, forecast dispersion, and analyst following. The result showed that the analyst's information environment revealed an effect only when the changes mandated by IFRS were considerable and strongly enforced. LI and Yang (2016) documented a substantial rise in the possibility and occurrence of management forecasts subsequent to the mandatory IFRS adoption in 2005. Nouri and Abaoub (2016) study reflected the effectiveness of the company board in earning management in the Spanish and UK inferences. The similarity between UK GAAP and IFRS led to minute effects in earning management as compared with affect on Spanish companies. The benefits of information comparability have been speculated for IFRS adoption through the study on effects. The study of Yip and Young (2012) was a contribution to the literatural view that mandatory IFRS adoption enhances financial reports comparability across countries. The results indicated a notable growth in the resemblance facet of cross-country combarability in the post-IFRS interval years.

Jermakowicz (2004) analysed BEL-20 companies on the Brussels Stock Exchange, and his study discovered the significant dual impact of three first-time IFRS adopters on the entities' reported equity and net income. Latridis and Rouvolis (2010) findings revealed improvements in financial performance measures in the form of profitability and future growth prospects after a year of official IFRS period that was 2005 for firms listed on the Athens Stock Exchange.

The adoption of IFRS influenced audit fees; the empirical study of Kim, Liu, and Zheng (2012) found an increase in audit fees due to the complexity involved in the auditing task. The mandatory adoption of IFRS raised the likelihood of cross-listing compared to those that did not opt for IFRS; moreover, following the adoption, there was an increase in cross-listing target countries (Chen, Ng, & Tsang, 2015). A similar observation was made by Hong, Hung, and Lobo (2014) in the study of how mandatory IFRS implementation affected initial price offering underpricing and foreign capital financing. The finding revealed that IFRS adoption enhanced an entity's ability to raise more capital from the foreign market. It was duly considered that the IFRS adoption increases the quality of financial information and thus limited the information asymmetries among the financial reports presented in the IPO process.

Li's (2010) test of whether mandatory IFRS introduction changes the cost of equity capital in the context of 18 EU countries between the time frames 1995 and 2006 resulted in an affirmative answer. The mandatory adopters experienced a significant reduction in the cost of equity capital pertaining to the quality of legal enforcement, disclosure, and financial reporting comparability. Likewise, the study of Turki, Wali, Ali, and Mohammed (2020) found the effect of IFRS on the cost of capital, which further affected the financial performance of French-listed companies in the CAC All Tradable Index.

Book-to-market ratio was another measurement variable to study the impact of IFRS on a company's performance. Susana, Jarne, & Lainez (2007) test whether IFRS implementation changes the book-market ratio on 26 IBEX Spanish firms revealed the ratios dependency on the accounting rules used. Specifically, the sum of ranks in the Wilcoxon tests indicated the book value further away from market value when IFRS was applied than when Spanish accounting standards was instrumentalized.

Black & Maggina (2016) claimed that the study's findings deviated from their anticipation that the empirical behavior of the publicly traded Greek companies investigated in financial ratios would not improve. However, following the implementation of IFRS, the majority of financial ratios' sizes changed. The analysis of 67 listed businesses on the Saudi Arabian Stock Exchange over a period of six years—divided into three years before and after the mandated adoption of IFRS—found a similar outcome. The study was unable to identify any statistically significant differences in profitability,

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liquidity, or financial leverage (Ebaid, 2022).The current study aims to evaluate the financial performance implications of IFRS adoption in the Indian context in light of research done to determine how IFRS adoption has affected businesses around the world. The following hypotheses are extracted and framed.

Ho1. There is no significant difference between pre and post IFRS Per share Ratios

Ho2. There is no significant difference between pre and post IFRS on Profitability ratios

Ho3. There is no significant difference between pre and post IFRS on Liquidity ratios

Ho4. There is no significant difference between pre and post IFRS on Valuation ratios

III. RESEARCH METHOD

Study Period

The goal of the study is to compare financial ratios between the IFRS mandatory adopted era and the non-adoption period. The two phases of the period have the same number of years: the pre-IFRS mandatory adopted period is 2010-2016, and the post-IFRS mandatory adopted period is 2017-2023.

Variables and Measurements

The study selected accounting performance-based ratios to measure the difference that occurred with IFRS adoption. The financial performance is carried out under the categories of net profit measures, profitability, liquidity and valuation measure.

The effectiveness of IFRS is determined by comparing key financial elements under pre- and post-IFRS standards in certain jurisdictions (Nijam & Jahfer, 2016). Based on the importance and accessibility of variables and measurements the following financial ratios as shown in Table 1 has been used.

Sample Selection

All Indian Companies falling under the ambit of (IndAS) Rules, 2015 which mandates IFRS mandatory adoption by 1st April, 2017, make up the study's population. The companies that have been used by Achalapathi and Bhanusireesha (2015) had been selected for the study.

Table 1. Variables measurement

Performance category	Ratios
Net Profit Measures	Basic EPS
	Diluted EPS
	Cash EPS
Profitability	Net Profit Margin
	Return on Networth/Equity (%)
	Return on Capital Employed (%)
	Return on Assets (%)
	Asset Turnover Ratio (%)
Liquidity	Current Ratio
	Quick Ratio
	Dividend Payout Ratio (%)
	Earnings Retention Ratio (%)
	Cash Earnings Retention Ratio (%)
Valuation Measures	MarketCap/Net Operating Revenue
	Retention Ratios
	Price/Net Operating Revenue
	Earnings Yield

IV ANALYSIS AND RESULT

Descriptive statistics of performance measure in pre- and post- adoption period

Descriptive statistics (specifically the mean) are exploited to ascertain the effect of the enactment of IFRS on accounting-based performance measures. The intention of this description determination is to figure out whether the obligatory enforcement of IFRS has induced a rise or fall in the amount of performance measures compared to what they were during the application of Indian GAAP. Table 2 presents descriptive statistics for the performance indicators. As depicted in Table 2, the mean for almost all performance measures corresponding to per-share ratios, profitability ratios, liquidity ratios, and valuation ratios has declined since the application of IFRS, except for the dividend payout ratio (%) that comes under liquidity ratio and valuation ratios of price/net operating revenue and cap/net operating revenue rise by a few margins following the implementation of mandatory IFRS.

Table 2. Descriptive statistics of performance measures in pre- and post-adoption periods

Ratio	Pre-adoption period (2010-2016)		Post-Adoption period (2017-2023)	
	Mean	Std.Dev	Mean	Std.Dev
Per Share Ratios				
Basic EPS	34.04029	41.77325	15.00185	15.00185
Diluted EPS	33.73929	41.28546	29.21572	44.00418
Cash EPS	52.25728	51.04864	38.42044	64.02074

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Profitability Ratios				
Net Profit Margin (%)	17.11985	13.12077	-53.6451	148.2959
Return on Net worth/Equity (%)	21.15443	10.52277	8.693131	14.62004
Return on Capital Employed (%)	16.38572	9.61329	14.94357	13.50192
Return on Assets (%)	11.14785	6.38032	4.62243	12.67502
Asset Turnover Ratio (%)	74.16871	33.09764	36.02686	-0.11954
Liquidity Ratios				
Current Ratio (X)	1.64400	1.03187	1.59299	0.99609
Quick Ratio (X)	1.41514	1.0859	1.30299	0.85754
Dividend Payout Ratio (CP) (%)	17.71729	216.986	18.58485	21.16394
Earnings Retention Ratio (%)	56.84272	18.9726	20.05142	75.32651
Cash Earnings Retention Ratio (%)	61.85343	19.30953	50.72657	34.05984
Valuation Ratios				
Market Cap/Net Operating Revenue	3.306004	1.957435	3.62171	2.70392
Retention Ratios	56.83457	17.95731	20.04514	75.3229
Price/Net Operating Revenue	3.306004	1.957435	3.62214	2.70444
Earnings Yield	0.052143	0.032828	-1.82529	5.70652

Testing the Normality Assumption

As examined in Table 2 Descriptive Statistics showed a variation in the values of accounting ratios after IFRS implementation. To statistically find significant difference between before and after IFRS implementation the type of test needs to be determined. A normality assumption test must be employed before the significant difference test. This process is essential for selection of the suitable test to evaluate the importance of the variations in performance metrics between before and after mandatory phases of IFRS adoption. The Kolmogorov-Smirnov test was used in the study to determine if the data analysed were regularly distributed. Significance value of 0.05 or greater is assumed for normal distribution. The results of the Kolmogorov-Smirnov test are displayed in Table3.

Table 3. Results of Kolmogorov-Smirnov test

Ratio	Pre-Adoption Period (2010- 2016)		Post-Adoption Period (2017-2023)	
	Statistic	Sig	Statistic	Sig
Per Share Ratios				
Basic EPS	.257	.061	.189	.200
Diluted EPS	.257	.059	198	.200
Cash EPS	.242	.100	.266	.043
Profitability Ratios				
Net Profit Margin	.204	.200	.431	.000
Return on Networth/Equity (%)	.163	.200	.200	.200
Return on Capital Employed (%)	.151	.200	.120	.200
Return on Assets (%)	.178	.200	.140	.200
Asset Turnover Ratio (%)	.200	.200	.167	.200
Liquidity Ratios				
Current Ratio	.165	.200	.146	.200
Quick Ratio	.274	.032	.187	.200
Dividend Payout Ratio (%)	.247	.084	.303	.010
Earnings Retention Ratio (%)	.214	.200	.217	.199
Cash Earnings Retention Ratio (%)	.203	.200	.191	.200

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Valuation Ratios				
Market				
Cap/Net Operating Revenue	.128	.200	.174	.200
Retention Ratios	.214	.200	.217	.199
Price/Net Operating Revenue	.128	.200	.174	.200
Earnings Yield	.274	.032	.505	.000

In accordance with the result presented in Table 3, it was found that most of the variables in the Pre and Post IFRS adoption have p> 0.05 hence, it had been assumed that the variables have normal distribution. Thus, a parametric independent t test was employed to determine the mean differences between performance measures in the before and after adoption phases.

Result of Independent t-test

As stated before, to test whether the differences between performance measures before and after mandatory IFRS adoption are significant, the independent t test was employed for all accounting ratios under examination. Table 4 exhibited the results of an independent t test to find a significant difference between the financial performance-based accounting ratios for the pre- and post-IFRS adoption periods.

Table 4. Independent t-test for Pre and Post IFRS adoption

Ratios	t	p-value
Per Share Ratios		
Basic EPS	.909	.376
Diluted EPS	.235	.817
Cash EPS	.534	.600
Profitability Ratios		
Net Profit Margin	1.503	.167
Return on Networth/Equity (%)	2.188	.044
Return on Capital Employed (%)	.275	.787
Return on Assets (%)	1.454	.169
Asset Turnover Ratio (%)	3.168	.007
Liquidity Ratios		
Current Ratio	.112	.912
Quick Ratio	.256	.801
Dividend Payout Ratio (%)	-.097	.924
Earnings Retention Ratio (%)	1.502	.164
Cash Earnings Retention Ratio (%)	.899	.384
Valuation Ratios		
MarketCap/Net Operating Revenue	-.299	.769
Retention Ratios	1.502	.164
Price/Net Operating Revenue	-.299	.768
Earnings Yield	1.040	.325

Ho1: There is no significant difference between pre and post IFRS Per share Ratios

Per share ratios were evaluated by Basic EPS, Diluted EPS and Cash EPS. The independent t-test result of difference between Pre and Post IFRS adoption of Basic EPS (t=.909, p=.376), Diluted EPS (t=.235, p=.817) and Cash EPS (t=.534, p=.600) showed no significant difference at 5% level of significance. Hence the null hypothesis, Ho1 was failed to be rejected.

Ho2: There is no significant difference between pre and post IFRS on Profitability ratios

Profitability ratios were examined through Net Profit Margin, Return on Networth/Equity (%), Return on Capital Employed (%), Return on Assets (%) and Asset Turnover Ratio. The independent t-test for Net Profit Margin (t=1.503, p=.167), Return on Capital Employed (%) (t=.275, p=.787) and Return on Assets (%) (t=1.454, p=.169) revealed significant difference. However, the result of Return on Networth/Equity (%) (t=2.188, p=0.044), and Asset Turnover Ratio (t=3.168, p=.007) showed no significant difference. Therefore, the null hypothesis (Ho2) was partially rejected at 5% significance level.

Ho3: There is no significant difference between pre and post IFRS on Profitability ratios

The independent t-test for Current Ratio (t=.112, p=.912), Quick Ratio (t=.256, p=.801), Dividend Payout Ratio (%) (t=-.097, p=924), Earnings Retention Ratio (%) (t=1.502, p=.164) and Cash Earnings Retention Ratio (%) (t=.899, p=384) in Liquidity ratio showed no significant difference. Hence the null hypothesis, Ho3 was failed to be rejected at significance level of 5%.

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H04. There is no significant difference between pre and post IFRS on Valuation ratios

Valuation ratios were determined by Market Cap/Net operating Revenue, Retention Ratios, Price/Net Operating Revenue and Earning Yields. The independent t-test revealed no significant difference for Market Cap/Net operating Revenue (t -2.99, p=.769), Retention Ratios (t=1.502, p=.164), Price/Net Operating Revenue (t=-2.99, p=.768) and Earning Yields (t=1.040, p=.325). Thus the null hypothesis, Ho4 was accepted at 5% significance level.

V. CONCLUSION

Research on the conceptual framework, disclosures, earning management, and fair valuation of the reformation of the international accounting standard brought about by the establishment of IFRS is merited. The current study attends only on the financial ratios aspect. The study's goal was to determine the financial effects of IFRS implementation on companies. The study looked at seventeen financial parameters pertaining to net profit measures, liquidity, profitability, and valuation measures over the course of two time periods, namely the period prior to the required IFRS adoption period (2010-2016) and the subsequent period (2017-2023). Comparing accounting ratios to determine if the implementation of IFRS affected financial performance failed to find a discernible difference.

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A POLYHERBAL BASED ORAL HEALTH BENEFITS OF MOUTH FRESHENER, BOOSTING ORAL HYGIENE AND THEIR VARIOUS EFFECT OF BODY

Dr. Swati Rawat [1], Dr Sunil.S. Jaybhaye[2], Mr Gitesh.V. Vyas [3], Ms. Bhagyashri.S. Gaikwad [4], Sanket.S. Gavai.[5*]

[1]Principal of Institute of Pharmacy, Badnapur, Jalna.
[2]Vice Principal of Institute of Pharmacy, Badnapur,Jalna
[3]Guide
[4]Co-Guide
[5]Student
Institute of Pharmacy, Badnapur , Jalna 431202

ABSTRACT

The use of polyherbal formulations for oral health has gained increasing attention due to their natural and multifaceted benefits. This review explores the potential of a polyherbal mouth freshener composed of betel leaf powder, sugar powder, fennel seeds, clove, Jasminum officinale powder, cardamom powder, licorice root, lemongrass oil, and orange oil. which contribute to oral hygiene and overall mouth freshness. Betel .this research contribute valuable insights to the field of polyhedral formulation for oral heath ,offering alternative or complementary formulation for oral mucosal disorders and bad breath (halitosis) ,remove bacteria and food particle.

KEYWORDS: *Betel (Piper betel), Mouth freshener, and pharmacological activities, Pan, Medicinal plant, Nutrious leaf.*

INTRODUCTION

Betel leaf powder, fennel seed powder, sugar powder, licorice root powder, cardamom powder, clove, lemongrass oil, and orange oil combine to form a potent polyherbal formulation used as a natural mouth freshener. This traditional blend harnesses the medicinal and aromatic properties of each ingredient to create a refreshing, soothing, and effective solution for oral hygiene and breath freshening.

Betel leaf powder is known for its antibacterial and antimicrobial properties, helping to cleanse the mouth and promote oral health. Fennel seeds contribute their mild, sweet flavor and digestive benefits, aiding in freshening breath while promoting digestion. Sugar powder enhances the palatability of the mixture and can also act as a gentle soothing agent for the mouth

Table 1: **Scientific Classification of Betel Leaf**

Synonyms	Chavica Beta. Artanthe Hixagona
Kingdom	Plantae
Order	Piperales
Family	Piperaceae
Genus	Piper
Species	Betle
Division	Magnoliphyta

Cardamom powder adds a pleasant flavor while offering digestive benefits and antimicrobial effects. Clove is renowned for its analgesic and antiseptic properties.

HISTORY

Ancient Origins

Early Use: Betel leaf has been cultivated and consumed for over 4,000 years. Its use is believed to have originated in the Indian subcontinent, with ancient texts and archaeological evidence suggesting that it was used for both medicinal and ceremonial purposes.

Cultural and Regional Spread

South Asia and Southeast Asia: Over time, the use of betel leaf spread across much of South Asia and Southeast Asia. It became an integral part of local culture, particularly in countries like India, Sri Lanka, Thailand, Indonesia, and the Philippines. In these regions, betel leaves are often chewed with areca nut and slaked lime to create a stimulant known as paan.

MEDICINAL USE

- Improves digestion and relieves constipation.
- Treats infections and mouth sores.
- Reduces pain from conditions like arthritis.
- Eases coughs, colds, and asthma.
- Reduces inflammation and swelling.

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- **PLANT PROFILE**

Taxonomical Classification

Kingdom	: Plantae
Division	: Magnoliophyta
Class	: Magnoliopsida
Order	: Piperales
Family	: Piperaceae
Genus	: Piper
Species	: Betel

Vernacular Names

Sanskrit	: Tambool, Muhbhushan, Varnalata
Hindi	: Paan
English	: Betel, Betel pepper, Betel-vine
Telugu	: Nagavalli, Tamalapaku
Tamil	: Vetrilai
Gujarati	: Nagarbael



Fig. 1. *Piper Betel* Plant



Fig. 2. *Piper Betel* Leaf

METHODOLOGY

Extraction methods for the crude drugs from betel leaves

Extracting crude drugs from betel leave involves various methods to obtain the active constituents, including essential oils, alkaloids, phenols, and flavonoids.

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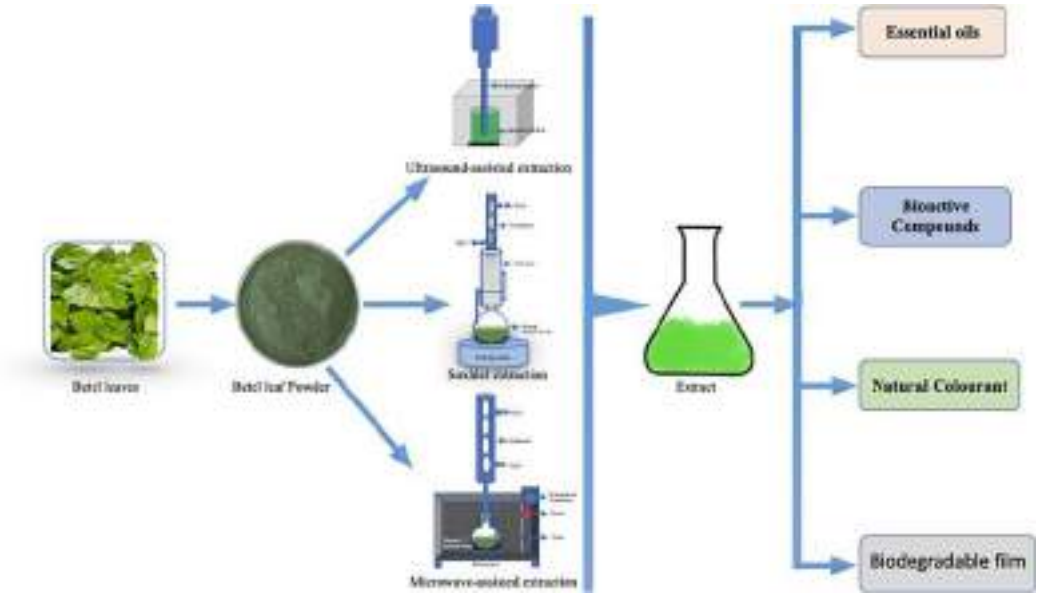


Fig.3 Extraction Method

Steam Distillation
Steam distillation is commonly employed to extract essential oils from betel leaves, which contain aromatic compounds like eugenol, chavicol, and cineole. Betel leaves are subjected to steam, which helps in releasing the volatile oils.

Solvent Extraction
Solvent extraction involves using organic solvents like ethanol, methanol, or hexane to dissolve the desired compounds from the betel leaves. Betel leaves are usually dried and ground into a powder. The powder is then mixed with the solvent, and the mixture is allowed to stand for a period to facilitate extraction

Soxhlet Extraction
Soxhlet extraction is particularly useful for extracting lipophilic compounds from betel leaves.The powdered betel leaves are placed in a thimble and loaded into a Soxhlet extractor.

Maceration
Maceration involves soaking the powdered betel leaves in a solvent for a specified period to allow the extraction of active constituents. The mixture is periodically agitated to enhance extraction efficiency

Percolation
Percolation involves passing a solvent through a bed of powdered betel leaves to extract the desired compounds. The solvent gradually percolates through the bed, picking up the active constituents as it passes through. The extract is collected at the outlet. Percolation is often used for large-scale extraction and allows for precise control over the extraction process**.**

Dry Granulation Method:
Weigh the polyherbal blend (fennel seed powder, clove, and lemon grass oil oil) according to the desired ratio. Mix the herbal powders thoroughly to ensure uniform distribution.

Dry Granulation: Pass the mixed herbal powder through a sieve (#60 or #80 mesh) to ensure uniform particle size.

Use a dry granulator or a mortar and pestle to granulate the powder into a coarse, free-flowing material**.**

Addition of Excipients
Add excipients like lactose, starch, or cellulose to improve flowability and compressibility. Mix well to ensure uniform distribution.

Lubrication
Add a lubricant like magnesium stearate or talc to reduce friction and improve tabletting. Mix well to ensure uniform distribution.

AYURVEDIC SIGNIFICANCE

- **Digestive Aid**: Betel leaves are considered to be heating and help stimulate digestion. They are commonly used to treat indigestion, bloating, and other digestive disorders. Chewing betel leaf can enhance appetite and improve the secretion of digestive enzymes.
- **Oral Health**: Betel leaves have antimicrobial properties and are used in Ayurvedic formulations to promote oral hygiene. They help prevent bad breath, gum disease
- **Antioxidant and Anti-inflammatory**: The leaf contains essential oils, phenols, and other compounds that have antioxidant, anti-inflammatory, and antimicrobial effects. This makes it useful for treating skin ailments, wounds, and infections.
- **Anti-stress and Relaxation**: Betel leaf has mild sedative properties that can help reduce stress and anxiety, promoting mental relaxation and well-being.
- **Sexual Health:** In Ayurveda, betel leaves are sometimes used to enhance libido and sexual vitality, often combined with other herbs for aphrodisiac properties.

CONTENT OF BETEL LEAF

Betel leaf (Piper betle) is a versatile plant commonly used in various cultures, particularly in South and Southeast Asia. The leaf contains several bioactive compounds, including essential oils, alkaloids like arecoline, and tannins, which contribute to

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its distinct aroma and therapeutic properties. Betel leaf is rich in antioxidants such as phenolic compounds, which have potential anti-inflammatory and antimicrobial effects. Terpene, Phenol, P-cymene, carvacrol, chavicol and its derivatives,allyl catechol, eugenol,estragol, oxalic acid, malic acid, amino acids etc. are found to be present in the betel leaves.

Essential Oil Content

MORPHOLOGY OF PIPER BETEL

Stem Characteristics

1. Robust Stem Varieties: Some betel vine varieties have robust, vigorous stems, contributing to their strong growth habit. Examples include Bangla, Kallimadugu and Calcutta varieties.



Fig 5: Green Betel



Fig 4: Red Betel



Fig 6: Black Betel

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Fig 7: Golden Betel

1. High Oil Content Varieties: These varieties have a high concentration of essential oils in their leaves, resulting in strong aroma and flavor. Examples include Calcutta and Kallimadugu varieties.
2. Moderate Oil Content Varieties: Varieties with moderate essential oil content offer a balanced aroma and flavor profile. Examples include Sanchi and Bangla varieties

Flavor Profile

1. Strong Flavor Varieties: Certain varieties are known for their intense flavor, often preferred for their bold taste in paan preparation. Examples include Bangla and Magahi varieties.

INDIVIDUAL BENEFITS OF KEY INGREDIENTS

1. The Power of Clove

Clove has been revered for centuries in traditional medicine for its strong antimicrobial properties. The active compound, eugenol, has natural analgesic, antibacterial, and antifungal effects, making clove an excellent choice for combating bad breath and promoting oral health.

2. Fennel Seed: (A Digestive Aid and Breath Freshener)

Fennel seeds are commonly used in herbal remedies for their digestive properties, but they also play a crucial role in freshening breath.

while their antibacterial properties help eliminate the bacteria responsible for foul-smelling breath.

3. Licorice Root: (Soothing and Protective)

Licorice root has long been known for its ability to soothe sore throats and support oral health. It contains glycyrrhizin, which has antibacterial and anti-inflammatory properties.



Fig.No.8

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4. Cardamom: (A Spice for Freshness)
Cardamom, a fragrant spice commonly used in Ayurveda, is known for its breath-freshening properties. It has been traditionally used as a natural mouth freshener and is also believed to have antiseptic properties that can help maintain oral hygiene.

5. Agar: (A Natural Binding Agent)
Agar, a natural plant-derived gelatin, is often used in herbal formulations to help bind ingredients together. In mouth fresheners, agar acts as a stabilizing agent.

6. Orange Oil: (Zesty and Antimicrobial)
Orange essential oil, extracted from the peels of sweet oranges, is not only refreshing but also packed with antimicrobial properties. It helps to fight the bacteria responsible for bad breath and can even uplift mood, giving your polyherbal mouth freshener a pleasant, citrusy aroma.

7. Lemon grass Oil: (A Powerful Antiseptic)
Lemongrass essential oil has potent antiseptic and anti-inflammatory properties. It is a natural disinfectant, making it an excellent addition to a polyherbal mouth freshener. Lemongrass oil helps to clear out bacteria in the mouth, reducing bad breath and supporting overall oral hygiene.

8. Jasmanium officinal : Jasminum officinale is utilized in the polyherbal mouth freshener for its antibacterial, anti-inflammatory, and antiulcer properties

TRADITIONAL USES OF BETEL LEAVES

Headache: Betel leaf is a popular home remedy for headache. The betel leaf has analgesic and cooling properties.

Scanty or Obstructed Urination: Betel leaf juice is credited with diuretic properties. Its juice, mixed with dilute milk and sweetened slightly, helps in easing urination.

Exhaustion And Debility. The juice of a few betel leaves, with a teaspoon of honey, will serve as a good tonic.

- **Sore Throat:** Betel leaf is an excellent household remedy in the treatment of cough and sore throat. Local application of the leaves is effective in treating sore throat. **Respiratory Disorders:** Betel leaves are useful in pulmonary affection in childhood and old age. The leaves, soaked in mustard oil and warmed, may be applied to the chest to relieve cough .
- **Constipation:** In the case of constipation in children, a suppository made of the stalk of betel leaf dipped in castor oil can be introduced in the rectum.
- **Problem of Breast milk secretion:** The application of leaves smeared with oil is said to promote secretion of milk when applied on the breasts during lactation .
- **Inflammation:** Applied locally, betel leaves are beneficial in the treatment of inflammation such as arthritis and orchitis that is inflammation of the testes.
- **Wounds:** Betel leaves can be used to heal wounds. The juice of a few leaves should be extracted and applied on the wound. Then a betel leaf should be wrapped over and bandaged..
- **Boils:** Betel leaf is also an effective remedy for boils. A leaf is gently warmed till it gets softened, and is then coated with a layer of castor oil.

KEY MECHANISM OF MOUTH FRESHENER

Polyherbal mouth fresheners typically work through a combination of antimicrobial, anti-inflammatory, and deodorizing properties of herbs. These herbs contain essential oils and compounds that help neutralize bad breath, inhibit the growth of odour-causing bacteria, and promote overall oral hygiene.

ADVANTAGE OF MOUTH FRESHENER

- **Natural Ingredients**: ensuring a natural and chemical-free
- **Antibacterial Properties**: Many herbs used in these mouth fresheners, like neem or clove,.
- **Improved Digestion**: Some herbal ingredients, such as cardamom and fennel, aid in digestion and may help alleviate bloating or indigestion.
- **Long-Lasting Freshness**: They provide long-lasting freshness due to the blend of herbs that neutralize odors.
- **Rich in Antioxidants:** Many herbs have antioxidant properties that promote overall health and protect the gums and teeth.
- **Prevention of Tooth Decay:** Some herbs help in reducing plaque and promoting oral hygiene, thereby potentially reducing the risk of tooth decay.

Disadvantages of Mouth Freshner

- **Allergic Reactions:** Some individuals may be allergic to specific herbs or ingredients, leading to irritation in the mouth or skin.
- **High Sugar Content:** Many commercial polyherbal mouth fresheners contain added sugars or artificial sweeteners, which can contribute to tooth decay.
- **Mouth Irritation:** Some herbs may cause a burning or tingling sensation in the mouth, especially if the product contains strong ingredients like mint or spices.

PHARMACOLOGICAL ACTIVITY

1. Antioxidant Activity
Betel leaves possess strong antioxidant properties due to the presence of polyphenolic compounds. These compounds help neutralize free radicals and reduce oxidative stress, which can contribute to chronic diseases like cancer, diabetes.

2. Antimicrobial and Antifungal Effects
Betel leaf has shown broad-spectrum antimicrobial activity against bacteria, fungi, and viruses..

3. Anti-inflammatory and Analgesic Activity
The leaves contain compounds that exhibit anti-inflammatory effects, which can help reduce inflammation in conditions like arthritis and other inflammatory disorders

4. Anticancer Properties
Betel leaf, especially its polyphenolic compounds, has shown potential anticancer activity by inhibiting the growth and spread of cancer cells.

5. Digestive Health
Betel leaves have been used traditionally to aid digestion. The active compounds stimulate the secretion of digestive enzymes and Betel leaves also act as a carminative .

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6. Cardiovascular Benefits

There is evidence to suggest that betel leaf has cardioprotective effects. It helps regulate blood pressure, reduce cholesterol levels, and improve blood circulation, thus supporting heart health.

7. Anti-diabetic Properties

Some studies have indicated that betel leaves can help regulate blood sugar levels, making it beneficial for managing diabetes.

8. Wound Healing

Betel leaf has antimicrobial and anti-inflammatory properties that can aid in wound healing. It has been traditionally used as a poultice for cuts, burns, and skin infections.

FUTURE SCOPE

A polyherbal mouth freshener based on betel leaf holds promising potential in the future due to increasing consumer demand for natural and functional oral care products. clove, and cardamom to enhance its flavor and effectiveness. With proper research, formulation, and regulatory approval, this polyherbal mouth freshener could become a staple in the global market.

CONCLUSION

Polyherbal mouth fresheners typically work through a combination of antimicrobial, anti-inflammatory, and deodorizing properties of herbs. These herbs contain essential oils and compounds that help neutralize bad breath, inhibit the growth of odor-causing bacteria, and promote overall oral hygiene. Overall , this polyherbal mouth freshener is a valuable addition to the oral care market, providing consumers with a natural and effective solution for maintaining optimal oral health. This type of formulation not only aligns with modern preferences for natural wellness but also integrates time-honored herbal knowledge into a convenient product for everyday use.

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A REVIEW ON UV- VISIBLE SPECTROSCOPY

Ms. Sheetal S. Ghogre[1], Ms. Komal D. Kangne[2], Dr. Sunil S. Jaybhaye[3]
Mr. Saurabh M. Bondre[4], Ms. Ashwini J. Bahir[5]

ABSTRACT

UV-Visible Spectroscopy is the earliest instrumentation techniques for analysis/ evaluation of different types of solvents and substances. In pharmaceutical sector UV-Visible spectroscopy is a fundamental technique for quantifying the concentration of active pharmaceutical ingredients (APIs) in formulations. It comprises the necessary to determine the identity, strength, quality, purity of compounds.

The method of analysis is based on measuring the absorption of monochromatic light by colourless compounds is near UV path of spectrum (200-400nm). Radiant energy absorption by materials can be quantitatively described using the general law 'Beers Law'.The application of Chemometrics in combination with UV spectroscopy for the assay of APIs, Impurities, adulteration issues and degradation products present in pharmaceutical dosage form. [1, 2]

KEYWORDS: *UV-Visible Spectroscopy, spectra, Chemometrics, APIs degradation products, Pharmaceutical dosage forms, Beers Law.*

INTRODUCTION

- **Spectroscopy**

Spectroscopy is a technique capable of identifying chemicals and performing quantitative analysis by utilizing the emissions or absorption spectra of different substances. It is the measurements and interpretation of Electro Magnetic Radiation (EMR) absorbed and emitted when molecule or atoms or ions of a sample move from one energy to other energy states.[3]

- **Types of Spectroscopy**

1) Atomic Spectroscopy

It is determination of elemental composition by its electromagnetic or mass spectroscopy.

- E= h v
- E= energy difference between two quantum levels.

V= frequency of photon which can result in electronic excitation.

2) Molecular Spectroscopy:

This deals with the interaction of electromagnetic radiation with molecules .

3) Microwave spectra: Spectra are shows by molecules which passes dipole moment (ex-HCL,NO ,etc.)
4) Vibrational-Rotational (IR spectra) :

These spectra occur in the spectral range of 500-4000cm-1 . These spectra arise due to transitions induced between the Vibrational energy levels of a molecule absorption of radiation belonging to IR region.

5) Raman Spectra: It observed in the visible region viz:12500-25000cm-1.Related to Vibrational-rotational transition in molecule but in different manner.
6) Electronic Spectra : Electronic spectra in visible region span 12500-25000cm.It arise due to electronic transitions in a molecular absorption of radiation falling in visible and ultraviolet regions.

UV -Visible Spectroscopy

It also known as UV-Visible spectroscopyoscopy. It has been in general use for last 37 year's and over this period it's become the most important analytical instrument in modern day laboratory. UV- Visible spectroscopy is widely utilized analytical technique in various fields, offering insights into molecular structure, concentration, electronic transition of compounds, particularly in both pharmaceutical and bio-allied sciences. [4, 5]

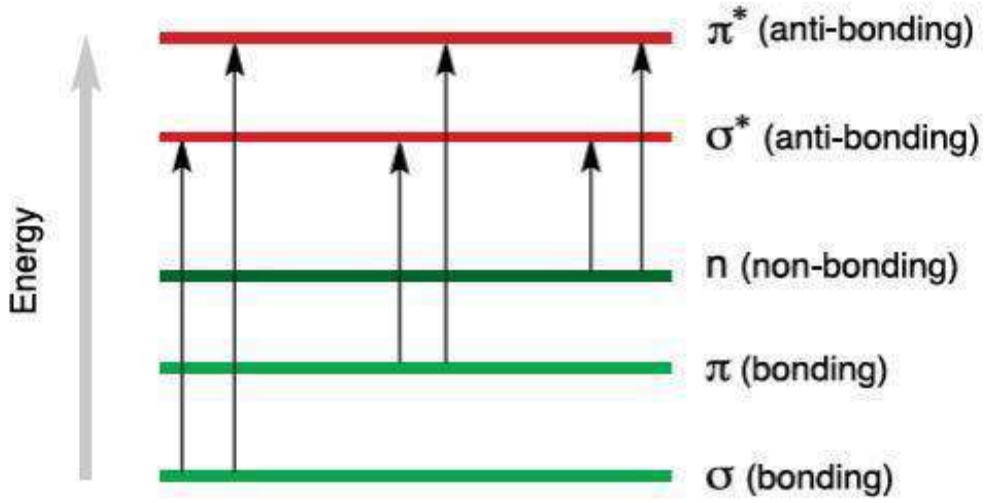
Principle Of UV-Visible Spectroscopy

UV absorption spectra arises from the transition of electrons within a molecules or an ion from a higher energy level and the UV emission spectra arise from the reverse type of transition. The UV radiation has sufficient energy to promote or excited the valence electrons in a molecule or an ion from ground state orbital to higher energy level, excited state orbital or anti bonding or orbital which can detected as absorptions.[6, 7]

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The Possible Electronic Transitions in UV and visible region are as follows:

1) σ→ σ* transitionπ
2) π → π* transition
3) n → σ* transition
4) n→ π* transition



(Fig. 1.Energy Required For Various Electronic Transition)

- σ → σ* transition
  σ electron from orbital is excited to corresponding anti-bonding orbital σ*.The energy required is large for this transition. e.g. Methane (CH4) has C-H bond only and can undergo σ → σ transition an
  n d shows absorbance maxima at 125 nm.

- π → π* transition
  π electron in a bonding orbital is excited to corresponding anti-bonding orbital π*. Compounds multiple bonds like alkenes, alkynes, carbonyl, nitriles, aromatic compounds, etc undergo π → π* transitions. e.g. Alkenes generally absorb in the region 170 to 205 nm.

- n → σ* transition
  Saturated compounds containing atoms with lone pair of electrons like O, N, S and halogens are capable of n → σ* transition. These transitions usually require less energy than σ → transitions. The number of organic functional groups with n → σ* . Peaks in UV region is small (150 – 250 nm).

- n→ π* transition
  An electron from non-bonding orbital is promoted to anti-bonding π* orbital. Compounds containing double bond involving hetero atoms (C=O, C≡N, N=O) undergo such transitions.
  n → π* transitions require minimum energy and show absorption at a longer wavelength around 300 nm. [8, 9]

Beer's law

Beer's law states that the absorbance 'A' of a substance in solution is directly proportional to the concentration of solution. When a beam of monochromatic radiation is passed through the absorbing medium, then the decrease in intensity of radiation is directly proportional to the concentration of solution.

$A \propto c$

where, (a= absorbance; c= concentration).

❖ **Absorbance analysis can be classified into two different classes:**

I. Photometer
II. Spectrophotometer

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- **Photometer**

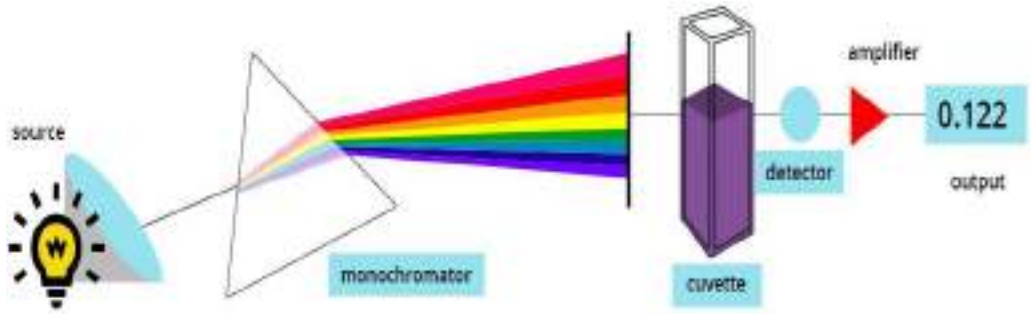
The photometer is a simple and relatively inexpensive tool for performing absorption analysis. In this instrument, filters are used to select wavelength. They can only detect a single wavelength at a time, have high throughout energy due to the simple optics and good signal to noise ratio.[10, 11]

Types of Photometer
a) Visible Photometer
b) Ultraviolet Photometer
c) Probe-Type Photometer

- **Spectrophotometer**

a) Single -Beam Instruments for the Ultraviolet-Visible Region:

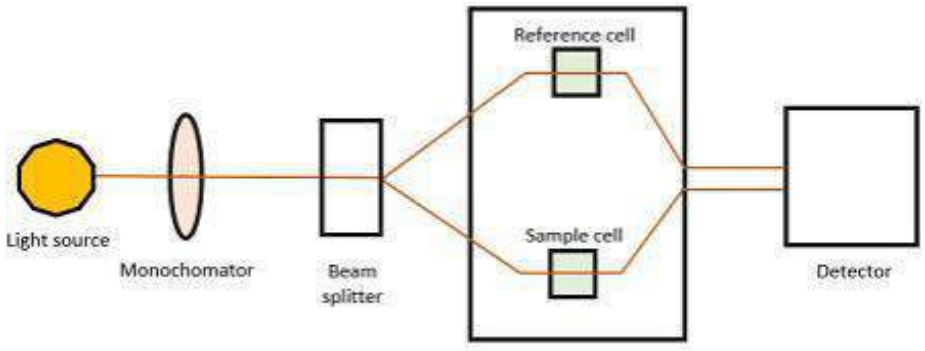
Single beam instrument can be used for both ultraviolet and visible measurements. The lower wavelength extremes for the instruments vary from 190-210 nm and upper from 800-1000 nm. It equipped with interchangeable tungsten and hydrogen Or deuterium lamps. Instrument employs Photomultiplier tubes or Photodiodes as detectors and gratings for dispersion. Digital readout meter is available in all UV -Visible spectrophotometer. [12, 13]



(Fig. 2. UV -Spectroscopy Single Beam)

b) Double Beam Instruments for the Ultraviolet-Visible Region

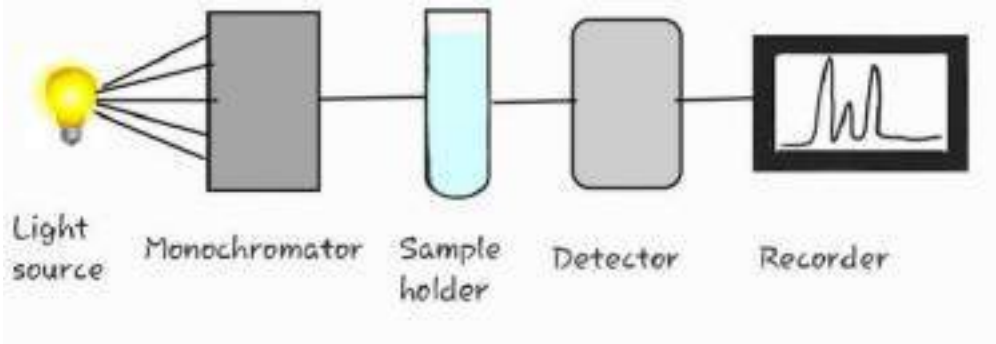
These instruments are more expensive as compared with single-beam spectrophotometer. Radiation from one of the sources passes through an entrance slit into the grating monochromator. After exiting the monochromator the radiation is split into two beams by chopper. The chopper contains a transparent segment and a mirrored segment. After passing through the cell, the beams are recombined by the second chopper and strike the photomultiplier tube at different times. [14,15]



(Fig. 3.UV -Spectroscopy Double Beam)

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Instrumentation



(Fig.4. Instrumentation of UV Spectroscopy)

Components of UV Visible Spectroscopy

- Source
- Monochromator
- Sample cell
- Detector
- Read out system
    a) Amplifier
    b) Display
    c)

➢ **Sources**

A continuous source, or one that emits radiation at a variety Of wavelengths, is necessary for UV- Vis spectroscopy. It is important that the power of the radiation source does not change abruptly over its wavelength range.. The mechanism for this involves the formation of an excited molecular species, which breaks up to give two atomic species and an UV photon.
The following are many sources of UV radiation:

1. Tungsten filament lamp
2. Deuterium
3. Hydrogen lamp
4. Mercury arc lamp
5. Xenon discharge lamp

▪ **Tungsten Filament lamp**



(Fig.5. Tungsten Filament lamp)

It also known as Quartz Halogen Lamp .
The most typical light source utilized in spectrophotometers is the tungsten lamp. With a Wavelength range of roughly 330 to 900 nm, it comprises of a tungsten filament encased in a glass envelope and is utilized for the visible spectrum. [16, 17]

▪ **Hydrogen Lamp**

The light spectrum emitted by hydrogen lamps is constant, dependable, and ranges from 160 to 380 nm. It is made up of high-pressure hydrogen gas, which results in an electrical discharge. The hydrogen molecules that are excited create radiation.[19]

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- **Deuterium Lamp**

Its wavelength range is 190nm – 370nm.It also known as a D2 lamp. A typical deuterium lamp lifespan of about 1000 hours.[18]



(Fig.6. Deuterium Lamp)

- **Mercury Arc Lamp**

In mercury arc lamp, mercury vapour is stored under high pressure and excitation of mercury atoms is done by electric discharge.[20]

- **Xenon Discharge Lamp**

It possesses two tungsten electrodes separated by some distance. Radiation from xenon ranges from 250-460.

- **The Monochromator (Wavelength selector)**

All Monochromator contain the following component parts;

- An entrance slit
- A collimating lens
- A dispersing device (usually a prism or a grating)
- A focusing lens
- An exit slit

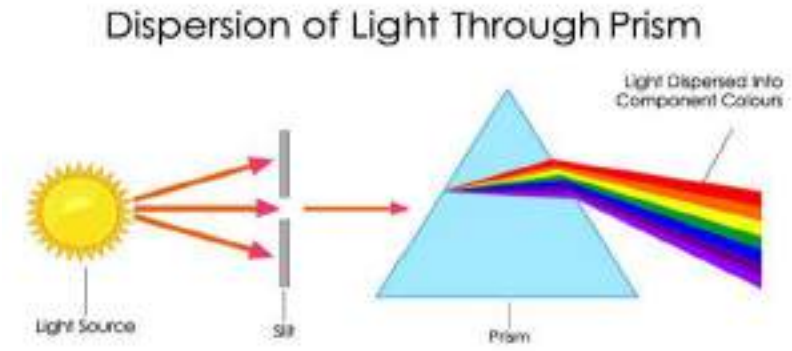
Polychromatic radiation (radiation of more than one wavelength) enters the Monochromator through the entrance slit. The beam is collimated and then strikes the dispersing element at an angle. The beam is split into its component wavelengths by the grating or prism. By moving the dispersing element or the exit slit, radiation of only a particular wavelength leaves the monochromator through the exit slit.[21]

Types of Monochromators

1. Prism Monochromators
2. Grating Monochromators

1) Prism Monochromators

Prism is made from glass, Quartz or fused silica. Quartz or fused silica is the choice of material of UV spectrum. When white light is passed through glass prism, dispersion of Polychromatic light in rainbow occurs. Now by rotation of the prism different wavelengths of the spectrum can be made to pass through in exit slit on the sample. The effective wavelength depends on the dispersive power of prism material and the optical angle of the prism.



(Fig.7. Prism Monochromators)

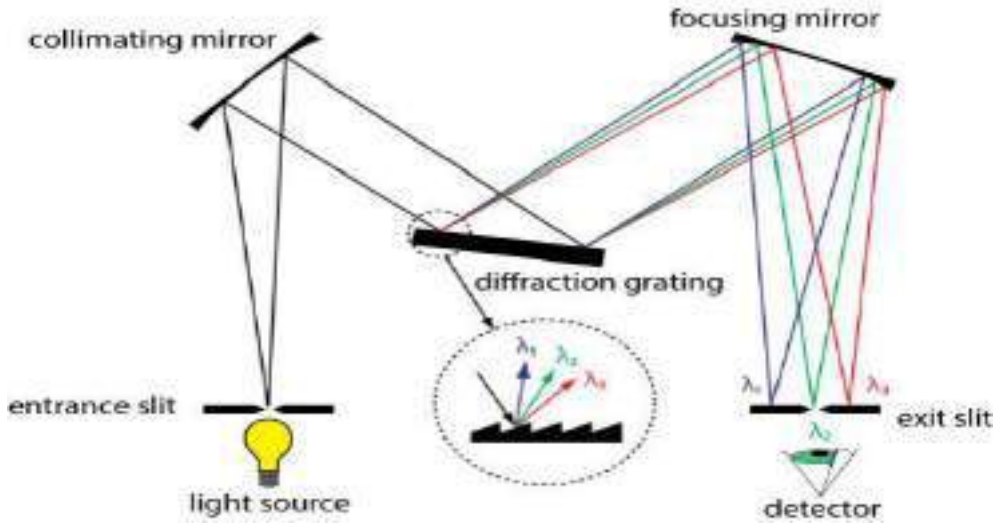
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2) Grating Monochromators

Are most effective one in converting a polychromatic light to monochromatic light . As a resolution of +/- 0.1 nm could be achieved by using ratings, they are commonly used in spectrophotometers.

Gratings are of two types.

- Diffraction grating.
- Transmission gratings.



(Fig.8. Grating Monochromators)

➢ **Sample Holders/Cuvettes**

• The cells or cuvettes are used for handling liquid samples.
•The cell may either be rectangular or cylindrical in nature.
• For study in UV region; the cells are prepared from quartz or fused silica whereas color corrected fused glass is used for visible region. The surfaces of absorption cells must be kept scrupulously clean.
• No fingerprints or a touch should be present on cells.
• Cleaning is carried out washing with distilled water or with dialcohol, acetone.

➢ **Detectors**

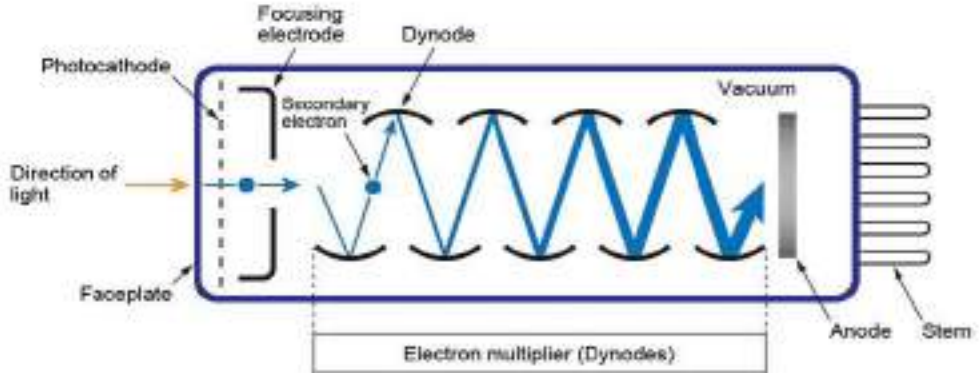
• Device which converts light energy into electrical signals, that are displayed on readout devices. The transmitted radiation falls on the detector which determines the intensity of radiation absorbed by sample .
• The following types of detectors are employed in instrumentation of absorption spectrophotometer .[22]

1. Photomultiplier
2. Phototube /Emissive Cell Detector
3. Photodiode Array
4. Barrier Layer Cellar/Photovoltaic Cell

1) Photo Multiplier Tubes

The principle employed in this detector is that, multiplication of photoelectrons by secondary emission of electrons. In a vacuum tube, a primary photo-cathode is fixed which receives radiation from the sample. Some eight to ten dynodes are fixed each with increasing potential of75-100V higher than preceding one. Near the last dynode is fixed an anode or electron collector electrode. Photo-multiplier is extremely sensitive to light and is best suited where weaker or lower radiation is received.

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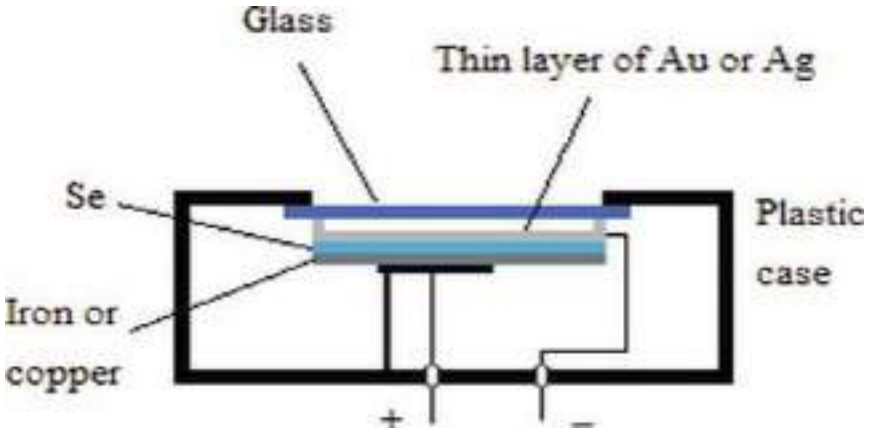


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(Fig.9. The Photomultiplier Tube)

2) Barrier Layer Cell / Photovoltaic Cell

It consists of a thin film metallic layer coated with silver or gold and acts as an electrode. It also has a metal base plate made up of iron which acts as an electrode. These two layers are separated by a semiconductor layer of selenium.

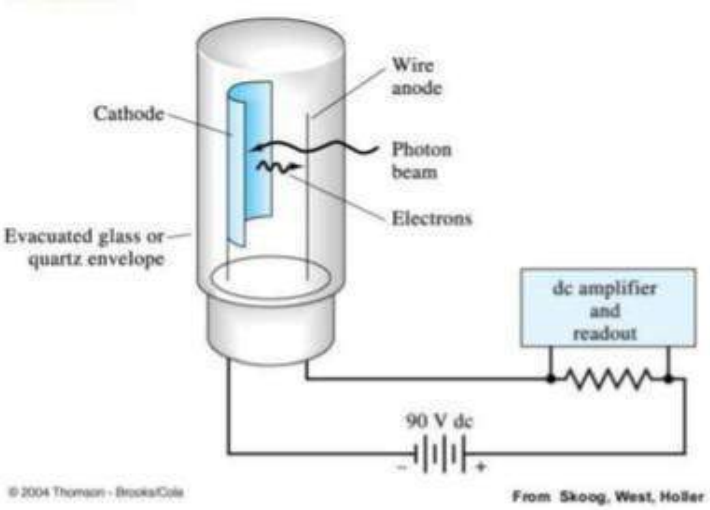


(Fig.10. Barrier Layer Cell / Photovoltaic Cell)

3) Phototubes/Photo Emissive Tubes

It consists of spherical shaped vacuum bulb containing photo emissive cathode and anode. The inner surface of cathode mounted inside bulb is coated with photosensitive material like cesium oxide, potassium oxide or silver oxide. It has anode to attract the electrons.

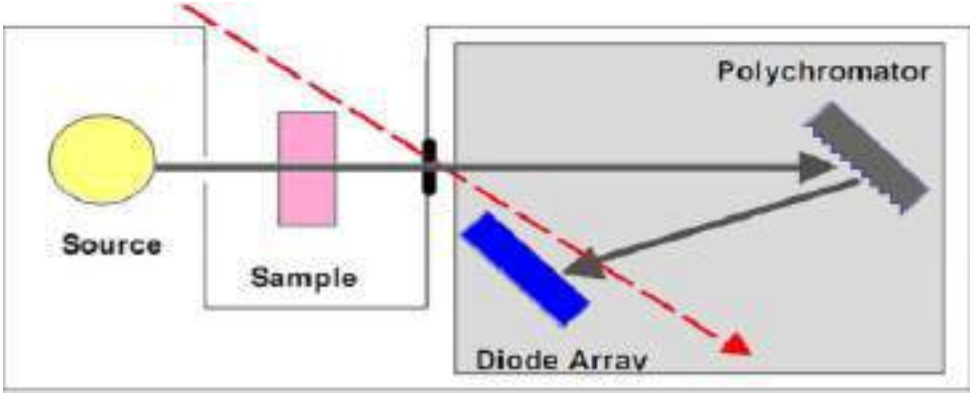
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(Fig.11. Phototubes/Photo Emissive Tubes)

4) Photodiode Array/Multichannel

The photodiode array is positioned at the focal plane of the monochromator (after the dispersing element) such that the spectrum falls on the diode array. They are useful for recording UV-Vis. Absorption spectra of samples that are rapidly passing through a sample flow cell, such as in an HPLC detector.



(Fig.12.Photodiode Array/Multichannel)

Applications Of UV Visible Spectroscopy [23]

1. Structure Elucidation of Organic Compounds.
   I. Effect of conjugation.
   II. Effect of geometrical isomerism.
   III. Effect of number of rigs.
   IV. Effect of substituents.

2. Detection of impurities .
3. Structural elucidation of organic compounds.
4. Quantitative analysis .
5. Qualitative analysis .
6. Chemical analysis .
7. Quantitative analysis of pharmaceutical substance .
8. Dissociation constant of acids and bases .
9. Molecular weight determination .
10. Derivation from the Beer-Lambert law.

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CONCLUSION

UV-Visible Spectroscopy is based on a firm theoretical basis, more selective, efficient, fast and reproducible analytical methods can be developed. In general terms, there are two major measurement techniques; how much analyte is in the sample (quantitative analysis) and which analyte is in the sample (qualitative analysis). The pharmaceutical analysis by UV-Visible Spectroscopy comprises the procedures necessary to determine the "identity, strength, quality and purity" of compounds.

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PINEAPPLE LEAF USED IN POLYHERBAL BANDAGE

Dr. Swati Rawat[1], Dr. Sunil S. Jaybhaye[2], Mr.Vyas Gitesh Vinod[3], Ms. Bhagyashri Shantilal Gaikwad[4], Parvez S. Shaikh[5*]

[1]Principal of Institute of Pharmacy, Badnapur, Jalna
[2]Vice Principal of Institute of Pharmacy Badnapur,Jalna
[3]Guide
[4]Co-Guide
[5]Student
Institute of Pharmacy (NKSPT) Pathrikar Campus ,Badnapur,Jalna 431202

ABSTRACT

Development of pineapple leaf fiber (PALF)-based polymer composites has gain interests due to sustainable and environmental benefits when compared with synthetic-based non-degradable fibers. However, the hydrophilic PALF has poor interfacial bonding with the thermosetting and thermoplastic polymers which are hydrophobic. Moreover, this hydrophilic nature of PLAF leads to more moisture absorption rate, which results in degradation of overall properties. This issue can be addressed by modifying the surface of the fibers. Therefore, a comprehensive understanding of the effect of fiber surface modification on various properties and adhesion with polymers is a key for improving the performance of the PALF and its composites

KEYWORDS : *Pineapple leaf fiber Soil cover – component of pineapple leaves-mechanism of bandage-advantage and disadvantage of bandage*

INTRODUCTION

There is a great deal of potential for large-scale pineapple production in north eastern India. The extraction of pineapple leaf fibre is opening up a market for both commercial and small-scale producers. Numerous other possibilities, such as different fibres that may come from the pineapple, are being researched. [1]The pineapple is an unidentified fruit that is native to tropical regions. An emerging industry that can be used for market opportunities is valuable dietary fibre. The fruit's fibre is a beneficial addition to a wide variety of foods. The fruit's microcrystalline cellulose, which is used in the other area, is visible.*The correspondence's author pharm fibre prosperity in addition to its strong foundation in the north eastern and Assamese regions. Thailand, the Philippines, Costa Rica, China, and India are the world's fastest-growing nations, along with Brazil[2]. The largest region available for pineapple crop cultivation on a productivity scale is Assam. India leads the world in this crop's production, which leads to additional opportunities for fibre production. Nearly 90–95% of the product is organic, and the area generates over 40% of the nation's pineapple[3]. The creation of fibres and textiles with an emphasis on the green environment is a result of rising consumption and living standards .aceutical sectors. Gaining knowledge from creative projects that utilise leaves and stems Concerns about sustainable development have recently sparked initiatives to decrease waste output and increase the efficiency of raw resource use. The use of agricultural waste as a substitute fibre source has been emphasised in this context. By reusing these wastes, the amount of garbage produced will be significantly reduced, which will lessen their impact on the environment[4]. In addition, the agricultural economy will become more diversified as a result of the repurposing of those byproducts for the production of value-added products. One of the most well-known tropical fruits that is grown extensively worldwide is the pineapple. For economic development, pineapple leaves—the plant's main underutilised portion—need international attention. Following the harvest of fruit, the leaves are burned or broken down for disposal. This occurred as a result of farmers' and local communities' misunderstanding of the existence of commercial uses of the antiquated technology used for this purpose. pineapple leaves. A thorough investigation is required to determine the potential of these useful agricultural wastes since plantation yield improvement will result from the in-situ decomposition and burrowing of the leaves [5]. Numerous researchers have conducted studies on different facets of pineapple leaf fibres (PALF). A number of writers have examined the physical, mechanical, and chemical characteristics of PALF from different pineapple species [6, 7]. Additionally, not much investigation has been done on the surface. effects of treatments on the tensile characteristics of PALF [8, 9].

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Drugs

Pineapple leaves themselves are not typically associated with any recreational or psychoactive drug use. However, there are some aspects of pineapple leaves and their potential uses in medicine or alternative health practices that are worth mentioning.



Medicinal Use of Pineapple Leaves

Pineapple leaves contain various bioactive compounds, including bromelain (a mixture of enzymes), antioxidants, and other phytochemicals. These compounds have been studied for various potential health benefits, including:

1]Anti-inflammatory effects: Bromelain has been researched for its ability to reduce inflammation, which could help with conditions like arthritis or sports injuries.[10]

2]Digestive aid: Bromelain may also assist in digestion by breaking down proteins and improving the absorption of nutrients.[11]

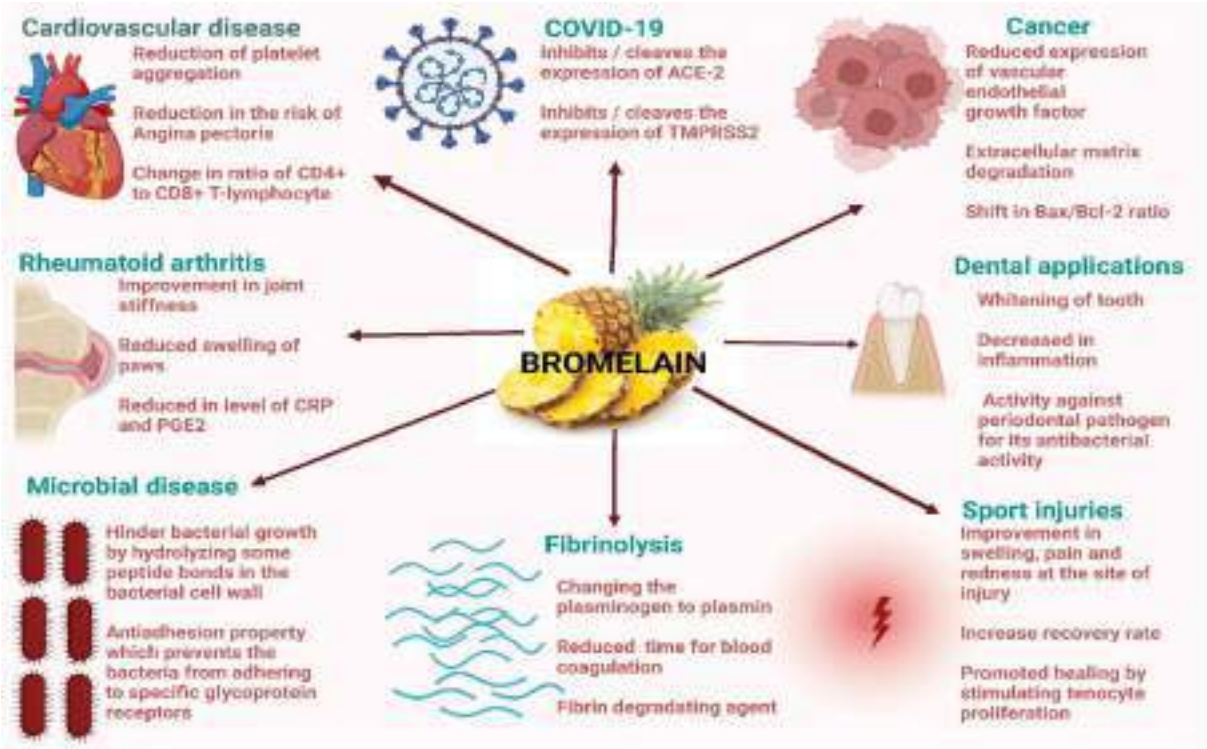
3]Antioxidant properties: Pineapple leaves contain antioxidants that may help combat oxidative stress and support general health[12]

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Key Components of Pineapple Leaves

Bromelain:

Bromelain is a mixture of enzymes found in pineapple, particularly in the stem and leaves. It has various health benefits, including anti-inflammatory, digestive, and potential anticancer properties.[13'14]



Fibers: The leaves are rich in cellulose and lignin, making them suitable for extraction into fibers that can be used in textiles, including Piñatex, a sustainable alternative to leather.[15]



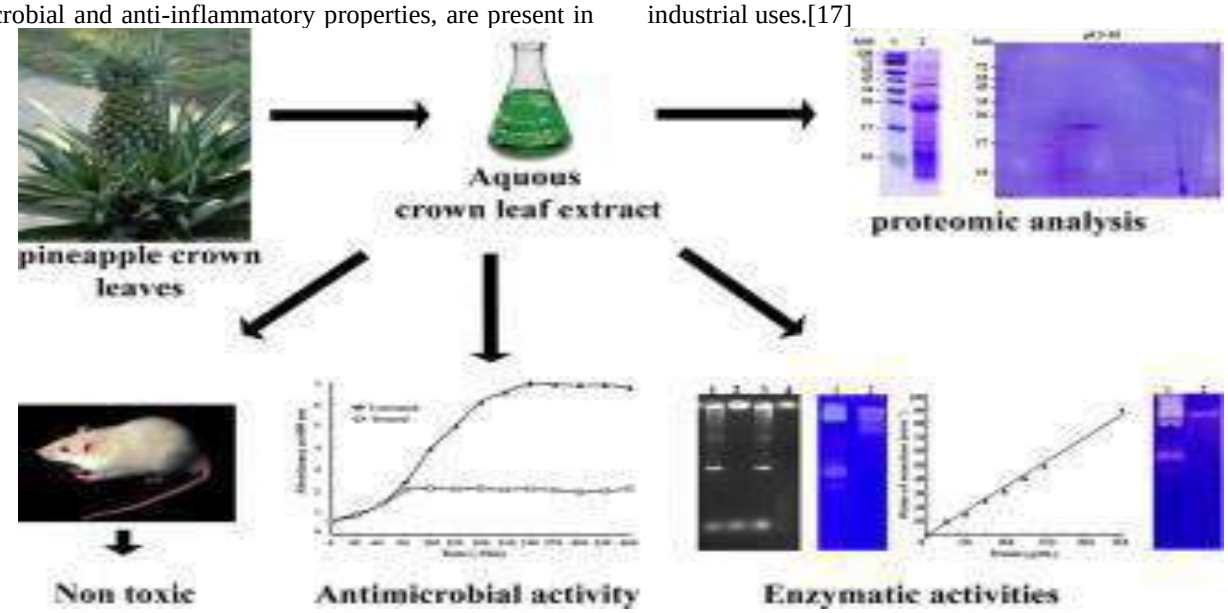
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Flavonoids and Antioxidants

Pineapple leaves contain various antioxidants like flavonoids, which have anti-inflammatory and disease-fighting properties. These antioxidants can be extracted for use in dietary supplements or cosmetics. [16]



Phenolic Compounds: These compounds, which have antimicrobial and anti-inflammatory properties, are present in pineapple leaves and are of interest for various health and industrial uses.[17]



Key Mechanisms of Bandage

- *Hemostasis (controlling bleeding)* through pressure.
- *Protection* from infection by creating a sterile barrier.
- *Moist wound healing* by maintaining a balanced moisture level.
- *Immobilization* to stabilize injured areas and reduce further damage.
- *Absorption* of exudate to prevent excess fluid build-up.
- *Comfort and pain reduction* through cushioning and reducing exposure to irritants.

Advantages of Bandages

1. *Protection of Wounds:*
   - Bandages help protect a wound or injury from dirt, bacteria, and external contaminants, reducing the risk of infection.
2. *Support and Immobilization:*
   - For sprains, strains, or fractures, bandages can help immobilize the injured area, providing support and minimizing movement to allow proper healing.
3. *Control of Bleeding:*
   - Bandages, especially when used with pressure, can help control bleeding by applying gentle pressure to the wound, promoting clotting and reducing blood flow to the injured area.
4. *Pain Reduction:*
   - By stabilizing the injured part of the body, bandages can reduce the amount of movement and therefore help alleviate pain, especially in cases of sprains or strains.
5. *Absorption of Exudate:*
   - Bandages, particularly those with absorbent pads, can absorb wound exudates (fluids that leak from the wound), keeping the wound clean and preventing maceration of surrounding skin.
6. *Compression:*

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- Elastic bandages, such as an ACE bandage, are commonly used to apply compression to reduce swelling, promote circulation, and speed up the healing process in conditions like sprains, strains, or edema.

7. *Aesthetic Coverage:*
   - Bandages help cover up visible wounds, burns, or abrasions, which can also be important for psychological reasons, especially in visible or socially sensitive areas like the face or hands.
8. *Easy Application:*
   - Bandages are relatively simple to use and apply, making them a practical and immediate solution for basic wound care, especially in emergency situations.[18]

Disadvantages of Bandages

1. *Improper Application Can Cause Harm:*
   - If a bandage is applied too tightly, it can restrict blood flow, leading to further tissue damage, swelling, or even the development of more serious complications like ischemia. Conversely, if applied too loosely, it may fail to provide the necessary support, causing the injury to worsen.
2. *Skin Irritation:*
   - Prolonged use of bandages, especially those with adhesive, can lead to skin irritation, allergic reactions, or rashes. People with sensitive skin are particularly vulnerable to such issues.
3. *Infection Risk (If Not Changed Properly):*
   - If bandages are not changed regularly, they can become a breeding ground for bacteria, leading to infection. It is essential to change bandages according to the wound's condition and the advice of healthcare professionals.
4. *Discomfort or Restriction:*
   - Some bandages, especially thick ones or those used for immobilization, can cause discomfort or restrict the range of motion, making it difficult for the person to move freely.
5. *False Sense of Security:*
   - A bandage can sometimes give the false impression that a wound or injury is fully healed or protected, leading individuals to neglect proper medical care or rehabilitation. Over-reliance on bandages can delay proper healing.
6. *Difficulty in Monitoring Wound Healing:*
   - While bandages provide protection, they can sometimes obscure the wound, making it harder for both the patient and healthcare provider to monitor for signs of infection or other complications.
7. *Expensive or Specialized Types:*
   - Some bandages, especially advanced ones like hydrocolloid or antimicrobial dressings, can be costly. Additionally, specialty bandages may not be readily available in all situations or may require medical supervision to apply correctly.
8. *Potential for Compression Injury:*
   - For injuries requiring compression (such as using an elastic bandage for a sprained ankle), if the compression is too tight or not applied correctly, it can cause further injury, such as nerve damage or blood circulation problems.[19]

CONCLUSION

In conclusion, The future of bandages lies in a perfect fusion of material innovation, smart technology, and personalized healthcare. As these developments unfold, bandages will not just be passive wound coverings but active, dynamic agents in promoting healing, preventing infection, and monitoring health. This progression will not only improve the quality of wound care but could also have significant impacts on healthcare efficiency, environmental sustainability, and patient outcomes. The next generation of bandages will undoubtedly play a crucial role in the transformation of modern medicine and wound care.

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COMPLETE STUDY FORMULATION OF EFFERVESCENT TABLET FROM CARICA PAPAYA, MORINGA AND AJWAIN IN DIABETIC

Dr. Swati Rawat[1], Dr. Sunil S Jaybhaye[2], Mr. Gitesh V. Vyas[3], Ms. Bhagyashri S. Gaikwad[4], Rushikesh Laxman Cheke[5]

Institute of Pharmacy, Badnapur

ABSTRACT

Objectives: *Studies show that papaya and bay leaf have significant medicinal properties, including the ability to help with degenerative diseases like diabetes. However, no herbal tablets combining these two plants have been made before. This research aimed to develop tablets using extracts from papaya and bay leaf, combined with different concentrations (1%, 2%, and 3%) of the binder polyvinylpyrrolidone (PVP) K30, prepared through the wet granulation method.*

Methods: *The tablets were evaluated for their physical properties, such as weight variation, friability (resistance to breaking), hardness, disintegration time, and appearance, using standard pharmaceutical methods. The total flavonoid content in the extracts was measured using a spectrophotometer.*

Results: *The tablets were light brown with flat surfaces, a specific smell, and a bitter taste. Their physical properties met pharmaceutical standards. The flavonoid content in papaya and bay leaf extracts was 1.562% and 2.240%, respectively.*

Conclusions: *PVP K-30 can effectively be used as a binder to produce high-quality, ready-to-use tablets from papaya and bay leaf extracts.*

KEYWORDS: *Papaya extract, Bay leaf extract, Tablets, Polyvinylpyrrolidone K30, Flavonoid.*

INTRODUCTION

Medicinal plants play a crucial role in healthcare, with about 80% of the global population relying on traditional medicine, which is mostly plant-based. Traditional medicine encompasses various natural healthcare systems like Ayurveda, Siddha, Unani, and tribal or folk practices. These practices, which date back to ancient times, are primarily based on practical experience rather than modern scientific principles.

In India, around 7,500 plants are used in traditional health practices, especially in rural and tribal areas. However, the medicinal properties of over 4,000 of these plants remain either unknown or poorly understood by the general population.

Classical systems like Ayurveda, Siddha, Unani, and Tibetan medicine utilize about 1,200 plants. Among these, plant-based treatments for liver diseases have been widely used in India and have gained global attention through pharmaceutical advancements. Despite this, many plant-based medicines, including those for liver diseases, are not widely accepted as mainstream treatments.

The process of combining multiple herbs in specific proportions to create tablets is known as herbal tablet formulation (HTF). This approach, rooted in ancient medical systems like Ayurveda, is based on the idea that combining herbs in the right ratio can effectively treat various diseases, including diabetes.

COUNTRY NAME	2000	2030
India	31.7	79.4
China	20.8	52.8
Europe	28.3	37.4
Australia	0.9	1.7
United States canada	19.7	33.9

Prevalence of diabetic: Estimated number of people region wise for the year 2000-2030

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MATERIAL AND METHOD

This experimental study measured blood glucose levels in male rats before and after treatment to evaluate the antidiabetic effects of Moringa leaves and papaya seeds.

The chemical compounds from Moringa leaves and papaya seeds were extracted using maceration with 96% ethanol as the solvent.

Antidiabetic activity was tested by monitoring the blood glucose levels of male rats induced with 10% glucose. The rats were divided into six groups: negative control, positive control, glibenclamide (5 mg), and groups treated with single or combined extracts.

Preparation of Moringa Leaf Extract

Fresh Moringa leaves (M. Oleifera) were sorted, washed, and weighed (2 kg wet weight). The leaves were dried, blended into powder, and sieved with a 40-mesh sieve. A powdered leaves were soaked (macerated) in 96% ethanol in a 1:5 ratio for three days with occasional stirring.

The mixture was then filtered, and the residue was soaked again with fresh ethanol. This process was repeated three times. The collected extract was filtered and concentrated using a rotary evaporator at 40°C. The final thick extract was collected, weighed, and stored.

Preparation of Papaya Seed Extract

Fresh papaya seeds (C. Papaya L.) were sorted, washed, and weighed (2 kg wet weight). After drying, They were ground into powder using a blender and sieved through a 100-mesh sieve. A powdered seeds were macerated in 96% ethanol in a 1:3 ratio for three days with occasional stirring.

The mixture was filtered, and the residue was re-soaked with fresh ethanol. This process was repeated three times.

The extract was then filtered and concentrated using a rotary evaporator at 50°C. The final thick extract was collected, weighed, and stored.

CARICA PAPAYA





MORINGA

EXTRACTION OF MCERATION PROCESS

Preparation of Plant Extracts

1. Carica papaya Leaves:

The leaves were washed under running tap water for 5 minutes and dried naturally. A total of 25 g of dried leaf powder was soaked in 250 ml of 75% ethanol for 72 hours.

The mixture was then filtered using Whatman No. 41 filter paper, and the filtrate was concentrated using a rotary evaporator at 45°C under reduced pressure.

2. Moringa oleifera Leaves:

Leaves were collected from mature plants and dried at 40°C for two days. To extract bioactive compounds, 25 g of powdered

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leaves were soaked in 80% ethanol for 72 hours at room temperature with occasional stirring.

The solvent was removed using a rotary vacuum evaporator, and the extract was stored in a dark container at 4°C for further analysis.

Development and Evaluation of Herbal Tablet Formulation (HTF)

To prepare herbal tablets, extracts from three plants were used:

Carica papaya (leaves)
Moringa oleifera (leaves)
Carrissa carandus (fruit)

The extracts were analyzed to identify active compounds and underwent phytochemical screening. The herbal tablets were formulated using the wet granulation method with the following excipients:

Microcrystalline cellulose: Binder
Starch: Filler
Cros-povidone: Disintegrant
Aerosol: Flow enhancer
Vanillin: Flavoring agent
Magnesium stearate: Lubricant

This process resulted in the development of a herbal tablet containing the combined benefits of the three plant extracts.

MECHANISM OF EFFERVESCENT

Effervescent Tablets



EFFERVESCENT TABLET IN GLASS WATER

Effervescent tablets are designed to dissolve in water, releasing carbon dioxide to form a fizzy solution.

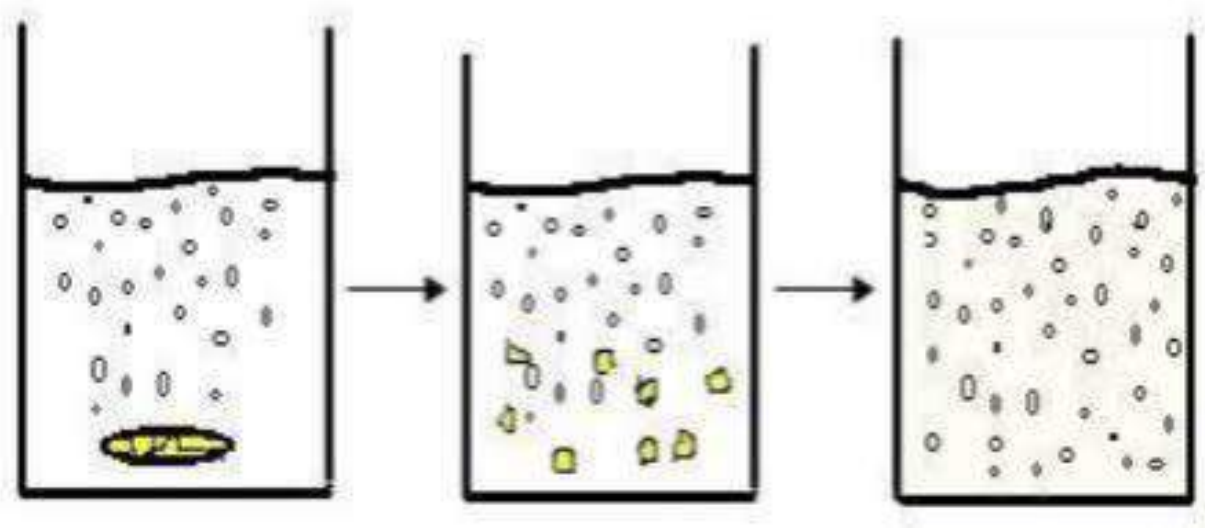
These tablets are made by compressing powdered ingredients into dense masses and are typically packaged in blister packs or hermetically sealed containers with desiccants to protect them from moisture. To use, the tablet is simply dropped into water to create a solution.

In addition to tablets, effervescent formulations are available as powders or granules. These powdered ingredients are often granulated before being compressed into tablets.

Effervescent tablets are increasingly popular in both the supplement and pharmaceutical industries due to their convenience and ease of consumption.

They dissolve quickly in liquids like water or juice, making them a preferred choice for people using them medicinally or as dietary supplements.

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MECHANISM of Effervescent

ADVANTAGES OF EFFERVESCENT TABLET

Quick action.
No need to swallow a tablet.
Gentle on the stomach and intestines.
Easy to carry and use.
Better taste.
Stable over time.
Consistent and reliable effects.
Can include large amounts of active ingredients.
Precise dosing.
Enhanced therapeutic effects.
Useful in remote areas where injections are costly or require trained personnel.

Disadvantages of Effervescent Tablets

Some ingredients may taste unpleasant.
Tablets are large and need special packaging.
Production is expensive due to costly ingredients and facilities.
A clear solution is preferred for consumption, though fine dispersions are now acceptable.

DRY GRANULATION

Dry granulation is a process where powders are compressed without using heat or solvents. It is considered the least preferred method of granulation. The process involves two main steps: compressing the powder mixture into a compact form and then milling the compact to produce granules.

There are two common methods for dry granulation:

1. Slugging: The powder is compressed into large tablets or "slugs," which are then broken down into granules.
2. Roller compaction: The powder is compressed between rollers to form a dense sheet, which is then milled into granules.

Methodology for Tablet Formulation

1. Preparation of Granules

All solid ingredients and excipients were sieved using sieve number 80.
Each material was weighed accurately using an electronic balance.
The active ingredient was mixed with diluents (microcrystalline cellulose and lactose) to form a dry powder, which was passed through sieve number 44.
Starch and methyl paraben were added to the mixture.
A paste of polyvinyl pyrrolidone was prepared by mixing it with isopropyl alcohol. This paste was added to the dry mixture to form a wet mass.

The wet mass was passed through sieve number 14 and dried in a tray dryer at 40°C for 30 minutes.
The dried granules were passed through sieve number 22.
Finally, the granules were lubricated with talc and magnesium stearate.

2. Compression of Tablets

The granules were evaluated and weighed to ensure a uniform weight of 500 mg per tablet.
Tablets were compressed using the RIMEK MINI PRESS-I machine and further evaluated.

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EVALUATION OF EFFERVESCENT TABLET

Pre-Compression Parameter: Angle of Repose

The angle of repose is the steepest angle formed between the surface of a powder pile and the horizontal ground. It measures the flow properties of the powder, as it reflects the friction between the particles.

The angle of repose (θ) can be calculated using the formula:

$\tan \theta = H / R$

Or

$\Theta = \tan^{-1} (H / R)$

Where:

Θ is the angle of repose

H is the height of the powder pile

R is the radius of the base of the pile

Procedure:

The powder is allowed to flow through a funnel fixed at a specific height onto a flat surface. The height (H) and radius (R) of the resulting powder heap are measured. Care is taken to ensure that the powder particles slide and roll smoothly through the funnel.

1. Angle of Repose (degrees)

20: Excellent flow

20-30: Good flow

30-34: Passable flow

40: Very poor flow

The angle of repose measures how easily a powder flows. A lower angle indicates better flow properties, while a higher angle suggests poor flow.

2. Flow Rate

Flow rate refers to how fast a mass of powder or granules flows through a funnel with a defined opening. To measure the flow rate:

1. Accurately weigh the powder.
2. Pour it into a funnel with an 8 mm opening.
3. Measure the time it takes for the powder to flow out completely using a stopwatch.

Flow Rate Formula:

Flow Rate = Weight of Granules / Time (seconds)

The flow rate indicates how easily the powder flows.

3. Bulk Density

Bulk density is the mass of the powder divided by its volume. To measure bulk density:

1. Pass 50 cm^3 of powder through a standard sieve (No. 20).
2. Fill a 100 ml graduated cylinder with the powder.
3. Drop the cylinder onto a hard surface from a height of 1 inch, three times.
4. Measure the final volume and divide the weight by this volume.

Bulk Density Formula:

Bulk Density (ρ) = Mass of Sample (M) / Final Volume (Vp)

4. Tapped Density

Tapped density is the mass of the powder divided by its tapped volume. To measure tapped density:

1. Pass 50 cm^3 of powder through a standard sieve (No. 20).
2. Fill a 100 ml graduated cylinder with the powder.
3. Drop the cylinder onto a hard surface from a height of 1 inch, 100 times.
4. Measure the final tapped volume and divide the weight by this volume.

Tapped Density Formula:

Tapped Density (Dt) = Mass of Sample (M) / Final Tapped Volume (Vt)

5. Carr's Index

method for measuring powder flow and density includes calculating the percentage of the powder's ability to settle or pack, which is important for determining the powder's suitability for processing.

Compressibility of Powder

The compressibility of a powder measures its potential to form strong and stable bridges or arches when compacted. It is often evaluated using Carr's Index, which is calculated using the following formula:

$\%\ \text{Compressibility} = (Df - Do) / Df \times 100$

Where:

Df is the fluff or poured (bulk) density.

Do is the tapped (consolidated) density.

Carr's Index and Powder Flow

The Carr's Index indicates how easily a powder flows, with a lower value suggesting better flow properties. Here's the classification based on Carr's Index:

5-15%: Excellent flow

12-16%: Good flow

18-21%: Fair to passable flow

23-35%: Poor flow

33-38%: Very poor flow

>40%: Extremely poor flow

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This index helps determine how the powder behaves during handling and processing

CONCLUSION

Herbal tablets were prepared using the wet granulation method with extracts from three plants:
Carica papaya (leaves)
Moringa oleifera (leaves)
Among the formulations, HTF-3 showed the best results in both pre-compression and post-compression evaluations. It was found to be suitable for oral administration and demonstrated effective pharmacological properties.

The formulations HTF-1, HTF-2, and HTF-3 showed standard values within acceptable limits. The results indicate that the developed formulations are suitable for oral administration and effective for pharmacological evaluation.

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BENEFITS OF AI ADOPTION IN ACCOUNTING INFORMATION SYSTEMS: PERSPECTIVES FROM INDIAN ACCOUNTING PROFESSIONALS

Chetan Kapasia[1], Dr. S. S. Sodha[2]
[1]*Senior Research Fellow, School of Commerce, Gujarat University, Ahmedabad*
ORCID- 0009-0006-8559-9623
https://www.researchgate.net/profile/Chetan-Kapasia
[2]*Professor, School of Commerce, Gujarat University, Ahmedabad*

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ABSTRACT

Purpose: *This study examines the benefits of AI in accounting, focusing on work efficiency, data quality, and financial management effectiveness, and explores demographic influences on AI familiarity.*
Methodology: *Descriptive, correlation, and regression analyses were conducted using data from 83 accounting professionals.*
Findings: *AI is perceived to enhance efficiency, data quality, and reduce workload. Significant findings include a negative correlation between age and AI familiarity, while education did not show a significant relationship. Only financial reporting tasks showed a marginal impact on data quality.*
Practical Implications: *The study provides insights into AI's role in accounting and highlights the need for strategic implementation and training.*
Originality/Value: *This research enhances understanding of AI's integration into accounting practices and demographic impacts.*
KEYWORDS: *Artificial Intelligence (AI), Accounting Information System, Benefits, Accounting technology*

1. INTRODUCTION

The integration of Artificial Intelligence (AI) into accounting marks a pivotal transformation in modern financial practices, reshaping the landscape of decision-making, auditing, and financial management. As businesses strive to adapt to a rapidly digitalizing world, AI has emerged as a critical tool, allowing accounting professionals to manage increasing complexities with greater efficiency and accuracy (Zhang et al., 2020).

Historically, accounting has evolved through generations of technological innovations, from the use of abacuses and double-entry bookkeeping to advanced computerized accounting systems. The current wave of AI technologies, including machine learning, robotic process automation, and data analytics, represents a continuation of this trend, fundamentally altering the traditional roles of accountants (Akhter & Sultana, 2018). AI-powered tools augment human expertise by streamlining workflows, enhancing financial reporting accuracy, and uncovering strategic insights that were previously inaccessible (Kroon et al., 2021). The ability to process vast volumes of data at unprecedented speeds signals a profound shift from manual tasks to a more data-driven and analytical approach (Zhang et al., 2020)

Moreover, the increasing reliance on AI-driven automation reflects the rising importance of technological proficiency for accounting professionals. As AI takes over repetitive and rule-based tasks, accountants are now required to develop skills that blend financial acumen with technological expertise, ensuring they remain relevant in an industry undergoing rapid transformation (Akhter & Sultana, 2018). AI adoption has become essential, not only for increasing operational efficiency but also for responding to growing data volumes, regulatory complexity, and the demand for real-time insights (Hasan, 2022).

The significance of this technological shift extends beyond automation. AI adoption in accounting is closely linked to the broader integration of emerging technologies such as blockchain, particularly among small and medium enterprises (SMEs) (Polas et al., 2022). These technologies are transforming financial operations by improving transparency, reducing errors, and enhancing decision-making processes. Despite the clear advantages, the adoption of AI is not uniform across regions and firm sizes. Larger firms in developed countries, such as the United States and the United Kingdom, have been quicker to embrace AI technologies, while smaller firms and those in emerging economies face barriers such as cost, lack of resources, and limited awareness (Luo et al., 2018). The historical trajectory of technology in accounting serves as a critical backdrop to this transformation. From manual ledger entries to the current state of AI integration, the evolution of accounting processes reveals a continuous push toward innovation and optimization (Hasan, 2022). AI is not only revolutionizing the industry but also challenging traditional skillsets, as professionals must now balance advanced technical

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knowledge with critical thinking and strategic analysis (Akhter & Sultana, 2018).

Despite its promises, AI's integration into accounting also presents challenges. Concerns about data security, job displacement, and the need for upskilling loom large as professionals navigate this shift (Yanling Shi, 2019). Addressing these concerns will require a multifaceted approach that includes the development of clear ethical guidelines, ensuring robust data privacy measures, and rethinking the educational curriculum to prepare future accountants for a world driven by AI (Cindy L. Greenman, 2017).

2. LITERATURE REVIEW

In *Riding the Waves of Artificial Intelligence in Advancing Accounting and Its Implications for Sustainable Development Goals* (Peng et al., 2023) explore the transformative role of AI in accounting, focusing on how AI-driven efficiency and real-time data analysis can streamline operations and support Sustainable Development Goals (SDGs). By automating repetitive tasks, AI reduces resource consumption and enhances accuracy, thereby fostering sustainable practices within organizations and promoting economic growth aligned with SDG objectives.(Peng et al., 2023).

Kureljusic and Karger, in *Forecasting in Financial Accounting with Artificial Intelligence* (2023), investigate the use of AI for improving accuracy in financial forecasting. They highlight AI's ability to predict financial trends and identify risks such as bankruptcy, while noting challenges in integrating AI with traditional forecasting models. The authors suggest that further research should focus on the sociotechnical aspects of AI to better understand and implement these technologies within accounting(Kureljusic & Karger, 2023).

In their study *Usage and Impact of Artificial Intelligence on Accounting: Evidence from Malaysian Organisations* (2020), Lee and Tajudeen analyze the implementation of AI in Malaysian accounting firms. They report that AI tools enhance productivity, especially in tasks like invoice processing and risk assessment, although adoption remains low due to cost and limited awareness. The study emphasizes the importance of AI integration in Malaysia's accounting industry to align with global trends (Lee & Tajudeen, 2020).
Losbichler and Lehner discuss the limitations of AI in *Limits of Artificial Intelligence in Controlling and the Ways Forward: A Call for Future Accounting Research* (2021), particularly in complex decision-making processes. They argue that while AI is effective in automating routine tasks, its efficacy in nuanced decision-making is constrained. They advocate for a research focus on collaborative models where human expertise complements AI in tackling sophisticated accounting challenges (Losbichler & Lehner, 2021).

Vărzaru's *Assessing Artificial Intelligence Technology Acceptance in Managerial Accounting* (2022) examines AI adoption in Romanian managerial accounting, identifying resistance to change and job security concerns as primary barriers. Vărzaru suggests that increasing educational programs and skill development can help bridge the acceptance gap, making AI adoption smoother and more effective in managerial decision-making (Vărzaru, 2022).

Bako and Tanko, in *The Place of Artificial Intelligence in Accounting Field and the Future of Accounting Profession* (2022), discuss AI's potential to streamline accounting processes while asserting that human judgment remains essential. They highlight the need for accountants to upskill in digital technologies and recommend that academic curricula evolve to include AI to better prepare future professionals (Bako & Tanko, 2022).

In *The Interest, Knowledge, and Usage of Artificial Intelligence in Accounting: Evidence from Accounting Professionals* (2021), Johnson et al. examine how accounting professionals perceive AI. Their findings show that while there is high interest in AI, actual implementation remains limited. They suggest that increasing familiarity and practical exposure to AI among accountants could facilitate its broader integration, especially as professionals recognize AI's potential to enhance accuracy and efficiency (Johnson et al., 2021).

Li and Zheng, in *The Impact of Artificial Intelligence on Accounting* (2018), explore how AI can mitigate financial fraud by implementing automated checks and balances, especially in small and medium-sized enterprises. They argue that AI's role in improving the quality of accounting information is substantial, as it can reduce human error and enhance data reliability through automation. The authors assert that AI's role in fraud prevention and data accuracy is pivotal in modernizing the accounting industry (Li & Zheng, 2018).

Zhang et al., in *The Impact of Artificial Intelligence and Blockchain on the Accounting Profession* (2020), assess the influence of AI and blockchain on the future of accounting. They highlight the capabilities of AI in automating data recognition, invoice processing, and report generation, which reduces dependency on basic accounting roles. The study also explores blockchain's role in secure data verification, which can aid in preventing fraud and improving the reliability of financial records. The authors recommend that educational institutions incorporate these technologies into curricula to prepare future accountants for a technologically advanced industry (Zhang et al., 2020).

3. RESEARCH METHODOLOGY

3.1. Research Questions

The study addresses the following research questions:

1. What is the relationship between experience in the accounting profession and belief in AI adoption?
2. How does familiarity with AI influence belief in AI adoption?
3. What is the impact of demographic factors (age, gender, education) on belief in AI adoption?

3.2. Research Aim

The primary aim of this research is to investigate the relationship between accounting professionals' experience, familiarity with AI, current AI usage, and demographic factors, and their belief in the adoption of AI in accounting practices.

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Additionally, the study examines the correlation between education level and familiarity with AI, as well as the benefits perceived from using AI for specific accounting tasks.

3.3. Research Objectives

The study was conducted with the following key objectives:

1. To assess the impact of experience in the accounting profession on the belief in AI adoption.
2. To examine the relationship between familiarity with AI and the belief in its adoption in accounting practices.
3. To determine the influence of current AI usage on the belief in AI adoption.
4. To analyze the effect of demographic factors such as age, gender, and education on the belief in AI adoption.
5. To investigate the correlation between education qualifications and familiarity with AI among accounting professionals.
6. To evaluate the association between specific accounting tasks performed using AI and the reported benefits of AI usage.
7. To study the correlation between age and familiarity with AI among accounting professionals.

3.4. Sampling Design

The study used data collected from 102 accounting professionals through a survey. A non-probability sampling method was employed, where participants were selected based on their willingness to participate and their relevance to the study. This method ensured the inclusion of a diverse range of accounting professionals with varying experience, familiarity, and use of AI in accounting practices.

3.5. Sources of Data

Primary data were collected through a structured questionnaire distributed to accounting professionals using survey. The questionnaire focused on collecting information regarding experience, familiarity, and usage of AI in accounting, as well as demographic details. Secondary data were obtained from existing literature on AI adoption in accounting practices.

3.6. Research Tools

The following statistical tests and data management tools were used for the analysis: I. Mean and paired t-test for comparing variables. II. Data management software, including Jamovi, SPSS, and MS Excel, were used for statistical analysis and data handling.

3.7. Limitations of the Study

The study faced certain limitations:

1. The geographic focus on Indian professionals may limit the relevance of the findings in an international context.
2. Rapid technological advancements in AI may render some findings less applicable in future scenarios.

4. DATA ANALYSIS AND FINDINGS

4.1. Reported Benefits of AI Usage:

Descriptive Statistics

	Minimum	Maximum	Mean	Std. Deviation
Improved the work efficiency	1	5	4.06	0.966
Improved the Time efficiency.	1	5	3.94	1.345
Improved the quality of our accounting information.	1	5	3.76	1.200
Improved the effectiveness of financial data.	1	5	3.82	1.074
Reduced work load	1	5	3.82	1.237

Table 1

Descriptive statistics were calculated to examine the reported benefits of artificial intelligence (AI) usage in the organization. To assess the perceived benefits of AI in work efficiency, time efficiency, quality, and workload, descriptive statistics showed that 'Improved work efficiency' had a mean of 4.06 (SD = 0.966) on a 5-point scale, indicating a positive perception among respondents. 'Time efficiency' followed with a mean of 3.94 (SD = 1.345), reflecting moderate variability in responses

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4.2. Usage of Various AI Tools Among Accounting Professionals

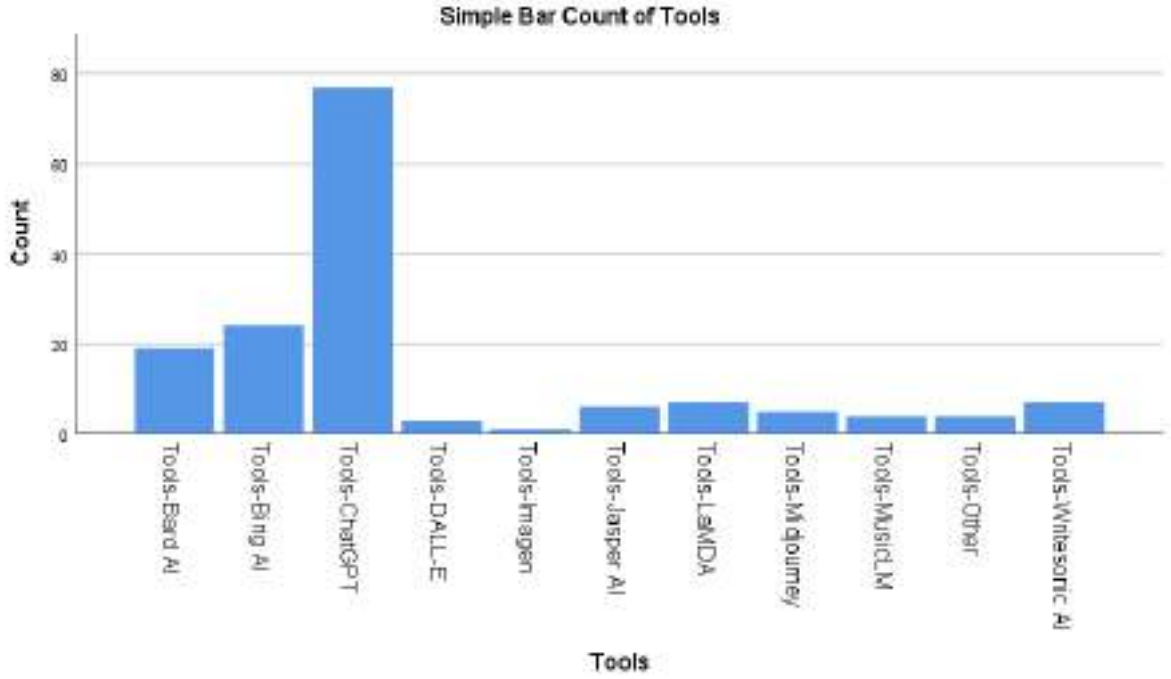


Chart 1

Among the listed AI tools, "ChatGPT" has the highest mean usage score of 0.93, suggesting that it is the most frequently used tool among the respondents, with a relatively low standard deviation of 0.261.

In contrast, "Bard AI" has a mean usage score of 0.23, with a higher standard deviation of 0.423, suggesting more variability in its usage among respondents.

"Midjourney" and "DALL-E" have mean scores of 0.06 and 0.04, respectively, with relatively low standard deviations, indicating less frequent usage compared to other tools.

4.3. Hypothesis 1:

H0: There is no significant relationship between experience in the accounting profession and belief in AI adoption.
H1: There is a significant relationship between experience in the accounting profession and belief in AI adoption.

		Do you believe that AI should be used in the field of accounting?
What is your experience in accounting profession?	Correlation Coefficient	-0.163
	Sig. (2-tailed)	0.14
	N	83
	Sig. (2-tailed)	.

Table 2

To investigate the relationship between experience in the accounting profession and belief in AI adoption, a Spearman's rho correlation was calculated.

The correlation coefficient between experience in the accounting profession and belief in AI adoption was found to be -.163, indicating a weak negative correlation. However, the correlation was not statistically significant (p = .140, 2-tailed).

This result suggests that there is no significant relationship between experience in the accounting profession and belief in AI adoption among the participants.

4.4. Hypothesis 2

H0: There is no significant relationship between familiarity with AI and belief in AI adoption.
H1: There is a significant relationship between familiarity with AI and belief in AI adoption.

		Do you believe that AI should be used in the field of accounting?
How familiar are you with artificial intelligence (AI)? [Familiarity]	Correlation Coefficient	0.195
	Sig. (2-tailed)	0.078
	N	83

Table 3

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A Spearman's rho correlation was conducted to investigate the relationship between familiarity with artificial intelligence (AI) and belief in AI adoption among the participants.

The correlation coefficient between familiarity with AI and belief in AI adoption was found to be 0.195, indicating a weak positive correlation. However, the correlation did not reach statistical significance (p = 0.078, 2-tailed).

Based on the data, there is no significant relationship between familiarity with AI and belief in AI adoption among the participants. This suggests that greater familiarity with AI may slightly increase the belief in its adoption.

4.5. Hypothesis 3

H0: There is no significant relationship between current AI usage and belief in AI adoption.
H1: There is a significant relationship between current AI usage and belief in AI adoption

	Are you currently using AI in your daily tasks?	N	Mean	Std. Deviation	Std. Error Mean
Do you believe that AI should be used in the field of accounting?	Yes	29	2.76	.577	.107
	N0	54	2.33	.752	.102

Table 4

		t-test for Equality of Means					
		F	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference
Do you believe that AI should be used in the field of accounting?	Equal variances assumed	10.211	2.652	81	0.01	0.425	0.16
	Equal variances not assumed		2.871	71.172	0.005	0.425	0.148

Table 5

To test the hypothesis regarding the relationship between current AI usage and belief in AI adoption, an independent samples t-test was conducted. The analysis involved comparing the mean belief in AI adoption scores between respondents who are currently using AI in their daily tasks and those who are not.

Group statistics revealed that the mean belief in AI adoption score for participants currently using AI (M = 2.76, SD = 0.577) was higher than for those not currently using AI (M = 2.33, SD = 0.752).

The assumption of equal variances was violated (Levene's test: F = 10.211, p = 0.002), suggesting unequal variances between the two groups. Therefore, the t-test assuming unequal variances was reported.

The t-test results indicated a significant difference in mean belief in AI adoption scores between the two groups (t(71.172) = 2.871, p = 0.005). The mean difference in belief in AI adoption scores was 0.425, with a standard error of 0.148.

The 95% confidence interval for the difference in means ranged from 0.130 to 0.721. This suggests that participants currently using AI in their daily tasks tend to have a significantly higher belief in AI adoption compared to those not using AI.

4.6. Hypothesis 4:

H0: There is no significant association between demographic factors (age, gender, education) and belief in AI adoption.
H1: There is a significant association between demographic factors (age, gender, education) and belief in AI adoption.

Age

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	46.222[a]	12	.000
Likelihood Ratio	44.604	12	.000
Linear-by-Linear Association	6.232	1	.013
N of Valid Cases	83		

Table 6

A cross-tabulation was conducted to examine the association between age and belief in AI adoption among respondents. The analysis included data from 83 participants.

The cross-tabulation revealed varying belief in AI adoption across different age groups. Among respondents aged 20-25 years, 18 believed AI should be used in accounting, while 4 did

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not and 6 were unsure. In contrast, among respondents aged 25-30 years, the majority (23) believed in AI adoption, with fewer (2) expressing uncertainty and only 2 opposing AI adoption.

A chi-square test was performed to determine the association between age and belief in AI adoption. The results indicated a significant association ($\chi^2(12) = 46.222$, $p < .001$), suggesting that age is significantly associated with belief in AI adoption among the participants.

Gender

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	2.055[a]	2	.358
Likelihood Ratio	2.010	2	.366
Linear-by-Linear Association	.097	1	.756
N of Valid Cases	83		

Table 7

Another cross-tabulation was conducted to explore the association between gender and belief in AI adoption. The analysis included data from 83 respondents.

The cross-tabulation revealed that both male and female respondents had varying beliefs in AI adoption. Among males, 35 believed AI should be used in accounting, while among females, 16 held the same belief. Similarly, there were variations in the "maybe" and "no" categories.

A chi-square test was conducted to assess the association between gender and belief in AI adoption. The results indicated no significant association between gender and belief in AI adoption ($\chi^2(2) = 2.055$, $p = .358$).

Education Qualification

Chi-Square Tests

	Value	df	Asymptotic Significance (2-sided)
Pearson Chi-Square	14.961[a]	6	.021
Likelihood Ratio	15.016	6	.020
Linear-by-Linear Association	.428	1	.513
N of Valid Cases	83		

Table 8

A third cross-tabulation was performed to investigate the association between education qualification and belief in AI adoption. The analysis involved data from 83 participants.

The cross-tabulation displayed differing beliefs in AI adoption across different education qualifications. For example, among respondents with post-graduation qualifications, 25 believed AI should be used in accounting, while only 3 opposed it.

A chi-square test was conducted to examine the association between education qualification and belief in AI adoption. The results indicated a significant association ($\chi^2(6) = 14.961$, $p = .021$), suggesting that education qualification is significantly associated with belief in AI adoption among the participants.

4.7. Hypothesis 5

H0: There is no significant correlation between education qualification and familiarity with AI among accounting professionals.

H1: There is a significant correlation between education qualification and familiarity with AI among accounting professionals.

		Education Qualification
How familiar are you with artificial intelligence (AI)? [Familiarity]	Pearson Correlation	-.051
	Sig. (2-tailed)	.648
	N	83

Table 9

To test the hypothesis regarding the correlation between education qualification and familiarity with artificial intelligence (AI), a Pearson correlation coefficient was calculated. The analysis included data from 83 respondents.

The Pearson correlation coefficient between education qualification and familiarity with AI was found to be -0.051. This indicates a very weak negative correlation between the two variables. However, the correlation was not statistically significant ($p = 0.648$, 2-tailed).

Based on the data, there is no significant correlation between education qualification and familiarity with AI among accounting professionals.

4.8. Hypothesis 6:

H0: There is no significant association between specific accounting tasks using AI and reported benefits of AI usage.

H1: There is a significant association between specific accounting tasks using AI and reported benefits of AI usage.

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Improved Work Efficiency

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	5.457	5	1.091	1.266	.345[b]
	Residual	9.484	11	.862		
	Total	14.941	16			

Table 10

a. Dependent Variable: Improved the work efficiency

b. Predictors: (Constant), Task-Auditing, Task-Tax preparation, Task-Payroll, Task-Financial reporting, Task-Bookkeeping

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.890	.601		6.474	.000
	Task-Bookkeeping	-.637	.605	-.310	-1.052	.315
	Task-Payroll	.705	.518	.343	1.361	.201
	Task-Financial reporting	.322	.506	.172	.636	.538
	Task-Tax preparation	.503	.613	.227	.821	.429
	Task-Auditing	.300	.545	.160	.551	.593

Table 11

a. Dependent Variable: Improved the work efficiency

The regression analysis for improved work efficiency revealed a nonsignificant relationship ($F(5,11) = 1.266$, $p = .345$) between specific accounting tasks using AI and reported benefits. None of the specific accounting tasks showed a significant effect on improved work efficiency.

Improved Time Efficiency

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.162	5	.832	.369	.859[b]
	Residual	24.780	11	2.253		
	Total	28.941	16			

Table 13

a. Dependent Variable: Improved the Time efficiency.

b. Predictors: (Constant), Task-Auditing, Task-Tax preparation, Task-Payroll, Task-Financial reporting, Task-Bookkeeping

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.526	.971		3.631	.004
	Task-Bookkeeping	-.114	.978	-.040	-.117	.909
	Task-Payroll	.433	.837	.151	.516	.616
	Task-Financial reporting	.686	.819	.262	.838	.420
	Task-Tax preparation	.412	.990	.134	.416	.685
	Task-Auditing	-.109	.881	-.042	-.124	.904

Table 14

a. Dependent Variable: Improved the Time efficiency.

For improved time efficiency, the regression analysis showed no significant relationship ($F(5,11) = 0.369$, $p = .859$) between specific accounting tasks using AI and reported benefits. None of the specific accounting tasks significantly influenced improved time efficiency.

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Improved Quality of Accounting Information:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	12.725	5	2.545	2.709	.078[b]
	Residual	10.333	11	.939		
	Total	23.059	16			

Table 15

a. Dependent Variable: Improved the quality of our accounting information.

b. Predictors: (Constant), Task-Auditing, Task-Tax preparation, Task-Payroll, Task-Financial reporting, Task-Bookkeeping

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.152	.627		5.025	.000
	Task-Bookkeeping	-.530	.632	-.207	-.839	.419
	Task-Payroll	1.030	.541	.403	1.905	.083
	Task-Financial reporting	1.182	.529	.506	2.235	.047
	Task-Tax preparation	.121	.639	.044	.190	.853
	Task-Auditing	.212	.569	.091	.373	.716

Table 16

a. Dependent Variable: Improved the quality of our accounting information.

The regression analysis for improved quality of accounting information indicated a marginally significant relationship ($F(5,11) = 2.709$, $p = .078$) between specific accounting tasks using AI and reported benefits. However, only the task of financial reporting showed a significant effect on improving the quality of accounting information ($\beta = .506$, $p = .047$).

Improved Effectiveness of Financial Data:

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	7.325	5	1.465	1.446	.283[b]
	Residual	11.145	11	1.013		
	Total	18.471	16			

Table 17

a. Dependent Variable: Improved the effectiveness of financial data.

b. Predictors: (Constant), Task-Auditing, Task-Tax preparation, Task-Payroll, Task-Financial reporting, Task-Bookkeeping

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.291	.651		5.052	.000
	Task-Bookkeeping	-.335	.656	-.147	-.511	.619
	Task-Payroll	1.040	.562	.455	1.852	.091
	Task-Financial reporting	.512	.549	.245	.933	.371
	Task-Tax preparation	.205	.664	.084	.309	.763
	Task-Auditing	.371	.591	.177	.627	.543

Table 18

a. Dependent Variable: Improved the effectiveness of financial data.

For improved effectiveness of financial data, the regression analysis revealed no significant relationship ($F(5,11) = 1.446$, $p = .283$) between specific accounting tasks using AI and reported benefits. None of the specific accounting tasks significantly influenced the effectiveness of financial data.

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Reduced Workload

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	4.848	5	.970	.544	.740[b]
	Residual	19.623	11	1.784		
	Total	24.471	16			

Table 19

a. Dependent Variable: Reduced work load

b. Predictors: (Constant), Task-Auditing, Task-Tax preparation, Task-Payroll, Task-Financial reporting, Task-Bookkeeping

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.518	.864		4.070	.002
	Task-Bookkeeping	-.131	.871	-.050	-.150	.883
	Task-Payroll	1.085	.745	.412	1.457	.173
	Task-Financial reporting	-.215	.729	-.089	-.295	.774
	Task-Tax preparation	.387	.881	.137	.439	.669
	Task-Auditing	.189	.784	.079	.241	.814

Table 20

a. Dependent Variable: Reduced work load

The regression analysis for reduced workload demonstrated no significant relationship ($F(5,11) = 0.544$, $p = .740$) between specific accounting tasks using AI and reported benefits. None of the specific accounting tasks significantly influenced reduced workload.

4.9. Hypothesis 7

H0: There is no significant correlation between age and familiarity with artificial intelligence (AI) among accounting professionals.

H1: There is a significant correlation between age and familiarity with artificial intelligence (AI) among accounting professionals.

		Age
How familiar are you with artificial intelligence (AI)? [Familiarity]	Pearson Correlation	-.294**
	Sig. (2-tailed)	.007
	N	83

Table 21

A Pearson correlation coefficient was calculated to examine the relationship between age and familiarity with AI among accounting professionals. The analysis included data from 83 respondents.

The Pearson correlation coefficient between age and familiarity with AI was found to be -0.294, which is significant at the 0.01 level (2-tailed), suggesting a moderately strong negative correlation. This suggests that as age increases, familiarity with AI tends to decrease among accounting professionals.

CONCLUSION

This study thoroughly examined the perceived benefits of artificial intelligence (AI) in accounting and its potential impact on work efficiency, data quality, and overall effectiveness of financial management. Through descriptive analysis, it was observed that AI adoption is widely believed to enhance work and time efficiency, improve the accuracy and quality of accounting information, increase the effectiveness of financial data processing, and reduce the workload of accounting professionals. The results underscore the growing recognition of AI's positive role in transforming the accounting landscape. Despite initial skepticism among some practitioners, AI is increasingly seen as a tool that can streamline tasks, enabling accountants to focus more on strategic decision-making rather than routine work.

The correlation analysis provided key insights into the demographic and professional factors that influence AI adoption. Interestingly, no significant relationship was found between the level of experience in accounting and belief in AI adoption, or between familiarity with AI and its adoption, suggesting that experience or familiarity alone does not determine one's openness to AI integration. However, there was a significant association between current AI usage and belief in AI adoption, highlighting that those already using AI tools are more likely to support their broader implementation. Demographic factors such as age and education were also significantly associated with the belief in AI adoption, suggesting that younger, more educated professionals are more inclined to see the value of AI in accounting. Gender, however, did not show a significant impact, reflecting the growing inclusivity of AI perceptions across the professional spectrum. In conclusion, AI adoption in accounting is shaped by various factors, and its potential to revolutionize the profession continues to gain recognition among accounting professionals.

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Future Scope

Future research can explore the impact of AI on specific accounting tasks in more depth, particularly how emerging AI tools might further enhance accounting efficiency. Expanding the sample size and focusing on industry-specific AI applications could also yield deeper insights into the evolving role of AI in professional accounting practices.

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REFLECTIONS AND EXPLORATIONS ON THE ADDITIVE STRATEGIES IN SCIENCE EDUCATION IN GUANGDONG PROVINCE UNDER THE "DOUBLE REDUCTION" POLICY

He Qianwen[1], Xu Zifeng[2]
[1]*School of Education, Zhaoqing University, Zhaoqing, Guangdong, China*
[2]*Music Department, Guangzhou Xinhua University, Guangdong, China*

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ABSTRACT
Under the framework of the "Double Reduction" policy, additive strategies in science education have become a vital pathway to enhance educational quality. This paper examines the current state of science education in Guangdong Province and explores the challenges and opportunities in policy guidance, teacher training, and curriculum reform. We propose a personalized teaching approach based on the theory of multiple intelligences, emphasizing the importance of interdisciplinary integration and practical activities. The study reveals that Guangdong has made preliminary progress in science popularization and teacher development; however, it still faces issues such as a shortage of science teachers and insufficient research. To advance high-quality development in science education, it is essential to strengthen policy support and integrate educational resources, enhancing teachers' professional competencies and research capabilities to achieve a comprehensive improvement in scientific literacy.

KEYWORDS: *Science Education; New Curriculum Standards; Teaching Practice*

1. INTRODUCTION
Science education serves not only as a core mechanism for cultivating innovative and practical talent essential for national development but also as a critical safeguard for enhancing the country's future innovation capabilities and international competitiveness. Against the backdrop of rapid globalization, the significance of science education has become increasingly prominent, emerging as a key driver of social progress and economic development. In recent years, China has significantly strengthened policy support and financial investment in the field of science education, aiming to effectively nurture and guide future talent. Notably, in September 2020, President Xi Jinping emphasized at a symposium with scientists that "guiding and fostering scientific interest should begin from an early age, enabling youth to better understand scientific knowledge, master scientific methods, and form a large cohort of young people with the potential to become scientists" (China Association for Science and Technology, 2020). This critical statement provides both a theoretical foundation and practical direction for the comprehensive development of science education. In this context, President Xi further proposed in 2023, amid the implementation of the "Double Reduction" policy, an "additive" approach to science education, advocating for resource integration and optimized teaching to enhance the quality and efficiency of science education (Ministry of Education of the People's Republic of China, 2021). This series of policies underscores the importance of science education within the modern educational system, aiming to cultivate highly skilled talent with innovative and practical capabilities. Therefore, this paper aims to reflect on and explore the current state of science education in Guangdong Province, analyzing the present challenges and opportunities, and proposing feasible recommendations for science education practices to offer valuable insights and guidance for advancing this field (Sun, 2010).

Through an analysis of the current situation in Guangdong's science education, we will explore specific issues and solutions in the areas of policy implementation, teacher professional development, and curriculum reform. Moreover, aligning with the principles of the new curriculum standards, we will propose how innovative practices such as scientific inquiry and interdisciplinary integration can be effectively incorporated into teaching to enhance students' scientific literacy and practical skills. We believe that such efforts can provide valuable insights for the science education reforms in Guangdong and throughout China, ultimately contributing to the high-quality development of science education nationwide (Yue, 2024).

2. SCIENCE EDUCATION ADDITIONS UNDER THE "DOUBLE REDUCTION" POLICY
In February 2023, President Xi Jinping explicitly stated during the third collective study session of the Politburo of the Communist Party of China Central Committee that "science education additions should be effectively implemented within the context of the 'Double Reduction' policy" (Communist Party Member Network, 2023). This critical directive indicates that,

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within the implementation of the "Double Reduction" policy, science education additions are not only a proactive response to educational policies but also a strategic measure to enhance educational quality and equity. The primary aim of the "Double Reduction" policy is to effectively alleviate the excessive academic burden on students and work toward reducing inequalities in educational resource allocation. However, in the context of rapid global technological development, China's pursuit of goals such as building a strong nation in education, science, and talent still faces significant challenges in science education. Specifically, the current foundation of science education in China is relatively weak, with regional disparities, unintegrated resources, limited teaching staff, and insufficient practical instruction. Moreover, mechanisms for the early identification and cultivation of high-caliber, innovative talent remain underdeveloped, and these issues urgently require attention and improvement. To support the nation's high-quality development, science education additions within the "Double Reduction" policy framework are crucial. International experience suggests that a technologically advanced nation must proactively promote science education from the elementary level to cultivate students' scientific literacy and innovative thinking, strengthening their practical abilities and enhancing their interest in scientific experiments. Science education is not only a driving force for national technological innovation and sustainable development; it also serves as a critical foundation for enhancing national technological competitiveness, cultivating innovative talent, and improving the scientific literacy of the general population. This series of initiatives will provide a solid foundation for China's future technological competitiveness and create favorable conditions for the comprehensive improvement of scientific literacy and innovation capabilities (Ren, 2023).

2.1 Policy-Guided Educational Direction

At the national policy level, several significant policy documents, such as *The Action Plan for Improving National Scientific Literacy (2021-2035)*, *Notice on Strengthening Primary School Science Teacher Training*, and *Opinions on Enhancing Science Education in Primary and Secondary Schools in the New Era*, have been released, laying a solid foundation for the development of science education and providing robust policy support. These documents underscore the government's emphasis and investment in science education, reflecting its determination and strategic clarity in promoting the improvement of scientific literacy and the cultivation of innovative talent. Among them, *Opinions on Enhancing Science Education in Primary and Secondary Schools in the New Era* (referred to as the *Opinions*) was jointly issued by the Ministry of Education and eighteen other departments, aiming to comprehensively implement President Xi Jinping's significant speech during the third collective study session of the 20th Politburo. This document provides systematic guidance on effectively implementing science education additions within the "Double Reduction" policy, supporting and promoting the high-quality, integrated development of education, science, and talent (Ministry of Education of the People's Republic of China, 2023). The goal of this comprehensive deployment document specifically tailored for primary and secondary science education in the new era is to address the needs of current technological development and industrial transformation.

The *Opinions* document seeks to strengthen and optimize various aspects, including curriculum materials, experimental teaching, teacher training, practical activities, and resource provision, aiming to integrate resources within and beyond the school to facilitate the organic connection between the school's primary educational space and the broader societal learning environment. The core objective of this policy is to elevate students' scientific literacy and nurture a cohort of young people with scientific potential who are committed to scientific research careers. The language of the policy indicates that it primarily targets primary and secondary education, emphasizing the importance of top-level planning to optimize the design and structure of the science education system. The policy advocates for strengthening science education research to achieve the goal of cultivating innovative talent, while also emphasizing multi-stakeholder collaboration and diversified development. However, it is noteworthy that science education in China is still in its early stages; although many policies embody commendable visions and goals, they face numerous challenges in practical implementation. Thus, the effective implementation of science education additions requires practical exploration and validation to ensure that policy measures are genuinely effective and impactful. To this end, educational administrative bodies, schools, and relevant research institutions should strengthen collaboration to advance systematic research and practice in science education, thus realizing the practical conversion of policy objectives and laying a solid foundation for the sustainable development of science education in China.

2. 2 Theoretical Foundation of Science Education Additions in Multiple Intelligences Theory

Within the framework of the "Double Reduction" policy, the concept of science education additions is not merely a positive response to existing educational policies but also a profound application of Howard Gardner's theory of multiple intelligences. This theory highlights the multidimensional nature of human intelligence, encompassing areas such as linguistic intelligence, logical-mathematical intelligence, spatial intelligence, bodily-kinesthetic intelligence, interpersonal intelligence, intrapersonal intelligence, musical intelligence, and naturalistic intelligence (Gardner, 1983). Therefore, science education should focus on each student's unique combination of intelligences, facilitating personalized teaching to meet diverse learning needs. This student-centered educational approach not only helps to stimulate students' learning interest but also promotes their comprehensive development, thereby establishing a solid foundation for cultivating innovative talent (Xu, 2023).

In practical teaching, teachers can effectively apply the core ideas of multiple intelligences theory by implementing personalized

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instruction and interdisciplinary integration. For example, after assessing students' intelligence types, teachers can design a variety of learning activities. Students with strong logical-mathematical intelligence may benefit from additional components like experiment design and data analysis to enhance their logical thinking skills, while students with prominent bodily-kinesthetic intelligence might engage more in hands-on activities and practical experiments to boost their learning engagement. This approach of teaching according to individual aptitudes allows each student to achieve optimal learning experiences in environments that match their intelligence profiles. Additionally, integrating subjects such as arts, music, and physical education through comprehensive projects can not only enrich students' learning experiences but also foster their creativity and aesthetic skills. Such interdisciplinary integration aims to inject new vitality into science education, enhancing students' overall competencies and cultivating their multifaceted abilities (Ran, 2024).

It is worth noting that multiple intelligences theory also emphasizes the importance of experiential learning and cooperative interaction. In science education, particular attention should be given to hands-on practice and experimental exploration, encouraging students to solve problems in real-world contexts. This approach not only enhances students' naturalistic intelligence and bodily-kinesthetic intelligence but also strengthens their scientific inquiry skills (Lave & Wenger, 1991). Through collaborative group learning, students share perspectives and experiences in an interactive setting, cultivating teamwork and communication skills. This cooperative learning model not only deepens students' understanding of scientific knowledge but also instills a sense of social responsibility and engagement, creating favorable conditions for the future implementation of science education.

Therefore, multiple intelligences theory provides a solid theoretical basis and practical framework for the "additions" in science education, fostering comprehensive development and innovation among students. As Gardner stated, "The purpose of education is not merely to convey knowledge but to cultivate individuals who can adapt to the demands of a future society" (Gardner, 1993). This concept supports the nation's mission to cultivate future scientists and innovative talent, thereby contributing to China's long-term goals in technological innovation and educational modernization (Gao, 2024).

3. INITIAL FORMATION OF A COMPREHENSIVE SCIENCE POPULARIZATION FRAMEWORK IN GUANGDONG PROVINCE

As a leader in China's educational reforms, Guangdong Province has continuously implemented relevant national policies, aiming to explore feasible ways to enhance science education additions within the "Double Reduction" framework, while promoting the integrated development of high-quality education, science, and talent cultivation.

3.1 Nationwide Science Popularization Showing Initial Results

The advancement of science education in Guangdong Province has benefited significantly from supportive policies, particularly the implementation of the *Guangdong Science and Technology Popularization Regulations*. The introduction of these regulations marks a substantial step forward for Guangdong in science popularization. According to the 2020 Chinese Public Scientific Literacy Survey, the proportion of Guangdong citizens with scientific literacy reached 12.79%, surpassing the national average of 10.56% and ranking sixth nationwide, though still trailing economically developed regions such as Shanghai, Beijing, Tianjin, Jiangsu, and Zhejiang (China Association for Science and Technology, 2021). To close the gap with these leading regions, Guangdong issued the *Guangdong Science and Technology Popularization Regulations* in 2021 (People's Government of Guangdong Province, 2021), outlining future directions and goals for science popularization, with a particular emphasis on strengthening foundational infrastructure. The regulations aim to achieve full coverage of science and technology facilities in all 21 prefecture-level cities and to establish campus science museums (or rooms) across eastern, western, and northern Guangdong. These initiatives provide richer science education resources for young students, enabling more children to access high-quality science education close to home, thereby enhancing their scientific literacy.

Beyond infrastructure, Guangdong also plans to establish a provincial science popularization group and gradually develop a provincial science popularization joint conference system led by the provincial government to more effectively coordinate and advance various science popularization activities. Additionally, the provincial government will invest in building the "Yue Science Popularization" digital public service platform and introduce a series of policies to encourage the development of the science popularization industry, aiming to create a win-win situation for both public-interest science popularization and market-driven science popularization industries (Guangdong Provincial Department of Science and Technology, 2023). These measures provide a solid foundation for the development of science education in Guangdong, creating more and better resources and opportunities for science education for young people. Leveraging its strong economic base, Guangdong strives to close the gap with other advanced regions domestically, seeking further breakthroughs in science education and cultivating future technology talents with innovative skills and scientific literacy. Since the implementation of the regulations, as of 2023, information from the Guangdong Provincial Department of Science and Technology indicates that a comprehensive science popularization framework in Guangdong has largely taken shape. By integrating resources and adopting innovative approaches, Guangdong has diversified its science popularization efforts and enhanced public scientific literacy, with initial results seen in its nationwide scientific literacy campaign. Statistical data show that in 2022, the proportion of citizens in Guangdong with

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scientific literacy rose to 14.8% (Guangdong Provincial Department of Science and Technology, 2023), demonstrating the effectiveness of policy implementation and laying a solid foundation for the future development of science education.

3.2 Urgent Need to Address the Shortage of Science Education Teachers

A key to strengthening science education lies in having a qualified teaching workforce. However, there remains a significant gap in both the quantity and quality of science teachers in China. According to statistics from the Ministry of Education, the total number of dedicated science teachers in primary schools nationwide grew by 35.3% from 2012 to 2022. Nevertheless, by 2022, there were only 240,000 science teachers nationwide, with an average of 1.61 science teachers per school, which is clearly insufficient. Many regions in China still face a shortage of dedicated science teachers in primary and secondary schools. For instance, a survey conducted at the 2023 "National Science Education Summer School" hosted by South China Normal University (SCNU) across Guangdong, Hainan, and Guangxi revealed a phenomenon among primary science teachers described as "two lows, one high, and three confusions": a low proportion of specialized science teachers, low professional teaching proficiency, high demand for professional training, and confusion about effectively implementing science education. The survey results showed that only 15.14% of surveyed primary science teachers were dedicated science teachers, with the majority serving as part-time teachers from other disciplines, and over two-thirds of them having a humanities background. Approximately 60% of respondents indicated that science classes lacked necessary scientific knowledge and experimental materials, and nearly 80% expressed an urgent need for training in scientific and interdisciplinary knowledge (Southern Plus, 2023). This shortage of professional science teachers and the lack of relevant expertise and training severely restrict the effective implementation of science education, especially in (1) effective pathways for delivering science education; (2) science class design; and (3) methods for interdisciplinary teaching (Yang, 2024).

The shortage of science teachers is a result of multiple factors. Firstly, the lack of adequate recognition of the importance of science education in current educational policies and society directly affects the recruitment and training of science teachers, with insufficient supporting measures in place. Many higher education institutions have weak science education programs within teacher training, lacking systematic training and practical opportunities to meet the demand for high-quality science teachers. Secondly, the attractiveness of science teaching as a profession is generally low, especially in rural and remote areas. Issues such as salary levels, career development prospects, and living conditions fail to attract top talent, leading many potential science teachers to shift to other industries, exacerbating the shortage. Additionally, the professional competence of existing teachers needs improvement; many long-serving teachers from other subjects lack the scientific expertise and practical experience necessary to teach science effectively, impacting their ability to deliver quality science education. Finally, the absence of a comprehensive teacher training system also contributes to this issue (Zhu, 2022). Although some science teacher training programs are currently available, they often lack specificity and systematic design, failing to address the actual issues teachers encounter in their teaching practice. Therefore, to effectively alleviate the shortage of science teachers, a multifaceted approach is required, including strengthening policy support, enhancing the profession's attractiveness, improving teacher training mechanisms, and establishing a scientific training system to ensure the sustainable development of science education (Chen, 2021).

4. ADDRESSING THE RELATIVE DEFICIENCY OF RESEARCH IN THE FIELD OF SCIENCE EDUCATION

On the other hand, Guangdong Province's research in science education remains relatively underdeveloped, underscoring a pressing need for increased focus and emphasis in this field. To gain an in-depth understanding of the state of science education in Guangdong, this study selected “Guangdong” and “science education” as search keywords for journal articles in CNKI. Based on the search results, a total of 45 articles were identified. The study employs bibliometric analysis on these articles to reveal the extent to which educators and researchers have previously examined issues related to science education in Guangdong, thereby providing new perspectives and references for the future development of science education.

Figure 1 illustrates that research on science education in Guangdong has shown an upward trend since 2002, but the overall volume remains limited, with the highest annual publication count being only four articles, a number that has stagnated. This indicates that the research conducted by educators and researchers in Guangdong on science education is insufficient in both quantity and focus. Therefore, more robust attention and efforts are needed in this area. Specifically, although there have been some research outputs in recent years, Guangdong’s academic production still lags behind other provinces in the national context, which could potentially impact the formulation and implementation of science education policies and, to some extent, limit improvements in the quality of science education. Conducting more systematic, in-depth research on science education, particularly in areas like teacher training, curriculum reform, and academic exchange, will establish a solid foundation for the long-term development of science education in Guangdong. Enhancing the quality and quantity of research will also help establish an academic voice in Guangdong’s science education, allowing a more effective response to the educational reform requirements under the "Double Reduction" policy.

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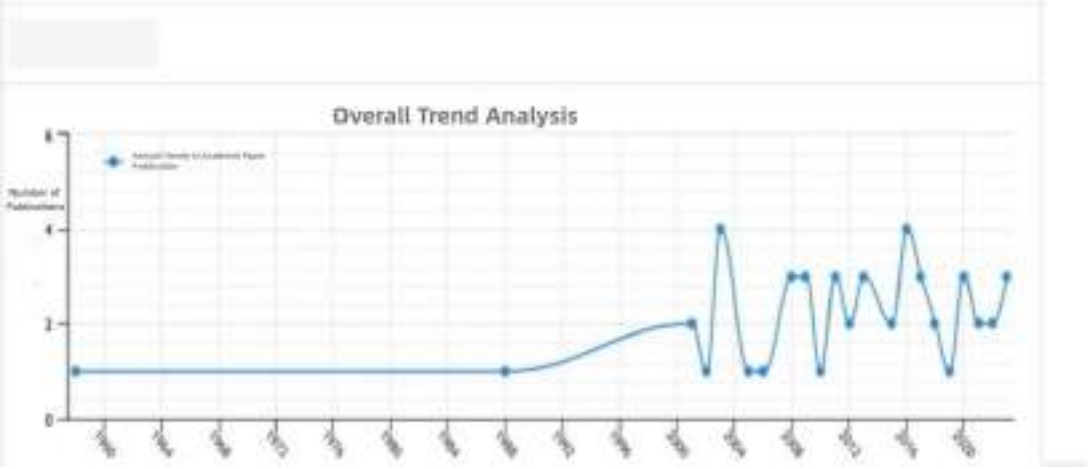


Figure 1. Annual Trend in Journal Publications on Science Education in Guangdong

Through thematic analysis of the 45 identified articles (as shown in Figure 2), it was found that 25.93% of the research focuses on science education itself. Additionally, 11.11% of the studies explicitly set "Guangdong Province" as the research context. This data shows that although science education research in Guangdong is gaining attention, the overall research focus is still limited. Notably, themes like "school-museum collaboration", "science centers", "scientific literacy", and "primary science education" have emerged, highlighting the province's emphasis on promoting science education through school programs, science museum education, and public science centers. This trend suggests that science education extends beyond classroom instruction, encompassing diverse forms of education aimed at comprehensively enhancing students' scientific literacy. School education is widely regarded as the primary means by which students gain systematic and comprehensive science education; thus, exploring ways to leverage primary and secondary science curricula, combined with integrated practice activities and social resources, to enhance students' scientific literacy and innovation skills has become a critical topic. Integrated practice activities not only effectively promote students' practical skills but also stimulate their inquiry and creativity, which is essential for cultivating future scientific talent. The school-museum collaboration model provides abundant resources and a broader perspective for science education, allowing students to experience the joy of science and foster an interest in it through hands-on exploration. For this reason, science education researchers and practitioners should actively explore diverse teaching models and strategies to drive innovation and development in science education, addressing current educational reform challenges while supporting the comprehensive development of students and nurturing scientific thinking (Ma, 2024).

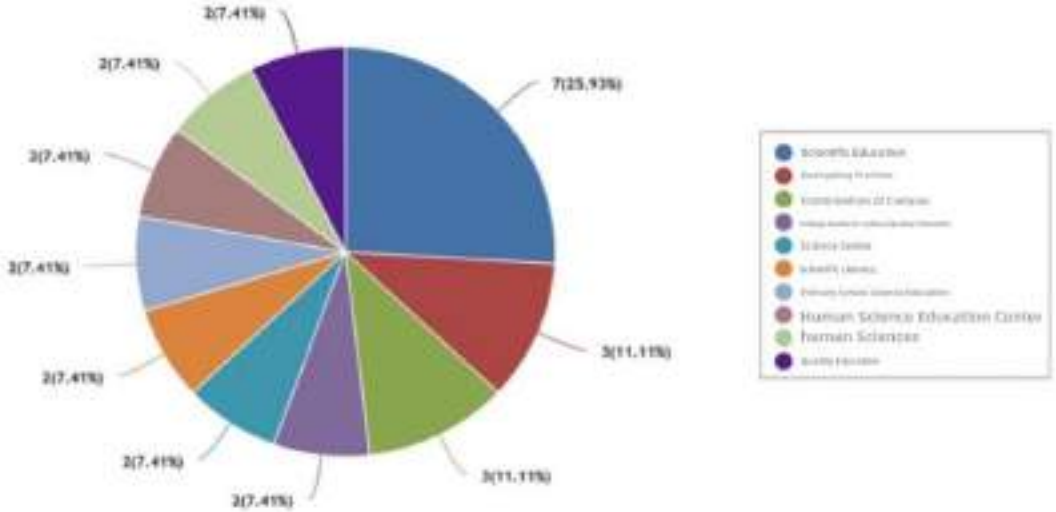


Figure 2. Major Themes in Journal Publications on Science Education in Guangdong

To preliminarily understand the research focus within Guangdong's science education field, this study conducted a word frequency analysis of the titles, keywords, and abstracts of relevant literature. Figure 3 shows that the two primary research emphases in Guangdong's science education are "science popularization" and "technology". This finding highlights the importance of science popularization (science outreach) and technology education in enhancing students' scientific literacy, reflecting educators' and researchers' concern with the effectiveness of science education. The primary subjects of

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research are students (mainly adolescents) and teachers, indicating an emphasis on improving students' scientific abilities and enhancing teachers' instructional competencies. The research primarily revolves around two key areas: (1) How to enhance students' scientific literacy, fostering their innovation and practical skills. Improving scientific literacy is regarded as a crucial goal of modern education, not only involving students' understanding of scientific knowledge but also equipping them with the ability to apply scientific knowledge to solve real-life problems. Researchers are dedicated to exploring various teaching methods and practice activities to spark students' interest, encourage initiative in scientific inquiry, and cultivate creativity. (2) Exploring models and resource coordination (e.g., school-museum partnerships) to support students' high-quality development, meeting the demands of a quality-oriented education in the modern era. This research direction emphasizes the integrated use of educational resources, especially the collaboration between schools and science museums, to enrich students' practical experiences and create diverse learning environments that promote holistic student development. These research priorities reflect the current research trends in science education in Guangdong and provide valuable theoretical foundations and practical guidance for future reforms and practices in science education in the context of the new era.



Figure 3. Word Frequency Analysis of Themes in Journal Publications on Science Education in Guangdong

Currently, Guangdong has seen initial success in advancing science education additions within the framework of the "Double Reduction" policy. However, the lack of systemic guidance and unified standards remains, especially in terms of research on school-level science education. Specifically, the training of science teachers and related educational research require strengthening, as this gap could potentially impact the overall quality and developmental potential of science education. Practical policies and measures will positively influence the quality development of science education additions in Guangdong. To effectively guide frontline teachers in advancing science curriculum reforms at the primary and secondary levels, the Ministry of Education released the new *Compulsory Education Science Curriculum Standards (2022 Edition)* in March 2022 (referred to as the "New Curriculum Standards") (Ministry of Education of the People's Republic of China, 2022). These standards not only provide clear directions and guidelines for science education but also include teaching philosophies and practical suggestions, offering theoretical and practical support for teachers in their teaching processes. Considering the current state of science education research in Guangdong, studying and understanding the principles and recommendations of the New Curriculum Standards will help align with the trends in science education during the compulsory education phase. For example, the New Curriculum Standards emphasize student-centered teaching approaches, advocating for inquiry-based learning to inspire students' interest and creativity, which aligns closely with Guangdong's current education reform objectives. An in-depth

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analysis and understanding of the characteristics and changes in the New Curriculum Standards will provide practical insights for educators, enabling them to address various teaching challenges more effectively. Therefore, the following sections will further explore specific methods of implementing science education additions, taking into account Guangdong's current state of science education and the New Curriculum Standards. These discussions aim to offer practical teaching strategies for frontline teachers and establish a solid foundation for the sustainable development of science education in Guangdong (Xie, 2014).

5. REFLECTIONS ON TEACHING PRACTICES IN LIGHT OF THE NEW SCIENCE CURRICULUM STANDARDS

From a literature analysis perspective, previous research in Guangdong's science education has primarily focused on science popularization, with limited studies addressing school-level science education. However, the new curriculum standards explicitly establish the goal of science education as cultivating students' core competencies. Through curriculum learning, students are expected to understand fundamental scientific concepts, principles, and methods, thereby helping them form scientific perspectives. In problem-solving and practical applications, the curriculum should develop students' hands-on and scientific research skills, stimulating their curiosity and scientific thinking. Additionally, the new standards emphasize problem-based and interdisciplinary approaches, aiming to closely link scientific knowledge with real-world issues to foster students' scientific attitudes and sense of responsibility. In this context, school-based science education becomes an essential pathway for students to form systematic and comprehensive scientific perspectives, thought processes, and attitudes (Sang, 2024).

Thus, the following section offers recommendations for teaching practices in primary and secondary education, addressing an area that has been relatively lacking in Guangdong's science education research. The cultivation of core competencies as emphasized in the new standards centers on scientific perspectives, scientific thinking, inquiry and practice, and a sense of responsibility. Learning these competencies can help students develop interdisciplinary concepts while enhancing their inquiry and practical skills. Students must engage both mentally and physically, combining learning with reflection, and effectively integrating theory and practice through hands-on tasks. In daily science education, we can adhere to the following principles to cultivate students' core competencies (Yi, 2024).

The principle of combining hands-on and intellectual engagement promotes inquiry-based teaching, a significant aspect of the new curriculum standards, emphasizing that students should engage in observational, experimental, and inquiry activities to develop their scientific thinking and spirit of exploration. Teachers' roles shift from traditional knowledge transmitters to guides and facilitators, encouraging students to think critically and solve problems. Scientific inquiry skills are foundational to scientific understanding and attitudes; students can effectively undertake scientific inquiries, test hypotheses, and, in doing so, form appropriate scientific attitudes and perspectives only when they comprehend the underlying concepts (ASE Education Group, 2018).

The integration of knowledge and action through social practice is another critical component emphasized by the new standards. These standards encourage students to explore and address real-world issues through social practice activities. Through this process, students learn how to apply scientific knowledge and methods holistically and to focus on societal issues, thereby developing a sense of social responsibility and innovation. Social practice, grounded in real-life contexts, not only improves students' problem-solving abilities but also provides opportunities for cross-disciplinary learning and interdisciplinary thinking (Ministry of Education of the People's Republic of China, 2022).

The new standards also advocate for conceptual transformation and diverse assessment methods. The standards encourage the use of a variety of assessment forms, such as lab reports, group projects and presentations, and scientific papers, stressing formative and performance-based assessments. Through diversified assessments, students' scientific literacy, practical abilities, and innovation skills can be thoroughly evaluated, with a specific emphasis on assessing inquiry skills in science. Teachers can evaluate learning and student performance across multiple dimensions, including learning outcomes, student engagement, interpretation, exploration, creation, assessment, and planning (Mang et al., 2023).

Keeping pace with the times by strengthening teaching in technology and engineering is also a major direction of the new curriculum standards. These standards encourage students to utilize information technology and engineering knowledge in scientific practice and research, including using simulation software, lab instruments, online resources, and model design. By employing these technologies, students gain easier access to scientific knowledge and come to understand the impact of digital and engineering technologies on individuals and society, equipping them with related technical skills, scientific thinking, and improved practical and innovative abilities (Department for Education, 2015). Thus, future science education should focus on comprehensive scientific capabilities, incorporating technology and engineering practices into learning tasks.

Another essential aspect emphasized by the new standards is developing sustainable perspectives through environmental education. Activities in ecological studies, ecological practices, and ecological projects aim to enhance students' understanding of environmental protection. Environmental education should begin from students' everyday life contexts, exploring environmental issues and their solutions to develop students' problem-solving

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skills and foster their civic responsibility and global outlook (Fraser et al., 2013).

In the context of the "Double Reduction" policy and considering the current state of science education in Guangdong, this paper reflects deeply on teaching practices in science education. From the perspective of the new curriculum standards, Guangdong's science education teaching practices can be enhanced through various forms of scientific inquiry and hands-on activities to cultivate students' scientific thinking, practical skills, and innovative spirit. Such practices enable students to apply scientific knowledge and methods to solve real-world problems and engage with social development and environmental protection (Zhang, 2018).

FUNDING PROJECTS

2024 Zhaoqing Philosophy and Social Sciences Planning Project: "Research on Collaborative Mechanisms for Science Popularization in Rural Primary Schools from the Perspective of New Productive Forces—A Case Study of the Zhaoqing Region". [14th Five-Year Plan for Zhaoqing Philosophy and Social Sciences, Project Approval Number: 24GJ-37].

2024 Key Education Research Project of the Zhaoqing Institute of Educational Development: "Research on the Current Status of Science Popularization Education in Rural Primary Schools in the Zhaoqing Region". [Project Approval Number: ZQJYY2024023].

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A THREE-DIMENSIONAL INTERPRETATION OF THE THOUGHT OF ECOLOGICAL CIVILIZATION WITH CHINESE CHARACTERISTICS

Zhang Weiman
School of Marxism, Zhaoqing University, Zhaoqing, Guangdong, China

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ABSTRACT

The theoretical framework of ecological civilization with Chinese characteristics is rooted in addressing the practical challenges facing China. It integrates the Marxist view of ecological civilization and China's traditional ecological culture into the construction of ecological civilization within the framework of socialism with Chinese characteristics. This article examines pressing issues highlighted in the current ecological civilization construction and provides strategic guidance for building a "Beautiful China".

KEYWORDS: *Socialism With Chinese Characteristics, Xi Jinping, Ecological Civilization Perspective*

1. INTRODUCTION

"Ecological civilization is a significant achievement of human societal progress. Human society has experienced primitive civilization, agricultural civilization, and industrial civilization; ecological civilization is the inevitable outcome of industrial civilization reaching a certain stage and represents a new requirement for harmonious development between humanity and nature" (Xi, 2022, p. 29).

The report of the 20th National Congress of the Communist Party of China emphasized the necessity of planning development from the perspective of "harmonious coexistence between humanity and nature". Promoting the theory of ecological civilization, which underscores this harmony, is a vital mechanism for achieving Chinese-style modernization. On July 17, 2023, General Secretary Xi Jinping delivered a keynote speech at the National Conference on Ecological and Environmental Protection titled *Advancing the Modernization of Harmonious Coexistence Between Humanity and Nature Through the Construction of a Beautiful China*. The speech outlined a significant strategic deployment to fully advance harmonious coexistence through the framework of building a "Beautiful China", emphasizing the central leadership's commitment to enhancing ecological civilization.

This paper adopts a comprehensive and systematic exploration of ecological civilization thought with Chinese characteristics from theoretical, practical, and empirical perspectives. It aims to facilitate a deeper understanding and implementation of Xi Jinping's ecological civilization thought, contributing to the construction of a beautiful, socialist, modernized country and achieving harmonious coexistence between humanity and nature through Chinese-style modernization.

2. THEORETICAL DIMENSIONS OF ECOLOGICAL CIVILIZATION THOUGHT WITH CHINESE CHARACTERISTICS

The theoretical foundation of ecological civilization thought with Chinese characteristics is exceptionally rich, with origins rooted in the Marxist view of ecological civilization, the essence of traditional Chinese ecological culture, and Xi Jinping's ecological civilization thought.

2.1 The Marxist View of Ecological Civilization

The original works of Marx and Engels contain numerous insights regarding ecological civilization. Unlike previous philosophers, Marx and Engels approached the relationship between humanity and nature from the standpoint of practical activity. Writing during the ascent of Western industrialization—when human efforts focused on conquering nature—Marx and Engels observed the destructive ecological consequences of capitalism's production methods. They criticized capitalism's exploitative approach toward nature and advocated for a transition toward harmonious coexistence between humanity and nature to achieve an enduring ecological civilization.

Marx argued that human society and the natural world are mutually dependent and interrelated. Humanity cannot exist in isolation from nature, as nature serves as the foundation for human life. However, humans occupy a central position in their relationship with nature, wielding their conscious agency to transform it and extract resources to meet their needs. Marx and Engels also revealed that the "human-nature-society" relationship forms an interconnected, dynamic system, emphasizing the need for systemic synergy among these elements. This perspective provides profound wisdom for ecological civilization in the modern era. As Xi (2017, p. 50) stated, "Humanity and nature

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form a community of life... Humanity's harm to nature will ultimately harm humanity itself, which is an unalterable law".

2.2 The Outstanding Traditional Ecological Culture of China

Chinese civilization, with a history spanning over 5,000 years, has accumulated profound ecological wisdom and developed an outstanding traditional ecological culture. This traditional culture, expressed through philosophy, ethics, and other dimensions, illustrates the wisdom of harmonious coexistence between humanity and nature. It plays a significant role in the construction of ecological civilization with Chinese characteristics and provides fertile intellectual resources for Xi Jinping's ecological civilization thought. Xi Jinping emphasized the importance of integrating the fundamental principles of Marxism with China's specific realities and its traditional culture.

Confucianism and Daoism, as two cornerstone schools of thought in traditional Chinese culture, have both explored the relationship between humanity and nature. They emphasize the interconnectedness of humanity and nature, as expressed in the saying, "Heaven and I are born together; all things and I are one'. This implies that humans are an integral part of nature, inseparable from and interdependent with it. Confucianism also underscores the principle of "the way of Heaven is unchanging; it does not exist because of Yao, nor perish because of Jie", signifying the immutable laws of nature that are not subject to human will. The idea of "harmony between humanity and nature" is a central tenet of Chinese philosophy and cultural tradition. It encompasses ecological wisdom about harmonious interpersonal relationships and orderly societal development.

In traditional culture, "Heaven" refers to nature, while "human" represents humankind. The concept of "harmony between Heaven and humanity" calls for a balanced and respectful relationship between humans and nature, adhering to objective laws and avoiding actions that would disturb ecological balance and provoke nature's retaliation. Confucianism's interpretation of this harmony advocates for respecting nature and treating it with benevolence, while Daoism emphasizes principles such as "humans follow the Earth, Earth follows Heaven, Heaven follows the Dao, and the Dao follows nature'. Daoism posits that the "Dao" is the origin of all things in the natural world and that human activities must align with nature's inherent laws and development patterns. It stresses equality in the relationship between humanity and nature.

Xi Jinping has placed great importance on combining traditional Chinese culture with contemporary practical needs to guide China's development. He remarked that concepts such as "following the way of nature" and "harmony between humanity and nature" contain valuable insights for solving contemporary human challenges. As Xi stated, "Building ecological civilization requires achieving harmony between humanity and nature, and the principle of harmony with Heaven. We must not attempt to dominate Heaven" (Central Compilation and Translation Bureau of the Communist Party of China, 2017, p. 24).

2.3 Xi Jinping's Ecological Civilization Thought

Xi Jinping has consistently prioritized ecological civilization construction, starting from his early experiences in Liangjiahe and extending through his leadership roles in Hebei, Fujian, Zhejiang, and Shanghai, and ultimately to his position at the helm of the Central Committee. Guided by Marxist ecological thought, Xi has persistently explored and developed China's ecological civilization framework, culminating in his ecological civilization thought, the latest theoretical achievement in the sinicization of Marxism. This thought serves as a critical guide for advancing ecological civilization and building a "Beautiful China" in the new era.

The origins of Xi Jinping's ecological civilization thought trace back to his seven years as a young educated youth in Liangjiahe. Confronted with material and natural resource scarcity, particularly the lack of fuel during harsh winters, Xi became acutely aware of ecological challenges. In 1974, as the Party secretary of Liangjiahe village, he led villagers in constructing the first biogas digester in northern Shaanxi. This not only provided clean energy for cooking and lighting but also mitigated pollution caused by burning wood.

In 1985, as the Party secretary of Zhengding County in Hebei Province, Xi proposed several measures to protect the environment, such as maintaining ecological balance during resource development and controlling pollution sources. During his tenure as Party secretary of Zhejiang Province, Xi made a historic visit to Yucun Village in Anji County, Huzhou, on August 15, 2005, where he first proposed the renowned "Two Mountains Theory", stating, "We strive for harmony between humanity and nature, and between economy and society. Simply put, we need two mountains: gold and silver mountains, and green mountains and clear waters'. He argued that while these two goals may appear contradictory, they can be reconciled through dialectical unity, reflecting the Marxist principle of dialectical reasoning.It scientifically reveals the laws governing economic and social development, fully embodying the green philosophy of harmonious coexistence between humanity and nature.

In 2020, on the 15th anniversary of the "Two Mountains Theory", Xi Jinping visited Zhejiang, Shaanxi, and Shanxi, highlighting ecological prioritization and green development. He advanced the idea of "man does not disappoint the green mountains, and the green mountains will not disappoint man", enriching the theoretical foundation of ecological civilization in the new era.

The "Two Mountains Theory" has evolved into Xi Jinping's ecological civilization thought, which has propelled China's ecological civilization construction to globally recognized achievements. A roadmap has been established: by 2035, fundamental improvements in ecological quality will be realized, with the "Beautiful China" goal essentially achieved; by mid-century, a fully developed "Beautiful China" will be completed. Guided by Xi Jinping's ecological civilization thought, the

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modernization of harmonious coexistence between humanity and nature will undoubtedly take root and flourish across China.

3. THE PRACTICAL DIMENSIONS OF ECOLOGICAL CIVILIZATION THOUGHT WITH CHINESE CHARACTERISTICS

The practical application of ecological civilization thought focuses on harmonizing economic growth with environmental protection, transforming theoretical insights into actionable strategies. By embedding ecological principles into policy-making and governance, this framework addresses real-world environmental challenges and integrates sustainability into the fabric of Chinese-style modernization. Practical measures prioritize systemic planning, public welfare, and sustainable development as the foundation for building a "Beautiful China".

3.1 A Good Ecological Environment Is the Most Inclusive Public Welfare

The relationship between humanity and nature is the most fundamental relationship in human society. Nature serves as the provider of all material life, forming the foundation and prerequisite for the emergence, existence, and development of human society. While humans can purposefully transform and utilize nature through social practices, they remain an integral part of nature and cannot dominate it. Exploiting nature without giving back, using it without building or restoring, or adopting unsustainable methods such as "killing the goose that lays the golden eggs" will ultimately harm humanity itself. Protecting the natural environment is synonymous with protecting humanity; building ecological civilization benefits all of humankind.

From a historical perspective, the prosperity of civilizations has been closely tied to ecological health, while ecological degradation has often precipitated the decline of civilizations. This principle transcends human will. Many ancient civilizations, such as those in Mesopotamia, Greece, and Anatolia, thrived in regions with favorable ecological conditions but ultimately declined due to severe ecological damage. In their quest for arable land, these societies deforested vast areas, rendering once-prosperous regions barren. As noted, "We must not become overly intoxicated with humanity's triumphs over nature... as we often undo the initial results ourselves" (Central Compilation and Translation Bureau of the Communist Party of China, 2017, pp. 10–11). Respecting, revering, and adhering to nature's objective laws are essential for maintaining the balance between humanity and nature. Only by understanding nature as the fundamental basis for human survival and development can we ensure sustainable ecological benefits for human society.

Since the reform and opening-up period, the Communist Party of China has consistently prioritized ecological civilization by adopting environmental protection and resource conservation as basic state policies. Notable progress has been made. However, after over three decades of rapid economic development, China faces an increasing prevalence of ecological problems, such as water system pollution, groundwater contamination, soil pollution from heavy metals, and air quality issues like smog. These environmental challenges disrupt the harmony between humanity and nature, adversely affect public health, and threaten the well-being of future generations. The societal repercussions are significant, even sparking social unrest.

These issues highlight a shift in public demand from basic survival to ecological well-being, including clean water, fresh air, safe food, and beautiful environments. Ecological protection is an intergenerational endeavor, essential not only for the current population but also for the long-term development of the Chinese nation. Xi Jinping has aptly stated, "A good ecological environment is the most equitable public good and the most inclusive public welfare". This ecological vision has driven significant achievements in environmental governance, such as the ecological restoration in Xishuangbanna, where improved conditions have led to the return of Asian elephants, and the ten-year fishing ban in the Yangtze River, resulting in a resurgence of the Yangtze finless porpoise population. Consequently, the 20th National Congress of the Communist Party of China emphasized the importance of prioritizing "harmony between humanity and nature" to ensure widespread understanding and implementation of this principle.

3.2 Protecting the Ecological Environment Is Protecting Productivity

On May 24, 2013, during the sixth collective study session of the 18th Central Politburo, Xi Jinping asserted, "We must properly balance economic development and ecological protection, firmly establish the concept that protecting the ecological environment is protecting productivity, and improving the ecological environment is developing productivity. We must consciously promote green, circular, and low-carbon development, and never sacrifice the environment for temporary economic growth" (Xi, 2018, p. 209).

This critical statement underscores the intrinsic connection between environmental protection and productivity development, representing a significant advancement in production theory. It exemplifies a value system that respects nature and seeks harmonious development between humanity and nature. This approach starkly contrasts with the Western model of "pollution first, remediation later". Many developed countries have experienced severe ecological consequences as a result of industrialization. For instance, London was long known as a "foggy city", and environmental disasters like the 1930 Meuse Valley smog in Belgium and the mid-20th century photochemical smog in Los Angeles serve as cautionary tales (Xi, 2017, p. 544). These nations created substantial material wealth during rapid industrialization but paid a heavy ecological price, offering sobering lessons for future development.

In China, economic growth has been the primary focus since the reform and opening-up period. While progress has been made in energy conservation and emission reduction, issues persist in certain areas where resources are over-exploited, and the

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environment is damaged to drive economic growth. Challenges such as dwindling energy resources, desertification, soil erosion, and rising greenhouse gas emissions must be addressed to ensure sustainable development. Without corrective measures, these problems will constrain China's economic prospects, deplete resources, and overwhelm the ecological system.

China's unique circumstances—limited energy resources and constrained ecological carrying capacity—demand a different path from the "pollute first, clean up later" trajectory followed by Western nations. As a country with over 1.4 billion people, China cannot afford the traditional modernizing approach that prioritizes short-term gains over long-term sustainability. Instead, it must forge a new development path, leveraging the advantages of socialism with Chinese characteristics to integrate development and protection seamlessly.

This approach requires breaking away from the conventional dichotomy between environmental protection and productivity. By recognizing ecological health as a productive resource, respecting natural laws, and preserving the environment, China can achieve higher levels of development. This balance ensures the organic harmony between ecological modernization and large-scale modernization. Achieving this requires abandoning unsustainable practices, restructuring industries, improving resource utilization, and promoting green, circular, and low-carbon development. By constructing a modern ecological civilization that embodies "harmony between humanity and nature", China can achieve a win-win scenario of economic growth and environmental protection.

4. PRACTICAL DIMENSIONS OF ECOLOGICAL CIVILIZATION THOUGHT WITH CHINESE CHARACTERISTICS

The implementation of ecological civilization hinges on strong governance systems and cultural awareness. Legal frameworks and institutional reforms must align with public participation to ensure ecological sustainability. This dual approach transforms not only policies but also societal values, fostering a shared commitment to harmonious coexistence between humanity and nature. The synergy of institutional and cultural efforts provides a comprehensive pathway for sustainable development and global ecological leadership.

4.1 Cultivating Ecological Awareness through Culture

Chinese-style modernization is not only about harmonious coexistence between humanity and nature but also about the coordinated development of spiritual and material civilization. Ideas precede actions, just as theory underpins practice. The formation of any concept requires prolonged immersion and subtle influence. Thus, constructing a new era of ecological civilization begins with reshaping people's perceptions, fostering a deep-rooted awareness of environmental protection among the public, and promoting a social ethos of respect and care for nature. First, ecological civilization-themed education should be widely conducted across society. By comparing the environmental changes before and after protection efforts, people can more intuitively perceive the effectiveness of governance and understand the importance and necessity of sustainable ecological development. Next, community-based environmental protection campaigns should be initiated, encouraging citizens to participate in activities such as neighborhood beautification and waste sorting. These activities help individuals recognize their role in ecological governance, bridging the gap between the public and ecological civilization efforts. Finally, strengthening ecological morality and related laws and regulations is essential. Ecological ethics should align with legal frameworks, as morality represents the baseline for every citizen, and laws provide foundational support for ecological ethics. Together, they enhance citizens' awareness of ecological civilization and contribute to the creation of a Beautiful China.

4.2 Regulating Behavior with the Strictest Environmental Protection Systems

Many prominent issues in China's environmental protection efforts stem from incomplete systems, inadequate mechanisms, and insufficient legal frameworks. The communique of the 20th Central Committee's Third Plenary Session emphasized that Chinese-style modernization requires building a sound ecological civilization system. Constructing ecological civilization entails a revolutionary transformation involving production methods, lifestyles, ways of thinking, and value systems. Achieving such transformative change demands a comprehensive system of ecological civilization regulations to protect the environment and advance its construction. Xi Jinping underscored, "Only by implementing the strictest systems and the most rigorous rule of law can we reliably guarantee the construction of ecological civilization" (Central Compilation and Translation Bureau of the Communist Party of China, 2014, p. 104).

Since the 18th National Congress, China has introduced numerous reforms and regulations, establishing the "four pillars and eight beams" of the ecological civilization framework. The vitality of any system lies in its enforcement, which hinges on rigorous oversight and accountability. First, ecological protection should be prioritized within the evaluation system for socioeconomic development. A scientific evaluation system serves as a "compass" for ecological civilization efforts. Moving beyond the traditional focus on GDP, indicators such as resource consumption, environmental damage, and ecological benefits must be integrated into development assessments. A system tailored to the goals of ecological civilization should include objectives, evaluation criteria, and reward-punishment mechanisms. Second, a lifetime accountability system for environmental damage must be established. Resources and the environment are public goods, and reckless decision-making that harms them cannot be condoned. Leadership accountability is crucial; those responsible for environmental damage must face consequences, including lifetime liability. Third, robust resource and environmental management systems must be implemented. As urbanization, industrialization, and lifestyle changes continue, environmental degradation remains an ongoing challenge.

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Addressing this requires effective management frameworks, including land-use planning, conservation areas, restoration systems for water, air, soil, forests, and wetlands, environmental monitoring and early warning systems, resource-use compensation mechanisms, and environmental damage compensation systems.

4.3 Enhancing Public Welfare through a Pristine Environment

Nature, as humanity's inorganic body, is the foundation of human existence. The ecological environment is irreplaceable; its loss is irreversible. It directly impacts people's quality of life and societal stability. When well-maintained, it enhances public happiness and satisfaction; when degraded, it causes ecological and economic harm, jeopardizes livelihoods, and poses risks to societal stability. Xi Jinping's profound reflections on ecological civilization have guided its practice, aligning with socioeconomic development laws and addressing public expectations. He stressed, "A good ecological environment is the most equitable public good and the most inclusive public welfare", advocating for the protection of the environment as one would safeguard their eyesight or life. Efforts must focus on key areas, including continuing the battles for clean air, water, and soil to reduce pollution and carbon emissions and improve environmental quality; strengthening water pollution control and water environment governance to ensure water quality; managing soil pollution risks to secure safe land use; and enhancing rural living conditions and infrastructure while promoting environmentally conscious habits and building eco-friendly, livable villages. Most importantly, addressing prominent environmental issues that endanger public health is critical. Creating a pristine ecological environment enhances public well-being and fulfills societal aspirations.

As a Chinese proverb reflects, "The clear breeze and bright moon are priceless; near waters and distant mountains are deeply felt". The modernization China seeks is one of harmonious coexistence between humanity and nature. Public demand for clean water, green food, fresh air, and a beautiful environment reflects their aspirations for a better life and is central to resolving current social challenges. The next five years are crucial for building a Beautiful China. Achieving this vision requires studying and comprehending ecological civilization thought with Chinese characteristics, adhering to the principles of prioritizing ecology and environmental protection, and practicing new development concepts without wavering. Zero tolerance for environmental destruction and abandoning unsustainable development models is essential. By centering development on the people, ensuring blue skies, green mountains, clear waters, and more beautiful surroundings, ecological well-being can become a growth engine for people's lives, a pillar of sustainable socioeconomic development, and a showcase of China's exemplary image. These efforts will usher in a new era of ecological civilization construction.

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HERBAL SYNERGY A STUDY ON THE COMBINED EFFECT OF NEEM, CLOVE AND POMEGRANATE

Dr Swati Rawat[1], Dr Sunil.S.Jaybhaye[2], Mr Gitesh.V.Vyas[3], MS Bhagyashri.S.Gaikwad[4], Rutuja.S.Dighe[5]

ABSTRACT

The ingredients used to make herbal tooth powders are many and easily found on the market. The use of modern methods that focus on these aspects is therefore advantageous for the standardization of herbs and their creations. Maintaining oral hygiene, which includes avoiding tooth decay and preserving breath freshness, is the main goal of dentifrices. To keep your mouth healthy all day, you can use a variety of dentifrices made from natural and synthetic substances. To manufacture the tooth powder, a number of plant ingredients with cooling, antibacterial, and antiseptic properties were used. Herbal ingredients Camphor, zindatilishth oil, miswak powder, Tulsi powder, clove powder, cinnamon powder, peppermint powder, neem powder, rock salt, turmeric powder, pomegranate powder, orange powder, amla powder, and camphor.

KEYWORDS: *Herbal toothpowder, Oral hygiene, Toothpowder.*

INTRODUCTION

The herbal dental care products are made to help clean the oral cavity and teeth. Tooth decay and bad breath can be avoided by using tooth powder as a preventative dental cosmetic. In order to help eliminate the minerals and food particles that have accumulated on the teeth, toothpaste and powder are applied and rubbed against the teeth. Tooth powder is used in conjunction with a toothbrush to maintain oral hygiene, which includes breath freshness and tooth decay prevention. The herbal dental care products are made to help clean the oral cavity and teeth. Tooth decay and bad breath can be avoided by using tooth powder as a preventative dental cosmetic.

Maintaining good oral hygiene is crucial for maintaining one's beauty, confidence, and personal image. The crown and the root are the two different types of teeth. Enamel, the hard tissue in the mouth, covers the tooth's crown. Saliva and teeth make up the oral cavity, which facilitates easy meal consumption. The key substance suggested to lubricate meals and preserve a suitable oral environment is saliva.

The teeth powder was made with a number of herbal ingredients that have antiseptic, cooling, and antibacterial properties. They come in both crystalline and amorphous forms. They are regarded as the most traditional and straightforward type of dosing.

Dental issues are prevalent in nations that are becoming more globalized. Poor eating habits and ignorance of oral hygiene are the main causes of common dental issues such gingivitis, halitosis (bad breath), tooth discoloration, and plaque or tartar buildup. Periodontal disease, dental caries, and dental plaque are the three categories of dental issues.

Dental plaque is a sticky substance that can harbor bacteria and covers teeth. Poor dental hygiene and foul breath might result from leaving this layer in place.

1. When gingivitis is not treated, inflammation develops around the tooth, resulting in periodontal disease. This inflammation causes infections and spaces between teeth and gums. The infection causes the gums, bones, and tissues that support teeth to deteriorate, which makes the teeth loose and causes them to fall out.
2. The Latin term for dental caries is "rot" or "rotten." An area of rot is referred to as a "carious lesion," and rotten teeth are symptoms of a condition known as "dental caries" or "tooth decay." This condition affects the calcified tissue of the teeth and is characterized by the breakdown of the organic material of the tooth and the remineralization of the inorganic component.
3. Many trace minerals, antimicrobial herbs, and calcium can be found in herbal tooth powder. The herbs have antimicrobial qualities and promote blood flow to the gums, while calcium and trace minerals aid in the restoration of dental enamel.

Types of Tooth Powder

1. Whitening tooth powder
2. Natural tooth powder
3. Herbal tooth powder
4. Homemade tooth powder

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1. Whitening Tooth Powders
   - Its purpose is to freshen teeth, help heal gums and help to reduce gums inflammation in the mouth. It can also polish and whiten teeth.
   - They may contain abrasive ingredients that gently whiten and remove stains. It can also polish and whiten teeth.
2. Natural tooth powders
   - Natural tooth powder uses naturally derived ingredients.
   - They would contain harsh chemicals and generally safe for people with sensitive teeth.
   - Ingredients like sea salt, which acts as an abrasive natural chalk. It contains essential oils like peppermint and eucalyptus.
3. Herbal tooth powders
   - Herbal tooth powder is beneficial or sore or bleeding gums.
   - It has been around for centuries, and many believe it to be as essential part of any teeth cleaning regimen.
   - It can have variety of ingredienst.
   - Baking soda, powdered chalk, and white clay are common.
4. Homemade tooth powder
   - These powders can be made at home.
   - It can be easily formulated by using organic neem powder, baking soda, sea salt, clove powder, fennel seed powder are weighed and mixed well and applied.

Dental: - Teeth taken from rural hospital.
Rural hospital: - Shelke clinic, Jalna.

Global Scenario of Dental Caries

While oral and pharyngeal malignancies as well as diseases in the oral tissue are also serious health concerns, dental caries is the most prominent oral health issue in the world[1].

In their permanent teeth, about 2.43 billion people (36% of the world's population) suffer from dental caries. Nine percent of the population, or over 620 million people, are affected by baby teeth. In South Asia, the Middle East, and Latin America, the disease is most common; in China, it is least common[2]. With a prevalence at least five times higher than asthma, dental caries is the most prevalent chronic pediatric illness in the US[3]. Children's tooth loss is primarily caused by this pathology[4]. From 29% to 59% of adult over the age of fifty experience caries[5].

Classification of Dental Caries

Caries can be categorized according to location, hard tissue damage, and rate of advancement. These classification schemes can be used to describe a specific instance of dental decay in order to more properly depict the disease to others and to show how severely the tooth has been destroyed[6].

Sr.no	On the basis of	Classification	Description
1	Rate of Progression	Acute	Signifies a quickly developing condition
		Chronic	Signifies an extended time to developing condition
2	Affected Hard Tissue	Enamel	Early in its development and may affect only enamel
		Dentinal	The extant of decay reaches the deeper layer of dentin
		Cementum	The decay on roots of teeth
3	Location	Class I	Pit and fissure caries (anterior or posterior teeth)
		Class II	Approximal surface of posterior teeth
		Class III	Approximal surfaces of anterior teeth without incisal edge involvement
		Class IV	Approximal surfaces of anterior teeth with incisal edge involvement
		Class V	Gingival/cervical surfaces on the lingual or facial aspect (anterior or posterior)
		Class VI	Incisal edge of anterior teeth or cusp height of posterior teeth

Stages of Dental Caries

1 White Spot Stage

The mineral matrix of teeth is dissolved by the acid that is created by the bacteria and yeast in tooth plaque. A chalky white spot on the tooth is the first sign of dental caries. At this point, the underlying lesion is reversible, and the surface is undamaged. It can be challenging to differentiate between white spots caused by developing caries and developmental hypocalcification. Additionally, the black staining stage replaces the white spot[7].

2 Cavity Stage

The surface eventually breaks or becomes "cavitated" if the mineral loss from acid challenge persists, and the damage cannot be undone. A significant portion of the tooth may be lost if the condition worsens. Typically, active cavitated lesions have a

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golden-brown color. Lesions that have been there for a long time are darker, often almost black. Since halted decay is frequently the darkest, color depth is not a reliable indicator of the severity of the lesions[7].

MATERIAL AND METHOD

Sample Collection and Preparation

Samples were taken from the oral cavity using sterile cotton swabs and a dietary media from 33 donors of each donor. Swabs were collected four times per person, including after breakfast, after using toothpaste, after rinsing with water, and after waking up.In accordance with the donors, this was carried out. The swabs were immediately brought to the lab to be grown on the proper growth media.

Three different types of culture media were utilized in this experiment: Mannitol salt agar medium for the detection of Staphlococcus bacteria, MacConkey agar for the detection of interobactereaceae, and nutrient agar for the estimation of the total number of microbes. The media were prepared according to the manufacturer's instructions on the packaging, and they were autoclave sterilized for 15 minutes at 121 °C and 15 lb/inch2 of pressure. After that, the culture media was kept at lab temperature until it solidified. Plotting the donor swabs directly onto the culture media allowed researchers to identify the type of bacteria present in the samples. An incubator set to 37 °C for 24 hours was used for the incubation process.

Bacterial Antibiotic-Resistance Test

Following colony activation, the antibiotics' resistances were assessed using the diffusion method on agar plates. Table 2 lists the antibiotic kinds, along with their code and concentration.

Table (2) Antibiotics and their concentration

Name	Code	Concentration/mcg
Doxycycline	DO	10
Mastdiscs	TS	25
Ceftriaxone	CRO	10
Tobramycine	TOB	10
Mastdiscs	T	30
Gentamycine	CN	10

Bacterial Isolation

The investigation included identifying the oral cavity's microbial composition while a number of male and female smokers and non-smokers went about their regular lives. There were 33 donors in all, with ages ranging from 25 to 35. According to Table 3, which displays the distribution of donor categories and percentages, there were 14–11 non-smokers and smokers, who made up 42.4 and 33.3 percent of the study samples, respectively, while there were 8–0 non-smokers and smokers who were female, making up 24.2 and 0.6 percent of the study samples, respectively.

The laboratory test results demonstrated that every sample exhibited positive development across the several phases of oral cavity isolation, with variations in the quantity and kinds of bacteria isolated across the identical donor category. This discrepancy results from the influence of different behaviours and routines during the phases of isolation, including breakfast, toothbrush use, mouthwash, and water washing.

Because of the high oral content of microorganisms, the results were consistent with those of Mahmood (2009) and Hussein (2018), who were able to isolate various bacterial species from all study samples[8].

Table (3) Distribution of Donor Categories.

Isolation Samples		NO.	%
Male	Non-Smoking	14	42.4
	Smoking	11	33.3
Female	Non-Smoking	8	24.2
	Smoking	0	0
Total		33	100

Pathophysiology

Enamel

When the enamel loses minerals, it develops several distinct zones: the translucent zone, dark zones, body of the lesion, and surface zone[9]. The translucent zone coincides with a 1/2% loss of minerals[10], while the dark zone is a slight remineralization of enamel. The body of the lesion experiences the greatest de-mineralization and destruction, while the surface zone remains relatively mineralized until the loss of tooth structure results in a cavitation[11]. Caries demineralizes enamel in the direction of the

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enamel rods, creating various triangular patterns between pit and fissure, and smooth-surface caries[12].

Dentine

The distinct regions of dentine that are impacted by caries are the zone of destruction, the zone of bacterial penetration, and the advancing front, which extend from the deepest layer to the enamel[9]. A zone of acid-demineralized dentine, devoid of microorganisms, is represented by the advancing front. The bacterial invasion sites and, eventually, the dentin breakdown are known as the zones of bacterial penetration and destruction. The bacterial population in the zone of destruction is more diverse, and the organic matrix has been degraded by proteolytic enzymes[11].

Cementum

Cemental caries is more common in older persons because gingival slump, a chronic condition that produces a wide, shallow lesion and gradually invades the cementum of the root and eventually the dentin to cause a chronic infection of the pulp, can be caused by trauma or periodontal disease[13].

Signs and Symptoms of Dental Caries

Depending on the degree and location of cavities, several indications and symptoms may be present. when there may be no symptoms at all and a cavity is just starting. The following indications and symptoms could appear as the deterioration gets worse:

- Tooth sensitivity is the term for toothache and mild to severe discomfort when consuming hot or cold, sweet foods or beverage[14].
- Teeth with obvious pits or holes[15].
- Any surface that has brown, black, or white discoloration of tooth[15].
- Bad breath and foul tastes[16].
- Fever, chills, abscess, and trismus (www.rightdi-agnosis.com).

Complications

- Ludwig angina with cavernous sinus thrombosis can be fatal[17].
- Dental diagnosis, tooth loss, pulpitis, and toothache (www.rightdiagnosis.com). Drugs

Diagnosis of Dentalcaries

Primary Diagnosis

A small chalky patch (smooth surface caries) may be the first appearance, but it could gradually grow into a big cavitation. Examine every surface of the teeth that is visible with an explorer, dental mirror, and a bright light source. For less noticeable tooth regions, such as cavities in between teeth, dental radiography, or X-rays, are utilized.

Nowadays, interproximal decay (between teeth) can also be detected with lasers that don't emit ionizing radiation. In order to identify pit and fissure caries, dentists commonly use visual and tactile inspection in addition to radiography[18]. By removing moisture and altering the optical characteristics of the unmineralized enamel, blowing air across the suspicious surface is a common method for diagnosing early, uncavitated caries[19].

Differential Diagnosis

Dental caries is caused by dental fluorosis and tooth developmental abnormalities, such as decreased tooth mineralization and tooth hypoplasia[19].

Drugs

- Tulsi
- Neem
- Orange peel
- Pomegranate peel
- Miswak
- Turmeric Powder
- Camphor
- Rocksalt
- Zindatelismath
- Amla
- Clove
- Cinnamon
- Mint

Treatment

Preservation of the tooth's structure and prevention of more tooth damage are the objectives of treatment. Above all, whether the carious lesion is cavitated or not affects how it is managed.

Non-Cavitated Lesions

It can be stopped, and remineralization can take place, if broad dietary modifications are made, such as cutting back on refined carbohydrates[20]. Through tooth remineralization, it can be treated non-operatively.

Tooth Remineralization

Minerals are restored to the tooth's molecular structure through a process known as tooth remineralization. Damaged tooth structure does not completely heal, but if dental hygiene is maintained at its best—twice daily brushing with fluoride toothpaste and flossing, as well as frequent topical fluoride application—remineralization of very minor carious lesions may take place. This kind of care for a carious lesion is known as "nonoperative treatment"[19].

Cavitated Lesion

Is far more difficult to restore, and a dental restoration is typically recommended, especially if dentin is involved. This type of care for a carious lesion is called "operative treatment."

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Other Measures

Prevention And Control

Oral Hygiene

Personal hygiene care consists of correct brushing and flossing everyday[16]. correct brushing and flossing are to remove and prevent the production of plaque or dental biofilm. Professional hygiene care consists of frequent dental examinations and professional prophylaxis (cleaning)[20].

Dental Sealants

The molars' chewing surfaces are coated with a thin substance that resembles plastic to keep food from becoming stuck in cracks and pits[21].

Dietary Modification

It is advised to cut back on snacking because it provides a steady flow of food for the oral bacteria that produce acid. It is advised to clean your teeth after meals since chewy, sticky items (such sweets or dried fruit) tend to stay on your teeth longer. For kids, the American Diabetes Association and the American Paediatric Association advise minimizing the number of sugar-filled beverages consumed and avoiding feeding babies bottles while they are sleeping. Reducing dental biofilm is facilitated by chewing gum that contains the sugar alcohol xylitol.[20]

CONCLUSION

The Significant issues for the person may arise from substantial caries damage, which could impair their functional and aesthetic quality of life. Their understanding of oral health care can be improved by raising their awareness of and familiarity with dental caries in general. Being able to recognize potential risk factors for health issues, such as lifestyle, ethnicity, health status, and social determinants linked to oral health status risk, allows healthcare professionals to actively participate in health screening to determine whether clinical preventive services, including dental preventive services, are necessary. Health care providers who possess the necessary information and practice good oral hygiene can be valuable contributors to the education of individuals and organizations about oral health and serve as role models for patients, friends. Oral health is a component of overall health. Therefore, preventing dental cavities is a crucial part of public health initiatives.

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DRUG EVALUATION METHODS OF GINGER

Dr. Swati Rawat[1], Dr Sunil S. Jaybhaye[2], Mr. G. V. Vyas[3], Ms. Bhagyashri Shantilal Gaikwad[4], Shivani Sanjeev Mahindre[5*]

[1]*Principal of Institute of Pharmacy (NKSPT) Badnapur.*
[2]*Vice Principal of Institute of Pharmacy, Badnapur ,Jalna*
[3]*Guide*
[4]*Co-Guide*
[5]*Student (B. Pharmacy)*
Institute of Pharmacy, Badnapur , Jalna 43120

ABSTRACT

Ginger (Zingiber officinale) has long been used in traditional medicine for its therapeutic properties, including anti-inflammatory, antioxidant, anti-nausea, and analgesic effects. This abstract outlines various drug evaluation methods employed to assess the pharmacological properties, safety, and efficacy of ginger and its bioactive compounds. Methods such as in vitro assays, animal studies, clinical trials, and analytical techniques like high-performance liquid chromatography (HPLC) and gas chromatography-mass spectrometry (GC-MS) are utilized to evaluate ginger's potential in treating a range of ailments, including digestive disorders, pain, and inflammation. Additionally, the role of bioavailability and pharmacokinetics in ginger's therapeutic effects is discussed. These evaluation methods help establish scientific validation for the medicinal use of ginger, support the standardization of its active constituents (e.g., gingerol), and guide the development of ginger-based pharmaceutical products. The abstract concludes by highlighting the need for further research to elucidate optimal dosing, long-term safety, and therapeutic efficacy in diverse populations.

INTRODUCTION

Canton ginger belongs to the family zingiberaceace .it is a herbaceaous perennial plant. It is commonly used as a spice and herbal medicine. The part used of plant used of the plant is the rhizome. The plant produces an orchid like flower with yellow green petals speckled with purple. Ginger has been used as a spice. In India an countries with hot and humid climates , gingers consumed in large quantities and is good or digestive problems.

Ginger belongs to the plant family that includes cardamom and turmeric. Its spicy taste is mainly due to the presence of ketones, especially ginger root, which seems to the main part of ginger that is Eaton. In Greek it is called ziggibeis, and in Latin zinziberi.Interestingly, ginger does not grow in wild and its true origin is uncertain. The Indians an Chinese are said to have produced ginger as a root tonic for 5000 years to cure many aliment, and the herb is now grown in the humid tropics.

India is the largest ginger producer. Ginger has been used as a salting agent since long before official history was recorded. It was an extremely important trade item and was exported from India to the Roman Empire over 200 years ago, where the Roman Empire over 2000 years ago, where it was particularly prized for its healing properties. Ginger continued to be a highly sought after commodity in Europe even after the fall of the Roman Empire, with Arab merchants controlling the trade in ginger and other spices for centuries.8 In the 13th and 14th centuries, the value of a pound of ginger was equivalent to the price of a sheep. Raw and preserved ginger was introduced to Europe in the Middle Ages, where it was included in the official pantry of various countries. In the Middle Ages, it was imported in canned form for use as sweets. Queen Elizabeth I of England is credited with inventing the anthropomorphic gingerbread, which has become a popular Christmas treat . Zingier official is a plant found locally in India that is widely used as a flavouring agent in savory dishes such as curries and sweets such as cakes and biscuits, alcoholic beverages as well. Like in tea. Ginger is a well-known herb, commonly used in traditional medicine all over the world. Ginger has been used for thousands of years to treat colds, nausea, arthritis, migraines, and high blood pressure. The many pharmacological activities of ginger are antiemetic, antidiabetic, analgesic, anti arthritis, anticancer, antioxidant, anti-ulcer, antibacterial, anti-inflammatory, estrogenic and cardiovascular. A chemical stimulant and an unsaturated liquid phenolic ketone C17H24O3 are responsible for the pungent taste of ginger. The main components of ginger are aromatic essential oils, antioxidants and pungent oleoresin. These aromatic or spicy compounds have been identified as C6H5C(O)CH3, known as a chemical stimulant, phenolic ketone unsaturated liquid C17H24O3 and Vanillylacetone. Lab-scale formulation is made with herbal syrup and evaluated for several parameters such as pH, viscosity, density, stability testing during formulation evaluation. Is a stable and ready-to-know formula. F1, F2, F3 and F4 have been prepared with different amounts of ingredients such as alcohol, sugar and a final amount of syrup.

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AIM : Drug evaluation methods of ginger

1. **SYNOYMS**: Rhizome ,ZINGBERIS ,ALE ,ADRAK ,SONTH
2. **BIOLGICAL SOURCE:** Ginger consist of whole or dried scrapped or unsacrutted rhizomes of zingiber oftirica roscoe ,
3. **FAMILY:** Zingiberaceae. It contain not less than 0.8%of totalgingerols on deied beam
4. **GEOGRAPHICAL SOURCE** :it said to be native of east Asia ,but is cultivated in Caribbean islands ,Africa ,Jamaica, Taiwn and India
5. **MORPHOLOGICAL CHARACTERS :**
   Colour: buff yellow
   Odour: Agreable and aromatic
   Taste: purgent and agreble

Active Ingredient

At least 115 components of fresh and dried ginger varieties have been identified through multiple analytical procedures. Ginger contains many active components, such as phenolic compounds and terpenoids.10 The phenolic compounds in ginger are mainly ginger root,6-shogaol and parasols. In fresh ginger, ginger root contains the main polyphenols such as 6-gingerol, 8-gingerol and 10-gingerol. Ginger root is the main component of fresh ginger and was found to be slightly reduced in dried ginger, while the concentration of6-shogaol, which is the main dehydration product of gingerol, was higher.11 ginger. At least 31 compounds related to gingerol have been identified from crude methanol extracts of fresh ginger rhizomes. Ginger is rich in active Ingredients, such as phenolic and saponins. Ginger has been subdivided into at least 14 bioactive compounds, including4-gingerol,6-gingerol,8-gingerol,10-gingerol, 6-paradol, 12-shogaol,6-shogaol, 1-dehydro-10-gingerdione,10-gingerdione, 3-heptanone, 5-hydroxy 1,7-bis(4-hydroxy-3-methoxyphenyl), C21H24O6inear heptatonic, 1,7-bis-(4′ hydroxyl-3′ metoxyphenyl) 5- methoxyhepthan-3-one and metoxy-10–gingerol.13 The proportions of each individual ingredient in a sample of ginger depend on the country of origin, commercial processor and fresh, dried or processed ginger.12,14 1.4.

Methods for Evaluation

Morphological Evaluation

Morphological evaluation refers to the analysis of the structure, form, and physical characteristics of an organism or its parts. In biology, this term is commonly used to assess the external features of cells, tissues, organs, or whole organisms. The evaluation can be do through various methods depending on the field of study, such as microscopic examination, imaging techniques, or computational analysis.

Physical Evaluation

Physical evaluation for ginger (Zingiber officinale) typically focuses on the physical properties that influence its cultivation, quality, and processing, such as mechanical, thermal, and optical properties, as well as moisture content and density. These physical properties are crucial for optimizing growing conditions, harvesting techniques, post-harvest processing, and quality control. Physics-based assessments help in understanding how the plant responds to external forces (such as mechanical stresses), how it retains or loses moisture, and how it behaves under different temperature conditions

Biological Evaluation

Biological evaluation of ginger (Zingiber officinale) focuses on assessing the biological activity of its compounds, their effects on human health, and how the plant interacts with biological systems.

Chemical Evaluation

Chemical evaluation of ginger (Zingiber officinale) focuses on analyzing its chemical composition, including bioactive compounds, essential oils, and other phytochemicals that contribute to its medicinal, culinary, and therapeutic properties. Chemical analysis is essential to understand the nutritional value, pharmacological effects, and quality control of ginger, particularly in the context of its widespread use in the food and pharmaceutical industries.

Uses of Ginger

Ginger is a common ingredient in Asian and Indian cooking, and is used in many dishes, including curries, soups, salad dressings, and desserts. Fresh ginger is often used in Asian dishes, while dried ginger is more common in European cooking.

Medicine

Ginger has been used in traditional medicine for thousands of years to treat a variety of conditions, including nausea, vomiting, diarrhea, stomach upset, arthritis, and headaches. Ginger is also used to help with symptoms of the common cold and flu.

Pain Relief

Ginger can provide similar pain relief to common pain medications like aspirin and ibuprofen. It can help relieve pain from menstrual cramps, but has a delayed effect, making it more of a long-term pain reliever.

Other uses : Its Rhizomes show fungicidal ,antibacterial and anthelmintic properties.

Disadvantages of Ginger

- Digestive Issues: High doses of ginger may cause heartburn, diarrhea, or indigestion. It can be irritating to the stomach for some people, especially those with sensitive digestive systems.
- Blood Thinning: Ginger has natural blood-thinning properties, which can increase the risk of bleeding, especially if combined with blood-thinning medications like aspirin or warfarin. People with bleeding disorders should consult a healthcare provider before using ginger extensively.
- Pregnancy Concerns: While ginger is often used to relieve morning sickness, excessive consumption during pregnancy can lead to complications like premature labor. It's generally recommended to limit intake and consult with a healthcare provider.

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- Allergic Reactions: Some people may be allergic to ginger, experiencing symptoms such as skin rashes, hives, or swelling. This is rare but possible.
- Interaction with Medications: Ginger may interact with certain medications, such as blood pressure medications, diabetes medications, and anticoagulants, potentially affecting their efficacy or causing side effects.
- Mouth Irritation: Consuming raw ginger or concentrated forms of ginger may cause irritation or a burning sensation in the mouth or throat.

CONCLUSION AND RESULT

Ginger has shown considerable promise as a natural therapeutic agent with multiple health benefits, including anti-inflammatory, anti-nausea, antioxidant, and anticancer properties. Its potential applications in managing chronic conditions such as arthritis, digestive issues, and even metabolic disorders make it an attractive option for further investigation and clinical use.

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REVIEW ON PREPARATION AND EVALUATION OF SUNSCREEN CREAM

Sonali Mahadev Guthe[1], Saurabh M Bondre[2], Dr. Swati S Rawat[3], Dr. Sunil S Jaybhaye[4], Yogiraj P Mule[5],

[1]Student of Bachelor of pharmacy
[2]Asst. Professor
[3]Principal
[4]Vice Principal
[5]Asso. Professor
Institute of pharmacy, Badnapur

ABSTRACT

Presently herbal sunscreens are widely used by almost everyone on this planet to prevent from harmful effects of UV radiation from sunlight, Due to the hasty-paced life of today, our life is affected by pollution and harsh synthetic chemicals, hence, nature has rendered us with its everlasting notable ingredients of herbal. The major cause of sunburn is UV rays which leads to precarious skin cancer. Sunscreen is a topical product that absorbs or reflects some of the sun's UV radiation on the skin from excessive exposure to UV radiation. It has the potential to prevent Sunburn and reduce the harmful effects of the sun such as premature aging and skin cancer.

The present research work portrays the formulations and evaluation of tapical photoprotector, containing antioxidant, anti-malignant, wound healing. moisturizer, & other photo-protective.

KEYWORD'S: *Sun protection factor, UV protection, Broad spectrum protection*

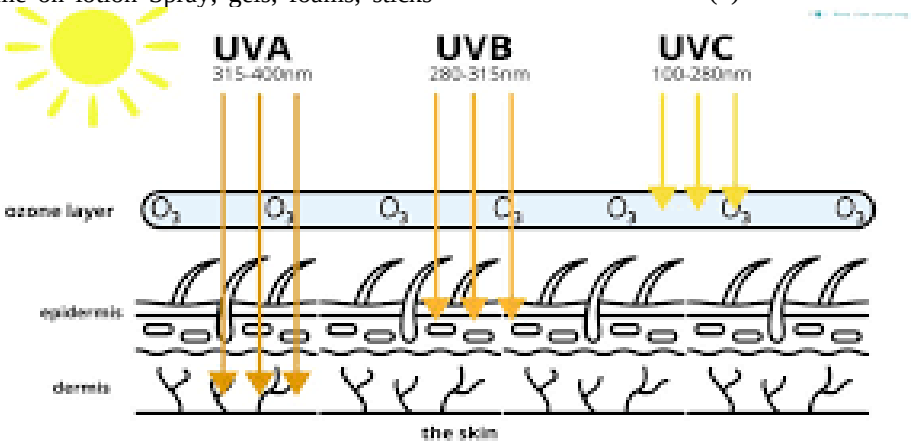
INTRODUCTION

Cosmetics are defined as "The items with mild action on human body for the purpose of cleaning, beautifying adding to the attractiveness, altering the appearance, or keeping or promoting the skin or hair in good condition" while functional cosmetics even after falling the cosmetics are designated as “Items fulfilling specific conditions like skin whitening, minimizing the appearance of items in the face and body, protecting from the sun and sun tanning. (1)

Sunscreen also known as sunblock or Suntan lotion, is a photoprotective topical product for the skin that absorbs or reflects some of the sun's ultraviolet (UV) radiation and thus helps protect against sunburn and most importantly prevent skin cancer. Sunscreen come on lotion Spray, gels, foams, sticks powders and other topical products. Sunscreen are common supplements to clothing particularly sun sunglasses, protective sunhats and special sun protective clothing and other form of protection (e.g- Umbrellas). (2)

The light emitted by consists of Frequency bonds of infrared, visible and ultraviolet radiation of these UV rays are harmful to most humans (UV spectrum 100-400 nm).

UVA (315-400nm) radiation penetrates the skin and cause damage to cell membrane, cause ageing of skin.
UVB (280-315 nm) rays cause skin cancer cause damage to cornea and lens of eye.
UVC (100-200 nm) generally absorbed by earth's atmosphere and are not harmful. (3)



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Ideal properties of sunscreen-

1) Must absorb a broad range of UV rays causing sunburn.
2) Must be stable in the presence of sunlight.
3) Should be able to provide complete protection for skin.
4) Should be safe effective, chemically inert, at low temperature.
5) Should not cause irritation, sensitization and toxicity.
6) Activity against UVA and UVB radiation.
7) Anti-oxidant property.
8) Anti-cancer property.
9) Anti-mutagenic property. (4)

Advantages of Herbal Sunscreen Cream

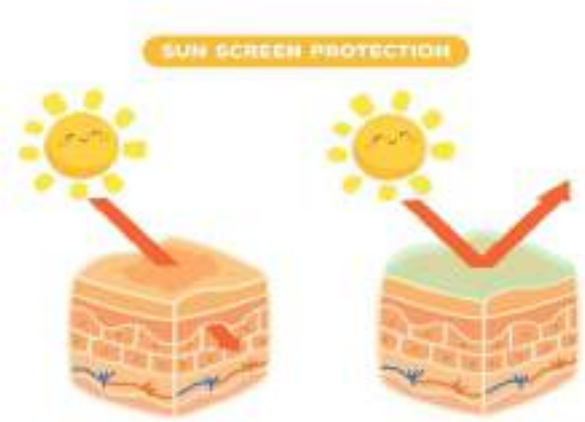
1) Easily available
2) Do not show allergy
3) Easy to manufacture
4) Cheap in cost
5) No side effect
6) Effective with small quantity
7) No special equipments needed for preparation
8) Renewable resources.(5)

Disadvantages of Herbal Sunscreen Cream

1) They are difficult to hide taste and odour.
2) Manufacturing process are time consuming & complicated.
3) Herbal drug have slow effects as compare to allopathic dosage form it also requires long term therapy. (6)

Importance of Sunscreen Cream

UV radiation is crucial for human healing through aiding mineral absorption and vitamin D3 production. However, direct interaction with DNA, RNA, proteins, and lipids poses health risks like potential carcinogenesis. To shield the skin effectively, topical application of active molecules with UV-absorbing or reflecting properties is optimal. Sunscreen has gained importance in the current scenario due to its ability to protect skin from damage and health risks like skin cancer and premature aging. Making sunscreen a part of your daily routine can help maintain your skin's health and appearance regardless of age. (7)



Why we use sunscreen?

- To much-unprotected sun exposure leads to
- Premature skin ageing
- Sun burn
- Skin cancer (8)



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Mechanism of Photoprotection

UV rays mediated photo oxidative damage reaches the dermal capillary via epidermis and dermis and cause depletion of enzymatic and non-enzymatic anti-oxidants in stratum corneum, epidermis and dermis. Photo oxidation of pre-existing melanin and its precursors will occur which result in immediate and persistent pigment darkening.

Sunscreen act by preventing and minimizing the damaging effects of the ultraviolet sunrays following exposure to the sunscreen have been demonstrated to increase the tolerance of the skin to UV exposure. The work on two mechanisms:

Scattering and reflection of UV energy from the skin surface mineral based on inorganic sunscreen works on this mechanism they provide a coating that blocks sun rays from penetrating through the skin. (9)

Aim and Objectives:

Aim: To study the formulation and evaluation of herbal sunscreen cream

Objectives:

1) Sunscreen inhibit the transmission of UV (ultra- violet) radiation into the skin by reflecting, absorbing or scattering such radiation.
2) Sunscreen have been recommended as a form of protection against sunlight, with protection increasing with higher sun protection factor
3) To develop sunscreen formulation using herbal ingredients.
4) To develop various formulation.
5) To perform physiochemical characterization.
6) To achieve maximum stability of formulation, and UV protection effects.(10)

Materials And Methods

Aloe vera

Aloe-vera gel is used in cosmetic lotion for it's moisturizing and revitalization. It blocks UVA and UVB rays and maintain skin natural moisture balance. It stop the sunburn and stimulate immune system intervention.(11))



Coconut oil

coconut oil keeps the skin soft and smooth while preventing premature ageing of the skin, coconut oil for skin use as a moisturizer, remove dead skin cells. Coconut oil has anti-inflammatory properties which reduce redneeson skin this can be helpful for both dry and oily skin conditions by reducing inflammation of the skin.(12)



Rose Water

Rose water contain vitamin B. which often used in sunscreen and sun product. It helps to bolster the effectiveness of SPF. Rose water can be used to lighten the skin pigmentation. Rose water con remove oils and dirt from your skin by unclogging yours pores. (13)

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Vitamin E Capsule

Vitamin E it provides extra protection against acute UVB damage and protect against cell mutation caused by sun and pollution exposure. Vitamin E it help cleanse your skin and removing the impurities.



Preparation of Sunscreen lotions

Ingredients	Quality
Rosemary extract	1gm
Turmeric extract	0.5gm
Alovera gel	5gm
Coconut oil	2ml
Rose water	1ml
Cetyl alcohol	2gm
Stearic acid	4gm
Glycerine	2ml
HPMC	3gm
Propyl paraben	19gm
Carbopol	2gm
Vitamin E	1ml
Triethanolamine	1g

Preparation Method

1) Prepare alovera gel and add little amount of carbapol in it and heat it to form a gel.
2) weight an accurate quantity of cetyl alcohol, stearic acid, glycerine, HPMC, propyl paraben, mix it well and melt it. (15)
3)In a beaker add 1g of triethanolamine and accurate quantity of water, heat it upto. 80-85 degree Celsius.
4)Transfer alovera extract in mortar and pestle. (16)
5) Add rosemary extract, turmeric extract, tomato extract, and triturate all the chemicals with continuous mixing.
6)Transfer it in a suitable container and label it properly. (17)

Evaluation of sunscreen

1) Physical parameters -

Colour - The colour of formulation was checked manually and observed.
Odour - The smell of formulation was checked by applying preparation on hand & feel the fragrance.
Appearance - visually checked the appearance of the formulation (18)

2) Determination of PH-

The PH of sunscreens was determined using digital pH meter. pH was measured after 1g of the formulation was dissolved in

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100ml of newly prepared distilled water for 2 hrs. The purpose of this study was to guarantee that the pH of the produced herbal sunscreens in similar to the pH of the skin after 24 hours of use. The result were triple-checked, and S.D. was recorded. (18)

3) Determination of Viscosity-

The brookfield viscometer was used to test viscosity, with the proper number of spindles Selected. A 50ml beaker was used to hold 50g of preparation until the spindle groove was dipped and the rpm was set. Sunscreen viscosity was measured at 5, 10, 20, 50 & 100 xpm. The viscosity was computed using the factor obtained from the reading (19)

4) Spreadability-

About 0.5 gm of cream was placed in a circle. Of 1cm diameter on a 20x20 cm glass plate over which the second glass plate was placed. A weight of 500gm was allowed to rest on the upper glass plate for 5 min & then on increase in the diameter of the cream due to spreading was noted.

5) Irritancy test-

Mark on area (one. sq. cm) on the left hand dorsal surface. The lotion was applied to the specified area and time was noted. Irritancy erythema, edema was checked if any for regular interval up to 24 hrs & reported.

6) Stability testing-

Stability testing of prepared formulation was conducted at room temp studied for 7 days And then the formulation was studied at 45 ± 1°C for 20 days. The formulation was kept both at room and elevated temp. And observed on 0th, 5th, 10th, 15th, 20th days for all the evaluation parameters. (20)

7**) Determination of SPF-**

A UV visible spectrophotomete was used to examine the in-vitro efficacy of herbal sunscreens. A 0.10%. solution (w/v) of herbal sunscreen. lotions in ethanol was made by dissolving 0.050g of herbal sunscreen lotions in 50.0ml of ethanol Between 290 and 320 mm, aliquots of each herbal sunscreen were scammed at 5nm intervals.(21)

Future Prospects of sunscreen-

The future of sunscreen cream looks promising with a number of trends and innovation on the horizon, including.

1. Brood-spectrum sunscreens -

Brands may promote the use of broad-spectrum Sunscreens to protect against visible light. infrared (IR), as well as UVA & UVB rays.

2. Lighter formulations -

Suncare products may become lighter and less sticky or greasy, them thanks to new ingredients and particle shapes.

3. Natural ingredients-

Natural plant extracts and botanicals may become more popular in sunscreens, due to their many benefits.

4. Novel technologies-

New technologies and approaches are being explored to address problems with existing Sunscreens

5. Protection from environmental aggressors-

Sunscreens may be able to protect against pollution, blue light, UV rays. and IR in addition to UV rays.

6. Higher SPF-

Sunscreens may combine UV filters with botanicals, vitamins, DNA repair enzymes and film forming polymers to achieve a higher SPF.

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REVIEW PAPER ON A SURVEY REPORT ON OVER THE COUNTER PRODUCTS AND IT'S MARKET STATUS

Dr. Swati Rawat[1], Dr. Sunil Jaybhaye[2], Mr. Avinash G. Wagh [3], Ashwini Shelke [4], Gokul .S. Chavan[5*]

[1]*Principal of Institute of Pharmacy Badnapur ,Jalna*
[2]*Vice Principal of Institute of Pharmacy, Badnapur,Jalna*
[3]*Guide*
[4]*Co-Guide*
[5]*Student*
Institute of Pharmacy, Badnapur, Jalna -431202

ABSTRACT

This survey report examines the consumer behaviour, preferences, and perceptions regarding over-the-counter (OTC) products. Conducted across diverse demographic groups, the study aims to understand the factors influencing purchasing decisions, including product awareness, perceived efficacy, safety concerns, and marketing impact. Data was collected through structured questionnaires distributed to 1,000 respondents. The results indicate that convenience and accessibility are primary drivers of OTC product usage. A significant portion of respondents reported reliance on brand recognition and peer recommendations when selecting products. Additionally, the survey highlights a growing trend towards natural and herbal alternatives, reflecting an increasing consumer preference for perceived safety and minimal side effects (1). The report also discusses the impact of digital media on consumer choices, revealing that online reviews and social media influence purchasing behaviours significantly. Furthermore, the findings suggest a disparity in awareness of regulatory information, with many consumers unaware of the potential risks associated with certain OTC products. Overall, the survey underscores the importance of effective communication and education regarding OTC products, as well as the need for manufacturers to adapt to evolving consumer preferences. This report serves as a valuable resource for stakeholders in the pharmaceutical and retail sectors, providing insights into market trends and consumer expectations (2).

KEYWORDS: *(OTC) over the counter, market analysis, User Satisfaction , sales data, product categories.*

INTRODUCTION

Over-the-counter (OTC) products, which include medications, dietary supplements, and personal care items, are widely accessible without a prescription. This market segment plays a crucial role in healthcare, enabling consumers to manage minor health issues independently. OTC products are typically available in pharmacies, supermarkets, and online platforms, contributing to their convenience and increasing market demand. The global OTC market has experienced significant growth, driven by factors such as rising healthcare costs, increasing self-medication trends, and a growing emphasis on preventive healthcare. According to a report by Grand View Research (2022), the global OTC market was valued at approximately USD 150 billion in 2021 and is projected to expand at a compound annual growth rate (CAGR) of around 7% through 2028. Key categories within the OTC market include analgesics, cold and flu medications, gastrointestinal treatments, and vitamins and supplements. The growing aging population, along with a rise in chronic diseases, further fuels demand for these products. Additionally, digital platforms are revolutionizing the way consumers access and purchase OTC products, enhancing market dynamics. In summary, the OTC market is poised for continued growth, driven by evolving consumer behaviours, technological advancements, and an increasing focus on health and wellness(3). OTC medication must be reasonably safe and well tolerated. It must be used to treat condition for which a doctor is not directly supervising. These are legally allowed to be sold by pharmacist without any regulations. Presently more than 300000 different OTC drugs are available worldwide. Due to the daily addition of new medications to the market, the number is always rising(4). Self-medication is becoming more common as a result of factors such as people's socioeconomic level, growing healthcare costs, rising literacy rates, easy access to information, time constraints, and the accessibility of OTC medications, among others. It is observed that literate is more likely to self-medicate than the illiterate. A study done in India in 1995, shows that self-medication, was found to be higher in urban regions (37%) than in rural areas (17%). A thorough understanding of a drug's composition, dosage, and mode of administration, duration of therapy, side effects, interactions, and precautions is necessary for responsible self-medication. Inadequate duration of consumption

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may contribute to development of resistance, wastage of resources, and drug dependence(5).



OBJECTIVE OF OTC DRUGS SURVEY

The objective of this survey report is to analyze and evaluate the current market status of Over-the-Counter (OTC) products, understanding consumer preferences, trends, and factors influencing purchasing decisions. The survey aims to:

1. Understand Consumer Behavior: Identify consumer demographics, habits, and preferences in purchasing OTC products, including frequency, types of products, and factors influencing choices.
2. Market Trends and Growth: Assess the overall growth, market size, and potential for expansion within the OTC sector. This includes identifying emerging trends, such as the shift towards natural or herbal products, e-commerce platforms, and online pharmacies.
3. Competitive Landscape: Evaluate the competitive environment, including major players, brands, and their market share. This will help in understanding the key players dominating the OTC space and emerging competitors.
4. Regulatory Impact: Examine how changes in regulatory frameworks, safety standards, and government policies influence the market for OTC products.
5. Product Categories: Investigate the various categories of OTC products, such as pain relievers, cold and flu medications, skincare, dietary supplements, and others, analyzing their popularity and market growth rates.
6. Price Sensitivity and Purchasing Channels: Identify the pricing strategies of OTC products and how consumers respond to different price points. Explore the primary purchasing channels for OTC products, such as retail stores, online marketplaces, or pharmacies.
7. Consumer Trust and Safety Concerns: Understand the role of product safety, quality assurance, and consumer trust in the OTC market, especially regarding counterfeit products or safety concerns (6).
8. Impact of COVID-19: Explore how the pandemic has shifted consumer behavior regarding OTC purchases, including an increase in online shopping, changes in demand for health-related products, and long-term impacts on the market (7).

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Survey of OTC products



METHODS

Over-The-Counter Drug Usage Pattern

The most commonly used OTC drugs found were cough syrups (87%), antibiotics (77%), analgesic (71%), cold medicine (63%), Motion sicknesses medicine (49%), sleeping pills (32%), Sedatives/antianxiety (19%) and others (1%). The most commonly Used cough syrup was Dextromethorphan, an antibiotic was Azithromycin and analgesic was paracetamol.

Frequency of over-the-counter drugs consumption per day

Among the 371 students who responded to the survey and used OTC Medications, 43% used the medication once daily, 50% used it twice Daily, 6% used it three times daily, and 1% used it more than three times (8).

Adverse Drug Reaction observed by the users

The common ADR observed by the users of OTC drugs were-Dry Mouth (73%), Hypersensitivity (69%), Diarrhoea (64%), Anxiety (61%), Increased heart rate (41%), Blackout (37%), Breathing Issues (33%) and Others (1%).

Main reasons to use over-the-counter drugs

The most common reasons for not visiting doctor were-it's easy Availability (100%),based on previous prescription (92%), timesaving (100%) and consultation fee saving (100%). For this question It was found that participants have opted to choose multiple options As answers.

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Consumer Insights

OTC product survey questionnaire .

Category	Question	Response type	Purpose
Demographics	What is your age group?	Multiple choice (18-24,25-34,etc.)	To underst and consumer segments
	What is your gender?	Multiple choice (male, female, other)	To gauge gender preferences
	What is your household income range?	Multiple choice ($0-$30k,$31k-$60k,etc.)	To assess purchasing power
Product usage	Have you used any OTC products in the past 6 months ?	Yes/No	To gauge product usage frequency
	Which type of OTC product do you use most often	Multiple choice (pain relief, cough syrup etc.)	To identify most commonly used products
	How often do you purchase OTC products?	Multiple choice (weekly, monthly, occasionally, rarely)	To assess purchasing frequency
	What factors influence your decision to purchase OTC products	Multiple choice (price, brand, recommendations, effectiveness)	To underst and decision - making drivers
Product perception	How satisfied are you with the effectiveness of the OTC product (s) use ?	Likert scale (very unsatisfied to very satisfied)	To assess satisfaction levels
	How would you rate the price vs. quality of the OTC products?	Likert scale (very poor to good)	To evaluate product value
	Do you trust the OTC brands(s) you use?	Yes/No	To gauge brand trustworthiness
Purchasing behaviours	Where do you typically purchase OTC products?	Multiple choice (pharmacy, grocery store, online, other)	To underst and purchase channels
	Are you more likely to buy OTC products online or in-store	Multiple choice (online, in-store)	To assess online vs. in – store purchasing behaviours
	What is your preferred method of discovering new OTC products?	Multiple choice (advertising, online review, word of mouth, in-store displays)	To underst and product discovery methods
Healthy and wellness	Do you consult a doctor or pharmacist before purchasing OTC products?	Yes/No	To assess professional consultation habits
	Are you aware of any health risks associated with OTC products?	Yes/No	To Gauge awareness of potential risks
Brand loyalty	Are you loyal to a specific OTC brand?	Yes/No	To assess brand loyalty
	Would you consider switching to a different brand?	Yes/No	To underst and brand switching tendencies
Recommendations	What improvement would you suggest for OTC products?	Open -ended	To gather consumer feedback on improvement
	Would you recommend the OTC products (s) you to others?	Yes/No	To measure the likelihood of Products recommendations

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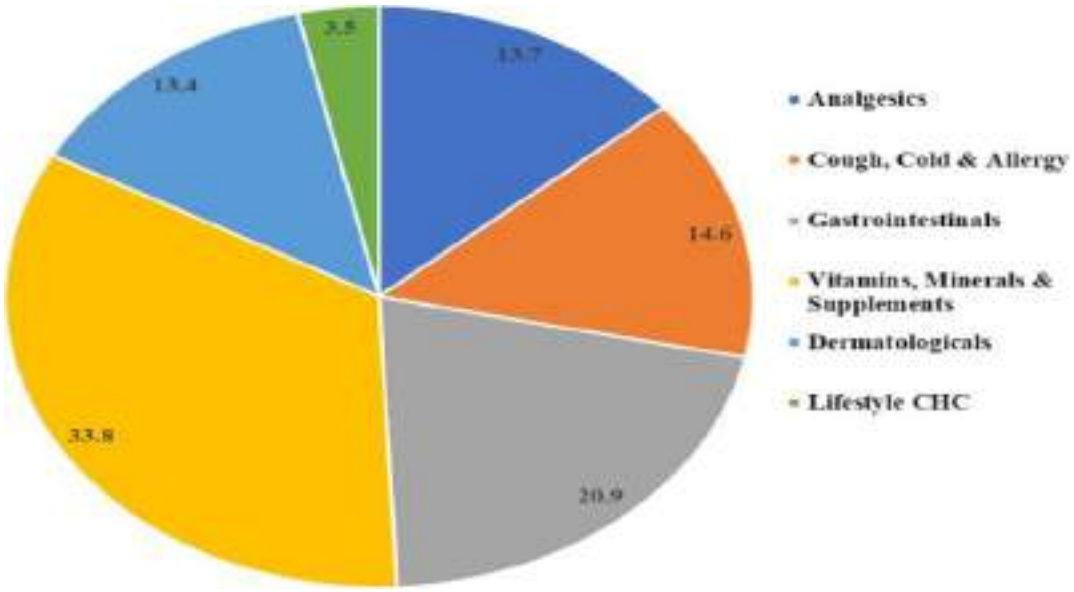
MARKET OVERVIEW

Over the Counter (OTC) Drugs Market Analysis and Size

Rise in the population of elderly people and favourable regulatory policies are the major factor that will enhance the market growth rate. Furthermore, rising patent expirations of many drugs resulting in use as OTC drugs and affordable cost of these drugs are the factors that will expand the over the counter (OTC) drugs market.

Data Bridge Market Research analyses that the Over the Counter (OTC) Drugs market which was USD 167.89 Billion in 2022, would rocket up to USD 245.87 Billion by 2030, and is expected to undergo a CAGR of 6.60% during the forecast period. This indicates that the market value. "Cold, Cough and Flu Products" dominates the product type segment of the over the counter (OTC) drugs market owing to the Increasing self-medication practices. In addition to the insights on market scenarios such as market value, growth rate, segmentation, geographical coverage, and major players, the market reports curated by the Data Bridge Market Research also include depth expert analysis, patient epidemiology, pipeline analysis, pricing analysis, and regulatory framework (9).

Regulatory, safety and economic considerations of over-the-counter medicines in the Indian population



Over the Counter (OTC) Drugs Market Dynamics

Drivers

- **Increasing Self-Medication Practices**

OTC drugs provide convenience and accessibility to consumers for self-treatment of common ailments, leading to market growth

- **Growing Consumer Awareness**

Rising health consciousness and access to information have empowered consumers to seek OTC drugs for minor health issues

Opportunities

- **Expansion in Emerging Markets**

Rapid urbanization, improving healthcare infrastructure, and increasing disposable incomes in emerging markets present significant growth opportunities for the OTC drugs market

- **Online Retailing**

The growth of e-commerce platforms provides a convenient channel for consumers to purchase OTC drugs, expanding market reach

Challenges

- **Stringent Regulatory Requirements**

OTC drugs need to meet regulatory standards for safety and efficacy, which can pose challenges for manufacturers

- **Competition From Generic Drugs**

The availability of generic alternatives to branded OTC drugs may impact market share and pricing.

This over the counter (OTC) drugs market report provides details of new recent developments, trade regulations, import-export analysis, production analysis, value chain optimization, market share, impact of domestic and localized market players, analyses opportunities in terms of emerging revenue pockets, changes in market regulations, strategic market growth analysis, market size, category market growths, application niches and dominance, product approvals, product launches, geographic expansions, technological innovations in the market. To gain more info on the over the counter (OTC) Drugs market contact Data Bridge Market Research for an Analyst Brief, our team will help you take an informed market decision to achieve market growth

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Recent Development

• In June 2021,Bayer announced the approval of Astepro Allergy from the U.S. Food and Drug(FDA) as an over the counter (OTC) product for the temporary relief of nasal congestion runny nose and Itchy nose and other respiratory allergies

• in March 2020, GSK announced that the company received approval of Advil Dual Action with Acetaminophen from the U.S. Food and Drug Administration (FDA) as an over the counter (OTC) product for the pain relief .It is the first FDA –Approved OTC combination of ibuprofen and acetaminophen in the U.S. and will be available worldwide

Global Over the Counter (OTC) Drugs Market Scope

The over the counter (OTC) drugs market is segmented on the basis of product type, end-users and distribution channel. The growth amongst these segments will help you analyse meager growth segments in the industries, and provide the users with valuable market overview and market insights to help them in making strategic decisions for identification of core market applications (10).

Product Type

• Analgesics
• cold, cough and flu products
• gastrointestinal product
• ophthalmic product
• Dermatology product
• Others

End -Users

• speciality clinic
• Homecare
• hospitals
• Others

Distribution Channel

• Hospital pharmacy
• retail pharmacy
• online pharmacy
• others

Marketing Strategies for OTC Healthcare Products in the Indian Market:

Marketing OTC healthcare products in the Indian Market requires a nuanced approach that takes into Account the diverse socio-economic landscape, Cultural factors, and regulatory requirements. Here Are some effective strategies tailored for success

1. **Understanding the Target Audience**

Effective marketing strategies begin with a deep Understanding of the target audience. In the Indian Context, it is essential to segment the market based On Demographics, psychographics, and Geographical locations. Factors such as age, gender, Income levels, health concerns, and purchasing Behaviour's should be considered to tailor marketing Messages and channels effectively (11).

2. **Building Brand Awareness and Trust**

Trust is a critical factor in the healthcare industry, And OTC product manufacturers must invest in Building strong brand awareness and credibility. Leveraging traditional media channels like Television, print, and radio, as well as digital Platforms like social media, can help establish Brand presence and educate consumers about the Benefits and proper usage of OTC products

3. **Emphasizing Product Quality and Safety**

Indian consumers are increasingly conscious of Product quality and safety, particularly in the Healthcare domain. Marketing campaigns should Highlight the rigorous quality control measures, Adherence to regulatory standards, and the safety Profile of OTC products. Certifications, Endorsements from healthcare professionals, and Transparent ingredient labelling can help build consumer confidence (12).

4. **Leveraging Digital Marketing**

With the rapid adoption of digital technologies in India, leveraging digital marketing channels is Essential. Strategies such as search engine Optimization (SEO), social media marketing, Influencer collaborations, and targeted online Advertising can effectively reach and engage techsavvy consumers. Additionally, developing user-friendly mobile apps and integrating e-commerce Capabilities can enhance the overall customer experience

5. **Focusing on Rural Markets**

While urban areas remain significant markets for OTC healthcare products, the vast rural population In India presents a significant growth opportunity. Developing region-specific marketing campaigns, Partnering with local pharmacies and retailers, and Leveraging community-based initiatives can help Penetrate these untapped markets effectively (13).

Most Common (OTC) drugs and uses

1. **Pain Relievers and Anti-inflammatory Drugs**

Acetaminophen (Tylenol): Commonly used for pain relief and fever reduction.

NSAIDs (Ibuprofen, Advil, Motrin, Naproxen, Aleve): Used for pain relief, reducing inflammation, and lowering fever.

Aspirin: Used for pain relief and as an anti-inflammatory, also for heart health in certain low doses.

2. **Cold, Flu, and Allergy Medications**

Antihistamines (e.g., Diphenhydramine, Claritin, Zyrtec, Allegra): Used for allergy symptoms such as sneezing, runny nose, and itching.

Decongestants (e.g., Pseudoephedrine, Phenylephrine): Help relieve nasal congestion caused by colds or allergies.

Cough Suppressants (e.g., Dextromethorphan): Help reduce coughing.

Expectorants (e.g., Guaifenesin, Mucinex): Help loosen mucus and make coughing more productive.

Combination Cold Remedies: Often combine pain relievers, decongestants, and cough suppressants.

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3. Digestive Health Products

Antacids (e.g., Tums, Rolaids, Maalox): Relieve heartburn and acid indigestion.

Probiotics: Supplements that may help balance gut bacteria and improve digestion.

Laxatives (e.g., Dulcolax, Miralax, Senna): Used for constipation relief.

Antidiarrheal (e.g., Loperamide, Imodium): Help control diarrhoea.

4. Skin Care and Dermatological Products

Topical Steroids (e.g., Hydrocortisone Cream): Used for skin irritation, rashes, and eczema.

Acne Treatments (e.g., Benzoyl Peroxide, Salicylic Acid, Retinoids): Used to treat acne.

Antifungal Creams (e.g., Lotrimin, Lamisil): Used to treat fungal infections such as athlete's foot and ringworm.

Sunscreens: Products with SPF to protect the skin from UV radiation.

Moisturizers: Used to hydrate and protect the skin.

5. Vitamins and Supplements

Multivitamins: Provide a combination of essential vitamins and minerals.

Vitamin D: Supports bone health and immune function.

Vitamin C: Often taken to boost immunity and as an antioxidant.

Fish Oil: Rich in omega-3 fatty acids, beneficial for heart health.

Herbal Supplements (e.g., Echinacea, Ginseng): Used for various health benefits, often related to immunity or energy.

6. Topical Pain Relief

Menthol or Capsaicin Creams (e.g., Biofreeze): Used for muscle and joint pain relief.

Arnica Gel: A topical remedy for bruising and inflammation.

7. Oral Health Products

Toothpaste and Mouthwash: Often containing fluoride to prevent cavities and gum disease.

Dental Floss: Used to remove food particles and plaque between teeth.

Teeth Whitening Products: Over-the-counter strips or gels that help whiten teeth.

8. Sleep Aids

Melatonin: A hormone that helps regulate sleep cycles, often used as a sleep aid.

Diphenhydramine (e.g., Unisom): An antihistamine that can cause drowsiness and is used as a short-term sleep aid.

9. First Aid and Wound Care

Bandages and Gauze: Used to cover wounds and promote healing.

Antiseptic Creams (e.g., Neosporin): Used to prevent infection in minor cuts, scrapes, or burns.

Hydrogen Peroxide: A common disinfectant for cleaning wounds.

10. Weight Loss and Appetite Control

Appetite Suppressants (e.g., Garcinia Cambogia, Orlistat): Help with weight management by reducing appetite or inhibiting fat absorption.

Fat Burners: Supplements that claim to increase metabolism and fat loss.

11. Eye Care

Artificial Tears (e.g., Visine, Refresh): Used to relieve dry or irritated eyes.

Allergy Eye Drops: Help with itchy, watery eyes caused by allergens.

12. Hair Care Products

Shampoos and Conditioners: Common OTC products for daily hair care.

Anti-Dandruff Shampoos (e.g., Head & Shoulders, Nizoral): Help control dandruff and scalp irritation.

Hair Growth Treatments (e.g., Minoxidil/ Rogaine): Stimulate hair regrowth in cases of thinning or hair loss.

13. Smoking Cessation Products

Nicotine Patches, Gum, Lozenges: Help smokers quit by gradually reducing nicotine dependence.

14. Personal Care and Hygiene Products

Deodorants and Antiperspirants: Used for odor control and reducing perspiration.

Feminine Hygiene Products: Tampons, pads, menstrual cups, and wiped

Shaving Creams and Razors: For hair removal.



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CONCLUSION

The over-the-counter (OTC) product market has shown consistent growth due to several key factors, including increasing consumer awareness, the rise in self-medication, and the availability of a wide range of products across various health and wellness categories. OTC products have become a vital part of the healthcare system, offering convenience, accessibility, and cost-effectiveness to consumers.

The market Is largely driven by the growing demand for non-prescription medications, dietary supplements, personal care products, and other wellness items. This shift is particularly noticeable in the growing preference for natural and organic ingredients in OTC offerings. Additionally, the rise of e-commerce has made OTC products more accessible to a broader audience, further expanding the market reach.

Despite the positive market trends, challenges remain, including regulatory concerns, potential risks of misuse, and competition from alternative wellness solutions. Companies must continue to innovate while ensuring consumer safety and maintaining transparency in labeling and claims to sustain long-term market growth.

In conclusion, the OTC market is poised for further expansion, driven by changing consumer behavior, the convenience of online shopping, and the increasing demand for preventive healthcare solutions. Companies that focus on consumer trust, product efficacy, and regulatory compliance will be better positioned to capitalize on the growing market.

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INDUSTRIAL DEVELOPMENT PATTERNS IN ASSAM: A QUANTITATIVE ANALYSIS

Mridusmita Patowary
Assistant Professor, Department of Economics, Sonari College, Sonari, Assam, India

ABSTRACT

Development is a multidimensional process that advances social, cultural, and political aspects in addition to improving the economic outlook. Even so, around 70% of India's labour force is still employed in the primary sector. The gross domestic product (GDP) of the nation was historically dominated by the primary sector before independence. But, even though most workers still depend on it for their living, its share of GDP has decreased over time. The industrial sector in Assam has been expanding gradually over time. A state's overall development depends on advancements in its primary, secondary, and service sectors. Given the growing contributions of the secondary and service industries, it is imperative to assess their development over the years. The development of any state necessitates growth across all three sectors: primary, secondary, and service. With the contributions of the secondary and service sectors steadily increasing over time, it is essential to evaluate their progress. This study focuses on analyzing the growth of Assam's industrial sector, utilizing indices to measure the level of development.

KEYWORDS: *Primary sector, secondary sector, service sector, Gross domestic product, industrial sector, indices.*

INTRODUCTION

The development of a country relies on sustained progress over time. This growth not only strengthens the economic framework but also uplifts social, cultural, and political dimensions. India, being primarily an agrarian economy, has seen steady advancements over the years, with a large portion of its workforce still employed in agriculture and allied activities—approximately 70 percent of the total working population. Before independence, the primary sector significantly contributed to the country's gross domestic product (GDP) due to the high proportion of workers engaged in agriculture. However, over time, its share in GDP declined, even though the majority of the workforce remained concentrated in this sector (Bhushan, 2021). With the introduction of the New Economic Policy (NEP) in 1991, the secondary and service sectors experienced notable growth. Today, the service sector accounts for about 60 percent of the GDP, the secondary sector for 23 percent, and the primary sector for just 17 percent (Datt & Mahajan,2018). This shift highlights the growing significance of the secondary and service sectors in India's economy compared to the primary sector. Assam, one of the Northeastern states of India, reflects a similar trend. While the majority of the workforce in Assam remains engaged in the primary sector, its contribution to the Net State Domestic Product has been declining in recent years. Conversely, the contributions of the secondary and service sectors have been steadily increasing, despite a smaller proportion of the workforce being employed in these sectors compared to the primary sector. This paper aims to examine the development of the secondary sector in Assam by analyzing the available data related to this sector.

LITERATURE REVIEW

Numerous studies have examined various aspects of industrial development in India. Some notable examples include works by Omar et al. (2009), Mishra (2012), Sahoo and Sethi (2012), Daveshwar (2014), Saikia (2014), Gautam and Yadav (2017), Elizabethrani (2019), Yasin (2019), and Dey and Datta (2020), among others. A review of the literature reveals that while some studies focus on India as a whole and others on specific states, relatively few have assessed industrial development in Assam. Therefore, this paper aims to address this gap by examining the current state of industrial development in Assam.

OBJECTIVES

1. To evaluate the levels of industrial development during the period from 2011 to 2019.
2. To analyse if any relationship exists between industrial development and economic development.

RESEARCH QUESTIONS

1. Has the industrial sector in Assam experienced any development over the years?
2. Is there a relationship between industrial development and economic development?

DATA AND METHODOLOGY

The study was carried out using data from 2010-11 to 2018-19, obtained from various secondary sources such as the Statistical Handbook of Assam (various issues), Nedfi databank, Indiastat, economic surveys, and others.

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METHOD OF ANALYSIS

The composite development index was constructed using the Wroclaw Taxonomic Method, which was developed by Florek et al. (1952). In 1967, this method was proposed to UNESCO as a tool for ranking and comparing the development of countries. It has been applied in studies by Arief (1982), Khan & Islam (1990), Ohlan (2013), Bhattacharjee & Patowary (2019). The Wroclaw method used in this study is outlined below.

Measuring the Level of Development

Let,$[X_{ij}]$ be the data matrix giving the values of the variables of i_{th} state and the j_{th} indicator where i=1,2,….,n(no. of States) and j=1,2,3…,k(no. of indicators). Since the units of measurement of the variables considered are not uniform, for combined analysis $[X_{ij}]$ is transformed to the matrix of standardized indicators $[Z_{ij}]$ as follows:

$$[Z_{ij}]=\frac{Xij-\overline{Xj}}{sj}$$

Where $\overline{Xj}$ = mean of the jth indicator and sj = the standard deviation of the jth indicators.

From [Zij], identify the optimal value of each indicator. The optimal value will be either the maximum or minimum value, depending on how the indicator impacts the level of development. For instance, an increase in literacy rate would have a positive effect on development, whereas higher population density might negatively impact development. For obtaining the level of development (C_i) of the ith state, first calculate the square root of the deviations of the individual value of a transformed variate from the best value. In other words, we calculate P_{ij} as:

$$P_{ij} =(Z_{iJ}-Z_{0J})^2$$

Where, Z_{0J} =optimal value.

For each i and j, Pattern of Development (C_i) is given by

$$C_i = \left[\left[\sum_{i=1}^{k} Pij/(CV)j\right]\right]^{1/2}$$

Where, (CV)j = coefficient of variation of Xij for jth indicators.

Therefore, Composite index of development is given by

$$D_i=C_i/C$$

Where, $C= \bar{C}+3s_i$

Where $\bar{C}$= mean of C_i and s_i = standard deviation of C_i.

The closer the value of Di is to 0, the more developed the state is, while a value closer to 1 indicates a less developed state.

The study selects the following indicators to assess industrial development: number of factories, number of workers employed, working capital, net income, functioning units, area under industrial estates, number of registered factories, and the index of industrial production. To evaluate the level of economic development, the chosen indicators are: per capita net State domestic product, literacy rate, and infant mortality rate. To determine if there is any relationship between industrial sector development and economic growth, a simple regression analysis is conducted.

FINDINGS AND DISCUSSION

Industrial development in Assam has advanced over the years, as shown below using the indicators outlined in the methodology section. Table 1 presents the industrial development indices for the period 2011-2019.

Table 1: Industrial Development in Assam from 2010-11 to 2018-19

Year	Industrial Development Index
2010-11	0.89
2011-12	0.78
2012-13	0.77
2013-14	0.72
2014-15	0.69
2015-16	0.65
2016-17	0.64
2017-18	0.61
2018-19	0.57

Source: Author's Computations

The table above clearly demonstrates the progress in industrial development in Assam over the years. The index value ranges from 0.89 to 0.57, indicating noticeable development in the industrial sector over time.

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Table 2: Economic Development in Assam from 2010-11 to 2018-19

Year	Economic Development Index
2010-11	0.81
2011-12	0.80
2012-13	0.77
2013-14	0.75
2014-15	0.73
2015-16	0.69
2016-17	0.68
2017-18	0.62
2018-19	0.60

Source: Author's Computations

Table 2 illustrates the development occurring from 2010-11 to 2018-19, showing a gradual increase from 0.81 to 0.60. This indicates slow progress over the 10 years.

To examine whether a relationship exists between industrial development and economic development, a simple regression analysis is conducted, the results of which are presented in Table 3 below.

Table 3: Industrial Development and Economic Development in Assam

Regression Statistics						
Multiple R	0.44					
R Square	0.25					
Adjusted R Square	0.04					
Standard Error	0.22					
Observation	8					
	Co-efficient	Standard Error	t Stat	P value	Lower 95%	Upper 95%
Intercept	0.76	0.30	2.218	0.072	0.121	1.755
Index	0.55	0.32	1.012	0.410	2.011	0.821

Source: Author's Computations

The regression results show a low R-Square value, with the industrial development index having a positive coefficient of 0.51. This indicates that there is a positive relationship between industrial development and economic development in Assam.

CONCLUSIONS

The analysis indicates that both industrial and economic development have been improving over the years. The study also reveals a positive relationship between economic and industrial development in Assam. Therefore, a greater focus on industrial development in the state is essential. Effective governance can significantly contribute to the continued progress and development of Assam.

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A REVIEW ON USE OF ARTIFICIAL INTELLIGENCE IN NOVEL HERBAL DRUG DELIVERY SYSTEM

Dr.Swati S Rawat[1], Dr. Sunil S Jaybhaye[2], Ashwini Bahir[3], Komal Kangane[4], Pratik Datta Handke[5]

*[1]Principal, [2]Vice Principal, [3]Asst prof, [4]Asst prof, [5]Student **

Institute of Pharmacy Badnapur

ABSTRACT

The kind of novel herbal formulations such as polymeric nanoparticles, nanocapsules, liposomes, phytosomes, animations, microsphere, transfersomes, and ethosomes has been reported using proactive and plant selections. The novel formulations are described to have remarkable advantages over conventional formulations of plant actives and extracts which include enhancement of solubility, bioavailability, and protection from toxicity, enhancement of pharmacological activity, enhancement of stability, improved tissue macrophages distribution, sustained delivery, and protection from physical and chemical degradation. Phytosome is a patented technology developed by a leading maker of drugs and nutraceuticals, to incorporate standardized plant extracts or water-soluble phytoconstituents into phospholipids to producd lipid-compatible molecular complexes. The herbal drugs can be used in a more upright course with enhanced efficacy by incorporating them into modern dosage forms. This can be accomplished by designing novel drug delivery systems for herbal ingredients. The present review highlights the current condition of the development of novel herbal formulations and summarizes their type of active components, biological activity, and applications of novel formulations.

INTRODUCTION TO ARTIFCIAL INTELLIGENCE (AI)

Artificial Intelligence (AI) is a stream of science related to intelligent machine learning, mainly intelligent computer programs, which provides results in the similar way to human attention process.[1] This process generally comprises obtaining data, developing efficient systems for the uses of obtained data, illustrating definite or approximate conclusions and self-corrections/adjustments.[2] In general, AI is used for analyzing the machine learning to imitate the cognitive tasks of individuals.[2,3] AI technology is exercised to perform more accurate analyses as well as to attain useful interpretation.[3] In this perspective, various useful statistical models as well as computational intelligence are combined in the AI technology.[4] The progress and innovation of AI applications are often associated to the fear of unemployment threat. However, almost all advancements in the applications of AI technology are being celebrated on account of the confidence, which enormously contributes its efficacy to the industry.

Recently, AI technology becomes a very fundamental part of industry for the useful applications in many technical and research fields.[3,4] The emergent initiative of accepting the applications of AI technology in pharmacy including drug discovery, drug delivery formulation development and other healthcare applications have already been shifted from hype to hope.[5,6] The uses of AI models also make possible to predict the in vivo responses, pharmacokinetic parameters of the therapeutics, suitable dosing, etc. [2,7] According to the importance of pharmacokinetic prediction of drugs, the uses of in silico models facilitate their effectiveness and inexpensiveness in the drug research.[8]

INTRODUCTION TO NOVEL HERBAL DRUG DELIVERY SYSTEM

In the past few decades, considerable attention has been concentrated on the evolution of a novel drug delivery system (NDDS) for herbal drugs. Conventional dosage forms, including prolonged-releasedosage forms, are unable to satisfy for both holding the drug component at a distinct rate as per directed by the requirements of the body, all through the period of treatment, as well as directing the phytoconstituents to their desired target site to obtain an utmost therapeutic response. In phytoformulation research, developing nano-sized dosage forms(polymeric nanoparticles and nanocapsules, liposomes, solid lipid nanoparticles, phytosomes, and nanoemulsion) has a number of advantages for herbal drugs, including enhancement of solubility and bioavailability, protection from toxicity, enhancement of pharmacological activity, enhancement of stability, improving tissue macrophage distribution, sustained delivery, and protection from physical and chemical degradation. Thus, the nano-sized NDDSs of herbal drugs have a potential future for enhancing the activity and overcoming problems associated with the plant medicines. Liposomes, which are biodegradable and essentially nontoxic vehicles, can encapsulate both hydrophilic and hydrophobic materials.[9]

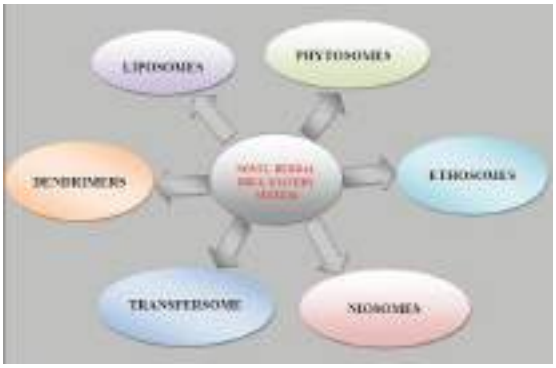
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From time immemorial, it has been the endeavor of the doctor and the apothecary to provide patients with the best possible varieties of medications, so that recovery from disease is faster and more complete. The drugs are rendered in a suitable formulation keeping in view the safety, efficacy, and acceptability among other ingredients, and the preparation is usually known as dosage form or drug delivery system. With the progress in all domains of science and engineering, the dosage forms have developed from simple mixtures and pills to highly sophisticated technology, intensive drug delivery systems, which are known as NDDSs.[10] In the past few decades, considerable attention has been concentrated on the evolution of an NDDS for herbal drugs.[11] Herbal drugs are getting more popular in the modern world for their diligence to cure a variety of diseases with less toxic effects and better therapeutic effects. Meanwhile, some limitations of herbal extracts/plant actives such as instability in highly acidic pH and liver metabolism have gone to attain the drug levels below to the therapeutic concentration in the blood resulting in lessor no healing effect.

Incorporation of novel drug delivery technology to herbal or plant actives minimizes the drug degradation or presystemic metabolism and serious side effects by accumulation of drugs to the nontargeted areas and improves the ease of administration in the pediatric and geriatric patients.[12] Conventional dosage forms, including prolonged-release dosage forms, are unable to fulfill the ideal requirements of novel carrierssuch as ability to deliver the drug at a rate directed by the penury of the body and to transmit the active entity of herbal drug to the site of activity. For good bioavailability, natural products must have a sound balance between hydrophilicity (for dissolving into the gastrointestinal fluids) and lipophilicity (to cross lipidic biomembranes). Many phytoconstituents such as polyphenolics have good water solubility, but are poorly absorbed[13] either due to their multiple-ring large-sized particles which cannot be soaked up by simple diffusion or referable to their poor miscibility with oil and other lipids, severely restricting their power to reach across the lipid-rich outer membranes of the enterocytes of the little bowel.[14] Thus, the nano-sized NDDSs of herbal drugs have a potential future for enhancing the natural process and overwhelming problems related with plant medicines.[11] Novel herbal drug carriers cure particular disease by targeting just the affected zone inside a patient's body and transporting the drug to that region. NDDS is advantageous in giving up the herbal drug at predetermined rate and delivery of drug at the site of action which minimizes the toxic effects with an increase in bioavailability of drugs. In novel drug delivery technology, control of the dispersion of the drug is achieved by incorporating the drug in carrier system or in modifying the social organization of the drug at the molecular level. Incorporation of herbal drugs in the delivery system also aids to increase in solubility, enhanced stability, protection from toxicity, enhanced pharmacological activity, improved tissue macrophage distribution, sustained delivery, and protection from physical and chemical degradation. For example, liposomes act as potential vehicles to take anticancer agents by increasing amount of drug in tumor area and decrease the exposure or accumulation of drug in normal cells/tissues, thereby preventing tissue toxicity effects. The phytosomal carriers have been considered for effective delivery of herbal extracts of ginseng (Ginkgo biloba), etc. Direct binding of phosphatidylcholine to herbal extract components led to better absorption characteristics as compared to conventional delivery of herbal infusions. Other vesicular assemblies such as microspheres, animations, and polymeric nanoparticles have been shown beneficial to carry herbal components. The presentreview article is directed to supply an overview of different cases of drug delivery systems incorporating active ingredients and potential advantages of such organizations.[12] In the present study, an effort has been induced to touch on various aspects and applications related to novel herbal drug preparations.

Types of Novel Herbal Drug Delivery Systems:

Several approaches in case of new herbal drug delivery system include different types of expressions such as mouth-dissolving tablets, liposomes, phytosomes, pharmacosomes, museums, nanoparticles, microspheres, transfersomes, ethosomes, transdermal drug delivery system (TDDS), and proniosomes are discussed.



Mouth-Dissolving Tablets

Asoka Lifescience Limited launched Res-Q, the world's first polyherbal mouth-dissolving tablet, fast mouth-dissolving drug. It induces a new drug delivery system that imparts increased efficacy.In theAyurvedicmedicine segment, thisisthe inauguralattempt to make medicines more effective in managing chronic ailments. Res-Q is a polyherbal medicine highly effective for lung problems and other respiratory ailments such as asthma. This unique mouth-dissolving drug delivery system ensures that the drug reaches the blood right away and the first-pass metabolism is bypassed. It dissolves in mouth by mixing with the saliva and get absorbed. This Res-Q provides relief from respiratory distress within 15 min. Hence the product shows a greatresemblance with the efficacy of Sorbitrate,a revolutionarymouth-dissolving drug used in cardiac distress.[15]

Controlled-Release Formulations

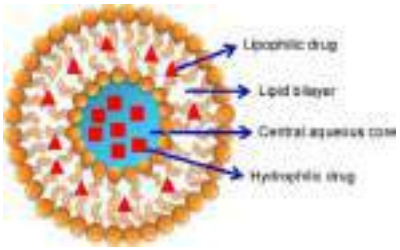
A patent describes an orally administrable formulation for the controlled release or stable storage of a granulated herb, comprising a granulated herband a carrier, the formulation release

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of 75% of the active ingredients between 4 and 18 h after administration. The active elements are selected from the group consisting of hypericin, hyperforin, and echinacosides. The invention seeks to provide improved herbal preparations, whose preparations offer a convenient oral dosage form of herbs for supplying optimum plasma concentrations of the biologically active compounds that facilitates user compliance. The oral-controlled and stable-releasedosage form of granulated herb is in either matrix formulations such as matrix tablets or in multiparticulate formulations such as microcapsules put into two-piece capsules that are performed in order to hold a drug delivery system, which will guarantee a regular supply of the active ingredients for a sustained period.[16]

Another US patent invention is a new stable herbal drug formulation in the form of prolonged-release microgranules containing G. biloba extract as well as the process for building it. Plant extracts have poor flow ability and compressibility properties. Therefore, the expression of such extracts in the kind of sustained-release tablets is difficult, as it requires homogeneous mixtures of extracts with pharmaceutical excipients during all compression straps. Microgranules can be cleared up by a number of different operations, for example, extrusion–spheronization, fluid–air bed process, or a cutting-pan method. Extrusion–spheronization is suitable for pellets with high content of active meaning, but need more equipment. For the manufacture of the granules of the invention, the cutting-pan method is preferred, as it requires only simple equipment and procedure.[17]

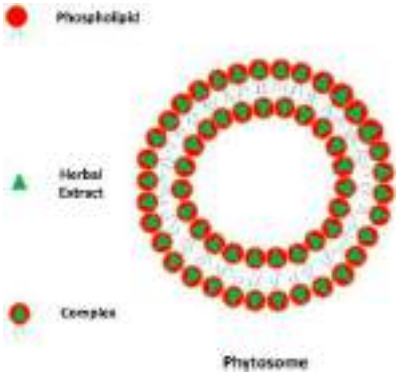
Liposomes



These are microparticulate or colloidal carriers, usually 0.05–5.0 μm in diameter which forms spontaneously whencertain lipids are hydrated in aqueous media.[18] The liposomes are spherical particles that encapsulate a fraction of the solvent, in which they freely pass around or float into their interior. They can carry one, several, or multiple concentric membranes. Liposomes

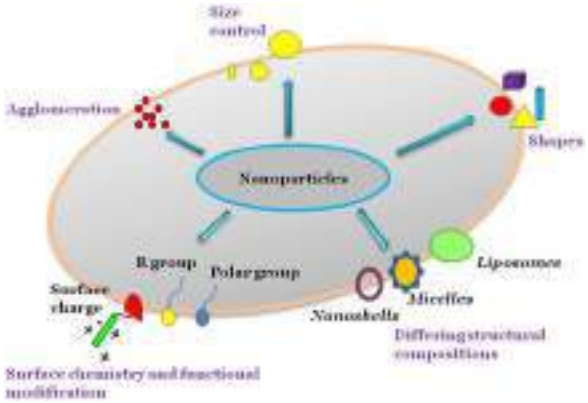
are constructed of polar lipids, which are characterized by having a lipophilic and hydrophilic group of the same molecules. On interaction with water, polar lipids self-layup and form self-organized colloidal particles.[3]Liposome-based drug delivery systems offer the potential to raise the therapeutic index of anticancer agents, by increasing the drug concentration in tumor cells or by lessening the exposure in normal tissues exploiting enhanced permeability and retention effect phenomenon or by utilizing targeting strategies.[19] The primary advantages of using liposomes include (i) the high biocompatibility, (ii) the easiness of preparation, (iii) the chemical versatility that allows the loading of hydrophilic, amphiphilic, and lipophilic compounds, and (iv) the simple modulation of their pharmacokinetic properties by varying the chemical composition of the player components. Few examples of herbal formulations in liposomal drug delivery systems.[20]

Phytosomes:



Most of the bioactive constituents of phytomedicines are flavonoids, which are poorly bioavailable when taken orally. Water-soluble phytoconstituent molecules (mainly polyphenols) can be converted into lipid-compatible molecular complexes, which are called phytosomes. Phytosomes are more bioavailable as compared to simple herbal extracts owing to their enhanced mental ability to skip through the lipid-rich biomembranes and finally arriving to the origin. The lipid-phase substances employed to make phytoconstituents lipid compatible are phospholipids from soy, mainly phosphatidylcholine.[21] Some of herbal formulations in Phytosomal drug delivery systems. Phytosomal complexes were first investigated for cosmetic applications, but mounting evidence of potential for drug delivery has been amassed over the past few years, with beneficial activity in the realms of cardiovascular, anti-inflammatory, hepatoprotective, and anticancer applications.[22] Phytosome complexes show better pharmacokinetics and therapeutic profile than their noncomplexed herbal extract. The phytosome technology has markedly enhanced the bioavailability of selected phytochemicals.[23]

NanoparticlesNanoparticles are efficient delivery systems for the delivery of both hydrophilic and hydrophobic drugs. Nanoparticles are the submicron-sized particles, ranging 10–1000



mm.[12]The major goal behind designing nanoparticle as a delivery arrangement is to control particle size, surface properties, and release of pharmacologically active agents in

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order to achieve the site-specific action of the drug at the therapeutically optimal rate and dose regimen.[24] In recent years, biodegradable polymeric nanoparticles have attracted considerable attention as potential drug delivery devices.[11] The nanospheres have a matrix type structure in which the active ingredient is dispersed throughout(the molecules), whereas the nanocapsules have a polymeric membrane and an active ingredient core. Nanonization possesses many advantages, such as increasing compound solubility, reducing medicinal doses, and improving the

absorbency of herbal medicines compared with the respective crude drugs preparations.[25] The examples of some herbal Naoparticulate drug delivery systems.

Niosomes

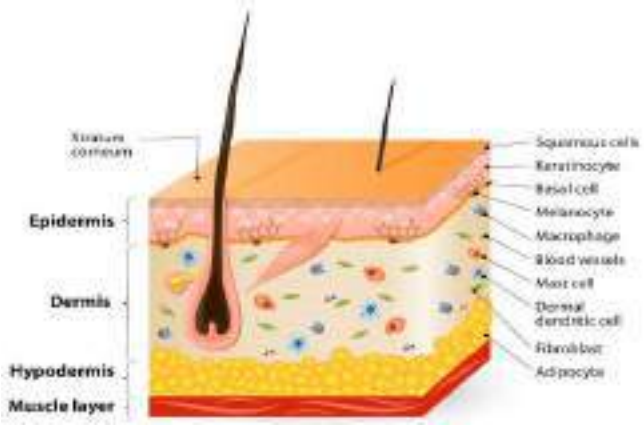
Niosomes are multilamellar vesicles formed from nonionic surfactants of the alkyl or dialkylpolyglycerol ether class and cholesterol. Earlier studies in association with L'Oreal have shown that, in general, niosomes have properties as potential drug carriers similar to liposomes.[26] Niosomes are different from liposomes in that they offer certain advantages over liposomes. Liposomes face problems such as they are expensive, their ingredients such as phospholipids are chemically unstable because of their predisposition to oxidative degradation, they require special memory and handling, and purity of natural phospholipids is variable. Niosomes do not have any of these problems.[27]

Proniosomes

Proniosome gel system is step forward to niosome, which can be utilized for various applications in delivery of actives at desired site.[28] Proniosomal gels are the formulations, which on in situ hydration with water from the skin are converted into niosomes.[29] Proniosomes are water-soluble carrier particles that are coated with surfactant and can be hydrated to form niosomal dispersion immediately before use on brief agitation in hot aqueous media.[30] Few examples of proniosomal formulations.[31]

Transdermal Drug Delivery System

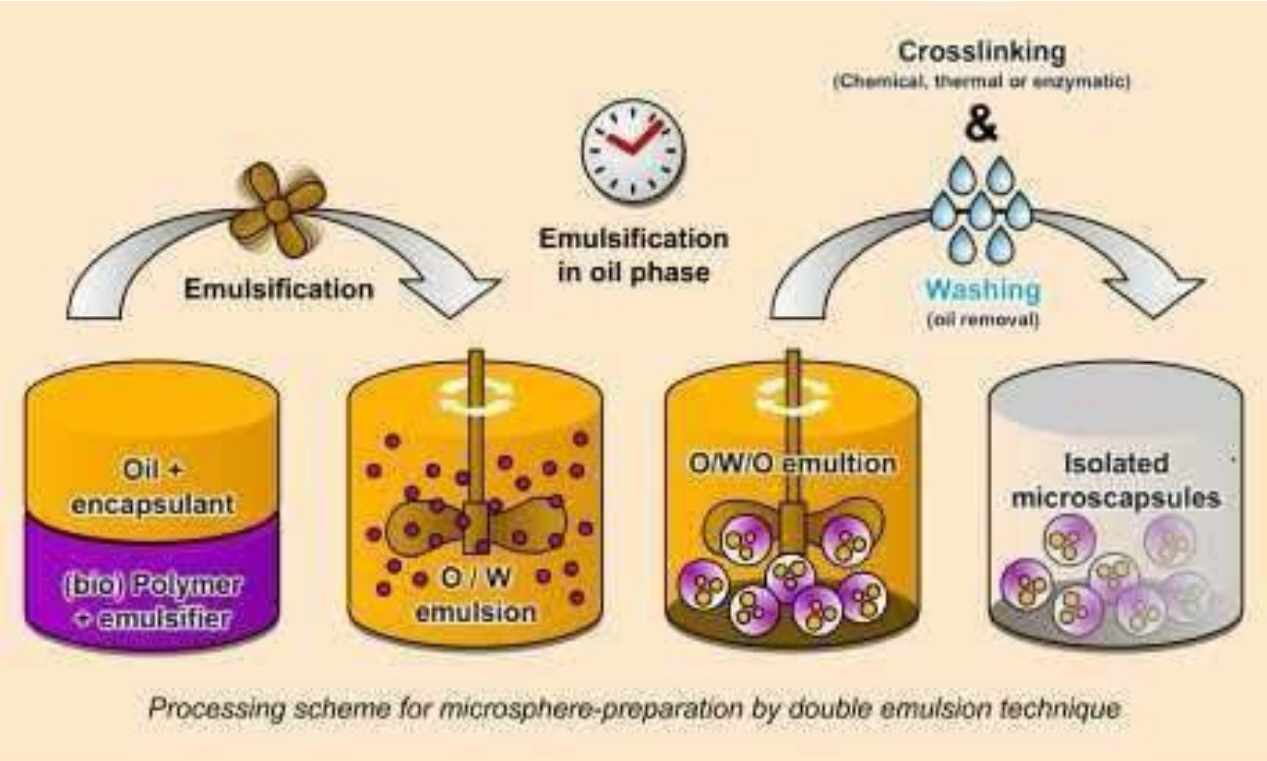
TDDS has been an increased stake in the drug administration via the skin for both local therapeutic effects on diseased skin (topical delivery) as comfortably as for systemic delivery of drugs.[32] However, they did not have had such expected success with other drugs. But, immense potential lies in transdermal drug as future smart drug delivery devices.[10] Transdermal delivery system provides the advantage of controlled drug delivery, enhanced bioavailability, reduction in side effects, and easy application. Formulation of transdermal films incorporating herbal drug components such as boswellic acid (Boswellia serrata) and curcumin (Curcuma longa) is one of the first few attempts to utilize Ayurvedic drugs through TDDS, which utilizes skin as a site for continuous drug administration into the systemic circulation. Thus, this delivery system avoids the first-pass metabolism of the drug without the annoyance associated with injection; moreover, the scheme offers a prolonged drug delivery with infrequent dosing via zero-order kinetics and the therapy can be easily fired atanytime. Use of turmeric in TDDS for the local action of the drug at the site of administration can also be regarded as a young version Ayurvedic turmeric poultice orleap.[33]



Microspheres

Microspheres are discrete spherical particles ranging in average particle size from 1 to 50 µ.[33] Microparticulate drug delivery systems are studied and taken on as a reliable one to rescue the drug to the target site with specificity, to assert the desired concentration at the situation of interest without untoward effects. Microencapsulation is a useful method which extends the duration of drug effect significantly and improves patient compliance. Finally, the entire dose and few adverse reactions maybe thinned out since a steady plasma concentration is kept.[34] So far, a series of active ingredients of plants, such as rutin, camptothecin, zedoary oil, tetrandrine, quercetine, and Cynara scolymus extract, has been made into microspheres. In addition, reports on immune microsphere and magnetic microsphere are also usual in recent years. Immune microsphere possesses the immune competence as a consequence of the antibody, and antigen was coated or adsorbed on the polymer microspheres.[35] Some of the herbal Microspheres developed as drug delivery systems.

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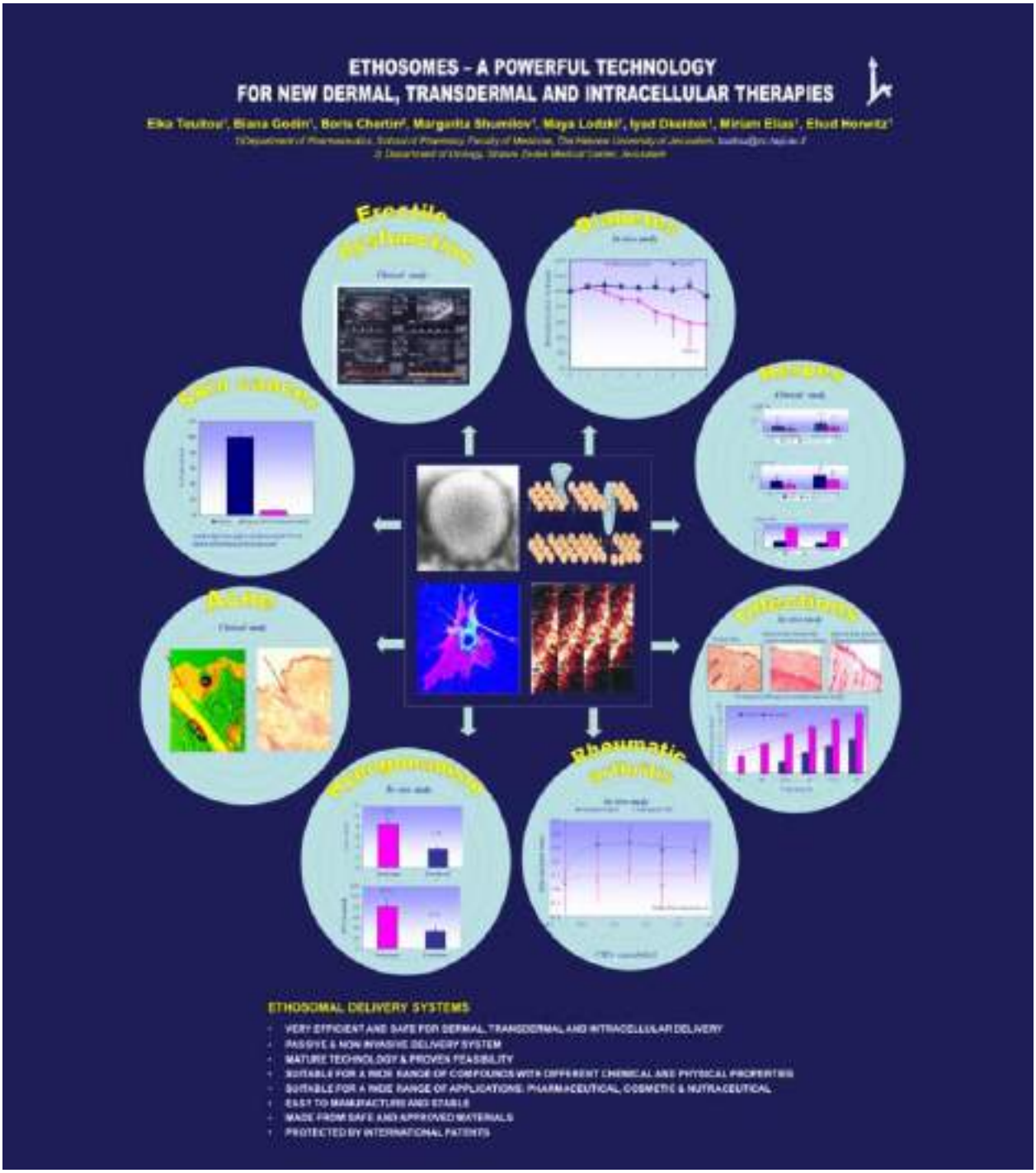
Processing scheme for microsphere-preparation by double emulsion technique

Emulsions

Emulsion refers to a nonhomogeneous dispersion system that is composed of two kinds of liquids unable to dissolve each other, and one of which disperses in the other one in a form of droplets.[36] Broadly speaking, the emulsion is composed of the oil phase, water phase, surfactant, and subsurfactant. Its appearance is translucent to transparent liquid. Emulsion can be split up into ordinary emulsion (0.1–100 μm), microemulsion (10–100 NM), sub-micro-emulsion (100–600 NM), etc. Among them, the microemulsion is also called nanoemulsions, and the sub-micro-emulsion is also called lipid emulsion. As a drug delivery system, emulsion gets distributed in vivo in the targeted areas due to its affinity towards lymphatic fluids. In addition, the drug can be a sustained release in a long time because the drug is packaged in the inner phase and kept off direct touch with the body and tissue fluid.[61] Afterward, along the oily drugs or lipophilic drugs being made into O/W or O/W/O emulsion, the oil droplets are phagocytozed by the macrophage and get a high concentration in the liver, spleen, and kidney in which the quantity of the dissolved drug is truly heavy. While water-soluble drug is produced into W/O or W/O/W emulsion, it can be well contracted in the lymphatic system by intramuscular or subcutaneous injection. The size of the emulsion particle has an impact on its target distribution. Aside from its targeted sustained release, producing the herbal drug into emulsion will also beef up the stability of the hydrolyzed materials, improve the penetrability of drugs to the skin and mucous, and reduce the drugs' stimulus to the tissues. So far, some kinds of herbal drugs, such as camptothecin, Brucea javanica oil, coixenolide oil, and zedoary oil, have been made into emulsion. For example, Kun Z etal.[37] examined the influence of the aluminum emulsion on the human lung adenocarcinoma cell line A549 and protein formulation. Resultsindicated that the aluminum emulsion has a significant inhibition on the growth and proliferation of the A549 in vitro and it showed a time and dose-dependent relationship. Elemenum emulsion is a type of new anticancer drug with great application prospects. Furthermore, it has no marrow inhibition and no damage to the tenderness and liver. A few examples of herbal emulsions.

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Ethosomes



Newer advancements in the patch technology have led to the development of ethosomal patch, which consists of drug in ethosomes. Ethosomal systems are made up of soy phosphatidylcholine, ethanol and water. They may form multilamellar vesicles and have a high entrapment capacity for particles of various lipophilicities. The elastic vesicles and transfersomes have also been used as drug carriers for a range of small molecules, peptides, proteins and vaccines.[38] Ethosome has a high deformability and entrapment efficiency and can penetrate through the skin completely and improve drug delivery through the skin. Likened to other liposomes, the physical and chemical properties of ethosomes make the legal transfer of the drug through the stratum corneum into a deeper skin layer efficiently or even into the blood circulation.[39] This property is very important as the topical drug carrier and transdermal delivery system. Moreover, the ethosomes

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carrier also can provide an efficient intracellular delivery for both hydrophilic and lipophilic drugs,[40] percutaneous absorption of matrine an anti-inflammatory herbal drug is increased,[41] It also permits the antibacterial Peptide to penetrate into the fibrocyte easily.[42]

From the review of literature it has been observed that, only three clinical trials have been conducted on ethosomal systems in human volunteers. Horwitz et al. carried out a pilot, double-blind, randomized clinical study to compare the efficacy of an ethosomal acyclovir preparation and commercially available acyclovir cream (Zovirax®) in treating recurrent herpes labialis in 40 human volunteers. The results revealed that the ethosomal acyclovir preparation performed betterthan Zovirax cream and showed significant improvement in all the evaluated clinical parameters, such as the time of crust formation and disappearance and pain parameters. The efficacy of ethosomal gel of clindamycin phosphate and salicylic acid was evaluated in a pilot clinical trial of 40 acne patients treated with the gel twice daily for 8 weeks. Volunteers treated with ethosomal gel showed considerable improvement in acne condition, with a decreased number of comedones, pustules, and total number of lesions compared to placebo. Ethosomal preparation of prostaglandin E1 was evaluated in a pilot clinical study in patients with erectile dysfunction. It was observed that 12 of 15 tested patients had improved peak systolic velocity and penile rigidity. Erection duration was 10–60 min. There was no reported adverse skin reactions associated with the treatment in any of the aforementioned clinical trials. [43]

Transfereosomes

Transfersomesarespecially optimized particles or vesicles that can respond to an external stress by rapid and energetically inexpensive, shape transformations.[44] The development ofnovel approaches such as transfersomes have immensely contributed in overcoming problem faced by transdermal drug delivery such as unable to transport larger molecules, penetration through the stratum corneum is the rate limiting step, physicochemical properties of drugs hinder their own transport through skin. These elastic vesicles can squeeze themselves through skin pores many times smaller than their own size and can transport larger molecules.[45] Transfersomes are applied in a nonoccluded method to the skin, which permeate through the stratum corneum lipid lamellar regions as a result of the hydration or osmotic force in the skin. It can be applicable as drug carriers for a orbit of small molecules, peptides, proteins and herbal
elements. Transfersomes can penetrate the stratum corneum and supply the nutrients, locally to maintain its functions resulting maintenance of skin[46] Transfersomes are a form of elastic or deformable vesicle, which were first introduced in the early 1990s and their elasticity is generated by incorporation of an edge activator in the lipidbilayer structure.[47] In this connection the transfersomesof Capsaicin has been made by Xiao-Yinget al.[48] which shows the better topical absorption in comparison to pure capsaicin. Examples of herbal Transfersomesand Ethosomes as drug delivery systems.

Other novel approaches

In a study by Ma et al., the effect and mechanism of Shuanghua aerosol (SHA) was investigated on upper respiratory tract infections in children aged from 3 to 14 years. SHA consists of Flos Chrysanthemum Indicum, Flos Lonicera, Herba Houttuynia, Radix Bupleurum and menthene. The control treatment was Shuanghuanglian aerosol, which consists of Flos Lonicera, Fructus Forsythiaand Radix Scutellaria. The authors conclude that SHA has obvious anti-inflammatory and antiviral effects and has a good curative effect in treating infantile upper respiratory tract infections.[49]

Gugulipid is a standardized extract prepared from the oleo gum resin of Commiphora wightii been clinically proven to reduce the levels of harmful serum lipids in the blood stream. Microparticles of Gugulipid were formulated by different techniques using Chitosan, egg albumin, sodium alginate, ethyl cellulose, cellulose acetate, gelatin and beeswax. The microparticles were evaluated for their physicochemical characteristics. The high-performance liquid chromatography (HPLC) profile showed distinct separation of Guggulsterone-E and -Z, confirming entrapment of Gugulipid in the prepared microparticles.[50]

Microcapsules with entrapped herbal water-soluble extracts of plantain, Plantago major and Calendula officinalis L. (PCE) were prepared by layer-by-layer adsorption of carrageenan and oligochitosan onto calcium carbonate microparticles with their subsequent dissolving after the treatment of ethylene diamine tetra acetic acid. Entrapment of PCE was performed using adsorption and coprecipitation techniques. The coprecipitation provided better entrapment of PCE into the carbonate matrix compared to adsorption. In vitro release kinetics was studied using artificial gastric juice. Applying the model of acetate ulcer in rats, it has been demonstrated that PCE released from the microcapsules accelerates gastric tissue repair.[51] Nanoparticles of traditional Chinese herbs(TCHs) are helpful to improve their absorption and distribution in body, and therefore enhance their efficacies. TCHs, including peach seed, safflower ,Angelica root, Szechwan lovage rhizome, rehmanniaroot, red peony root, leech, gadfly, earthworm, and ground beetle, were mixed and prepared through drying,[86] mincing, extracting, crushing into liquid particles with ultrasonic wave, filtering, and nanometerizing into nanoparticles with nanometer Collider. Nanoparticles of TCHs showed significant thrombolytic effects, resulting in quick recovery from arterial embolism and diminution of thrombi. The thrombolytic effects of nanoparticles of TCHs are much intensified than their non-nanoparticle form. There are also some research works on integrative evaluation, pharmacokinetics, and pharmacological activity of the oral prolonged-release formulations of traditional Chinese medical specialty.[52]

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Novel sustained-release implant of herb extract using chitosan has proved to be very useful. The extract of danshen (Radix Salvia miltiorrhiza), a medicinal herbal, was developed with CS–gelatin as an implant for the promotion of anastomosing and healing on muscles and tissues at the organic incision site in abdominal cavities. Measurements were made of the sustained release of tanshinone IIa, a marker component, from the material in vitro. The dissolution medium was assayed with a HPLC method. Biodegradation studies of the material were also carried both in vitro and in vivo. The film made of this material exhibited a sustained-release effect. The release profile conforms to the Higuchi equation.At most about 20% of the incorporated drug was released over 15 days in a CS–gelatin (1:2) matrix. Drug release was found to be effectively controlled by the drug-amount loaded in the matrix. The improved film (CS/gelatin ratio 1:16) can be hydrolyzed by lysozymes in vitro in 4 days.This film of 0.5 cm2 was implanted and degraded completely in rats over 28 days and the animals' wounds of abdominal incision healed well.[53]

Arthri Blend-SR is a marketed formulation containing herbal extracts and nutrients to support healthy joints and connective tissues in the body. It is a proprietary clinically validated blend of natural actives for joint care applications. The composition has the added advantage ofsustained-release technology, which benefits the continuous management of symptoms of arthritis. The blend contains Glucosamine sulfate, Boswellin (B. serrata extract) and Curcumin C3 Complex (Curcuminoids from C. longa), ingredients that work synergistically to support the management of inflammatory conditions such as arthritis. It will provide a slow-release profile of 80%–90% active ingredient release, in an 8-h period. The benefits of a sustained-release formulation are especially relevant to the bioavailability of Glucosamine.[54]

Marketed Herbal Novel Drug Delivery Formulations

Two companies dominate the market for these systems, namely, Cosmetochem and Indena. For herbal drug delivery, Cosmetochem launches Herbasec® technology in markets which are actually liposomal preparations of various herbal ingredients such as extracts of White tea, Green tea, white hibiscus, Gurana, and Aloe Vera. These extracts are used in cosmetics because of their anti-oxidant effects for prevention of aging. Indena patented the technology of phytosomes® and launches many products in market under this having diverse therapeutic benefits. Indena commercializes the plant constituents/extracts of liquorice (18ß-glycyrrhetinic acid), Ammivisnaga (visnadin), Centella asiatica (triterpenes), G. biloba (ginkgoflavonglucosides, ginkgolides, bilobalide), Hawthorn flower (vitexin-2″-O-rhamnoside), milk thistle (silymarin and Silybin), horse chestnut (escin ß-sitosterol), Terminalia sericea (sericoside), Panax ginseng (ginsenosides), grapeseed (polyphenols), Green tea (polyphenols), etc.[55]

Advantages of herbal drugs

Herbal drugs possess following advantages [56-58].

1. Low risk of side effects

Mostly herbal drugs are well tolerated by the patient, having fewer unintended consequences and fewer side effects than traditional medicine, and may be safer to use.

2. Effectiveness

Herbal drugs are more effective for long-standing health complaints that don't respond well to traditional medicine. One example is the herbs and alternative remedies used to treat arthritis. Vioxx, a well-known prescription drug used to treat arthritis, was recalled due to increased risk of cardiovascular complications. Herbal treatments for arthritis, on the other handle, have lesser side effects. Such treatments include dietary changes like adding simple herbs, eliminating vegetables from the nightshade family and reducing white sugar consumption.

3. Lower cost

Cost of herbal drugs is much less than prescription medications. Research, testing, and marketing add considerably to the cost of prescription medicines. Herbs tend to be inexpensive compared to drugs.

4. Widespread availability

Herbs are available without a prescription. Simple herbs, such as peppermint and chamomile, can be cultivated at home.

Disadvantages of herbal drugs

Herbal drugs possess following limitations [59-64].

1. Not suitable for many diseases

Modern medicine treats sudden and serious illnesses and accidents much more effectively than herbal or alternative treatments. An herbalist would not be able to treat serious trauma, such as a broken leg, nor would he be able to heal appendicitis or a heart attack as effectively as a conventional doctor using modern diagnostic tests, surgery, and drugs.

2. Lack of dosage instructions

Self-treatment with herbal drugs may consist of many risk factors. Moreover, with no proper direction of doses may lead to overdose.

3. Poison risk associated with wild herb Consumption of herbal drugs without correct identification of plant i.e., use of wrong part of plant may lead to poisoning.

4. Lack of regulation

Herbal products are not strictly regulated, consumers may buy inferior quality herbs. The quality of herbal products may vary among batches, brands or manufacturers. This can make it much more difficult to prescribe the proper dose of an herb. All herbal drugs are not safe, some maybe poisonous or may cause allergenic reactions.

5. Longer duration of treatment

Curing period is usually longer in comparison to conventional medication. Immense patience while undergoing herbal treatment is needed

CONCLUSION

Herbal medications have been widely employed all over the globe since ancient times and have been acknowledged by doctors and patients for their better therapeutic value as they cause fewer

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adverse effects as compared with modern medications. The drugs of Ayurvedic origin can be utilized in a more upright course with enhanced efficacy by incorporating in modern dosage forms. However, phytotherapeutics need a scientific approach to render the components in a new way to increase patient compliance and avoid repeated administration. This can be accomplished by designing NDDS for herbal ingredients. NDDS not only reduce the repeated administration to overcome noncompliance, but also help to increase the therapeutic value by reducing toxicity and increasing the bioavailability and so on. Recently, pharmaceutical scientists have shifted their focus to designing a drug delivery system for herbal medicines using a scientific approach. The novel research can also aid in capturing as well as to remain in the market. But there are many challenges with herbal drugs which need to be overcome like difficulty of conducting clinical research in herbal drugs, development of simple bioassays for biological standardization, pharmacological and toxicological evaluation methods' development, investigation of their sites of absorption, toxic herbal drugs in use, discovering various animal models for toxicity and safety evaluation, legal and regulatory aspects of herbal drugs and so on.

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SPATIAL ANALYSIS AND INTERVENTION STRATEGIES FOR SUSTAINABLE WATERSHED MANAGEMENT: A CASE STUDY OF MICRO WATERSHED 27K15G

Dilna K S
College of Agriculture, Ambalavayal, Kerala Agricultural University

ABSTRACT

The study focuses on the 27k15g watershed, a sub-watershed of the Kabani River (k), the 27th river from the south, 15th sub watershed and micro watershed 'g' in Wayanad, Kerala (KSLUB, 2024). The main objectives are to control runoff and soil degradation, utilize runoff for beneficial purposes, improve land productivity, and enhance water resources within the watershed. The study likely employed a mixed-methods approach, combining spatial analysis using GIS tools and maps with field observations and socioeconomic data collection (KSPB, 2024). Also, the study involved mapping and spatial analysis, field surveys and socioeconomic data collection. Key findings highlight the influence of spatial factors like slope and existing land use on intervention planning, the importance of considering socioeconomic conditions and community needs for intervention prioritization, and the need for integrating GIS data with field observations for informed decision-making. The study proposes a range of interventions, including arable land interventions, drainage line interventions, livelihood interventions and soil and water conservation interventions. The significance of this study lies in its contribution to sustainable watershed management in the 27K15g watershed and its potential for informing similar efforts in other regions. By identifying site-specific interventions and emphasizing community engagement, the study promotes the efficient use of natural resources, improved land productivity, and enhanced livelihoods for the local population.

KEYWORDS: *Watershed Management, Soil and Water Conservation, Sustainable Land Use, Livelihood Interventions, Kerala, Watershed 27K15g, Meenangadi, Ambalavayal, Sulthan Bathery*

1.INTRODUCTION

Watershed 27k15g, encompassing Ambalavayal, Meenangadi, and Sulthan Bathery, is characterized by laterite soil which is highly prone to erosion, particularly on the steep slopes prevalent in the region. The dominant coffee-based cropping system exposes the land to erosion, especially during periods of intense rainfall *(DES, Kerala ,2024)*. The communities' reliance on agriculture for their livelihoods makes them vulnerable to the impacts of soil erosion, which reduces agricultural productivity and exacerbates the effects of drought conditions *(DES, Kerala, 2024)* that are increasingly impacting the area. This combination of erosion-prone conditions, sensitive crops, and vulnerable livelihoods underscores the urgent need for watershed-based interventions to promote sustainable land and water management practices, enhance agricultural resilience, and improve the well-being of the communities in watershed 27k15g.

Farmers in Ambalavayal, Meenangadi, and Sulthan Bathery are facing significant challenges due to drought conditions. A report by the Wayanad principal agricultural officer states that 90% of local self-government institutions in the district are facing drought, with severe crop damage reported *(The New Indian Express, 2024).* Water bodies have dried up, leading to water scarcity for both residents and farmers. The drought has caused widespread crop damage, impacting coffee, pepper, and banana cultivations across hundreds of hectares, with paddy and vegetable cultivations also affected *(The New Indian Express,2024)*. This situation has resulted in significant financial losses for farmers, with the report estimating crop damage worth Rs 25 crore *(The New Indian Express, 2024)*.

The watershed-based interventions such as stone bunds, earthen bunds, staggered trenches, and rainwater harvesting pits**,** offer multiple benefits. These interventions will help to control runoff and soil erosion**,** leading to improved water retention, soil health and mitigate drought. Consequently, agricultural productivity can be enhanced, contributing to increased and sustained production**.**

GIS-based interventions enhance these benefits by providing a powerful tool for precise and efficient planning and implementation **(***Prasannakumar et al.,2011*). By integrating various spatial datasets, such as slope, soil type, land use, and rainfall patterns**,** GIS allows for the identification of optimal locations for interventions, maximizing their effectiveness *(Vijith et al., 2008)*. This targeted approach ensures resources are used efficiently and interventions are tailored to the specific needs of the watershed, leading to more sustainable and impactful outcomes *(Smiths et al., 2013*)**.**

2.OBJECTIVE

- Analyze spatial and contextual factors shaping effective watershed interventions.
- Control damaging runoff and degradation, thereby conserving soil and water.
- Protect, conserve, and improve the land of the watershed for more efficient and sustained production

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3.MATERIALS AND METHODS

3.1 Study Area

- **Geographic Location and Climate**: Watershed 27k15g is part of the Kabani river basin, the 27th river from the south in Kerala, Wayanad district *(KSLUB, 2024)*.
- **Topography**: The watershed's topography is characterized by varying slopes, influencing land use patterns and susceptibility to soil erosion *(KSPB, 2024)*.
- **Soil Characteristics**: The predominant soil type in the watershed is laterite, which is typical of tropical regions with high rainfall.
- **Demographics**: The total population of the watershed is 300,529, with a population density of 384 per square kilometer *(DES, Kerala, 2024)*. The overall literacy rate is 89.32% *(LSGD, 2023)*.
- **Socioeconomic Context**: Agriculture is the primary economic activity in the watershed, with major crops including paddy, black pepper, coffee, coconut, ginger, turmeric, tea, and arecanut *(KSPB, 2024)*. This diversity in agricultural practices influences land management decisions and the types of interventions required to promote sustainable livelihoods.

3.2 Data Collection and Fieldwork

- Secondary data: watershed boundaries, soil and slope data, land use data from the Kerala State Land Use Board *(KSLUB, 2024)*.
- Primary data: field surveys to document drainage, fallow land, and eroded areas, with photographs.
- Contextual data: local government (population, housing, cropping patterns, water bodies *(LSGD, 2023); (DES, Kerala, 2024)*

Ambalavayal Gramapanchayat

Table 1 – Demographic details of Ambalavayal gramapanchayat (LSGD, 2023)

Specifications	Data
Total number of wards	20
Total area	6065 Ha
Total population	35207
Male	17214
Female	17993
SC	955
ST	5867
Sex ratio	0.95
Population density	580
Number of households	6963
Soil type	Laterite
Elevation	974 m
Cropping pattern	Coffee based
Major crops	Ginger, coffee, pepper, banana, turmeric
Canal	2
Pond	180
Open well	200
Stream	2
Ditches	3
Rainwater harvest pond	1

Sulthan Bathery Municipality

Table 2 – Demographic details of Sulthan Bathery Municipality (LSGD, 2023)

Specifications	Data
Total number of wards	35
Total area	103 sq Km
Total population	45417
Male	22342
Female	23075
SC	1761
ST	5346
Sex ratio	0.97
Population density	416
Literates	88%
Number of households	10230

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Soil type	Laterite
Elevation	901 m
Cropping pattern	Coffee based
Major crops	Paddy, pulses, arecanut, nutmeg, ginger,coffee, pepper, turmeric
Canal	10
Pond	230
River	1
Check dam	28
Tube well	317

Meenangadi Gramapanchayat

Table 3 – Demographic details of Meenangadi gramapanchayat (LSGD, 2023)

Specifications	**Meenangadi**
Total number of wards	19
Total area	53.51 sq Km
Total population	35859
Male	16624
Female	16826
SC	908
ST	8283
Sex ratio	1007-1000
Population density	646
Number of households	8199
Soil type	Laterite
Elevation	773
Cropping pattern	Coffee based
Major crops	Paddy, coconut, rubber, coffee, pepper, banana, arecanut, turmeric
Canal	32
Pond	826
Open well	3126
Tube well	200
Ditches	15

3.3 Spatial Analysis

Integrating and Analyzing Diverse Datasets in QGIS for Watershed Management

Integrating and analyzing diverse datasets in QGIS is crucial for effective watershed management. Various maps, including slope, relief, soil depth, soil texture, geomorphology, and land use maps, provide valuable insights into the characteristics of a watershed, like 27K15g *(KSLUB, 2024)*. QGIS, a powerful open-source Geographic Information System (GIS) software, allows users to import, overlay, and analyze these diverse datasets. By integrating these maps, spatial relationships and patterns emerge, informing decisions on appropriate interventions, such as identifying areas prone to erosion based on slope and soil type. This integrated analysis, combined with field observations and community input, enhances the effectiveness of watershed management strategies.

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4.RESULTS

4.1 Spatial Patterns and Contextual Observations

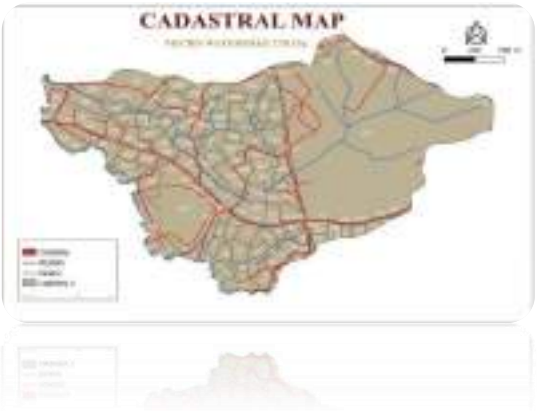


Figure 1 – Cadastral map

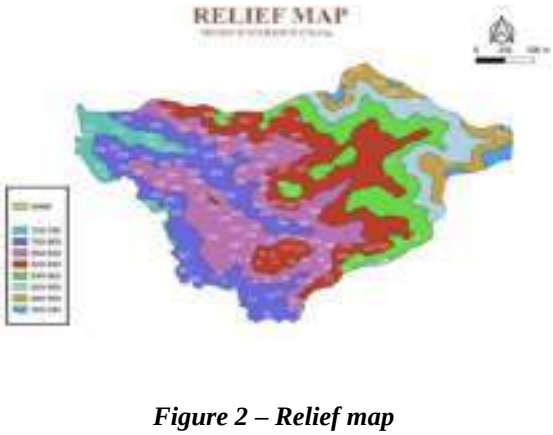


Figure 2 – Relief map

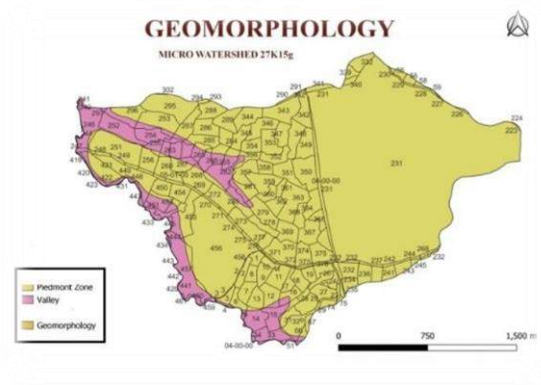


Figure 3 – Geomorphology map

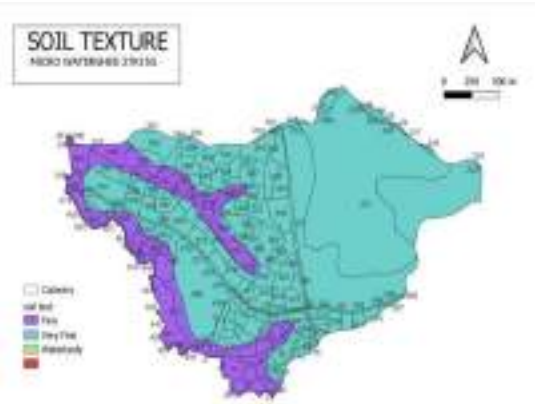


Figure 4- Soil texture map

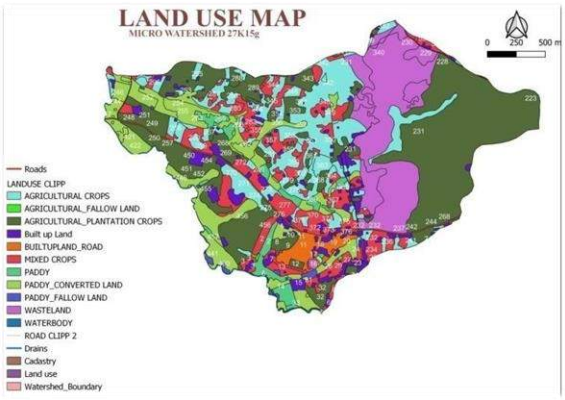


Figure 5 – Land use map

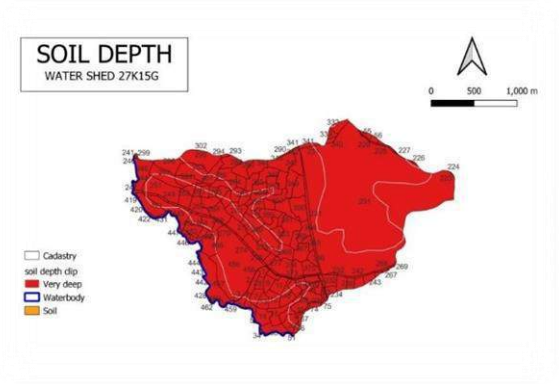


Figure 6- Soil depth map

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Figure 7- Slope map

Cadastral Map: This map delineates the boundaries of land ownership within the watershed.

Slope Map: The slope map classifies the watershed area based on the degree of slope, which is a crucial factor for planning interventions. For example, the map reveals that the largest portion of the watershed (49.96%) has a moderately steep slope ranging from 15-35%, while only a small area (0.72%) has a steep slope exceeding 35%.1 These steep areas are particularly vulnerable to soil erosion and might necessitate interventions like terracing or agroforestry to stabilize the slopes and reduce runoff.

Relief Map: The relief map visually represents the elevation and topography of the watershed. Understanding the terrain helps in identifying high-altitude areas, valleys, and drainage patterns, which are crucial for planning interventions related to water management, irrigation, and flood control.1

Soil Depth Map: The soil depth map is essential for understanding the soil's capacity to hold water and support vegetation. Areas with shallow soil depth might require interventions like soil conservation measures to improve water infiltration and prevent erosion.

Soil Texture Map: The soil texture map reveals that a significant portion of the watershed (81.20%) comprises very fine soil, while only 18.56% has fine soil.2 Understanding soil texture informs decisions related to crop suitability and soil management practices. For instance, very fine soil might be prone to compaction and require interventions like organic matter addition to improve soil structure and drainage.

Geomorphology Map: The geomorphology map depicts the landforms and geological features of the watershed. This information helps in understanding the watershed's susceptibility to erosion, landslides, and other natural hazards, thus informing interventions aimed at mitigating these risks.

Land Use Map: The land use map illustrates the distribution of different land uses within the watershed, such as forests, agriculture, settlements, and water bodies. Analyzing the current land use patterns is essential for identifying areas suitable for specific interventions. For instance, the map could reveal areas of fallow land suitable for fodder cultivation or degraded forest areas requiring restoration efforts.

Integrating Map Information for Effective Watershed Management

By combining the information from these maps, a comprehensive understanding of the 27K15g watershed can be developed. This integrated analysis can guide the selection and prioritization of interventions that address specific challenges and opportunities in the watershed. For instance, areas with steep slopes, shallow soil depth, and existing land use conflicts might be prioritized for soil and water conservation measures. Conversely, areas with gentle slopes, fertile soil, and proximity to water sources might be suitable for promoting sustainable agricultural practices or developing community-based irrigation systems.

By utilizing these maps in conjunction with field observations and community input, watershed managers can develop more effective and targeted interventions that contribute to the sustainable management of the 27K15g watershed.

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Proposed Interventions for Watershed Management

- **Arable land interventions**

Table 4 – Arable Land Interventions

Survey No.	Soil	Slope	Existing land use	Problem	Interventions	Expected outcome
278	Fine soil	0-3 %	Fallow land	Weed infestation, soil erosion	Weeding and fodder cultivation (Hybrid napier)	Improved soil fertility, reduced erosion, provision of nutritious fodder for livestock
351	Very fine soil	10-15%	Fallow land	Weed infestation and underutilization of land.	Weeding, land preparation and banana cultivation	Improved utilization and income from the land
352	Very fine soil	5-10%	Arecanut field	Weed infestation, YLD and less space utilization	Mixed cropping with ginger, black pepper and vegetables	Enhanced soil fertility and diversification of farm income.
362	Very fine soil	15-35%	Fallow land	Weed infestation and degraded soil	Tapioca cultivation along with cowpea	Increased crop yields, and diversification of farm income.
368	Very fine soil	15-35%	Fallow land	Weed infestation and under-utilized land area	Weeding, land preparation and strip cropping with coffee and calogonia	Reduced soil erosion, increased land suitable for cultivation and improved water management
369	Very fine soil	15-35%	Eroded roadside boundary	Soil erosion	Weeding and side wall construction	Improved pest and disease control, soil erosion control



Figure 8- Arable land interventions



Figure 9 – Drainage line treatment map

Drainage Line Treatment Interventions

Table 5- Drainage line treatment interventions

Survey no	Soil	Slope	Existing land use	Problem	Interventions	Expected Outcome
352	Very fine soil	5-10%	Drain	Unprotected boundary	Maintenance and repair, boundarystrengthening.	Reduced drain bank erosion, improved stability and longevity of drainage structures, and reduced maintenance costs.
278	Fine soil	0-3%	Drain	Heavy weed infestation, unprotected boundary and soil clogging	Weeding and cleaning, construction of side wall	Reduced gully erosion, decreased downstream sedimentation, improved water infiltration, and potential for restoring degraded land.
352	Very fine soil	5-10%	Common well	Algal infestation, torn net covering	Cleaning and provision of net cover	Improved water quality.

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277	Very fine soil	15-35%	Common well	No proper covering, lack of rope andbucket for water collection.	Cleaning, provision of covering net and installation of solar panel motor	Improved water quality, reduced maintenance costs.

Livelihood Interventions

Table 6-Livelihood Interventions

Survey no	Soil	Slope	Existing land use	Problems	Interventions	Expected outcome
363	Very fine soil	10-15%	Fallow land	Weed infestation and soil erosion	Weeding and fodder cultivation	Improved soil fertility, reduced erosion, provision of nutritious fodder for livestock, and potential income generation from surplus fodder.
279	Fine soil	10-15%	Rubber field	Lesser space utilisation	Construction of apiary unit	Increased income diversification, reduced dependence on single crops, potential for value addition and processing, and creation of employment opportunities.
369	Very fine soil	15-35%	pond	Weed infestation and under utilisation	Geotextiles and pisciculture	Increased income, improved nutrition, and potential for integrated aquaculture-agriculture systems (e.g., using pond water for irrigation).



Figure 10- Livelihood intervention map

Soil and water conservation intervention

Table 7- Soil and water conservation intervention

Specific Intervention	Description	Expected Outcomes
Stone Bunds	Constructed across the slope to intercept runoff, reduce soil erosion, and promote water infiltration.	Reduced soil erosion, enhanced soil moisture, improved crop yields, and reduced downstream sedimentation.
Earthen Bunds	Similar to stone bunds, but constructed with earth. They are cost-effective but may require more frequent maintenance.	Reduced soil erosion, improved soil moisture, and enhanced agricultural productivity.
Staggered Trenches	Excavated trenches arranged in a staggered pattern along the contour to slow down runoff, trap sediment, and increase water infiltration.	Reduced runoff velocity, decreased soil erosion, improved soil moisture, and enhanced groundwater recharge.
Rainwater Harvesting Pits	Excavated pits or ponds designed to collect and store rainwater runoff.	Increased water availability for irrigation, livestock, and domestic use. Reduced runoff and soil erosion.
Check Dams	Small dams constructed across gullies or streams to control erosion, reduce peak flows, and promote sediment deposition.	Reduced gully erosion, decreased downstream flooding, improved water availability, and potential for groundwater recharge.

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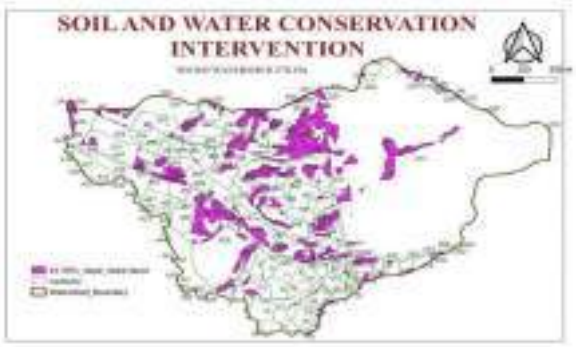


Figure 11- Stone bund intervention map



Figure 12-Rainwater harvesting pits map



Figure 13- Earthen bund intervention map

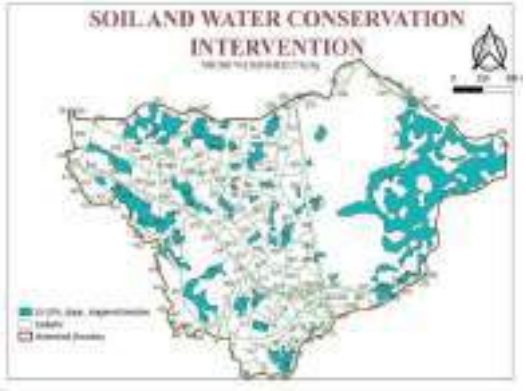


Figure 14- Staggered trenches intervention map

6.DISCUSSION

6.1 Influence of Spatial Factors on Intervention Planning

Spatial factors like slope and land use play a crucial role in determining the type of interventions needed in a watershed. For instance, areas with fallow land and slopes between 10-15% might be suitable for fodder cultivation to prevent soil erosion and provide livestock feed.

6.2 Role of Contextual Factors in Intervention Prioritization

Socioeconomic conditions and community needs are crucial in prioritizing interventions. The data contains the population density, literacy rate, major crops, and cropping patterns of the region, highlighting the importance of understanding the community's reliance on agriculture. Understanding the community's needs ensures that interventions are relevant and sustainable.

6.3 Challenges and Lessons Learned from Integrating GIS with Field Observations

While the source doesn't explicitly discuss the challenges and lessons learned from integrating GIS with field observations, it does provide examples of how spatial data (slope, soil type) is used to inform interventions. Based on common practices in watershed management, some potential challenges and lessons could include:

- **Data accuracy and resolution:** Ensuring that GIS data is accurate and high-resolution is crucial for effective planning. Field observations can be used to verify and refine GIS data.
- **Ground-truthing:** It is important to validate GIS-based plans with field observations. Site visits can help identify practical constraints or opportunities that might not be apparent from the GIS data alone.
- **Community engagement:** Integrating local knowledge and observations with GIS analysis can lead to more effective and locally accepted interventions.

7. CONCLUSION

The study of watershed 27K15g, encompassing Ambalavayal, Meenangadi, and Sulthan Bathery, underscores the critical need for interventions to address the pressing issues of soil erosion, water scarcity, and drought conditions. The study highlights the vulnerability of the region due to its laterite soil, steep slopes, and reliance on coffee-based agriculture. The interventions like construction of stone bunds, earthen bunds, staggered trenches, and rainwater harvesting pits, coupled with the integration of GIS technology for precise planning and resource allocation, hold the promise of mitigating soil erosion, improving water retention, and enhancing agricultural productivity. The successful implementation of these strategies, combined with sustained community engagement, has the potential to transform watershed 27K15g, leading to improved water security, enhanced agricultural resilience, and a better quality of life for the communities in this region *(The Hindu. (2024).*

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A REVIEW ON TRANSDERMAL PATCH

Dr. Swati Ravat[1], Dr. Sunil Jaybhaye[2], Mr. Sachin Dighole[3]
Mrs. Aditi Pungale[4], Ajay Prabhakar Lahane[5]
Institute of Pharmacy Badnapur

ABSTRACT

A transdermal patch is a medicated adhesive patch that you place on your skin to deliver medication directly into your bloodstream. This method is part of a newer way to deliver drugs, which offers benefits over traditional methods like pills. Transdermal patches come in different sizes and can contain one or more active ingredients. This review provides important information about transdermal patches, including their advantages and disadvantages, how they work, the different types available, their basic components, methods of making them, how they are evaluated, and their uses. Many types of medications are now available in patch form.

INTRODUCTION

The transdermal drug delivery system has been around for a long time. In the past, people mostly used creams and ointments for skin issues, but these sometimes caused side effects because the medicine absorbed into the bloodstrem. Transdermal delivery includes any medication applied to the skin that aims to enter the bloodstream. These systems are designed for controlled, continuous release of drugs through the skin, avoiding painful injections and bypassing the liver's first-pass metabolism, which can reduce the drug's effectiveness.The main benefits of this system are the controlled release of medication and the fact that it's painless. A transdermal patch adheres to the skin and consists of several parts, such as liners, adhesives, drug reservoirs, and membranes, all of which help deliver the drug effectively.Different types of patches and application methods have been developed to enhance drug delivery. Because of these advantages, transdermal delivery has become an important area of research in drug delivery systems.



ADVANTAGES

Transdermal patches offer several advantages:

1. Steady Drug Delivery: They provide a controlled release of medication over time, maintaining stable drug levels in the bloodstream.
2. Convenience: Patches are easy to use and can be applied and removed without the need for injections or oral medications.
3. Reduced Side Effects: By bypassing the digestive system, transdermal patches can minimize

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gastrointestinal side effects and improve drug absorption.
4. Non-invasive: They offer a non-invasive alternative to injections, making them more acceptable for patients who fear needles.
5. Improved Adherence: The simplicity of use can enhance patient compliance with medication regimens.
6. Localized Treatment: Some patches can deliver medication directly to the site of action, reducing systemic exposure and potential side effects.
7. Long-lasting Effects: Many patches can provide extended relief for chronic conditions, reducing the need for frequent dosing.
8. Potential for Combination Therapies: Some patches can deliver multiple medications simultaneously, simplifying treatment for complex conditions.

DISADVANTAGES

Transdermal patches have several disadvantages, including:

1. Skin Reactions: Some users may experience irritation, redness, or allergic reactions at the application site.
2. Limited Drug Types: Not all medications can be effectively delivered through the skin due to molecular size or solubility issues.
3. Variable Absorption: Absorption rates can vary based on factors like skin thickness, temperature, and moisture levels, leading to inconsistent dosing.
4. Duration of Effect: Patches may not provide immediate relief, as they typically release medication slowly over time.
5. Cost: Transdermal patches can be more expensive than oral medications.
6. Displacement Issues: Patches may become dislodged or fall off, especially if exposed to moisture or friction.
7. Limited Dosing Flexibility: Once applied, it's challenging to adjust the dose quickly, unlike oral medications.
8. Potential for Systemic Side Effects: Medications delivered systemically can lead to side effects that may not occur with localized treatments.
9. Patient Compliance: Some patients may forget to change patches or may not follow the application guidelines properly.

STRUCTURE OF SKIN

The skin is composed of three primary layers, each with distinct structures and functions:

1. Epidermis

Outer Layer: The outermost layer, primarily made up of keratinized stratified squamous epithelium.

Cell Types: Contains keratinocytes (produce keratin), melanocytes (produce melanin), Langerhans cells (immune response), and Merkel cells (touch sensation).

Sub-Layers: Includes several sub-layers, such as the stratum corneum (outermost), stratum lucidum (found only in thick skin), stratum granulosum, stratum spinosum, and stratum basale (where new cells are generated).

2. Dermis

Middle Layer: Beneath the epidermis, the dermis provides structural support and strength.Components: Contains connective tissue, blood vessels, nerves, hair follicles, and glands (sweat and sebaceous).

Sub-Layers: Divided into the papillary dermis (upper layer with dermal papillae) and reticular dermis (deeper, thicker layer).

3. Hypodermis (Subcutaneous Layer)

Deepest Layer: Not technically part of the skin but lies beneath the dermis.

Function: Composed of loose connective tissue and fat, it provides insulation, cushioning, and energy storage, as well as anchors the skin to underlying structures.

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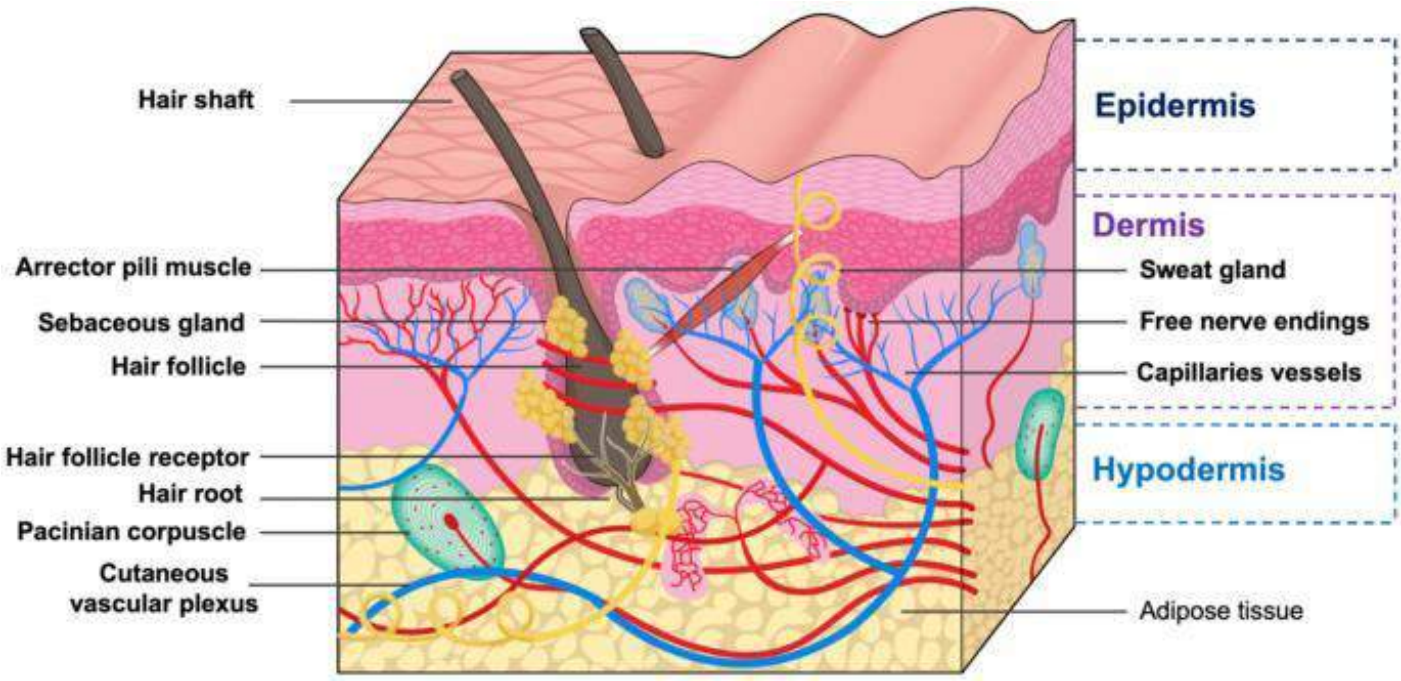


Figure No-02

PATHWAYS OF SKIN PERMEATION

Drug molecules can enter the skin through various pathways, including sweat ducts, hair follicles, and sebaceous glands, or directly across the outermost layer called the stratum corneum. Recently, scientists have debated the significance of these different routes, particularly the shunt (appendageal) pathway versus the direct pathway through the stratum corneum. This discussion is complicated by the absence of suitable experimental models to separate these pathways. A recent review by Menon offers useful insights into this topic. The stratum corneum is made up of 10 to 15 layers of cells called corneocytes.

TRANSDERMAL PATCH

A transdermal patch is a medicated adhesive patch that you place on your skin to deliver medication directly into the bloodstream. The first prescription patch approved by the U.S. Food and Drug Administration (FDA) was for scopolamine to treat motion sickness, available since December 1979. The most popular transdermal patch in the U.S. is the nicotine patch, which helps people quit smoking. The first vapor patch for reducing smoking was approved in Europe in 2007.

Many other transdermal patches are available, including:
Fentanyl Patches: Used for severe pain relief.
Nitroglycerin Patches: Help manage angina (chest pain).
Lidocaine Patches (Lidoderm): Relieve pain from shingles.
Buprenorphine Patches (Bu Trans): Provide pain relief for moderate to severe chronic pain and are sometimes used off-label for acute injuries.
Flector Patches (Diclofenac Epolamine): Nonsteroidal anti-inflammatory drug (NSAID) patches for treating acute pain from minor injuries and for chronic conditions like fibromyalgia and arthritis.

In 2005, the FDA began investigating reports of serious side effects, including deaths related to narcotic overdoses, specifically concerning the Duragesic fentanyl patch.

COMPONENTS OF TRANSDERMAL PATCHS

Transdermal patches consist of several key components:

1. **Backing Layer:** This is the outer layer that protects the patch and provides structural support. It's usually made from a polymer material.
2. **Drug Reservoir or Matrix:** This contains the active pharmaceutical ingredient (API). It can be in a liquid reservoir or a solid matrix form.
3. **Rate-Control Membrane:** This regulates the release of the drug from the reservoir into the skin.
4. **Adhesive Layer:** This allows the patch to adhere to the skin. It must be biocompatible and often contains a specific type of adhesive that ensures effective contact.
5. **Release Liner:** This is a protective layer that covers the adhesive before application, preventing premature adhesion.
6. **Permeation Enhancers (optional):** These are added to increase the skin's permeability to the drug, facilitating better absorption

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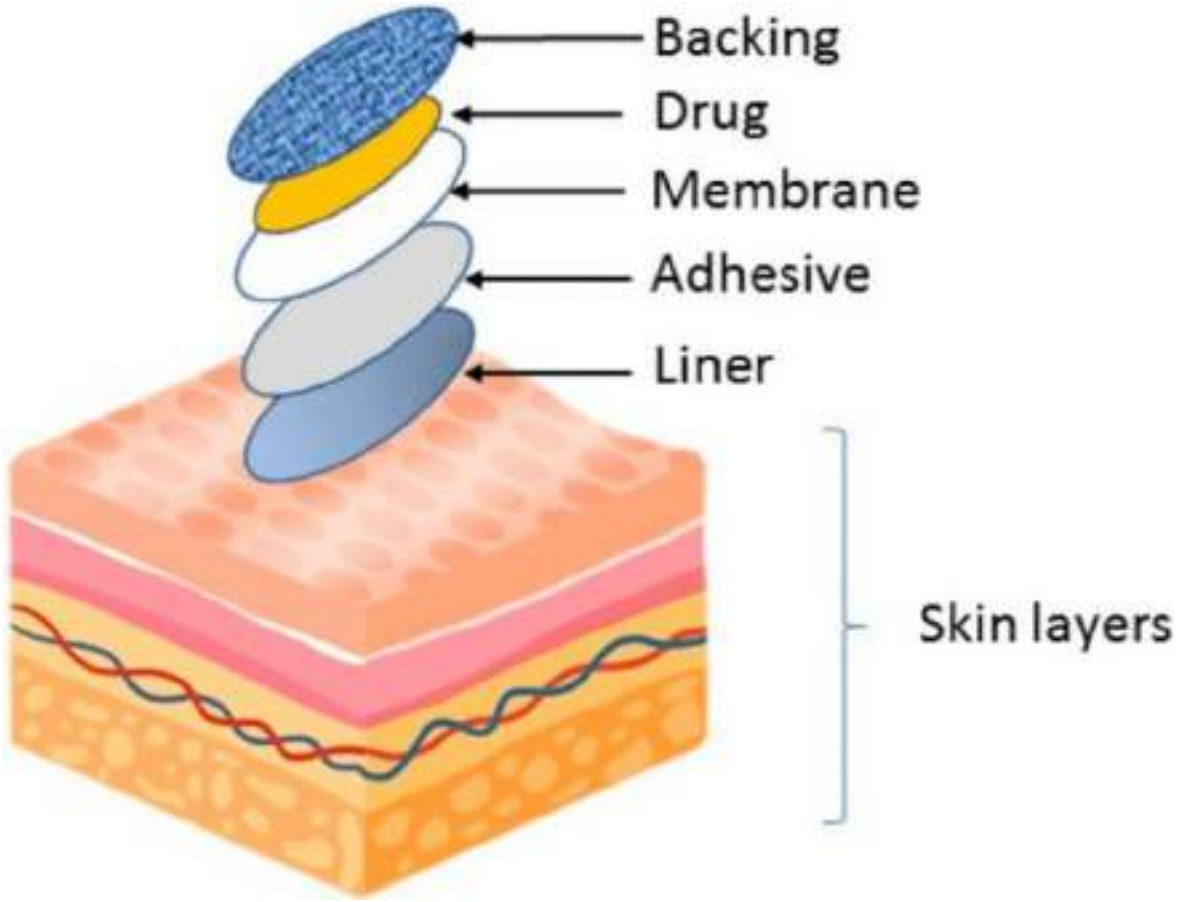


Figure no-03

1. Polymer Matrix
Polymers form the core of transdermal delivery systems. These systems typically consist of multilayer laminates with a drug reservoir sandwiched between two polymer layers:An outer layer that prevents drug loss.An inner adhesive layer that controls drug release and adheres to the skin.Choosing the right polymers is crucial for effectiveness, balancing release rates, adhesion, compatibility, and stability.

Types of Polymers
Natural Polymers: Cellulose derivatives, zein, gelatin, waxes, chitosan.
Synthetic Elastomers: Polybutadiene, silicon rubber, butyl rubber.
Synthetic Polymers: Polyvinyl alcohol, polyethylene, polyacrylate.

2. Drug Properties
The drug must have suitable physicochemical and pharmacokinetic properties for TDDS. This method is ideal for drugs that:Undergo extensive first-pass metabolism.Have a narrow therapeutic window.Require frequent dosing due to short half-lives.

3. Permeation Enhancers:
These substances increase skin permeability, allowing more drug absorption. They interact with skin components (like proteins and lipids) to improve drug delivery. Enhancers can help both oil-soluble and water-soluble drugs penetrate the skin better.

4. Pressure-Sensitive Adhesives (PSA)
PSAs ensure the patch stays in contact with the skin. They should adhere easily with light pressure and maintain a strong hold. Common PSAs include polyacrylates and silicon-based adhesives. The choice of adhesive depends on the patch design and drug formulation and should not interfere with drug release.

5. Backing Laminate
The backing layer provides structural support and must be chemically resistant to prevent interactions with the drug and other components. It should also ensure that no additives leach out during use.This simplified overview captures the key components and considerations for effective transdermal drug delivery systems.

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6. Backing Layer: The backing layer should have low moisture vapor transmission to keep the drug stable. It needs to be elastic, flexible, and strong enough to support the patch.

7. Release Liner

The release liner protects the drug during storage, preventing it from migrating into the adhesive and avoiding contamination. It acts as primary packaging, not as part of the dosage form.The release liner consists of:A base layer (which can be either non-occlusive or occlusive).A release coating layer made of materials like silicone or Teflon.Other materials for release liners can include polyester foil and metalized laminates.

8. Other Excipients

Various solvents (like chloroform, methanol, and acetone) are used to create drug reservoirs.Plasticizers (such as dibutyl phthalate and polyethylene glycol) are added to make the transdermal patch more flexible.This summary highlights the key elements related to backing layers, release liners, and additional excipients in transdermal drug delivery systems.

Types of Transdermal patches

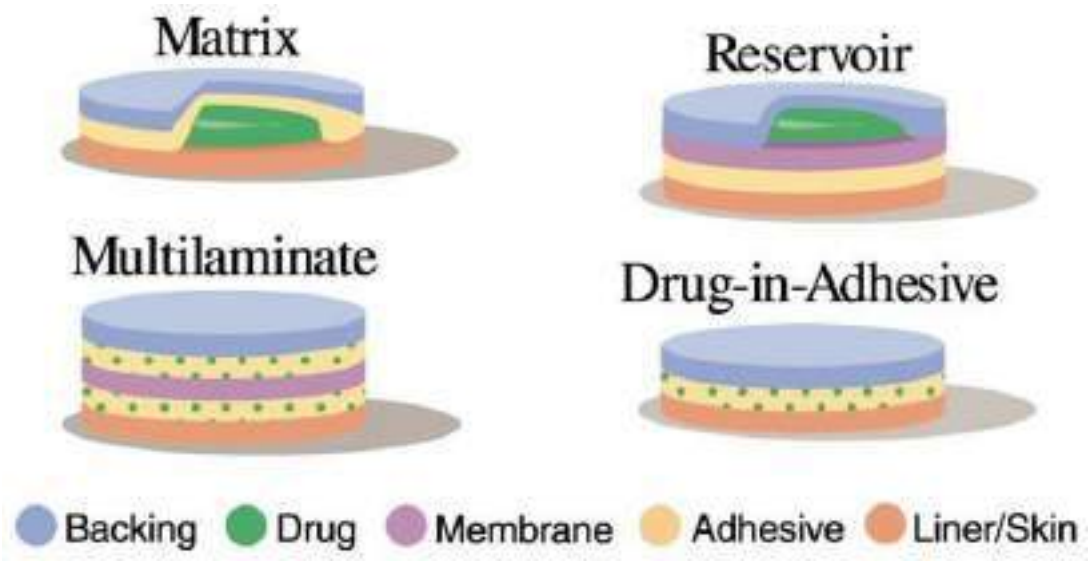


Figure No-04

1. Single-Layer Drug-in-Adhesive Patch

This patch has a layer of adhesive that contains the drug. The adhesive not only holds the patch together but also releases the drug onto the skin. It is covered by a temporary liner and a backing layer.

2. Multi-Layer Drug-in-Adhesive Patch

Similar to the single-layer patch, this type includes an immediate-release layer and a controlled-release layer, all within the adhesive. It also has a temporary liner and a permanent backing.

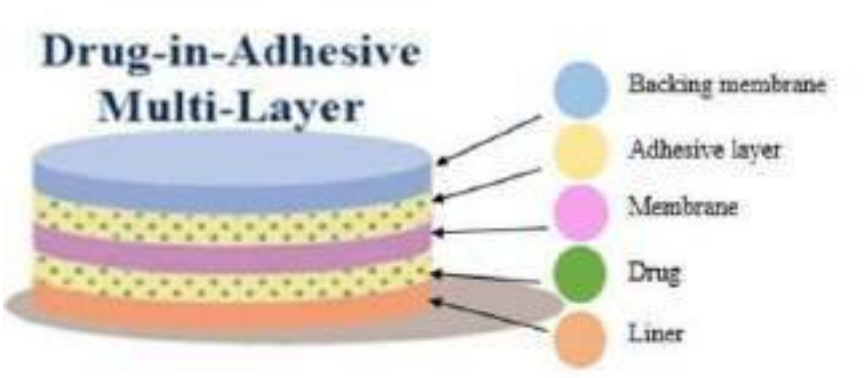


Figure No-05

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3. Vapor Patch
These patches release vapor instead of a solid drug. They are used for various purposes, such as delivering essential oils for congestion relief or improving sleep quality.

4. Reservoir System
In this system, the drug is contained in a reservoir between a non-permeable backing and a rate-controlling membrane, which can be porous or non-porous. The drug can be in various forms (solution, suspension, gel) and is held with a hypoallergenic adhesive on the outer surface.

5. Matrix System
Drug-in-Adhesive System: The drug is mixed with an adhesive to create a reservoir. This is then spread onto a non-permeable backing, protected by an additional adhesive layer. It can deliver multiple drugs and is known for its thin profile and good skin fit.

Matrix-Dispersion System: The drug is evenly mixed in a polymer matrix and formed into a medicated disc. This disc is then placed on an occlusive base, using a drug-impermeable backing layer.These systems are designed to enhance drug delivery through the skin, offering various benefits depending on their structure and formulation.

Micro Reservoir System: is a method for delivering drugs at a steady rate over time. It combines two types of drug delivery systems: the reservoir system and the matrix-dispersion system. First, a water-soluble polymer is mixed with the drug to create a reservoir. Then, this mixture is dispersed using high shear mechanical force into a lipophilic (fat-loving) polymer to form tiny, microscopic drug reservoirs. To stabilize the mixture and prevent it from breaking down, cross-linking agents are added, which help form stable bonds and keep the system intact. This allows the drug to be released at a consistent rate, maintaining constant drug levels.

METHOD OF PREPARATION OF TDDS

a) Asymmetric TPX membrane method.
b) Circular Teflon mould method.
c) Mercury substrate method.
d) By using IPM membranes" method.
e)By using "EVAC membranes" method.
f) Preparation of TDDS by using Proliposomes.
g) By using free film method.

a) Asymmetric TPX Membrane Method
discovered by Berner and John in 1994, involves creating a prototype patch using a heat-sealable polyester film (type 1009, 3M) as the backing membrane. The drug is spread on the concave surface of this membrane, which is then covered by an asymmetric TPX (poly(4-methyl-1-pentene)) membrane and sealed with an adhesive.

Preparation Process:The membrane can be prepared using either the dry or wet inversion method. For the wet method:

1. TPX is dissolved in a mixture of cyclohexane and non-solvent additives at 60°C to form a polymer solution.
2. The solution is then kept at 40°C for 24 hours.
3. Afterward, the polymer solution is cast onto a glass plate.
4. The casting film is dried at 50°C for 30 seconds.
5. The glass plate with the film is then immediately immersed in a coagulation bath at 25°C for 10 minutes.
6. After this, the membrane is removed and air-dried in a circulation oven at 50°C for 12 hours.

This process results in the formation of an asymmetric TPX membrane ready for use in creating drug delivery patches.

b) Circular Teflon Mould Method (Discovered by Baker and Heller, 1989)
A polymeric solution is prepared by dissolving a drug in one part and enhancers in another part.Both solutions are mixed together, and a plasticizer (like Di-N-butylphthalate) is added.The mixture is stirred for 12 hours and poured into a circular Teflon mould.The mould is covered with an inverted funnel to control solvent evaporation in a laminar flow hood (air speed of 0.5 m/s).The solvent is allowed to evaporate for 24 hours, and the dried film is stored for 24 hours at 25°C ± 0.5°C in a desiccator with silica gel before testing to avoid aging effects.

c) Mercury Substrate Method
The drug and plasticizer are dissolved in a polymeric solution and stirred for 10-15 minutes to form a homogeneous mixture.

The mixture is poured onto a levelled mercury surface and covered with an inverted funnel to control solvent evaporation.

d) IPM Membranes Method
The drug is dispersed in a mixture of water and a polymer (like propylene glycol with Carbomer 940) and stirred for 12 hours.The dispersion is neutralized by adding triethanolamine, and if the drug has poor solubility in water, a buffer (pH 7.4) is used to form a gel.This gel is then incorporated into the IPM membrane.

e) EVAC Membranes Method
For transdermal drug delivery systems (TDS), a 1% Carbopol gel is made using polyethylene (PE) and ethylene vinyl acetate copolymer (EVAC) as the rate-controlling membrane.If the drug is insoluble in water, propylene glycol is used to prepare the gel.The drug is dissolved in propylene glycol, and Carbopol is added and neutralized with sodium hydroxide.The drug gel is spread on a backing layer and covered with the rate-controlling membrane, then sealed to form a leak-proof device.

f) Preparation of TDDS by Using Proliposomes
Proliposomes are made using a film deposition technique with a drug-to-lecithin ratio of 0.1:2.0.Mannitol powder (5 mg) is dried in a round-bottom flask at 60-70°C while rotating.After drying, the flask temperature is lowered to 20-30°C.

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g) By Using Free Film Method

involves preparing a cellulose acetate-free film by casting it onto a mercury surface. Here's the simplified process:

1. Prepare the Polymer Solution: Dissolve 2% w/w polymer in chloroform, and add plasticizers at 40% w/w of the polymer weight.
2. Film Casting: Pour 5 ml of the polymer solution into a glass ring placed on a mercury surface inside a glass petri dish.
3. Control Evaporation: To control the rate of solvent evaporation, cover the petri dish with an inverted funnel.
4. Film Formation: Once the solvent evaporates completely, the film will form on the mercury surface.
5. Drying and Storage: After the film is dry, remove it and store it between sheets of wax paper in a desiccator until needed.By adjusting the volume of the polymer solution, films of different thicknesses can be created.The drug and lecithin are dissolved in an organic solvent, and 0.5 ml of the solution is added to the flask at 37°C.This process is repeated with additional solvent to complete the drying.

FACTORS AFFECTING TRANSDERMAL PATCH

There are various factors which affects the action of transdermal patches. These are given below:

a.Physicochemical Properties
i.Partition coefficient
ii. Molecular size
iii. Solubility/melting point
iv. Ionization
b. Physiological & Pathological Conditions of Skin
i.Reservoir effect of horny layer
ii. Lipid film
iii. Skin hydration
iv. Skin temperature
v. Regional variation
vi. Pathological injuries to the skin
vii. Cutaneous self-metabolism
viii. Skin barrier properties in the neonate and young infant
ix. Skin barrier properties in aged skin
x. Race
xi. Body site
xii. Penetration enhancers used [13]

PHYSICOCHEMICAL PROPERTIES

- Partition coefficient
- Molecular size
- Solubility/melting point
- Ionization

PHYSIOLOGICAL & PATHOLOGICAL CONDITION OF SKIN

- Reservoir effect of horny layer
- Lipid film
- Skin hydration
- Skin temperature
- Regional variation
- Pathological injuries to the skin
- Cutaneous self-metabolism
- Skin barrier properties in the neonate and young infant
- Skin barrier properties in aged skin

APPROACHES IN DEVELOPING TRANSDERMAL PATCH

1. Membrane-Controlled System

This type uses a membrane to control the release of the drug through the skin.

2. Adhesive Diffusion-Controlled System

In this system, the drug is released through an adhesive layer that controls how the drug diffuses through the skin.

3. Matrix Dispersion System

The drug is evenly dispersed within a matrix (a solid structure), and the drug is released as it diffuses through the matrix.

4. Microreservoir System

Tiny drug reservoirs are embedded in the patch, and the drug is released from these microreservoirs over time.

LIMITATIONS TRANSDERMAL DRUG DELIVERY SYSTEM (TDDS)

1. Not all drugs are suitable: The drug must have specific physical and chemical properties to be effective for transdermal delivery.
2. Drugs needing high plasma levels: TDDS is not suitable for drugs that require high concentrations in the bloodstream.
3. Skin irritation: Drugs that cause skin irritation or contact dermatitis cannot be used in transdermal patches.
4. High molecular weight drugs: Drugs with large molecules are not suitable for transdermal delivery.
5. Metabolism through the skin: Drugs that are metabolized by the skin cannot be delivered effectively through this route.
6. Limited drug penetration: The skin is a strong barrier, so only drugs with low doses can be delivered transdermally.In summary, the transdermal route has limitations and is not suitable for all drugs, particularly those that require high doses or are prone to causing skin irritation.

RECENT ADVANCES IN TRANSDERMAL PATCH

1. Protein Delivery via Patch Technology

New patches are being developed to deliver proteins through the skin, providing a non-invasive alternative to injections.

2. Pain-Free Monitoring for Diabetes

Transdermal patches are now being used to monitor blood glucose levels in diabetics without the need for painful finger pricks.

3. Testosterone Patches for Women with Premature Ovarian Failure

A transdermal patch system is being used to deliver testosterone to young women with spontaneous premature ovarian failure to help manage symptoms.

4. Oxybutynin Patch for Overactive Bladder (OAB)

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Transdermal patches delivering oxybutynin are being used to treat overactive bladder, offering a more convenient treatment option.
5. Pain Relief through Transdermal Patches
Transdermal patches are being developed to provide localized pain relief, offering an alternative to oral pain medications.
6. Molecular Absorption Enhancement
New technologies are improving the skin's ability to absorb medications, making transdermal patches more effective in delivering various drugs.
This arrangement provides a clearer overview of current developments in transdermal patch technology.

CONCLUSION

The provides valuable information about transcutaneous drug delivery systems (TDDS) and methods for analyzing them, serving as a useful reference for those involved in TDDS research. The findings suggest that TDDS has great potential, capable of delivering both hydrophobic and water-soluble active ingredients. To fully optimize this drug delivery system, a deeper understanding of the biological interactions and mechanisms involved is necessary. TDDS holds promise as a practical solution for the next generation of drug delivery systems.

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TOTAL HIP ARTHROPLASTY TECHNIQUES

Pilar Alejandra Parreño Castillo[1], Angélica Karina Guamán Lema[2], Estefani Mishel Serrano Ordóñez[3], Maricela Fernanda Neira Rodas[4], Bryam Esteban Coello García[5]

[1]General Practitioner at "UCI- Clínica Santa Ana",faculty of Medical Sciences, Universidad de Cuenca. Azuay- Ecuador ORCID https://orcid.org/0000-0001-7033-7811
[2]General Practitioner at "Uroclinic and independent practice", faculty of Medical Sciences, Universidad de Cuenca. Azuay- Ecuador ORCID https://orcid.org/0009-0008-1932-8002
[3]General Practitioner in Independent Practice, Faculty of Medical Sciences, Universidad Católica de Cuenca. Azuay- Ecuador ORCID https://orcid.org/0000-0002-1497-5939
[4]General Practitioner in independent practice, faculty of Medical Sciences, Universidad de Cuenca. Azuay- Ecuador ORCID https://orcid.org/0009-0003-0334-8475
[5]Postgraduate doctor in orthopedics and traumatology at Faculdade de Ciências Médicas Minas Gerais. Belo Horizonte - Brasil. ORCID https://orcid.org/0000-0003-2497-0274

Corresponding Author: *Bryam Esteban Coello García* ***Address:*** *Rua Teresópolis 183. Belo Horizonte. Minas Gerais. Brasil.*
Postal Code: *31130050*

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ABSTRACT

Introduction: *Total hip arthroplasty (THA) is one of the most effective and successful surgical interventions within the orthopedic specialty. THA offers consistent results for patients suffering from advanced degenerative osteoarthritis of the hip (OA), mainly by relieving pain, restoring function and improving overall quality of life.*
Objective: *detail current information related to total hip arthroplasty techniques, as well as anatomy, physiology, indications, contraindications, history, preparation, preoperative evaluation, technique, treatment and complications of total hip arthroplasty.*
Methodology*: a total of 42 articles were analyzed in this review, including review and original articles, as well as clinical cases, of which 30 bibliographies were used because the other articles were not relevant to this study. The sources of information were PubMed, Google Scholar and Cochrane; the terms used to search for information in Spanish, Portuguese and English were: hip arthroplasty, hip prosthesis, osteoarthrosis, osteonecrosis.*
Results: *analysis of the 30 articles reviewed reveals that the most commonly used surgical approaches for CTA are posterior, direct anterior (DA) and anterolateral, with the posterior approach being the most common, although it presents a slightly higher risk of postoperative dislocation. Wound closure technique plays a crucial role in preventing complications, and the use of barbed sutures and a sterile dressing is recommended to ensure stability and adequate recovery. Regarding deep vein thrombosis (DVT) prophylaxis, aspirin has proven to be an effective option, comparable to more traditional agents such as heparin. The most common complications identified in the studies were dislocations, periprosthetic fractures and wound-related problems, which require appropriate management during postoperative follow-up.*
Conclusions: *total hip arthroplasty (THA) is an effective and widely used procedure for the treatment of advanced osteoarthritis and other hip pathologies that do not respond to conservative treatments. Its evolution from its first applications in the 19th century to modern techniques has led to a significant improvement in clinical and functional outcomes, with a marked reduction in pain and improvement in patients' quality of life. Although the main indications for surgery include hip osteoarthritis and osteonecrosis, the technique should be tailored to the individual conditions and characteristics of each patient, considering factors such as anatomy, comorbidities and post-surgical expectations. A comprehensive approach during preoperative, surgical and postoperative management is essential to optimize outcomes and minimize complications.*
KEY WORDS: *arthroplasty, hip, prosthesis, osteoarthrosis.*

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INTRODUCTION

Total hip arthroplasty (THA) is one of the most effective and successful surgical interventions within the specialty of orthopedics. THA offers consistent results for patients with advanced degenerative osteoarthritis of the hip (OA), primarily by relieving pain, restoring function and improving overall quality of life. OA affects millions of people, with an incidence of approximately 88 symptomatic cases per 100,000 patients annually, making hip OA the leading diagnosis leading to CTA. Other associated diagnoses include osteonecrosis of the hip (ON), congenital malformations of the hip, and inflammatory arthritis. The underlying diagnosis causing the hip degeneration is a key factor, as it has been shown to influence the final outcome. Overall, total hip arthroplasty provides consistent pain relief in both the short and long term, with positive clinical and functional outcomes as reported by patients. Overall, total hip arthroplasty offers even more stable and reliable results than its equivalent procedure, total knee arthroplasty (TKA)(1-5).

METHODOLOGY

A total of 42 articles were analyzed in this review, including review and original articles, as well as cases and clinical trials, of which 30 bibliographies were used because the information collected was not important enough to be included in this study. The sources of information were Cochrane, PubMed and Google Scholar; the terms used to search for information in Spanish, Portuguese and English were: hip arthroplasty, hip prosthesis, osteoarthrosis, osteonecrosis.

The choice of bibliography exposes elements related to total hip arthroplasty (TC); in addition to this factor, anatomy, physiology, indications, contraindications, history, preparation, preoperative evaluation, technique, treatment and complications of total hip arthroplasty are presented.

DEVELOPMENT

Anatomy and Physiology

The hip is a synovial ball-and-socket joint. The stability of the hip joint is achieved by the dynamic interaction between the bony anatomical elements and the soft tissues. In this joint, the femoral head is almost spherical in shape and articulates with the hemispherical cavity of the facies lunata of the acetabulum. The surface of the articular cavity covers 50% of the area of the femoral head. The bony components comprise the proximal femur (head, neck, trochanters) and the acetabulum, which is formed from three distinct ossification centers (the ileum, ischium and pubic bones). The native acetabulum is oriented at an angle of 15 to 20 degrees of anteversion and 40 degrees of abduction. The femoral neck is oriented in a range of 15 to 20 degrees of anteversion and presents an angle of 125 degrees with respect to(6-9).

Indications

The most common indication for hip arthroplasty is end-stage symptomatic hip osteoarthritis. In addition, osteonecrosis of the hip, congenital hip disorders including hip dysplasia, and inflammatory arthritic diseases are common causes for hip arthroplasty. Osteonecrosis of the hip generally affects a younger patient population (between 35 and 50 years of age) and accounts for about 10% of annual hip osteoarthritis(5).

Contraindications

Hip infection or sepsis, active and continuous remote (i.e. extra-articular) infection or bacteremia, and severe cases of vascular dysfunction, among others specific to the individual.

History

Hip prosthesis models have undergone a process of improvement since the late 19th century, when Dr. Themistocles Gluck conducted a series of tests with various alternatives for joint replacements in preliminary animal trials. In 1890, one of the 14 total hip arthroplasty procedures reported by Dr. Gluck included a femoral head replacement using ivory in a human patient. In 1940, Dr. Austin Moore worked with orthopedic surgeon Dr. Harold Bohlman to design the first hip hemiarthroplasty (partial prosthesis) to treat displaced femoral neck fractures. In 1952, Dr. Moore created his renowned "Austin Moore prosthesis" as a globally available prefabricated joint replacement. In the 1960s, Sir John Charnley broke into the field by introducing the principle of "low friction arthroplasty" using a metal femoral stem and a small femoral head articulating with a cemented polyethylene acetabular component(10,11).

Modern Implants and Bearing Surfaces

Current hip arthroplasty techniques have progressed toward press-fit femoral and acetabular components. In general terms, femoral stems can be classified into the following main models:

- Press-fit, with proximal overlay and distal taper (can be double or single taper in the medial-lateral and/or anterior-posterior planes).
- Press-fit, fully overlapped, with diaphyseal coupling.
- Press-fit, modular stems: modular connection alternatives include: (1) head-neck, (2) neck-stem, (3) stem-sleeve, and (4) intermediate stem.
- Cemented femoral stems: cobalt-chrome is the preferred material for cement bonding(5,12,13).

Alternatives for Bearing Surfaces Include

- Metal on polyethylene (MoP): MoP has the longest track record of all bearing surfaces and is offered at relatively low cost.
- Ceramic on polyethylene (CoP): This option has gained increasing popularity.
- Ceramic-on-ceramic (CoC): CoC has the best wear properties of all bearing surfaces in total hip arthroplasty (THA).
- Metal-on-metal (MoM): Although disused, MoM has historically demonstrated superior wear properties compared to MoP. MoM exhibits lower linear wear rates and generates lower particle volume. However, the potential for the development of pseudotumors, as well as reactions associated with metallosis (delayed type IV hypersensitivity), has led to a reduction in its use. In addition, MoM is contraindicated in pregnant women, patients with renal insufficiency and those at risk of hypersensitivity to metals.

A hip arthroplasty prosthesis generally includes a press-fit acetabular component, a neutral polyethylene shell and a head/liner construction in MoP, CoP or CoC, depending on the patient's age and projected activity level. In addition, a

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cemented femoral stem option is often considered for patients with poor bone quality. This approach is especially relevant in the treatment of hip arthroplasty in active geriatric patients with displaced femoral neck fractures(5,14,15).

Preparation

According to the most recent American Academy of Orthopaedic Surgeons (AAOS) guidelines for the management of symptomatic osteoarthritis of the hip or knee, strong or moderately strong level recommendations for nonsurgical treatment have been approved for the following modalities:

- Weight reduction programs
  Indicated as first-line treatment for all patients with symptomatic hip arthritis.
  This indication is emphasized in all patients with a body mass index (BMI) greater than 25.
- Physical activity and physiotherapy programs
  Aimed at improving joint function and reducing pain through specific exercises and rehabilitation techniques.
- Nonsteroidal anti-inflammatory drugs (NSAIDs) and tramadol
  Recommended for the management of pain and inflammation in patients with symptomatic hip and knee arthritis.
- Corticosteroid injections
  These can be both therapeutic and diagnostic for symptomatic patients. This modality is particularly useful in patients where low back pain and lumbar spinal stenosis, with or without radicular symptoms, can create clinical confusion in diagnosis.
- Use of a cane for walking
  A cane may be beneficial in decreasing the joint reaction forces generated at the hip. In patients with unilateral hip pain, cane use should be recommended in the contralateral upper extremity to improve load distribution and reduce joint stress.

Other symptomatic treatment modalities, which are not strongly supported but are considered reasonable alternatives for the control of symptoms secondary to hip arthritis, include, among others, acupuncture, hyaluronic acid injections (viscoelasticity), and glucosamine and chondroitin supplementation(5,19,20).

Preoperative Evaluation: Clinical Examination

Before hip arthroplasty is considered in any patient, a thorough history and detailed physical examination is essential. Patients should be asked about previous interventions and treatments, including joint replacements, arthroscopic procedures or other previous surgeries in the hip region. It is especially important to consider a history of intertrochanteric fractures, which are common in these patients, or open pelvic fractures, which are one of the most severe and life-threatening of musculoskeletal trauma injuries. These injuries are critical because previous surgical incisions or the presence of devices in the femur or acetabulum can significantly influence the planned surgery or the design of the prosthesis to be used.

Additionally, a comprehensive medical evaluation is necessary, including a review of the patient's general conditions, comorbidities and possible contraindications. It is recommended that medical clearance and risk stratification be obtained for all patients before surgery is considered, ensuring that they are fit to undergo hip arthroplasty(21-23).

Other considerations include the patient's body habitus, previous functional activity level, and post-surgical expectations and goals. It is also essential to evaluate the pattern of arthritic involvement and to review any history of previous trauma to the hip. The hip should be inspected for alterations in skin coloration, previous scars or injuries that may influence surgical planning. The soft tissues should be evaluated for signs of muscle atrophy, symmetry and overall hip stability.

Atypical leg pain and pain at rest are common symptoms of peripheral vascular disease (PVD). Although up to 50% of patients may be asymptomatic at the time of consultation, clinical suspicion of PVD may warrant a preoperative consultation with vascular surgery to assess surgical risk.

The physical examination should also include an evaluation of the mechanical axis and general alignment of the lower extremity. It is crucial to rule out or at least consider the possibility of spine or knee pathology before proceeding with hip surgery. In addition, any leg length discrepancy (LLD) that may affect the post-surgical outcome should be recorded.
It is essential to consider the impact of associated conditions that may influence hip mechanics, such as:

- Spinal conditions with hyperlordosis.
- Pelvic obliquity.
- Hip flexion contractures, which may prevent the patient from standing upright.
- Trendelenburg gait or Trendelenburg sign, which indicate gluteus medius weakness and may affect hip stability.

In addition, preoperative range of motion (ROM) should be assessed and recorded. Patients with end-stage osteoarthritis often present with a combination of adduction and flexion contractures of the hip, so it is crucial to document any appreciable flexion contracture greater than 5 degrees and lack of flexion beyond 90 to 100 degrees. Range of motion in the rotational arc, especially internal rotation, is often limited. The neurovascular examination should also include a straight leg raise test to assess neurologic function.

Preoperative Evaluation: Radiographs

Preoperative radiographs including an anteroposterior (AP) pelvis and an AP/lateral projection of the affected hip(s) are recommended. In cases of hip dysplasia, a false profile view is considered useful. For severe hip dysplasias and when custom components are contemplated, it is recommended that a preoperative 1 mm thin-slice computed tomography (CT) scan be obtained for a more detailed evaluation of the anatomy.

On imaging, the hip joint should be evaluated for joint space narrowing, the presence of osteophytes, and subchondral sclerosis or degenerative cysts. It is important to pay particular attention to the planned center of rotation of the hip (COR) relative to the native COR, as this directly influences the placement of the prosthesis. The surgeon must take into account

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the planned medialization of the acetabular cup and the corresponding reaming necessary to ensure proper alignment and fit of the acetabular implant. In addition, any appreciable leg length discrepancy (LLD) can be calculated using a combination of the radiographic methods described(24).

Figure1. **Right hip arthroplasty in Two Radiographic Views.**



Source: The Authors.

Technique or Treatment

There are several methods for performing total hip arthroplasty (THA), and the three most common approaches are as follows:

Posterior Approach

The posterior approach is the most commonly used in both primary and revision hip arthroplasty cases. This approach does not use a true internervous plane. Dissection begins with a blunt dissection of the gluteus maximus fibers and a sharp incision of the fascia lata distally. The deep dissection includes meticulous exploration of the short external rotators and joint capsule, taking special care to protect these structures while repairing posteriorly to the proximal femur via transosseous tunnels.

A notable advantage of this approach is that it avoids section of the hip abductors. Other advantages include excellent exposure of both the acetabulum and femur and the possibility of extensible conversion in either the proximal or distal direction. However, historical studies comparing this approach with the direct anterior (DA) approach have cited higher dislocation rates with the posterior approach. Although this finding remains controversial and inconclusive, especially when the posterior technique includes adequate soft tissue repair at the end of the operation.

Direct Anterior Approach (DA).

The DA approach has gained popularity among hip arthroplasty surgeons because of its purported benefit in reducing postoperative dislocation rates and preserving the abductor musculature. The internervous interval is located between the tensor fascia latae (TFL) and the sartorius (femoral nerve) in the superficial layer, and between the gluteus medius and rectus femoris in the deep layer.

Disadvantages of the DA approach include a significant learning curve, with a decrease in reported complications once the surgeon has performed more than 100 cases. In addition, this approach has increased wound complications in obese patients with large abdominal panniculus, difficulties in femoral exposure, the risk of lateral femoral cutaneous nerve paresis (LFCN), and a higher rate of intraoperative femoral fractures. Many surgeons require access to a specialized operating table and trained staff, which also involves a considerable learning curve.

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Anterolateral Approach (Watson-Jones).
The anterolateral approach (AL) is less commonly used than the previous approaches because it involves the hip abductor muscle, which may result in a postsurgical limp in exchange for a theoretically lower dislocation rate. The dissection interval in this approach involves the anterior thoracic ligament musculature and gluteus medius, which affects abductor function.

Steps of the procedure.
Once the surgical approach has been made, the next step is the osteotomy of the femoral neck. Generally, a reciprocating saw is used, starting approximately 1 to 2 cm proximal to the lesser trochanter and advancing in a proximal-lateral direction toward the base of the greater trochanter. After completion of the osteotomy, the femoral head and neck are freed from the soft tissue attachments and removed.

Visualization of the acetabulum is facilitated by the use of retractors. Some surgeons prefer to place the anterior retractor at 2 o'clock (right hip) or 10 o'clock (left hip), and the bent Hohmann retractors are positioned at 12 o'clock and 8 o'clock (right hip) or 4 o'clock (left hip). The blunt Hohmann retractor is placed in the extracapsular position at the level of the transacetabular ligament (TAL). The remnants of the round ligament and fibroadipose pulvinar should be excised to expose the acetabular tear and remove the labrum (if present), allowing proper use of the acetabular reamers.

Reaming methods should start small (usually a 44) and focus on proper medialization of the cup, exposing the medial wall without protrusion. Once medialization is accomplished, sequential reaming is performed to place the acetabular cup in the proper position, which is usually between 35 to 40 degrees of inclination and 15 to 20 degrees of anteversion. After completion of reaming, the press-fit acetabular component is inserted, followed by insertion of the appropriate acetabular liner.

The femur is then prepared using specific drills or instrumentation systems until provisional stability is obtained by press-fit. After placement of the trial femoral stem, the hip is reduced and assessed for stability using a combination of trial implants or progressively displaced neck stems. The femoral head can also be adjusted depending on the implant system used. Most systems offer various head size options (“plus” and “minus”) to add or subtract length and ensure hip stability.

Methods to Assess Intraoperative hip Stability

1. Shelling test to release any interposed soft tissue and assess stability with axial traction.
2. Equal leg lengths, comparing the patella and heels to the contralateral extremity by direct palpation.
3. With the hip in 0 degrees of extension, externally rotate to check for posterior impingement.
4. The hip should be in abduction and external rotation to ensure no posterior impingement or anterior subluxation.
5. The hip should be brought to 90 degrees flexion with additional adduction and internal rotation of approximately 70 to 90 degrees, ensuring stability.

Direct Lateral Approach (Hardinge)
The direct lateral approach (also known as the transgluteal approach) does not use an actual internervous plane. Superficial dissection involves the fascia lata to access the gluteus medius, with the risk of injury to the superior gluteal nerve when performing proximal dissection, which can result in a post-surgical Trendelenburg gait. However, this approach has been shown to have the lowest dislocation rate (0.55%) compared to the posterior (3.23%) and anterolateral (2.18%) approaches(25,26).

Wound Closure
Proper wound closure after hip arthroplasty is critical to prevent postoperative complications and ensure optimal recovery. Special attention to detail should be paid during closure, using a meticulous approach. For repair of the joint capsule and short external rotators to the proximal femur, a sterile, braided, nonabsorbable ethylene terephthalate surgical suture is used. This technique is performed through two transosseous tunnels.

A recommended protocol includes the use of unidirectional or bidirectional barbed sutures for the deep fascia, deep fat and dermal/subcutaneous layers. For the skin, staples or polyglecaprone can be used. Some surgeons prefer to opt for a continuous polyglecaprone-based barbed suture, supplemented with a mesh dressing and glue closure for the skin. After the closure is completed, a sterile dressing is applied and left in place unchanged for the first seven days.

It is crucial to place an abduction pillow on the patient's hip to avoid excessive movements that may compromise the stability of the implant. In addition, clear instructions should be provided to the patient regarding hip flexion precautions and activity restrictions during the early postoperative period. Topical application of tranexamic acid (TXA) is also recommended prior to pulsatile saline lavage, which may help reduce bleeding during the procedure and promote faster recovery.

Pharmacologic Modalities for DVT Prophylaxis
Prophylaxis of deep vein thrombosis (DVT) and venous thromboembolic events (VTE) is a major concern in patients undergoing hip arthroplasty because of the increased risk of clot formation after surgery. Although the choice of the most effective agent remains a matter of debate, many surgeons have opted for aspirin because of its proven efficacy and similar results in preventing symptomatic pulmonary embolism (PE) in certain groups of total joint patients. Aspirin has been shown to be an appropriate and well-tolerated option, especially in comparison with other prophylactic agents, such as low-molecular-weight heparin (LMWH).

The use of these drugs should be individualized, taking into account each patient's risk of developing VTE and their safety

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profile. In addition, treatment should be complemented with physical measures, such as early mobilization and the use of compression stockings to reduce the risk of thromboembolic complications(27,28).

Complications

- THA dislocation
- Periprosthetic THA fracture.
- Wound complications
- Aseptic loosening of THA
- Prosthetic joint infection (PJI)
- Venous thromboembolic events (VTE)
- Sciatic nerve palsy
- Vascular injury
- Leg Length Discrepancy (LLD)
- Iliopsoas impingement
- Heterotopic ossification(29,30).

CONCLUSIONS

Total hip arthroplasty (THA) is an effective and widely used procedure for the treatment of advanced osteoarthritis and other hip pathologies that do not respond to conservative treatments. Its evolution from its first applications in the 19th century to modern techniques has led to a significant improvement in clinical and functional outcomes, with a marked reduction in pain and improvement in patients' quality of life. Although the main indications for surgery include hip osteoarthritis and osteonecrosis, the technique should be tailored to the individual conditions and characteristics of each patient, considering factors such as anatomy, comorbidities and post-surgical expectations. A comprehensive approach during preoperative, surgical, and postoperative management is essential to optimize outcomes and minimize complications.

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MORPHOLOGICAL ANALYSIS OF NANOCAPSULES PROCEED BASED ON DEER ANTLER EXTRACT

Miss. Suchita S. Lathi[1] , Tushar Sanjay Sawant[2*] , Sudarshana Shelke[3], Shruti Shinde[4], Prajakta Shinde[5]

Asst.Proff.(Facultyof P'ceutics) Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
Raosaheb Patil Danve College Of Pharmacy Badnapur,Jalna 431202

ABSTRACT

Peptides and other chemical factors set up in deer antler excerpt have been demonstrated tohave a variety of pharmacological goods. nonetheless, the excerpt might also display possible nanoscale flyspeck parcels, performing as an essential nanozyme during processing. Our thing is to examine how cancer cells are affected at the nanoscale. In addition to having nanozyme orco-nanozyme conditioning of phosphatase and catalase that have crosstalk linked to antiprostate cancer cell viability, particularly with combined asset of MET kinase byco-targeting phosphorylation, we discovered that the water excerpt contains nanoscale patches that are characterized by SEM, TEM, AFM, and zeta eventuality. Immune pathways were also revealed via network pharmacology analysis.Docking exploration demonstrates that MET kinase is inhibited by a strong antler excerpt element. Antler excerpt's nanoscale patches and chemicals at least incompletely supportanticancer processes.

KEYWORDS: *Nanocapsules, Nanoparticles, prize from Deer Antlers, Bioavailability, An enzyme, Anti-inflammatory.*

INTRODUCTION

- The surface coating of extract from deer antlers, which are abundant in enzymes, hormones, vitamins, and peptides, is one of the major problems facing medical and pharmaceutical science today.
- It is well known that the new medication that is produced by covering the surface of unstable, tasteless, and odorous medical compounds is known as a nano capsule. Immunomodulatory, anti-cancer, anti-stress, anti-osteoporosis, anti-inflammatory, anti- infertility, pain-relieving, antibacterial, anti-oxidant, hypoglycemia, and anti-aging propertiesare all found in the base of deer antler.
- A hollow nanoparticle is made up of a solid shell enclosing a core-forming region.[2]
- A substance can be encapsulated in a core-shell structure by nanocapsules, which are particles that are nanoscale in size. Their process entails stages to create and describe these nanostructures for use in environmental, agricultural, and medicine delivery applications.

Release

- By altering their porosity or breaking down their structure, nanocapsules can releasebioactive substances.
- Environmental cues such as temperature, pH, or ionic strength might cause this. Drugs can also be released from nanocapsules using ultrasound.Getting ready:[2
- Numerous techniques, such as precipitation, emulsification-solvent evaporation, and in situhydrolysis of metallic salts, can be used to create nanocapsules.

Uses

- Applications for nanocapsules are numerous and include adhesives, cosmetics, pesticides, carbonless copying paper, and pharmaceutical comp

METHODOLOGY

1. **Nanocapsule Preparation:** Selection of Materials: For stability and compatibility, it is crucial to choose the core material (such as a medication, enzyme, or pesticide) and the shell material (usually a polymer, lipid, or protein).[2]

• Techniques for Encapsulation

Emulsion-Based Techniques: O/W (Oil-in-Water) Emulsion: This technique involves dispersing an oil-soluble active ingredient in an aqueous solution, then forming nanocapsules by polymer deposition around the oil droplets.
W/O/W, or water-in-oil-in-water Double emulsion is a common technique for hydrophilic chemicals in which the active ingredient is dissolved in an oil phase of awater-based solution and stabilized in a second water phase. [2]

Under controlled circumstances, certain lipids and polymers have the ability to self-assemble around the core material.

o Solvent Evaporation: An aqueous solution containing the active component is combined with a polymer dissolved in an organic solvent, and the solvent is thenevaporated to form a

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polymer shell around the core.
The process of interfacial polymerization involves the formation of a polymer shellthat encloses the core material at the interface between two immiscible phases.

Layer-by-Layer (LbL) Assembly: The nanocapsule shell is constructed by depositing alternating layers of oppositely charged polymers onto the core.[2]

2. Nanocapsules' Characteristics

- **Confines and Shape**

The hydrodynamic periphery and polydispersity indicator of nanocapsules are measured by Dynamic Light Scattering(DLS).

High- resolution filmland of the size and shape of nanocapsules can be attained usinscanning electron microscopy(SEM) and transmission electron microscopy(TEM).

The face charge of nanocapsules, which influences their stability and capacity to interactwith natural membranes, is determined by their zeta eventuality.(3)

The chance of active substance contained within the nanocapsules is determined by encapsulation effectiveness, which is generally measured using spectroscopic or chromatographic ways.

Thermal and Chemical Stability To make sure the nanocapsules remain stable under theintended circumstances, styles similar as Differential Scanning Calorimetry(DSC) and Thermogravimetric Analysis(TGA) are used.

Using in vitro assays, controlled release assesses the encapsulated substance's release profile to guarantee the intended release kinetics.(3)

3.Testing and Optimization

- Parameter optimization To increase encapsulation effectiveness and nanocapsule stability,variables like pH, temperature, polymer attention, and stirring rate are acclimated.

- In Vitro and In Vivo Testing To assess biocompatibility, release geste and remedial efficacity for operations similar as medicine administration, in vitro cell- grounded testsand in vivo beast studies are carried out.

Depending on the intended use and the rates demanded in the finished nanocapsuleproduct, each process and phase can be acclimated.(3)

METHODS AND MATERIALS

1. MATERIALS

Ethanol excerpts and antler water were supplied as marketable goods by the" Katon- Karagal Deer Situate" group establishment and Intrade pot in Kazakhstan. The company made the water excerpt by boiling water, which can denature or break down the maturity of native proteins and enzymes that are grounded on proteins. Accordingly, the excerpt was used for nanozyme and flyspeck characterization. We adulterated the water excerpt from the stock product(10X) and used it straight down. After operation, the ethanol excerpt was employed as 1X.(3)

Scrutinized(SEM), Transmission(TEM), Luminescence Diapason, and Fourier-Transfigure Infrared Spectroscopy(FT- IR) Electron Microscopy

The antler water excerpt patches' size and shape were measured using SEM and TEM. TEMsamples were prepared by dilution(11000) of the original antler water excerpt stock or firmed dried samples with water at pH 7 or buffer at pH 13 and dropped to the carbon fortitude side, consequently. A sample containing 4 µL of the antler water excerpt was put onthe cover plate for SEM analysis. We examined the FT- IR gamuts between 600 and 3600 wavenumber/ cm −1 and the luminescence diapason between 650 and 750 nm to learn further about the chemical makeup of the antler water excerpt and the eventuality of the nanoparticles.(5)

Analysis of Antler Excerpt Patches using zeta implicit :

Using disposable microcuvettes and a nanoparticle shadowing analysis outfit with a ZetaView TWIN Ray(PMX- 230) system, the size and distribution of antler excerpt patches were determined and quantified at a temperature of 25 °C. The attention range is 105 – 109 patches/ mL, and the dimension size is 10 nm – 1000 nm for real- time imaging of electrophoretic mobility and Brownian stir. The working range for Zeta eventuality is between-500 mV and 500 mV; the attention range is between 106 and 1010 patches/ mL; and the conductivity range is between 3 µS/ cm and 15 mS/ cm.(2)

Superoxide Dismutase(SOD) Exertion Tests and Enzymes

The enzymatic exertion of the antler excerpt was examined using a variety of substrates. Phosphatase exertion was measured using the NBT set with BCIP. A marketable tackle was used to assess SOD exertion in agreement with the tackle's instructions(Sigma Aldrich).
The SOD exertion was measured directly from the water excerpt.(2)

Analysis of Cell Viability

Eight cell lines — prostate cancer DU 145, PC- 3, Myc- Cap, bone cancer MDA- MB- 231, B16 Carcinoma, HeLa, and normal cells NRK and TM3 — were employed for the cell viability test. After the cells were cultivated and also replated in a 24- well plate for 24 hours, the indicated chemical emulsion or asset — similar as a phosphatase asset blend(PPi), PI3K/ Akt asset LY294002(Akti), MET asset crizotinib(METi), EGFR asset Erlotinib Hydrochloride(EGFRi), androgen, or PARP asset olaparib(PARPi) — was administered either alone or in combination, as shown in the results section or numbers. Cells were fixed,stained with 4 crystal clear violet, irrigated with ddH2O, and also subordinated to absorbance analysis using a microplate anthology three to four days after the medium resultwas removed. The optic viscosity indicators.(2)

Styles of Medication of Nanocapsules

The medication of nanocapsules can be different types they're

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- **Polymerisation system**
- **Conflation Polymerisation**
- **Interfacial Polymerisation**
- **Encapsulation of Nanocapsules**

The Polymerization Process: involves polymerizing the monomers in an waterless result to produce nanoparticles, after which the drug is added either by adsorption of the nanoparticlesor by dissolution in the polymerization medium[3]. The **ultracentrifugation process,** which has been used to purify the suspense of nanoparticles, eliminates different stabilizers and surfactants used in polymerization. After that, the nanoparticles are resuspended in a media free of isotonic surfactants. It has been proposed for the product of nanoparticles of polybutylcyanoacrylate or polyalkylcyanoacrylate. The attention situations of surfactants and chemical and physical stabilizers used determine the product of nanocapsules and the size of their patches. A mean periphery range of 20 nm to 100 nm is suggested by the expression of the nanoparticles grounded on the phase-inversion fashion[3]. conflation polymerization fashion An illustration ofpre-emulsion medication for a nanocapsule is given. Two portions were blended to produce thepre-emulsion; Part 1 comprised 40g of styrene and 0.8 g of divinylbenzene.40 g of Desmodur BL3175A and 0.82 g of 2,2'-azobisisobutyronitrile were present in part 2, together with 1.71 g of sodium. dodecyl sulfate, 1.63 g of IgepalCO-887, and 220 g of water[3]. For ten twinkles, corridor 1 and 2 were magnetically combined in different holders. Under mechanical agitation, part 2 was added to part 1, and the admixture was agitated for 30 twinkles at 1,800 rpm. A Misonix Sonicator 3000 was used to sonicate the attendantpre-emulsion after it had cooled tolower than 5 °C. After being moved to a three- neck round- bottom beaker with a nitrogen input, influx condenser, and mechanical stirrer, thepre-emulsion was degassed[3]

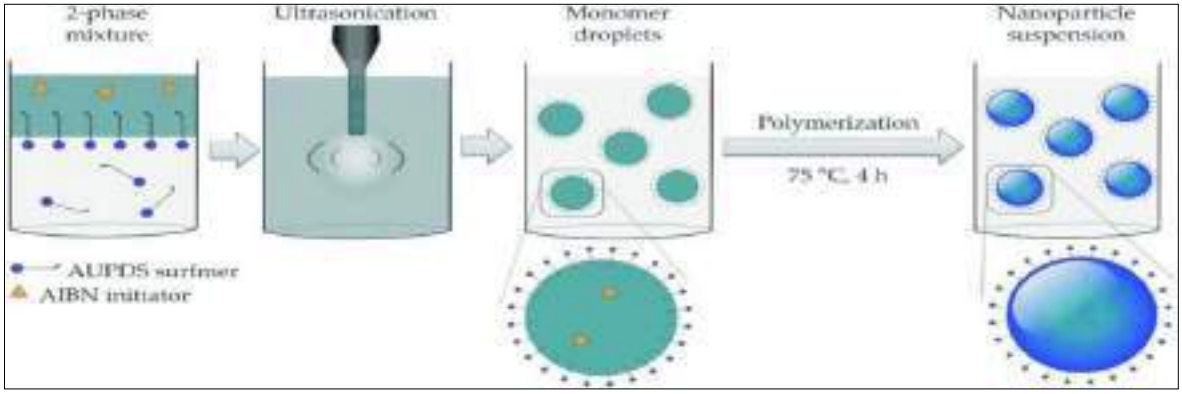


Figure 1 Schematic Representation of Emulsion Polymerisation Method

The System of Interfacial Polymerization : An volition to bulk polymerization of condensation polymers, which necessitates high temperatures, is interfacial polymerization. It consists of two immiscible detergents, where the monomer in one detergent reacts with the monomer of the other solvent incontinently, or it may take time to do so.Since monomers are more likely than their opposing monomers to stumble onto a structure chain, they've advanced molecular weights(31). The waterless core can be used to formulate the nanocapsules. containing isobutylcyanoacrylate oligonucleotides in a W/ O conflation. Nanocapsules are synthesized using both an waterless and an organic phase. Canvases, polymers, the medicine patch, and detergents make up the solvent phase. still, thenon-solvent phase, which is made up of anon-solvent or(31)

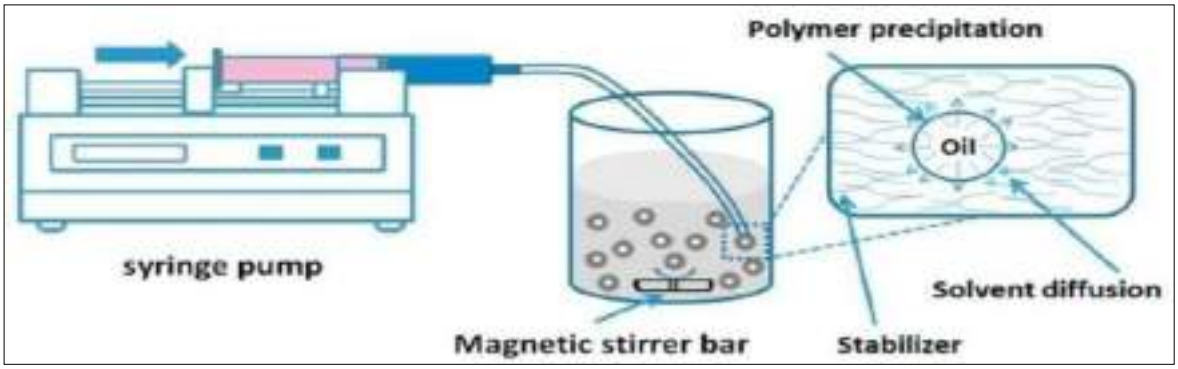


Figure 2 : Schematic representation of nano rush Or interfacial polymerisationmethod4

Nanocapsule Encapsulation

Micro/ nanocapsules with their specific operation rates used in food, biology, and drug have been created using recent advancements in encapsulation technology(31). The maturity of encapsulation ways use isocyanates in bulk or detergent to produce a shell or apply pressure to delicate copying paper. medicine release from nanocapsules, similar as Aerosil 200 and Xerogels, which are employed as reprised accoutrements , is delayed by encapsulation. The Aerosil 200's major excrescence is that it bursts the nanocapsules. colorful ways have been proposed to reduce the burst release of drugs from xerogel mesopores(31).

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The following table illustrates the colorful characteristics of nanocapsules according to theirmedication process. The size, drug attention, and duration of active component release distinguish different types of nanocapsules.(reference needed) (3)

	Mean size(nm)	Drug conc indiluted dispersion (mg/ml)	Drugconc in concentration dispersion (mg/ml)	Active substance release time (90%) (min)
Nanoprecipitation	250	0.002-0.09	0.15-6.5	750
Emulsion- diffusion	425	~0.2	50	60
Double emulsification	400	2-5	20-50	45
Emulsificationcoacervation	300	~0.24	12	>2000

Table 1 How nanocapsules parade different traits grounded on the system by whichthey were set(31)

Mean size(nm) medicine conc in adulterated dissipation(mg/ ml) medicine concattention dissipation(mg/ ml) in Active substance release time(90)(min)
Nanoprecipitation 250 0.002- 0.09 0.15- 6.5 750

conflation- prolixity 425

02 50 60

Double emulsification 400 2- 5 20- 50 45

Emulsification coacervation 300

024 12> 2000

Procedures for Nanocapsule Manufacturing

- The process of solvent evaporation involves dissolving a polymer in a unpredictable detergent and also emulsifying it with an waterless phase that contains surfactants.
- Nanocapsules are left before once the detergent evaporates.
- The process of interfacial polymerization creates a polymeric shell around the center of thenanocapsule by polymerizing monomers at the interface between two immiscible liquids.
- Coacervation is a system that creates nanocapsules by separating a polymer result into itsconstituent phases.
- Nano- rush is the process of dissolving a polymer in a detergent and also combining it withanon-solvent to produce nanocapsules.
- Subcaste- by- subcaste assembly the nanocapsule is created by depositing interspersinglayers of negatively and appreciatively charged polymers onto a core flyspeck.

THE PROCESS OF MANUFACTURING DEER ANTLER EXTRACT

- Surgically removing antlers.
- Removing the velvet.
- Drying and grinding.
- Combining with an extract solution.
- Ultrasonic extraction.
- Filtering.
- Mixing and reacting.
- Concentrating and sterilizing.

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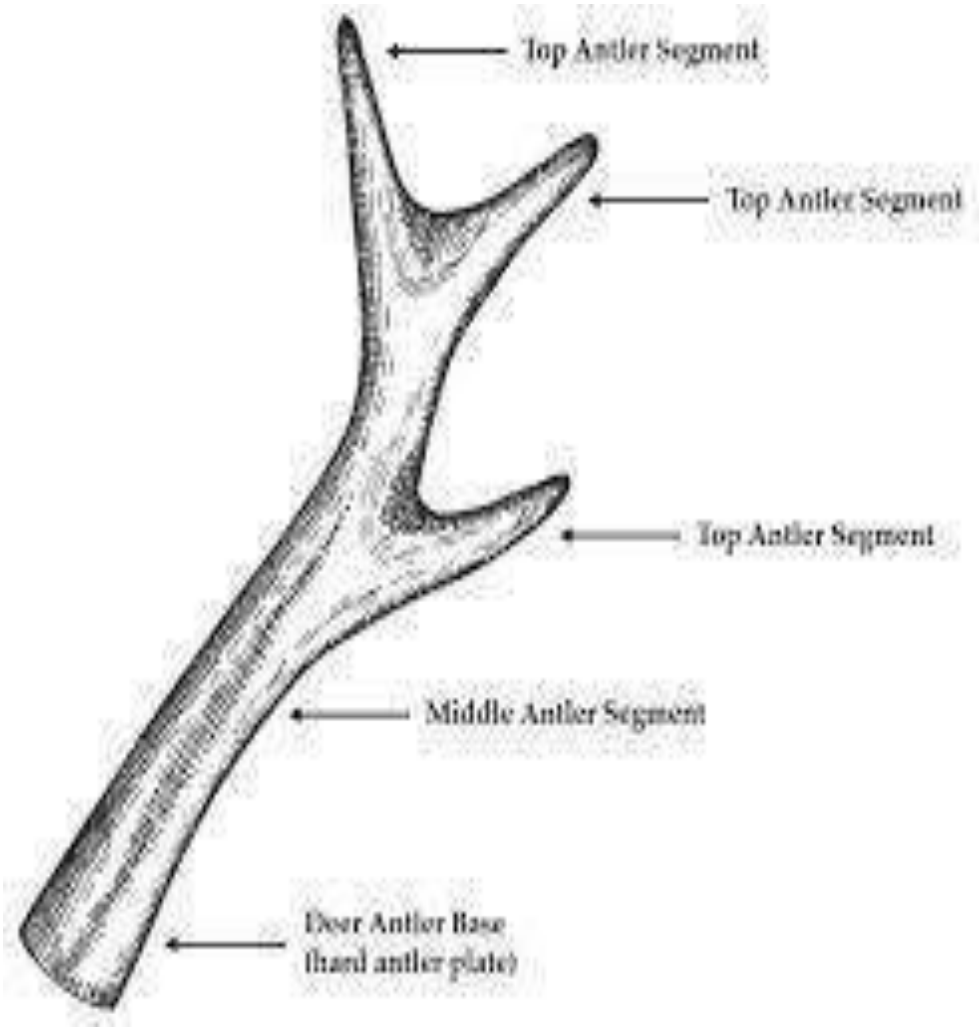


Fig No :03 [Deer Antlet Extract]

• Growth and development: Deer antler extract has been used to assist the body grow and receive nutrition that is rich in vitamins, hormones, enzymes, and peptides that help the bones and muscles get stronger.

• Nano capsules, which usually range in size from 10 nm to 1000 nm, are a simple method of administering dosages to boost body immunity.

• Deer antler extract, which has anti-inflammatory properties, decreased body pain and blocked the body's inflammatory chemicals. Morphological analysis of nanocapsules processed based on the deer antler extract Raosaheb Patil Danve College Of Pharmact Badnapur, Page 15

• Runners, bodybuilders, atheists, and others benefit from improved immune systems. are goods made from deer antler extract that are utilized in daily life Practice endurance.
Exercise endurance may be enhanced by deer antler extract.

• Antler extract, which treats a variety of illnesses, such as

THE STEPS THAT GO INTO MAKING GELATIN

Choosing between types A and B of gelatin depends on the desired qualities and the source (beef or pork). Generally speaking, type an is more acidic while type b is more neutral.
Gelatin sheets or powder are often used forms of the ingredient. [12]Depending on the application, the solvent could be water or another appropriate liquid. The additives could besweeteners, flavorings, colors, or active compounds (such vitamins or medications).

Steps in preparation For powdered gelatin, bloom by sprinkling it with cold water (about 5–10 times its weight) and letting it settle for 5–15 minutes. To make sheets softer, soak themin cold water for five to ten minutes. Dissolution: gently heat (do not boil) the bloomed gelatin in a water bath or microwave until completely dissolved. Mixing: add any other ingredients (sweeteners, flavors) and mix completely. [7]To cool and set, pour the Pour the mixture into containers or molds and allow it to cool to room temperature. Set in the refrigerator (typically a few hours).

Testing as well as quality assurance Texture evaluation: make sure the appropriate elasticity and stiffness are present. Ph testing: confirm that the formulation's pH falls withinthe range that is suitable for stability and flavor.
Stability studies: determine the formulation's shelf life by evaluating it under variouscircumstances. [7]

Storage To avoid moisture absorption, store in an airtight container in a cool, dry location.Conclusion: Depending on its

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intended purpose, gelatin composition might vary greatly, but the basic ideas are always the same. The qualities can be customized to meet particular needsby varying the quantities and adding extra substances. You mentioned the procedures used to make gelatin from antler extract. To guarantee the extraction and inclusion of bioactive substances while preserving the intended gel characteristics, the process of creating gelatin from deer antler extract entails multiple processes. This is a well-organized outline.

To prepare the collection of deer antler extract, get fresh antlers. Cleaning: wash well toget rid of impurities and grime. Cut the antlers into tiny pieces for extraction. To extract bioactive chemicals, use an extraction solvent (such as ethanol or water). To increase yield,apply heat or ultrasonic extraction. To get a clear extract, filter the mixture to get rid of anysolid residues.

Gelatin preparation: pick the type of gelatin (either type A or type B) according to the necessary qualities. For gelatin powder, bloom by sprinkling it with cold water (about 5–10times the weight of the gelatin) and letting it sit for 5–15 minutes. To make sheet gelatin,soak till pliable in cold water.

Mixing gelatin with extractDissolution: Avoid boiling the bloomed gelatin; instead, slowlyheat it in a water bath until it dissolves completely.Mixing: Slowly add the deer antler extract to the gelatin that has dissolved. Stir well to guarantee uniform dispersion.

Adding more componentsoptional additives: if necessary for the intended use, think about including flavorings, sweeteners, or stabilizers.pH adjustment: To maximize the formulation's stability and functionality, check and modify the pH.

Setting and coolingPouring: pour the mixture into containers or molds.cooling: let the mixture drop to ambient temperature before chilling it for a few hours or until it solidifies.

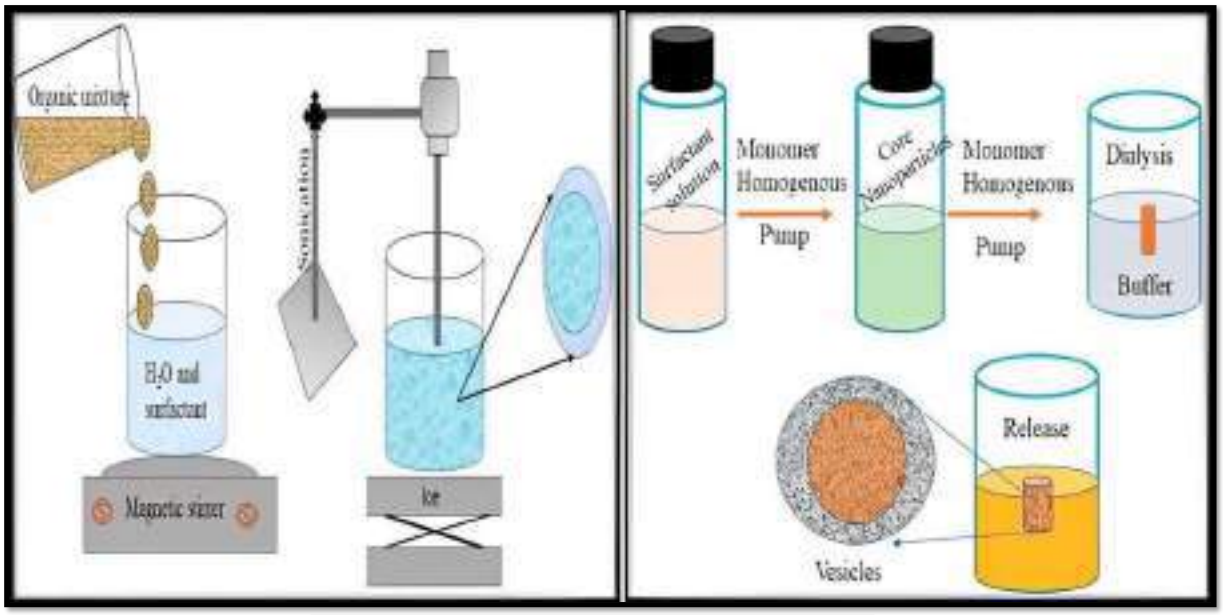


Fig no 4 Steps of Formation of Gelatine

ADVANTAGES

1. Anti-inflammatory: deer antler containsprostaglandins, which can reduce inflammation.
2. Antioxidant: deer antler peptides (daps) have antioxidant properties.
3. Immune system support: deer antler extract may help enhance the immune system.
4. Anti-tumor: deer antler extract may help suppress tumor growth. Bone health: deer antler contains chondroitin sulfate, which may help treat arthritis.
5. Blood and circulation: deer antler extract may have beneficial effects on blood and circulation

DISADVANTAGES

1. Complex structure: deer antler extracts contain a complex mixture of proteins, lipids, and minerals, making it difficult to standardize nanocapsule formation and analyze theirmorphology.
2. Variability in composition: the composition of deer antler extracts can vary based on factors like the age of the deer, season, and extraction methods, leading to inconsistent nanocapsule characteristics.
3. Size distribution: achieving a uniform size distribution in nanocapsules can be challenging. Variability in size can affect drug delivery efficacy and release profiles.
4. Stability issues: nanocapsules may exhibit stability issues, leading to aggregation or degradation over time, complicating morphological analysis
5. Characterization limitations: techniques used for morphological analysis (e.g., tem, sem) may require specific sample preparation that can alter the original structure of the nanocapsules.

CONCLUSION

- The study's conclusion was that the use of nano-capsules

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made from deer antlers—which have an ample supply of raw materials in Azerbaijan—created by an effective technologicalmethod is thought to be suitable for treating diseases like cancer, infertility, osteoarthritis, cardiovascular disease, and nervous system disorders in the future. [2]

- Developing a permeation approach into the skin can be greatly aided by nano-capsules, whichcan be effectively employed as carriers of active chemicals.
- Because of their target-specific pharmaceutical delivery and controlled release, nanocapsulesare becoming more and more common in drug delivery systems.

SUMMARY

- In summary, hollow nanoparticles known as nanocapsules are made up of a solid shell enclosing a core-forming region that can hold contents. They are polymeric membrane vesicular systems that include a liquid core inside. They have new and exciting uses in medicine delivery and material self-healing.
- The study's findings made it evident that using nanocapsules made from deer antlers which have an abundance of raw materials in Azerbaijan that were created using an effective technological method is thought to be suitable for treating conditions like osteoarthritis, cancer, and infertility in the future.
- The study's findings made it evident that using nanocapsules made from deer antlers, which have an abundance of raw materials in Azerbaijan, and created using an effective technological process is thought to be suitable in the future for the treatment of conditions like osteoarthritis, infertility, and cancer.

FUTURE SCOPE OF NANOCAPSULE

- Existing medications can be delivered to their target via nanocapsules; they should enable a10,000-fold reduction in dosages, minimizing the negative side effects of chemotherapeutic treatments.[31]
- Developing techniques can be complicated by a number of issues, such as designing biomemetic polymers, controlling sensitive drugs, active drug targeting, bioresponsivetriggered systems, systems interacting with smart delivery, and carriers for advanced polymers used in protein delivery. Drug delivery techniques were created to deliver or regulate the amount and rate of delivery. [31]
- Drug Delivery: By delivering medications to precise targets, nanocapsules may lessen the need for large dosages and the associated adverse effects. Additionally, nanocapsules can increase medication stability as well as bioavailability .[31]
- -Although there are still obstacles to overcome, nanocapsules may be utilized as MRI-guided nanorobots or nanobots. room for substances to be trapped.[31]
- -Although there are still obstacles to overcome, nanocapsules may one day be employed asMRI-guided nanorobots or nanobots. room for substances to be trapped.[31]

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ARTIFICAL INTELLIGENCE IN PHARMACEUTICAL SALES AND MARKETING

Aditya Vaijinath Shinde[1], Dr. Swati S. Rawat[2], Dr. Sunil S. Jaybhaye[3], Ms.Ashwini Bahir[4] Ms.Komal Kangne [5]

[1]Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Dist. Jalna.
[2]Faculty of Pharmaceutics, Principal of Institute of Pharmacy, Badnapur, Dist. Jalna.
[3]Faculty of Quality Assurance, Vice Principal of Institute of Pharmacy, Badnapur, Dist. Jalna.
[4]Faculty of Pharmaceuticals Analysis, Institute of Pharmacy, Badnapur, Dist.Jalna.
[5]Faculty Of Pharmaceuticals Analysis, Institute of Pharmacy, Badnapur, Dist. Jalna.

ABSTRACT

Artificial Intelligence (AI) refers to the notion of how knowledgeable individuals perceive intelligent machines, whether they are computer-driven robots or software applications. Sales and marketing teams will concentrate on identifying the appropriate healthcare professionals and categorizing them Abstract into the correct channels at the most opportune moments. AI will aid marketing teams in comprehending brand history, conducting brand assessments, and mapping out the future trajectory of the brand. The sales and marketing teams will concentrate on identifying the appropriate healthcare professionals and categorizing them into the correct channels at optimal times. Artificial Intelligence will support marketing teams by providing insights into brand history, conducting brand assessments, and mapping out the brand's future trajectory. Furthermore, AI has the potential to enhance the process. Artificial intelligence plays a crucial role in enhancing sales and marketing within the pharmaceutical industry and significantly influences consumer behavior. This article aims to explore strategies to boost sales and marketing efforts in the pharmaceutical sector, providing valuable insights for new and aspiring entrepreneurs in India.

KEYWORDS*: Artificial intelligence, Marketing, Pharmaceutical, sales, Pharmacutical Industry, Strategy*

1.INTRODUCTION

Sales and marketing serve different purposes in a business. Sales is about closing deals and generating revenue through direct interaction with customers. In contrast, marketing adopts a wider perspective, aiming to create awareness, foster relationships, and support sustainable sales growth over time. The concept that intelligence, a fundamental aspect of human nature, can be accurately defined and replicated by machines is the basis of the field of artificial intelligence. This article explores the current role of artificial intelligence in the pharmaceutical industry and its potential future applications. Artificial intelligence is a branch of computer science. Creating a machine, robot, or software that simulates human intelligence is called artificial intelligence (AI). To develop such intelligent systems, it's crucial to understand the functioning of the human brain and how people learn, assess situations, and approach problem-solving. The sales and marketing teams could improve and influence their interactions with each of these groups by leveraging AI.

2. WHY AI NEED IN PHARMACEUTICAL INDUSTRY AS WELL AS IN MARKETING PURPOSE

The volume of pharmaceutical data stored in computer databases and submitted to regulatory agencies has grown considerably in recent years. [1] The pharmaceutical industry now encompasses not only drug development companies but also academics, mathematicians, business intelligence specialists, and research and development teams. This sector generates a significant amount of unstructured data, which includes prescription records, medical imaging reports, doctor notes, patient histories, and much more. Prior to determining a patient's treatment plan, their medical history is thoroughly reviewed and analyzed. Effectively managing this extensive unstructured data requires a range of analytical techniques and tools. [2] These technologies can be utilized for data extraction, processing, and visualization. There are several open-source programs available specifically for managing pharmaceutical data, each with its own strengths and weaknesses. It is crucial to address the gaps in data collection and processing. [3] The growing patient population in the healthcare sector has led to significant information overload. However, by leveraging machine learning, the extensive amounts of patient data can be harnessed for evidence-based practices. [4] Current marketing and sales data is stored in electronic database systems

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that collect real-time information on medications, various physician prescriptions, and consumer attitudes toward different drugs.

3. WHY AI MATTERS IN PHARMACEUTICAL SALES AND MARKETING

Many industries have been revolutionized by artificial intelligence (AI), and the pharmaceutical sector is no different. AI holds significant potential for enhancing sales and marketing efforts within this field. It enables companies to gather and analyze vast amounts of data, improve decision-making, tailor consumer experiences, and optimize advertising campaigns.[5] The application of AI in drug development and discovery highlights how algorithms can assist in identifying potential targets, refining lead compounds, and optimizing the design of clinical trials, all while considering the marketing and sales aspects of pharmaceuticals. By integrating AI into these processes, companies can significantly enhance pharmaceutical sales and marketing. This technology enables the creation of more efficient and targeted medications, improving market positioning and driving sales growth. [6] This conference paper explores various applications of AI in pharmaceutical marketing, including sales forecasting, social media analysis, personalized marketing strategies, and consumer segmentation. By leveraging AI-driven customer segmentation, pharmaceutical companies can enhance their engagement with target audiences and increase revenue through tailored sales and marketing approaches. [7] This study examines how artificial intelligence (AI) can be applied in pharmaceutical marketing strategies, focusing specifically on customer relationship management, competitive analysis, and market research. By utilizing AI-powered systems that collect and analyze data from various sources, pharmaceutical sales and marketing teams can develop strategies that enhance business performance, generating insights into market trends, competitor activities, and customer preferences. [8] AI plays a significant role in the marketing and sales of pharmaceuticals. It can forecast product demand, identify influential figures in the medical community, optimize sales representative territories, and refine marketing channels. By leveraging AI technology, pharmaceutical companies can boost sales revenue, enhance promotional strategies, and adapt their marketing approaches to meet the constantly evolving market landscape.

4.USE OF ARTIFICIAL INTELLIGENCE IN PHARMACEUTICAL MARKETING

Marketing is the process of advancing the sales of a business's goods and services. [9]. "Machine learning and artificial intelligence allows global life science sales, marketing, and branding team to come up with more profitable and actionable commercialization strategies from the insights uncovered from AI," said Jon Resnick, President, RealWorld & Analytics Solutions, IQVIA, in an interview. Additionally, he underlined how AI/ML helps healthcare organizations to go further into finer layers of HCP, patient, and payer data in order to uncover hitherto undiscovered insights, provide recommendations for appropriate courses of action, and facilitate quicker and better decision-making. [10] Other advantages of employing AI systems in pharmaceutical marketing include enhanced value propositions, increased market share through better resource allocation, opportunities for growth maximization, and personalized sales and marketing channels and information. [11] Based on a significant research study, a leading US pharmaceutical company enhanced its promotional strategy by leveraging physician-level insights gained from optimizing multichannel marketing activity data. They aimed to maximize return on investment through targeted segmentation and tailored promotional campaigns.

In another case, a European pharmaceutical company utilized AI and machine learning to uncover new insights. Such AI techniques can be beneficial for pharmaceutical sales and marketing. AI is being increasingly adopted across various settings within the healthcare ecosystem. Beyond shaping sales and marketing strategies for financial management in the pharmaceutical sector, artificial intelligence can also assist in analyzing an individual's DNA to identify the most effective treatment options with fewer side effects. This allows organizations to better understand healthcare professionals' preferences for digital interactions, enabling them to segment physicians and develop a digital engagement plan based on the insights gathered. [12] Across the globe, companies, including those in the pharmaceutical and healthcare sectors, are adopting artificial intelligence. Implementing AI can help identify ways to make faster, more informed decisions at every stage from molecule to market, including improving patient adherence and refining sales strategies.

Several pharmaceutical companies, such as Pfizer, GSK, Novartis, Lundbeck, Takeda, AstraZeneca, and Teva, are leveraging AI to enhance their marketing campaigns for both new and existing drugs. A report by Eularis found that sales representatives who utilized insights from AI analytics to tailor their communications experienced a 43% increase in prescriptions compared to those who did not. Dr. Merton of JLABS noted, "AI will be able to better process stakeholder-aligned information for the customer, allowing for more targeted dissemination of information." He also predicted a decrease in marketing expenses in the near future.

According to Bjarni Kornbech, VP of Marketing & Communications at Agnitio, the company aims to drive a new revolution in the marketing and sales of pharmaceutical products through AI. He emphasized the importance of training the sales force on CRM systems, but noted that not many companies are prioritizing this training. Kornbech further stated that to deliver real value, it is crucial to integrate consumer interaction data with the CRM and ideally link it to the marketing engine. Ultimately, all of this information should be accessible to the sales team in one centralized location. [13] Pharmaceutical sales must evolve to meet the changing needs and preferences of physicians. Historically, marketing and sales teams bombarded physicians with messages across various channels, hoping to encourage them to prescribe their products. This strategy proved ineffective for

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product marketing and led to the excessive use of financial and human resources.

By leveraging analytics and machine learning in commercial applications, companies have developed more sophisticated and targeted branding and sales strategies. Healthcare providers are increasingly moving towards digital solutions that enhance healthcare delivery. A recent report found that 70% of physicians consider themselves tech-savvy. Consequently, they are becoming less likely to engage with medical representatives in person and more inclined to seek information online. [14]

5. ADVERTISING AND SOCIAL NETWORKING USED FOR SALE AND MARKETING OF PHARMA PRODUCT THROUGH AI:

Many consumer product companies have successfully utilized social media platforms like YouTube, Twitter, and Facebook for viral advertising and marketing campaigns. These campaigns are aptly named, as the spread of an advertisement through these networks resembles the way viral illnesses propagate within a population. However, the pharmaceutical industry has not fully leveraged these platforms, and it can be quite challenging to identify who is accountable for the content shared on them.

5.1.Social Media Strategy

Social media platforms are highly effective for promoting and selling pharmaceuticals and medical equipment. They attract a highly engaged audience that can be targeted through both paid and organic methods, making them ideal for successful advertising campaigns. As part of social media optimization, businesses enhance their websites with features like sharing and commenting sections.

This strategy can either focus on the social media channels most frequented by potential clients or be expanded to include all major platforms, such as Facebook, Instagram, LinkedIn, and Twitter.

5.2. Mobile Applications

Mobile application are among the most commonly used tools for pharmaceutical companies to engage with their customers. Companies can develop mobile apps to monitor client behavior, offer health advice, and provide information about their products.

5.3. Virtual Reality

By utilizing virtual reality (VR) technology, companies can create a more immersive and engaging experience for their customers. For example, pharmaceutical firms can use VR to provide interactive product demonstrations or educational resources.

5.4 Personalization

Pharmaceutical companies can leverage AI and big data to analyze large volumes of information and deliver personalized marketing messages to specific clients. By understanding each customer's preferences, businesses can make their messaging more engaging and relevant. For example, a company can customize its marketing communications based on a customer's previous searches related to a particular medical condition, providing more pertinent information about that condition.

5.5 Email Marketing and List Building

Email marketing has emerged as one of the most effective strategies for companies in the rental industry. Businesses can generate revenue by leasing their email lists to other companies. This allows the subscribers on the email list to be accessible to the clients of those companies, thereby increasing the likelihood that these clients will purchase products from the rental company.

6. HUMAN INVOLVEMENT IN ARTIFICIAL INTELLIGENT

To effectively market pharmaceutical products and devices, human involvement is essential in the field of artificial intelligence for sales and marketing. This necessitates the implementation of a precise and adaptable process.

6.1 Data Scientists and Analysts

Data scientists play a crucial role in developing and refining AI models. They are responsible for collecting, preparing, and processing data for analysis. Additionally, they design and train machine learning algorithms to extract valuable insights from pharmaceutical data. [17] [18]

6.2 Pharmaceutical Marketers and Sales Teams

Human experts in pharmaceutical marketing and sales provide specialized knowledge and strategic insights. They collaborate with AI systems to interpret data-driven recommendations and effectively incorporate them into marketing campaigns and sales strategies. [19]

6.3 Regulatory Experts

Compliance with regulations is vital for the pharmaceutical industry. Regulatory experts collaborate closely with AI teams to ensure that AI-driven marketing strategies and materials meet industry regulations and standards. [20]

6.4 Ethics and Bias Experts

Experts in ethics and fairness are responsible for ensuring that AI applications in pharmaceutical marketing are free from discrimination and uphold ethical standards, as AI systems can unintentionally introduce biases. [21]

6.5 Medical and Scientific Advisors

Scientists and medical experts provide valuable insights into the scientific aspects of pharmaceutical products. They collaborate with AI teams to ensure that marketing materials are accurate and aligned with current medical knowledge.[22]

6.6 Managers and Decision-Makers

Executives and managers in pharmaceutical companies depend on AI-generated insights to guide their strategic decisions. They utilize AI to receive data-driven recommendations for product development, marketing budget allocation, and market expansion.[23]

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6.7 Customer Relationship Managers
These professionals build and maintain relationships with patients and healthcare providers by leveraging AI-generated consumer insights. They ensure that customer needs and preferences are addressed through marketing and sales initiatives.[24]

6.8 Quality Assurance and Monitoring Teams
These teams are responsible for continuously evaluating and monitoring the effectiveness of AI systems in pharmaceutical sales and marketing to ensure compliance with regulations and achieve the desired outcomes.[25]

7. IMPORTANCE OF DIGITAL TRANSFORMATION THOUGHT ARTIFICIAL INTELLIGENT

AI plays a crucial role in pharmaceutical sales and marketing as digital transformation reshapes how companies interact with patients, healthcare providers, and stakeholders. The integration of artificial intelligence into various facets of the pharmaceutical industry has resulted in enhanced efficiency, improved customer experiences, and better decision-making. In this context, we explore the advantages of digital transformation for AI in pharmaceutical marketing and sales.

7.1.Enhanced Data Utilization
Digital transformation enables pharmaceutical companies to harness the vast amount of data available in the digital landscape. AI systems can analyze this data to uncover valuable insights into competitor activities, industry trends, and customer preferences. Pharmaceutical sales and marketing teams leverage this information to identify growth opportunities, customize marketing strategies, and make informed, data-driven decisions. [26]

7.2.Personalized Marketing
Personalized medicine and marketing are becoming increasingly prevalent in the pharmaceutical industry. Digital transformation enables the collection and analysis of patient data, allowing AI to develop highly customized marketing campaigns. For instance, AI can determine the most suitable medication for a patient based on their medical history, resulting in more effective marketing and better patient outcomes. [27]

7.3. Real-Time Engagement
Digital transformation facilitates real-time communication between healthcare providers and patients. AI-powered chatbots and virtual assistants can quickly answer questions, offer information about medications, and assist medical professionals in decision-making. This enhanced focus fosters stronger relationships and builds trust.[28]

7.4. Predictive Analytics
With the advancements in digital transformation and artificial intelligence, pharmaceutical companies can leverage predictive analytics for various applications. For instance, AI can anticipate market trends, demand for specific treatments, and potential disease outbreaks. By utilizing these predictive capabilities, companies can enhance supply chains, optimize manufacturing schedules, and refine marketing strategies.[29]

7.5.Clinical Trial Optimization
Digital transformation enhances the management of clinical trials by making data collection and analysis more efficient. AI can forecast trial outcomes, pinpoint the best patient demographics, and improve recruitment strategies. As a result, medication approvals happen more quickly and at a lower cost.[30]

7.6.Cost Efficiency
The integration of digital transformation and artificial intelligence can greatly lower operating costs. Pharmaceutical companies can more effectively allocate resources by automating repetitive tasks such as data entry and analysis. Additionally, AI can enhance the effectiveness of marketing budgets by accurately identifying target audiences and minimizing resource waste.[31]

7.7.Compliance and Regulatory Adherence
The pharmaceutical industry faces stringent legal regulations. Digital transformation has enabled AI-driven marketing materials to comply with these standards. Automated technology can aid in the evaluation and approval of marketing content, decreasing the risk of non-compliance.[32]

7.8.Competitive Advantage
Embracing AI and digital transformation provides pharmaceutical companies with a significant competitive advantage. These companies can monitor competitors, swiftly respond to market changes, and innovate in areas such as drug development and customer engagement. In a rapidly evolving market, this adaptability is essential. Digital transformation serves as the foundation for effectively integrating AI into pharmaceutical sales and marketing. By harnessing AI's capabilities in data analysis, targeted marketing, predictive analytics, and compliance, pharmaceutical companies can enhance efficiency and competitiveness in an ever-changing industry. Adopting AI and digital transformation is not just a smart strategic move; it is crucial for the pharmaceutical sector's productivity and competitiveness.[33]

8. IMPACT OF AI IN PHARMA INDUSTRY CONSIDERATION SALE AND MARKETING

The pharmaceutical industry has experienced a significant transformation due to artificial intelligence (AI), which has disrupted various facets of drug discovery, manufacturing, and healthcare delivery. AI technologies are revolutionizing the sector by enhancing productivity, reducing costs, and accelerating the development of new medications. This article provides an in-depth exploration of AI's impact on the pharmaceutical industry, supported by relevant sources.

8.1. Drug Discovery and Development
Early-Stage Drug Discovery: AI systems can analyze vast datasets, including genetic information, chemical structures, and

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published research, to identify new therapeutic opportunities. Machine learning algorithms can assess the potential of a chemical to become a successful drug during the initial phases of drug discovery, ultimately saving both time and resources.[34]

8.2. Drug Repurposing
AI can pinpoint existing pharmaceuticals that may have additional therapeutic applications. By examining data on drug interactions and disease pathways, artificial intelligence can suggest new uses for current medications, potentially speeding up the development of new treatments.[35]

8.3. Clinical Trial Optimization
AI-driven algorithms can help identify suitable patient groups, forecast enrollment rates, and improve trial designs. This optimization results in lower trial costs and faster drug development.[36]

8.4. Drug Manufacturing and Quality Control
Process Optimization:AI-driven process optimization ensures the efficient and consistent production of pharmaceuticals. AI can detect anomalies, adjust parameters to maintain quality, and monitor manufacturing processes in real time.[37]

8.5. Quality Control
AI-based computer vision systems can be employed to inspect pharmaceutical products for defects, ensuring compliance with quality standards. These technologies reduce the risk of recalls while improving product safety.[38]

8.6. Drug Safety and Pharmacovigilance

8.7.Adverse Event Detection
Artificial intelligence can analyze large volumes of clinical and post-market data to detect potential adverse effects of drugs. Early identification enables timely regulatory action and enhances patient safety.[39]

8.8.Personalized Medicine
Patient Stratification:AI can be utilized to categorize individuals into subpopulations based on their responses to various pharmaceuticals, genetics, biomarkers, and clinical data. This approach enables more personalized treatment plans and improved outcomes.[40]

8.9.Dosage Optimization
AI algorithms can determine the optimal medication dosages for individual patients, minimizing the risk of adverse effects while maximizing therapeutic effectiveness.[41]

8.10.Drug Marketing and Sales
AI enables pharmaceutical companies to design personalized marketing campaigns tailored to the characteristics of patients and healthcare professionals, enhancing engagement and improving returns on marketing investments.[42]

8.11.Healthcare Delivery
Clinical Decision Assistance:AI technologies support healthcare professionals in making real-time clinical decisions by offering recommendations for diagnosis and treatment.[43]

8.12.Drug Adherenc
AI-powered tools and applications can help patients adhere to their medication regimens by offering educational resources and sending reminders.[44]
In summary, AI is set to significantly influence the pharmaceutical industry, affecting drug discovery, manufacturing, safety, personalized care, and healthcare delivery. As AI technologies continue to evolve, they have the potential to transform how pharmaceutical companies function, resulting in more efficient processes, lower costs, and ultimately better patient outcomes.

9. AI APPLICATIONS IN PHARMACEUTICAL MARKETING

9.1.Real-Time Pricing Optimization
AI systems can dynamically assess market conditions, competitor pricing, and demand trends to optimize pharmaceutical product prices. This approach helps maintain competitiveness while maximizing profits.[45]

9.2.Targeted Advertising
AI-powered algorithms can analyze extensive patient data and behavioral patterns to identify target markets for specific pharmaceutical products. This enables the execution of targeted and personalized advertising campaigns that enhance consumer engagement.[46]

9.3.Drug Discovery
AI systems can analyze large datasets to identify trends and potential treatment targets. This accelerates the identification of promising molecules, saving both time and resources in the drug discovery process.[47]

9.4.Adverse Event Detection
AI can monitor and detect adverse events related to pharmaceutical products by analyzing data from social media, online forums, and other sources.

9.5.Medication Adherence
AI-powered solutions can monitor patients' adherence to prescribed medication schedules and provide personalized support and reminders. This improves both patient outcomes and medication adherence rates. [48]
These examples illustrate how artificial intelligence (AI) is revolutionizing pharmaceutical marketing by enhancing pricing strategies, targeting advertisements, accelerating drug development, tracking adverse events, and increasing prescription adherence.

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10. LIMITATIONS OF ARTIFICIAL INTELLIGENC

While artificial intelligence (AI) offers significant potential for pharmaceutical sales and marketing, there are several important considerations to keep in mind. Here are some of the limitations of AI in this field.

10.1.Data Privacy and Security Concerns

AI relies heavily on large volumes of data, including sensitive medical records. Any breach of this data could have serious consequences, making it essential to protect the privacy and security of sensitive information. Companies must comply with strict regulations, such as the General Data Protection Regulation (GDPR) in the EU, to safeguard consumer data.[49]

10.2.Lack of Human Touch

While AI can automate certain sales and marketing tasks, some clients may feel that it lacks the personal touch they need. Building trust and relationships often requires more individualized, human interactions—something that AI cannot achieve on its own.[50]

10.3.Limited Understanding of Complex Healthcare Systems

AI algorithms may struggle to fully grasp the complexities of the healthcare sector, including clinical workflows, intricate medical conditions, and regulatory constraints. This limitation can hinder their ability to provide clients with accurate and relevant information tailored to their specific context.[51]

10.4.Ethical and Legal Considerations

Artificial intelligence (AI) raises ethical dilemmas in pharmaceutical sales and marketing, including potential biases in algorithms, misinterpretation of patient data, and issues related to automated decision-making. Companies must navigate these ethical challenges and ensure that AI applications comply with laws and regulations.[52]

10.5. Overreliance on Data Quality

High-quality data is crucial for AI systems to conduct reliable analyses and make accurate predictions. Conversely, biased or insufficient data can adversely affect decision-making and lead to incorrect outcomes. To ensure trustworthy AI applications, it is vital to maintain the completeness, accuracy, and representativeness of the data.[53]

METHODOLOGY

This study employs a qualitative approach, primarily based on a comprehensive review of existing literature, to explore the impact of artificial intelligence (AI) in sales, with particular emphasis on improving customer satisfaction, experience, and loyalty. The approach is structured to methodically gather, analyze, and synthesize relevant academic articles, industry reports, and case studies that focus on AI-driven personalization in sales, the use of AI in customer relationship management (CRM), the enhancement of customer experience through AI, and the impact of AI on customer loyalty. The literature review began with an extensive search of academic databases, including Google Scholar, PubMed, and IEEE Xplore, utilizing keywords such as "artificial intelligence," "sales," "customer satisfaction," "customer relationship management," "personalization," "customer experience," and "customer loyalty." The selection criteria prioritized peer-reviewed journal articles, conference papers, and credible industry reports published within the past ten years to ensure the findings were both relevant and up-to-date. The reviewed literature was categorized into four key themes: AI-driven personalization in sales, the role of AI in CRM, the enhancement of customer experience through AI, and the effect of AI on customer loyalty. Each theme was explored to uncover the major contributions of AI technologies—such as machine learning, natural language processing, and predictive analytics—in revolutionizing sales practices and improving customer outcomes. The reviewed literature was synthesized to generate in-depth insights into how AI technologies are being applied to personalize sales strategies, optimize CRM systems, enhance customer experience, and strengthen customer loyalty. This methodology offers a comprehensive understanding of the current role of AI in sales and sets the foundation for identifying future research opportunities and practical implications for businesses looking to improve their sales processes and customer relationships through AI.

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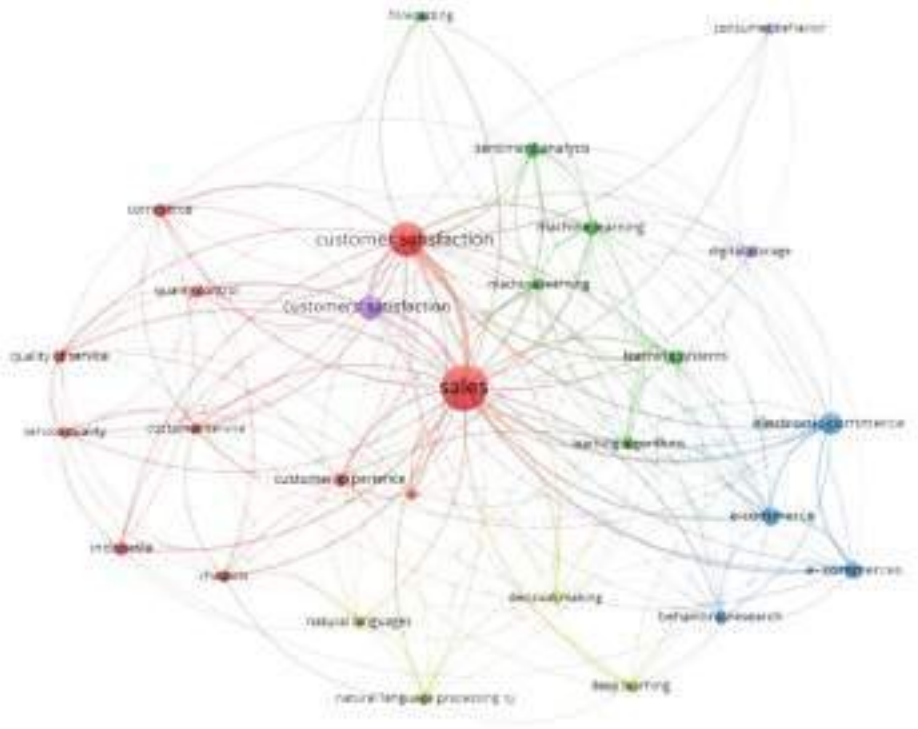


Fig.1

Market Share and Competition

In recent years, a growing number of business practitioners and theorists have postulated that one way for a company to increase its return is by increasing its market share, and studies appear to have confirmed this relationship. But the authors of this article refuse to accept the blanket inference that "more" is necessarily always going to mean "better." a given project promising higher returns than others will surely entail greater risks as well.



Fig.2

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MARKETING RESEARCH AND THE INFORMATION

Marketing Research: Marketing research is often partitioned into two sets of categorical pairs, either by target market Consumer marketing research, (B2C) and Business-to-business (B2B) marketing research. Consumer marketing research is a form of applied sociology that concentrates on understanding the preferences, attitudes, and behaviours of consumers in a market-based economy, and it aims to understand the effects and comparative success of marketing campaigns.



Fig.3

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A REVIEW ON ARTIFICIAL INTELLIGENCE IN HEALTHCARE MANAGEMENT AND DRUG DISCOVERY

Ms. Shruti Maharudra Rughe[1], Dr. Sunil. S. Jaybhaye[2], Ms. Ashwini.J. Bahir[3], Ms. Komal D. Kangne[4], Ms. Ashwini. R. Shelke[5]

[1]Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Dist. Jalna
[2]Faculty of Quality Assurance, Vice Principal, of Institute of Pharmacy, Badnapur, Dist. Jalna.
[3]Faculty Of Pharmaceutical Analysis Institute of Pharmacy, Badnapur, Dist. Jalna
[4]Faculty of Pharmaceuticals chemistry, Institute of Pharmacy, Badnapur, Dist. Jalna.
[5]Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.

ABSTRACT

The application of Artificial Intelligence (A.I.) in healthcare has led to significant advancements and transformative developments in various areas. Medical imaging and diagnostics benefit from A.I.'s ability to analyze and interpret complex imaging data, enabling moreaccurateand timely diagnoses.

AI-driven disease prediction and risk assessment models aid in identifying potential health risks early, enabling proactive interventions and preventive measures.

Additionally, A.I.'s involvement in drug discovery and development accelerates the search for new medications and treatment options, promising advancements in the pharmaceutical industry.

Virtual assistants and chatbots equipped with A.I. capabilities provide personalized support, answering medical queries and offering guidance to patients and healthcare providers.

KEYWORD: *Artificial Intelligence,healthcare management,technology Evolution,Advantages and Disadvantages.*

- **INTRODUCTION TO HEALTHCARE MANAGEMENT**

The fourth edition of Introduction to Health Care Management is driven by our continuing desire to have an excel- lent text that meets the needs of the health care management field, health care management educators, and students enrolled in health care management programs around the world.[1]

The inspiration for the first edition of this book came over a good cup of coffee and a deep- seated unhappiness with the texts available in 2004

For this edition, many of the same master teachers and researchers with expertise in each topic revised and updated their chapters. A third editor, Bobbie Kite, joined the Buch- binder/Shanks team for this new edition in an effort to bring greater knowledge of several increasingly important areas in the health field, bringing expertise in health information systems and population health.

Several other new contributors stepped forward to revise several chapters and write completely new cases for this text. This was the result of our listening to you, our readers and users. With a track record of more than 12 years in the field, we learned exactly what did or did not work in the class- rooms and online, so we further enhanced and refined our student and professor Friendly. [2]

As before, this text will be useful to a wide variety of students and programs. Undergraduate students in health care management, nursing, public health, nutrition, athletic training, and allied health programs will find the writing to be engaging. In addition, student in graduate programs in discipline- specific areas,

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- **ARTIFICIALINTELLIGENCE**

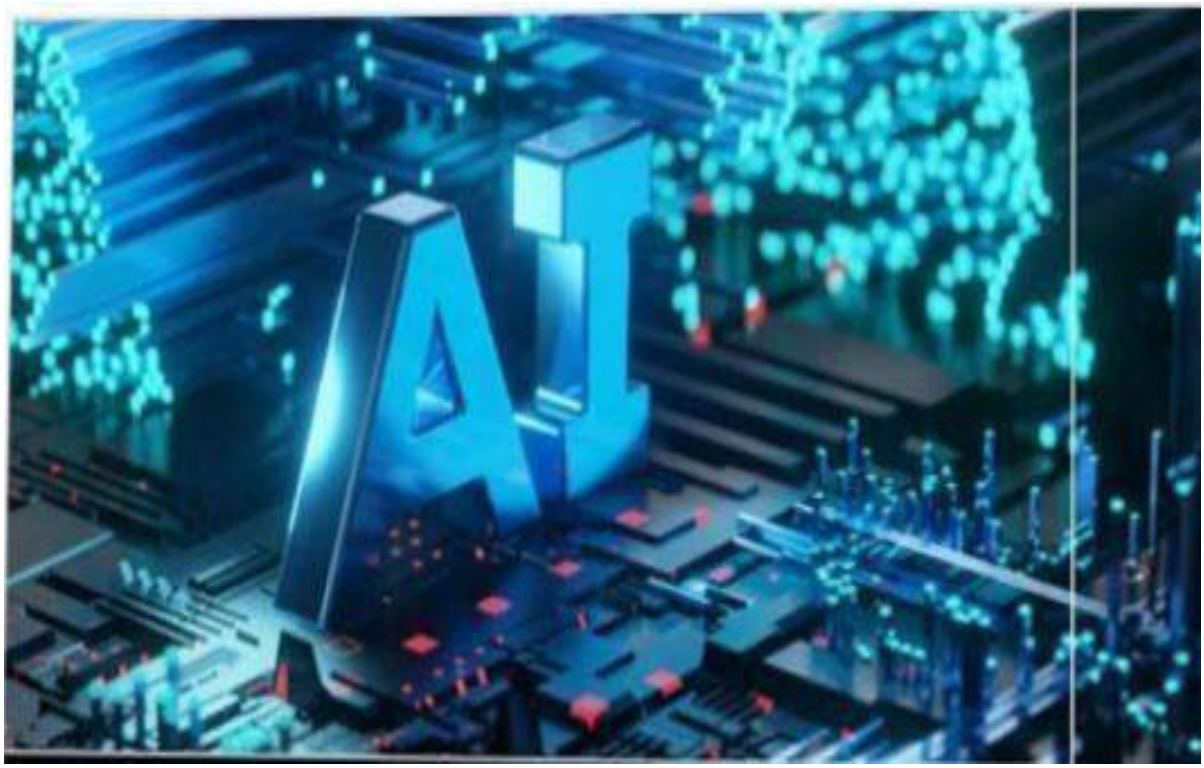


Fig.1

- **INTRODUCTION TO ARTIFICIAL INTELLIGENCE**

Artificial intelligence (AI) has emerged as a powerful tool that harnesses anthropomorphic knowledge and provides expedited solutions to complex challenges.RemarkableadvancementsinAItechnology and machinelearning present a transformative opportunity in the drug discovery, formulation, and testingofpharmaceuticaldosageforms.ByutilizingAIalgorithmsthatanalyze extensivebiological data, including genomics and proteomics, researchers can identify disease-associated targets and predict their interactions with potential drug candidates.

- **Preliminary Features of AI**
  - Categorization
  - Classification
  - Machine learning
  - Deep learning
  - Reinforcement learning
  - Robotics
  - Natural language processing
  - Recommender system
  - Computer vision
  - Collaborative refinement

- **Working process of AI**

  Most tasks in many contemporary organization are not automated. Intelligence powered smart functionality is need of the hour. AI in enterprise domain can be defined as the ability of organizational intelligence to acquired knowledge and apply it to produce superior results.

  The learning aspect of AI programming focuses on data acquisition.

1. Reasoning relates to the AI capability of selecting to most appropriate algorithms

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2. Self-correction focuses on AI ability to improve and enhance results.

- **Origins of AI**

The modern field of AI dates back to1956, when you term AI used in proposal for an academic conference at Dartmouth College . It was built around the assumption that the human brain can be controlled by a machine to produce smart results in a sustained format.[5]

- **ARTIFICIALI MNTELLIGENCE: HEALTHCAREAND MANAGEMENT**



Fig.2

Artificial intelligence is a field of science concerned with building computers and machines that can reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze.

AI is a broad field that encompasses many different disciplines, including computer science, data analytics and statistics, hardware and software engineering, linguistics, neuroscience, and even philosophy and psychology.

- **Artificial Intelligence in healthcare**
- **Background/Introduction**

Artificial intelligence (AI) in the healthcare sector is receiving attention from researchers and health professionals. Few previous studies have investigated thistopicfromamulti-disciplinaryperspective,includingaccounting,business and management, decision sciences and health professions.

Before AIsystems can be deployed in healthcare applications, they need tobe 'trained' through data that are generated from clinical activities, such as screening, diagnosis, treatment assignment and so on, so that they can learn similargroupsofsubjects,associationsbetweensubjectfeaturesandoutcomes of interest. These clinical data often exist in but not limited to the form of demographics, medical notes, electronic recordings from medical devices, physical examinations and clinical laboratory and images.[12]

Topic 1: Balancing technology and humanity

- **Perspectives on AI in healthcare**

This indicates the balance between technology and humanity in the health care sector. Particularly focusing on the patient centered approach within hospital employing AI

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Topic2: AI for public health and population Health Management.
This topic explore the potential of Artificial intelligence transforming public health and population management, particularly in resources constrained setting.
It discuss how AI, through machine learning algorithms and digital health practices.

Topic3:Explainable AI in health care amultidisciplinary perspective.
Focusing on the multi-disciplinary aspect of Explain able AI in healthcare,this topic examine the integration of machine learning tools to improve healthcare delivery and personalized treatment.

Topic4: Challenges and limitations of Explainable AI in healthcare .
Highlighting the challenge and limitations of Explainable AI implementation in healthcare this topic provide valuable insights into navigating the complexities of AI – driven healthcare system

Topic5: **Exploring Explainable AI in health care challenges and future direction**
Focusing on the importance of Explainable AI in health care this topic discuses it's role in providing transparent explanation for machine generated prediction.

Topic1: balancing technology and humanity perspective on AI in healthcare
In this professionals are focusing on fostering agility, making work more accurate and time saving, avoiding application, and good decision – making for the short term and long term welfare of healthcare industries.

To enhance strategic capabilities, human must embrace learning agility , an environment of innovation ,and talent and knowledge development practices .

The topic discuses HealthCare's growth and development with AI and patient priorities.
In this AI revolution association of human and technology in the healthcare sector is a great transformation with the acceleration of artificial intelligence.

Acceptance of this revolution with the balancing ratio is very important with the assurance of empathy, compassion, and patient centered care remaining at the center.

The adoption of AI in healthcare give heterogeneous experience and transformation in treatment, diagnosis of disease, socially practical, and legal consideration, etc.

Topic2:AI for Public Health and Population
Health Management
Artificial intelligence (AI) has great promise for changing the healthcare industry , especially in resources – constrained setting.
From the discovery of medications to publish health artificial intelligence has reshaped traditional approaches to health innovation .
It applications are well documented : machine learning algorithms have been employed by electronic health record (HER) system to identify data and perform predictive analysis to alert doctor to co – morbidities and high risk situation.

Electronic health records , mobile health , telemedicine artificial intelligence and other digital health practices , together with smart phone – healthcare solutions,areeffectiveinstrumentsinthebattleagainstinfectiousillnessesthat are prone to pandemics.

IT is possible to hunt down those who are infected by using sign – monitoring devices.
AI Powered gadgets that constantly track the vitals of patient along with medical metrics can help healthcare professionals recognise the beginning stages of DRPs or poor response.

Topic3: Explainable AI in Healthcare: Amulti-Disciplinary Perspective
Itisobservedthatthemasfiveamountofhealthcaredatawhichhasbeengenerated everyday without electronic health records.

In turn, the healthcare provides take a more predictive approach to come out with a more unified system which concentrate on clinical decision support , clinical practice development guidelines , and automated health care system, thereby offering a broad range of features previse manner such as improving patient data for better diagnosis , medical research for future references.

This topic provide a complete overview of a typical ML workflow comprises the predominant phrases, namely data collection , data

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pre- processing , modelling,training,evaluation,tuninganddeploymentandtheroleexplainable artificial intelligence mechanism assist to integrate interoperability and explain ability into the ML workflow.

The ultimate aim lies in Explaining the interaction to the end user lead to truth worthy environment .
In addition to that XAI assures the privilege the regards to the healthcare domain are dimensions reduction, features importance, attention mechanism, knowledge distillation surrogate representation used to develop and validate a decision supporting tools using XAI.

Topic4: Challenge And Limitations of Explainable AI in healthcare
Explainable A1(XAI) is at the forefront of healthcare innovation. It has the potential to revolutionize clinical decision-making, improve patient care, and transform Healthcare delivery.

Despite having said that, the integration of (XAT) into Health Care systemis not devoid of challenges and limitations.

This topic explores the multifaceted landscape of shortcomings faced in the process of implementation of XA1 in healthcare, providing valuable insights into the complexities and hurdles that need to be given direction in order to utilize its full potential in interpreting Al in enhancing healthcare results.

One of the initial challenges encountered in implementation of XAI is the is it my love complexity of healthcare data.
This topic is an attempt to identify and address challenges and embrace a collaborative commitment to transparency, fairness, sad accountability. and also to navigate the complex nature of the Explainable Al in the process of implementation in lead to a new age of interpretable and trustworthy Al- generated healthcare system.

Topic5: Exploring Explainable AI in healthcare challenges and future direction
Artificial intelligence (AI)has revolution ized the health care industry by making decisions similar to human intelligence.

However, the need to illustrate Al predictions based on healthcare data is a challenging task. To address this, Explainable AI (EXAI) has emerged toprovide transparent explanations for machine-generated predictions and ensure accuracy in healthcare. This review emphasizes the importance of adopting EXAI in healthcare and discusses its concept of providing reliable AI- based solutions.

The authors analyze the most recent developments in EXAI-based technologies and present research findings on their extensive implementation aspects, including the challenges and limitations of existing models. The importance.

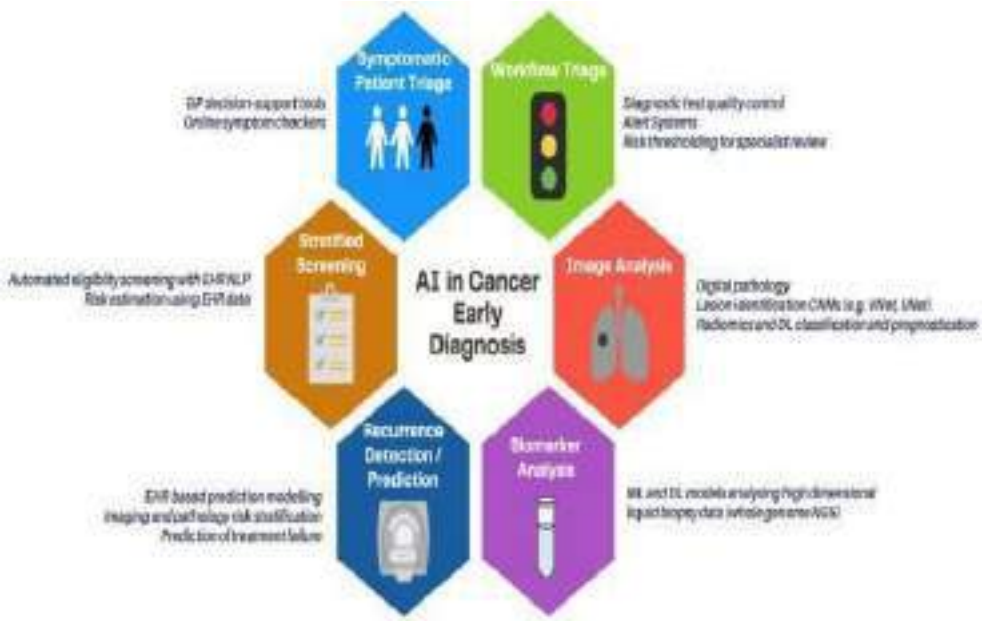


Fig.3

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- **Artificial Intelligence Application in disease cancer care.**
  - **Introduction**

Over the course of the last 50 years, the field of cancer care has undergone a transformative journey, achieving unprecedented success and consistently evolving to enhance patient outcomes. This remarkable progress is evident in the continuous stream of innovations, discoveries, and advancements that have reshaped the way we understand, diagnose, and treat various forms of cancer (1).

These successes have gone hand in hand with increasing complexity of modern cancer care. The continuous advancements have been achieved through a high level of effort and an intricate web of human input.

The complexity arises from the integration of cutting-edge technologies, personalized treatment approaches, a continuously updating number of treatment options and scheduling, and the multifaceted nature of addressing the physical, emotional, and psychosocial aspects of cancer.

This cancer workforce is expected to deliver complex cancer care for an ever- increasing number of people, who are invariably now living much longer than in previous decades

- **Diagnosticgenomics**

Diagnostics: genomics The development and delivery of optimal management plans for patients with cancer relies on the provision of personalized medicine.

Next generation sequencing (NGS) has revolutionised cancer medicine by facilitating the achievement of high precision medicine through identification of cancer associated mutations in the genome as well as characterisation of tumour heterogeneity.

While significant progress has been made in cancer genomics using NGS, there are limitations due to the high-dimensional and great heterogeneity of datasets within cancer medicine that may be targeted using Al approaches.

Given how both Al and genomic medicine are data-driven sciences, there is great scope for integration of Al and genomics to reshape what can be achieved in terms of precision and reliability.

Applications of Al in genomic medicine include the discovery of biomarkers to aid in patient stratification, the prediction of gene function and identification of aberrant protein interactions and genetic mutations.
The possibility of integrating machine learning, specifically deep learning

- **Treatment**
  - **Drug Choice**

The selection of drug treatments most likely to be efficacious for individual patients is essential for the delivery of personalised care.
Supervised machine learning algorithms, which are algorithms trained on a labelled dataset, contribute to the prediction of cancer patients' responses to specific drugs, informing strategic decisions for optimal treatment

Algorithms grounded in support vector machine (SVM) methodology have proven effective in forecasting individual patient reactions to conventional chemotherapeutic drugs by analysing gene-expression patterns . The application of machine learning-derived prediction algorithms, leveraging correlations between molecular profiles across various cancers and their reactions to therapeutic drugs, shows potential for advancing treatment efficacy
By analysing molecular profiles, machine learning algorithms can identify unique characteristics of individual patients' cancers which would enable the development of personalised treatment strategies that target specific molecular markers associated with cancer..

- **Cancer Research**

Al is playing an increasingly important role in cancer research, particularly in the areas of diagnosis, prognosis, and treatment. Al algorithms can analyze large volumes of medical imaging data and assist doctors in detecting early-stage cancers, which can improve the effectiveness of treatment and patient outcomes.

cancers, which can improve the effectiveness of treatment and patient outcomes.[13]
Al can also be used to predict a patient's prognosis by analyzing various data sources, including medical images, electronic health records, and genomic data.

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This can help doctors develop personalized treatment plans for their patients.In addition, Al can assist in drug development for cancer treatment. By analyzing large amounts of genomic data, Al can identify potential new drug targets and predict the effectiveness of drugs in specific patient populations.

This can accelerate the drug discovery process and bring new treatments to patients more quickly. Overall, Al has the potential to revolutionize cancer research and improve patient outcomes by assisting doctors in making more accurate diagnoses, developing personalized treatment plans, and accelerating the drug discovery process.

- **Cancer Research**
- **Healthcare Technology Evolution**

In the healthcare sector from traditional healthcare practices to Al transformation is a great achievement for diagnosing diseases, taking care of patients, shaping medicines future, and many more Alpromises the best service when it joins with healthcare for the welfare of the HealthCare sector as well as the patient . [13]

Best practices of doctors, futuristic approach of medicines, accurate and quick diagnosis results, etc. Health professionals provide a variety of facilities to the patient's early-stage diagnoses of diseases, clarity in medical images, personalized medical plans, maintenance of speed, and accuracy in emergencies, and data privacy.

Engagement of patients increases with doctors with the help of Chatbot and viral health assistants, trust.
Patents and healthcare professionals are the links that create of build trust in Artificial lintelligence. It is the responsibility of health care professionals to keep transparency with the patient at the time of diagnosis with technology.

Building trust is humanity and careful behavior toward patients from professionals. Professional training and development programs are important for healthcare professionals to make them more responsible.

- **Advantages of Balanced Al and Healthcare**

1. **Enhanced Diagnosis:** Through pattern recognition and advanced data analyzingthecapabilityofartificialintelligencediagnosisbecomeaccurateand less time-consuming.
2. **Customized Treatment:** According to the needs and characteristics of patients treatment plans will be customized with the help of AI algorithms.
3. **ElaboratedPatientsResults:** patients results will be better and improve with
4. **Organized work:** with the help of advanced technologies and Al-driven healthcare professionals streamlined workflows take less time, in this way. Professionals communicate with patients without any time constrains.
5. **Accessincrease:** underserved areas as well as remote areas, both get telemedicine and virtual treatment with the help of artificial intelligence. Al extended medical facilities all over the world.
6. **Prognostic Analytics:** Predictions of diseases are in progress with the help Of advanced technology and timely diagnoses and information to the patient While keeping the patient-centered approach. .
7. **Enhancement in Research:** Artificial intelligence enhances medical research 7 programs on drugs, big data analysis, medical facilities, etc.
8. **Efficiency & Effectiveness in Healthcare with Al:** Artificial intelligence increases the efficiency and accuracy in the diagnosis of medical issues in
9. **Reduction of cost:** With artificial intelligence in healthcare necessary proceduresprevention,losersthepriceofadministration,andproperutilization
10. **Decision-Making Support Legally**: In various complex situations artificial intelligence support sethicaldecision-makingforhealthcareproviders.

- **Disadvantages Artificial Intelligence and Healthcare**

1: Concerns with Privacy of Data: There is sensitive information or medicalhistoryofpatientssodataprivacyisoneoftheimportantconcernswith artificial intelligence.

2: Biasness in Algorithms: baise in the algorithm is dangerous for the Patient because it leads to in accuracy of diagnosis and many more things effects fromit.So,itisabigdisadvantageforhealthcareprofessionalsandpatientston

3: **Limited Access on healthcare facilities:** Some of the healthcare centersdonothaveadvancedtreatmentsorsomemachineriesaretherebutthere by a lack of skills. So it affects the healthcare centers and patients too.

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4: **Costing of Treatments** : Due to these advanced terminologies and techniques .These things are expensive for the patients and they can't avail the facility

- **Need of AI in the healthcare**

Al in field of Pharmacy It is one of the top technologies shaping the future of pharmacy. Pharma industries has been developing cure & treatment for centuries. Traditionally the design & manufacturing of drug requires several years, lengthy clinical trials & huge costs with the rise of 21st century technologies, this has been changing..[14]

In future we will see completely different drug designs, manufacture &clinical trials. Collaboration between pharma and Al companies: The future of Al in pharma will depend on collaboration between pharmaceutical companies and Al technology providers. Partnerships between these two sectors can help to accelerate the development and adoption of Al technologies in the pharmaceutical industry.

Pharmaceutical Industry can accelerate innovation by using technological advancements. An estimate by IBM shows that entire healthcare domain has approx. 161 billion GB of

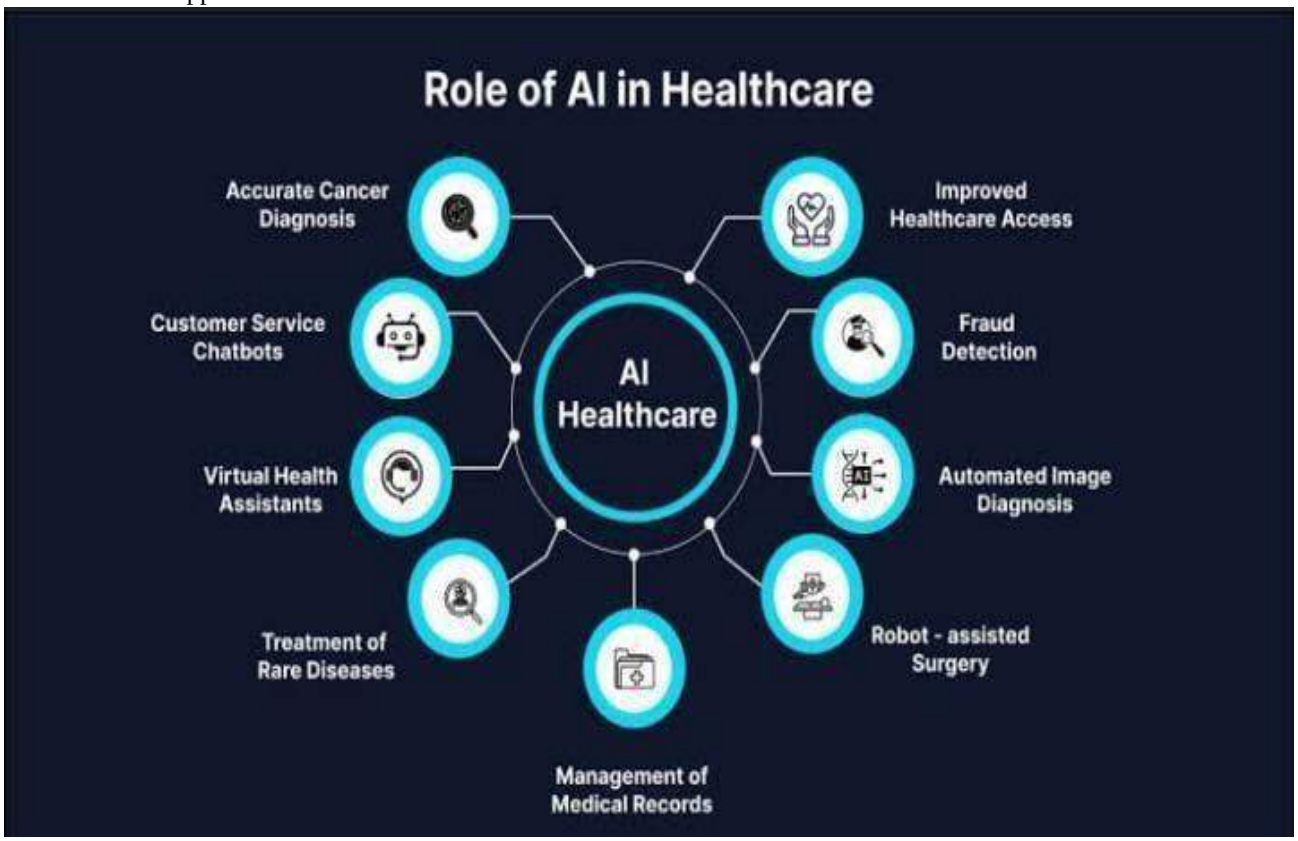


Fig.4

- **Application of Al healthcare**

- **Disease Identification:** Berg, an innovative US biopharma company, is using Al to research and develop diagnostics and therapeutics in the fields of oncology, endocrinology, and neurology.
  Their unique Al-based Interrogative Biology platform combines patient biology and Al- based analytics to identify differences between healthy and disease environments
- **Radiology and Radiotherapy**: This is an area in which Al has been speculated to play a major role in the future.
  Presently, Google's Deep Mind Health is working on machine learning algorithms to detect differences between healthy and cancerous tissues.
  Thegoalistoimprovetheaccuracyofradiotherapyplanningwhileminimizing damage
- **Clinical trial Research:** Advanced predictive analytics can analyze genetic information to identify the appropriate patient population for a trial.
  ArtificialIntelligencecanalsodeterminetheoptimalsamplesizesforincreased efficiency and reduce data errors such as duplicate entries.
- **Drug discovery:** A study published by the Massachusetts Institute of Technology (MIT) has found that only 13.8% of drugs

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successfully pass clinical trials.
Furthermore, a company can expectto paybetween$161 millionto$2billion for any drug tocomplete the tire clinical trial sprocess and get FDA approval

- **Healthcare Future with Artificial Intelligence**

Alkingaboutthefutureofhealthcarewithartificialintelligence,advanced technologies, Chatbot, and other advancements is bright if there is a combination of technology and most importantly humans.

If technology is quick, accurate, better, and transparent then human is the amalgamation of all because of its kindness to the patients because they are human too. Healthcare providers cannot with the patients, understand them ,listen to them ,and show humanity to them after technology plays thei rrole, so human Al is having an amazing future together. Moreover, this evolution in technology will guide patient centered care, kindness, and the importance of humanity in the digital era. Administrative tasks, repetitive data entries, and many more of these kinds of work will become easier with Al, and health professionals will have more time to interact and communicate with patient.[15]

- **Drawbacks**
- **Data Collection Concern**

The first problem is the inaccessibility of relevant data. The healthcare business has a complex issue with information accessibility. Because patient records are often regarded as confidential, there is a natural reluctance among institutions to exchange health data.

- **Algorithms Developments Concern**

Potentially distorted outcomes might be the consequence of biases in the data collection processes used to inform model development. For instance, under- representation of minorities as a consequence of racial biases in dataset Development might lead to subpar prediction results.

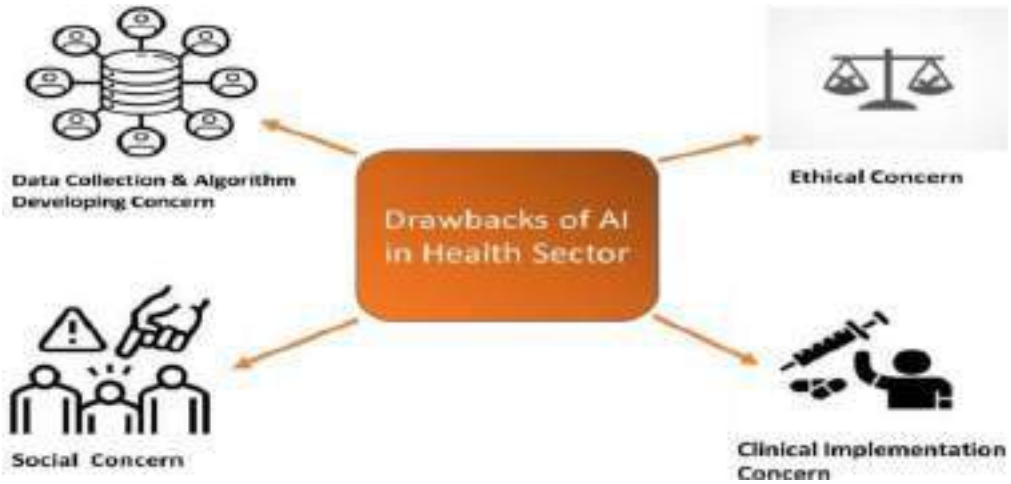
- **Ethical Concerns**

Artificial intelligence has had ethical concerns raised about it ever since it was first conceived. The main problem is accountability, not the data privacy and security issues previously noted. Because of the gravity of the consequences, the current system requires that someone be held accountable when poor decisions are made, especially in the medical field.

Humans have always feared that artificial intelligence (AI) in healthcare might eliminate their jobs. Some people are skeptical about and even hostile to AI- based projects because of the threat of being replaced. This perspective, however, is largely based on a misinterpretation of Al in its various manifestations

- **Clinical Implementation Concerns**

Lack of empirical data validating the effectiveness of Al-based medications in planned clinical trials is them ain obstacle to successful deployment. Most research on AI's application has been conducted in the business setting; thus, we lack information on how it affects the final results for patients



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- **Conclusion**

  A Review on Artificial Intelligence in Healthcare Management and Drug Discovery In conclusion, the integration of Artificial Intelligence (AI) into healthcare management and drug discovery holds transformative potential for the medical field. Al has already demonstrated significant improvements in areas such as personalized medicine, diagnostic accuracy, predictive analytics, and operational efficiency in healthcare settings. By automating routine tasks, analyzing complex datasets, and offering novel insights, Al supports clinicians in making more informed decisions and optimizing treatment plans for patients.

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THE CASE STUDY OF BRAIN TUMOR

Mr. Shubham G. Doifode[1], Mr. Sharad P. Kanhere[2], Dr. Sunil S. Jaybhaye[3], Dr. Swati Rawat[4], Mr. Abhishek R.Vanjare[5]

[1]*Guide*
[2]*Student*
[3]*Vice Principle of Institute Pharmacy Badnapur,Jalna*
[4]*Principle of Institute of Pharmacy Badnapur,Jalna*
[5]*Student*
Institute of Pharmacy, Badnapur , Jalna 431202

ABSTRACT

This project focuses on the development and evaluation of pharmaceutical strategies for the treatment of brain tumors. It encompasses the formulation of novel drug delivery systems, such as nanoparticles and liposomes, to enhance the targeted delivery of chemotherapeutic agents to the brain. The study aims to overcome challenges like the blood-brain barrier, drug resistance, and systemic toxicity. Key findings include improved drug bioavailability, enhanced tumor specificity, and reduced side effects, demonstrating the potential of advanced drug delivery platforms in brain tumor therapy. The project concludes with recommendations for clinical translation and further research in personalized medicine

KEYWORD:- *Brain tumor, type, india ,Canada ,treatment, prevention*

• INTRODUCTION

A brain tumor is a growth of cells in the brain or near it. Brain tumors can happen in the brain tissue. Brain tumors also can happen near the brain tissue. Nearby locations include nerves, the pituitary gland, the pineal gland, and the membranes that cover the surface of the brain.

Brain tumors can begin in the brain. These are called primary brain tumors. Sometimes, cancer spreads to the brain from other parts of the body. These tumors are secondary brain tumors, also called metastatic brain tumors.

Many different types of primary brain tumors exist. Some brain tumors aren't cancerous. These are called noncancerous brain tumors or benign brain tumors. Noncancerous brain tumors may grow over time and press on the brain tissue. Other brain tumors are brain cancers, also called malignant brain tumors. Brain cancers may grow quickly. The cancer cells can invade and destroy the brain tissue.

Brain tumors range in size from very small to very large. Some brain tumors are found when they are very small because they cause symptoms that you notice right away. Other brain tumors grow very large before they're found. Some parts of the brain are less active than others. If a brain tumor starts in a part of the brain that's less active, it might not cause symptoms right away. The brain tumor size could become quite large before the tumor is detected.

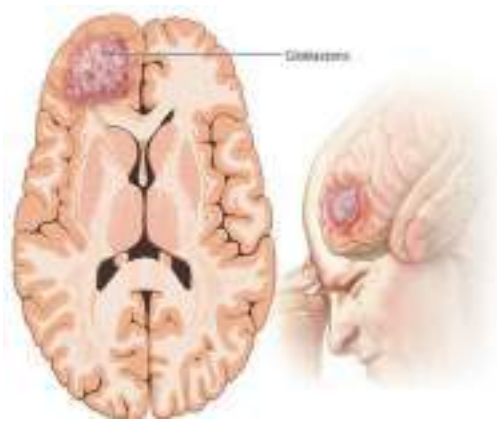
Brain tumor treatment options depend on the type of brain tumor you have, as well as its size and location. Common treatments include surgery and radiation therapy.

• Types Brain Tumor

There are many types of brain tumors. The type of brain tumor is based on the kind of cells that make up the tumor. Special lab tests on the tumor cells can give information about the cells. Your health care team uses this information to figure out the type of brain tumor

Some types of brain tumors usually aren't cancerous. These are called noncancerous brain tumors or benign brain tumors. Some types of brain tumors usually are cancerous. These types are called brain cancers or malignant brain tumors. Some brain tumor types can be benign or malignant.

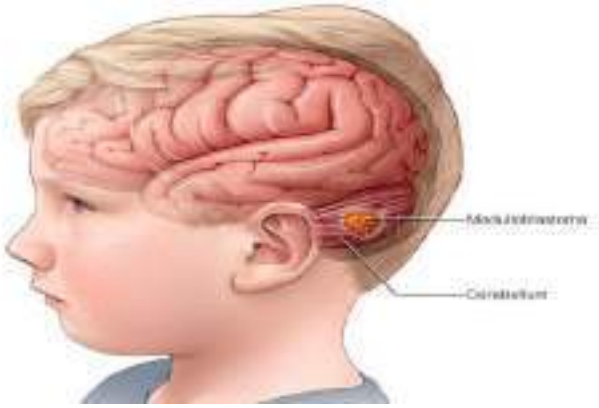
Benign brain tumors tend to be slow-growing brain tumors. Malignant brain tumors tend to be fast-growing brain tumors.



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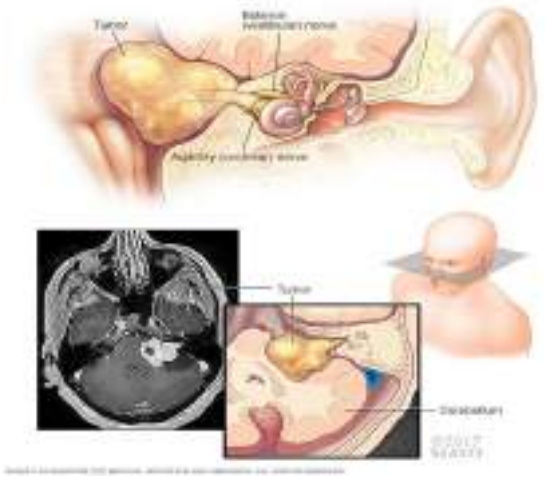
1.Glioblastoma

Glioblastoma is a type of cancer that starts in cells called astrocytes that support nerve cells. It can form in the brain or spinal cord.



2.Medulloblastoma

Medulloblastoma is a type of brain cancer that starts in the part of the brain called the cerebellum. Medulloblastoma is the most common type of cancerous brain tumor in children.



3.Acoustic Neuroma (Vestibular Schwannoma)

An acoustic neuroma (vestibular schwannoma) is a benign tumor that develops on the balance and hearing nerves leading from the inner ear to the brain. These nerves are twined together to form the vestibulocochlear nerve (eighth cranial nerve). The pressure on the nerve from the tumor may cause hearing loss and imbalance.

- **Types Brain tumor Gliomas and related brain tumors :** Gliomas are growths of cells that look like glial cells. The glial cells surround and support nerve cells in the brain tissue. Types of gliomas and related brain tumors include astrocytoma, glioblastoma, oligodendroglioma an d ependymoma. Gliomas can be benign, but most are malignant. Glioblastoma is the most common type of malignant brain tumor.
- **Choroid plexus tumors:** Choroid plexus tumors start in cells that make the fluid that surrounds the brain and spinal cord. This fluid is called cerebrospinal fluid. Choroid plexus tumors are located in the fluid-filled cavities in the brain, called the ventricles. Choroid plexus tumors can be benign or malignant. Choroid plexus carcinoma is the malignant form of this type of brain tumor. It's more common in children.
- **Embryonal tumors:** Embryona l tumors begin in cells that are left over from fetal development. The cells, called embryonal cells, stay in the brain after birth. Embryonal tumors are malignant brain tumors that happen most often in babies and young children. The most common type of

- **Introduction to Cancer in India**

Cancer is a major cause of morbidity and mortality in developing and developed countries alike.1 In many low-income and middle-income countries, including India, most of the population does not have access to a well organised and well regulated cancer care system. A diagnosis of cancer often leads to catastrophic personal health expenditures.2 Such expenditures can push entire families below the poverty line and may, especially when combined with an absence of what are seen as acceptable services, threaten social stability.

Population ageing is often assumed to be the main factor driving increases in cancer incidence, death rates, and health-care costs. 5 However, the actual picture is more complex. In high-income countries age-standardised cancer mortality is now typically decreasing in all age groups, although more than half of all cancer deaths are people older than 70 years. In India, despite the weakness of data in terms of population coverage, no evidence exists for a decrease in age-standardised cancer mortality rates, and most deaths occur in individuals younger than 70 years.1 These dierences are only partly due to India having a relatively younger population compared with high-income countries. They are also a product of con trasting causal patterns, with infections and unique local patterns of tobacco use playing a much greater part in causing cancer in India than in richer countries. Poor access to screening and early-stage case-finding services also helps to explain the paradox of India's seemingly low cancer incidence rates but relatively high age-specific death rates

Although improvements in living standards and Human Development Index rankings are typically linked to increases in the occurrence of, for example, sex hormone exposure-related cancers, and cancers epidemiologically associated with reduced average family sizes,6 the positive gains that economic and social development bring—eg, improved food quality—normally far outweigh any such costs. The International Agency for Research on Cancer GLOBOCAN project1 has predicted that India's cancer burden will nearly double in the next 20 years, from slightly over a million new cases in 2012 to more than 1·7 million by 2035. These projections indicate that the absolute number of cancer deaths will also rise from about 680 000 to 1·2 million in the same period.1 Yet the extent to which cancer-related mortality and disability will actually increase partly depends on the investment decisions made in future decades in health care, cancer research, the wider public understanding of cancer harm-reduction, and on other technical

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or social changes that will arect disease incidence and outcomes. Here, we review publish.[2]

- **Introduction to Cancer in Canada**

Primary malignant brain tumours are among the most disabling and lethal types of cancer. Although they constitute only about 2% of all cancers brain tumours are associated with severe disability and a high risk of death. For all ages combined the median survival time is about 9 months and the 5-year survival rate less than 25%.' Many of the patients who are alive after 5 years are left with permanent disabilities.2 Moreover, survival rates have increased only slightly in recent years.

ates have increased only slightly in recent years.1'2 Brain cancer is of particular concern because of major increases in death and incidence rates ob served over the last few decades in Canada and in most developed countries.3-10 These increases are most pronounced among elderly people. Greig and associates"I reported major increases in the incidence of brain tumours in the US elderly population between 1973 and 1985. Davis and collaborators6 found an approximate threefold increase in the rate of death from brain cancer between 1968 and 1983 among US white people aged 75 to 84 years and a significant increase among those 65 to 74. Others reported similar trends in Norway'2 and England and Wales.'3 Two international studies of trends in the rate of death from brain cancer showed that increases were observed in most of the countries studied.

- **Material and Methods Mortality,**

incidence and hospital morbidity data were obtained from the Vital Statistics Section, the National Cancer Incidence Reporting System (NCIRS) and the Institutional Health Section of the Canadian Centre for Health Information. Annual population estimates were obtained from the Demo graphic Division of Statistics Canada. The study period was from 1959 to 1988 for mortality data, from 1969 to 1985 for incidence data and from 1971 to 1985 for hospital morbidity data.

The annual rates of brain cancer (International Classification of Diseases [ICD] code 19116) were calculated by sex and 5-year age groups for Canada and for each province. Broader age intervals were also examined. The direct method was-used to calculate age-adjusted rates, the 1971 Canadian pop ulation being the standard. A cohort analysis was performed for all cancers of the nervous system, since brain cancer was not available as a separate category within the ICD classification before 1959.

We analysed the geographic distribution of brain cancer by comparing death rates in census divisions with the national rates. The statistical significance of the age-standardized death rates was assessed with the use ofthe Fisher-Neyman test.'8 Survival rates were estimated on the basis of cases diagnosed in Saskatchewan between 1967 and 1986. The crude survival rates were calculated with the use of a life-table method and adjusted for the deaths expected to occur in the general Saskatche wan population according to the normal life expec tancy for that province.' Long-term (5-year, 10-year and 15-year) survival rates have been estimated and are published elsewhere.' However, because the me dian survival time of brain cancer patients is very low the 1-year, 2-year, 3-year and 4-year survival rates are more relevant clinically and are presented by age, calendar period and tumour type. The statistical significance of differences in relative survival rates was calculated on the basis of their relative standard errors.

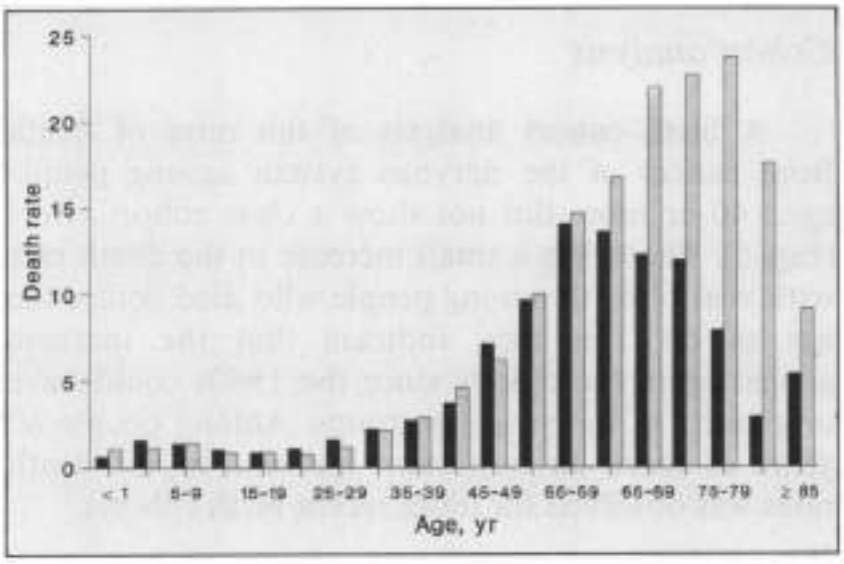


Fig. 1: Age-specific rates of death from brain cancer among males per 100 000 population in Canada from 1965 to 1967 (black bars) and from 1985 to 1987 (screened bars).

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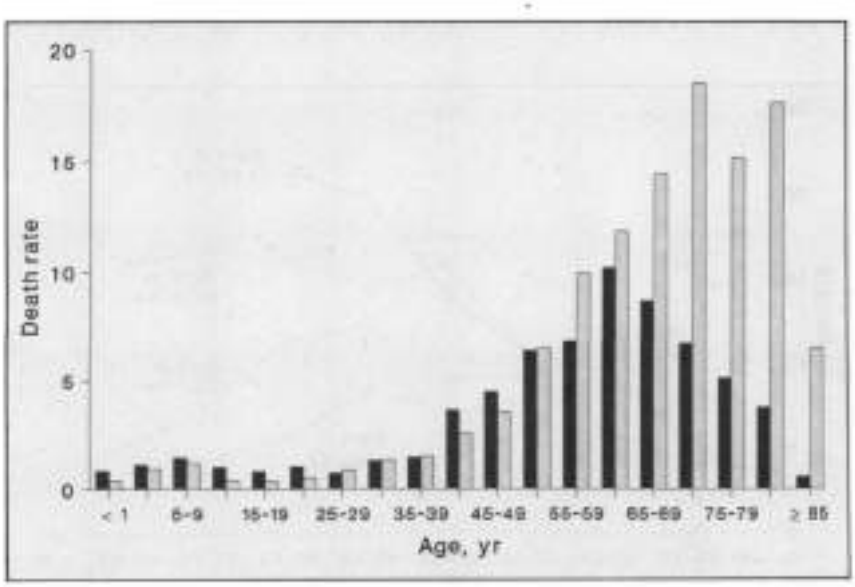


Fig. 2: Age-specific rates of death from brain cancer among females per 100 000 population in Canada. Bar designations as in Fig. 1

- **Age and Sex Distributions**

The age-specific death rates among males and females for two periods are presented in Figs. 1 and 2. During 1965-67 the death rate peaked in the group of people aged 55 to 60 years and then declined. During 1985-87 the death rate increased to a slight peak around age 5 years, decreased until about age 15 to 19, continuously increased until about age 75 to 79 and then decreased. Age patterns were very similar for males and females, although in the two periods the rates among the males were in general slightly higher.[3]

- **Symptoms**
- **General signs and symptoms caused by brain tumors may include:**
  - Headache or pressure in the head that is worse in the morning.
  - Headaches that happen more often and seem more severe.
  - Headaches that are sometimes described as tension headaches or migraines.
  - Nausea or vomiting.
  - Eye problems, such as blurry vision, seeing double or losing sight on the sides of your vision.
  - Losing feeling or movement in an arm or a leg.
  - Trouble with balance.
  - Speech problems.
  - Feeling very tired.
  - Confusion in everyday matters.
  - Memory problems.
  - Having trouble following simple commands.
  - Personality or behavior changes.
  - Seizures, especially if there is no history of seizures.
  - Hearing problems.
  - Dizziness or a sense that the world is spinning, also called vertigo.
  - Feeling very hungry and gaining weight.

Brain tumors that aren't cancerous tend to cause symptoms that develop slowly. Noncancerous brain tumors also are called benign brain tumors. They might cause subtle symptoms that you don't notice at first. The symptoms might get worse over months or years.

Cancerous brain tumors cause symptoms that get worse quickly. Cancerous brain tumors also are called brain cancers or malignant brain tumors. They cause symptoms that come on suddenly. They get worse in a matter of days or weeks.

- **Brain Tumor Headaches**

Headaches are the most common symptom of brain tumors. Headaches happen in about half of people with brain tumors. Headaches can happen if a growing brain tumor presses on healthy cells around it. Or a brain tumor can cause swelling in the brain that increases pressure in the head and leads to a headache.

Headache pain caused by brain tumors is often worse when you wake up in the morning. But it can happen at any time. Some people have headaches that wake them from sleep. Brain tumor headaches tend to cause pain that's worse when coughing or straining. People with brain tumors most often report that the headache feels like a tension headache. Some people say the headache feels like a migraine.

Brain tumors in the back of the head might cause a headache with neck pain. If the brain tumor happens in the front of the head, the headache might feel like eye pain or sinus pain.

- **Causes**
- **Brain tumors that begin in the brain:**

Brain tumors that start as a growth of cells in the brain are called primary brain tumors. They might start right in the brain or in the tissue nearby. Nearby tissue might include the membranes

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that cover the brain, called meninges. Brain tumors also can happen in nerves, the pituitary gland and the pineal gland.

Brain tumors happen when cells in or near the brain get changes in their DNA. A cell's DNA holds the instructions that tell the cell what to do. The changes tell the cells to grow quickly and continue living when healthy cells would die as part of their natural life cycle. This makes a lot of extra cells in the brain. The cells can form a growth called a tumor.

It's not clear what causes the DNA changes that lead to brain tumors. For many people with brain tumors, the cause is never known. Sometimes parents pass DNA changes to their children. The changes can increase the risk of having a brain tumor. These hereditary brain tumors are rare. If you have a family history of brain tumors, talk about it with your health care provider. You might consider meeting with a health care provider trained in genetics to understand whether your family history increases your risk of having a brain tumor.

When brain tumors happen in children, they're likely to be primary brain tumors. In adults, brain tumors are more likely to be cancer that started somewhere else and spread to the brain.

- **Cancer that spreads to the brain**

Secondary brain tumors happen when cancer starts somewhere else and spreads to the brain. When cancer spreads, it's called metastatic cancer.

Any cancer can spread to the brain, but common types include:

- Breast cancer.
- Colon cancer.
- Kidney cancer.
- Lung cancer.
- Melanoma.

- **Prevention**

There's no way to prevent brain tumors. If you get a brain tumor, you didn't do anything to cause it.
People with an increased risk of brain tumor might consider screening tests. Screening isn't brain tumor prevention. But screening might help find a brain tumor when it's small and treatment is more likely to be successful.

If you have a family history of brain tumor or inherited syndromes that increase the risk of brain tumor, talk about it with your health care provider. You might consider meeting with a genetic counselor or other health care provider trained in genetics. This person can help you understand your risk and ways to manage it. For example, you might consider brain tumor screening tests. Testing might include an imaging test or a neurological exam to test your vision, hearing, balance, coordination and reflexes.

- **Departments and specialties**

Mayo Clinic has one of the largest and most experienced practices in the United States, with campuses in Arizona, Florida and Minnesota. Staff skilled in dozens of specialties work together to ensure quality care and successful recovery.

- **Departments that treat this condition**
  - Brain Metastases Specialty Group
  - Brain Tumor Program
  - Cancer Care at Mayo Clinic
  - Glioma Specialty Group
  - Meningioma Specialty Group
  - Neurology
  - Neurosurgery
  - Oncology (Medical)
  - Pediatric Brain Tumor Clinic
  - Pediatric Hematology/Oncology
  - Pediatric Rehabilitation
  - Physical Medicine and Rehabilitation
  - Proton Beam Therapy Program
  - Radiation Oncology
  - Radiology
  - Skull Base Tumors Specialty Group
  - **Areas that research this condition**
  - Neurologic Surgery
  - Neurology Research
  - Radiology Research

- **Treatment**

Treatment for a brain tumor depends on whether the tumor is a brain cancer or if it's not cancerous, also called a benign brain tumor. Treatment options also depend on the type, size, grade and location of the brain tumor. Options might include surgery, radiation therapy, radiosurgery, chemotherapy and targeted therapy. When considering your treatment options, your health care team also considers your overall health and your preferences.

Treatment might not be needed right away. You might not need treatment right away if your brain tumor is small, isn't cancerous and doesn't cause symptoms. Small, benign brain tumors might not grow or might grow so slowly that they won't ever cause problems. You might have brain MRI scans a few times a year to check for brain tumor growth. If the brain tumor grows more quickly than expected or if you develop symptoms, you might need treatment..

1.Surgery

The goal of surgery for a brain tumor is to remove all of the tumor cells. The tumor can't always be removed completely. When it's possible, the surgeon works to remove as much of the brain tumor as can be done safely. Brain tumor removal surgery can be used to treat brain cancers and benign brain tumors.Some brain tumors are small and easy to separate from surrounding brain tissue. This makes it likely that the tumor will be removed completely. Other brain tumors can't be separated from surrounding tissue. Sometimes a brain tumor is near an important part of the brain. Surgery might be risky in this situation. The surgeon might take out as much of the tumor as

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is safe. Removing only part of a brain tumor is sometimes called a subtotal resection.

Removal of part of your brain tumor may help reduce your symptoms

2.Radiation Therapy

Radiation therapy for brain tumors uses powerful energy beams to kill tumor cells. The energy can come from X-rays, protons and other sources. Radiation therapy for brain tumors usually comes from a machine outside the body. This is called external beam radiation. Rarely, the radiation can be placed inside the body. This is called brachytherapy.

Radiation therapy can be used to treat brain cancers and benign brain tumors.

External beam radiation therapy is usually done in short daily treatments. A typical treatment plan might involve having radiation treatments five days a week for 2 to 6 weeks.

External beam radiation can focus just on the area of your brain where the tumor is located, or it can be applied to your entire brain. Most people with a brain tumor will have radiation aimed at the area around the tumor. If there are many tumors, the entire brain might need radiation treatment. When all of the brain is treated, it's called whole-brain radiation. Whole-brain radiation is most often used to treat cancer that spreads to the brain from another part of the body and forms multiple tumors in the brain.

Traditionally, radiation therapy uses X-rays, but a newer form of this treatment uses energy from protons. The proton beams can be more carefully targeted to only hurt the tumor cells. They may be less likely to hurt nearby healthy tissue. Proton therapy may be helpful for treating brain tumors in children. It also may help in treating tumors that are very close to important parts of the brain. Proton therapy isn't as widely available as traditional X-ray radiation therapy.

Side effects of radiation therapy for brain tumors depend on the type and dose of radiation you receive. Common side effects that happen during treatment or right after it are fatigue, headaches, memory loss, scalp irritation and hair loss. Sometimes radiation therapy side effects show up many years later. These late side effects might include memory and thinking problems.

3.Radiosurgery

Stereotactic radiosurgery for brain tumors is an intense form of radiation treatment. It aims beams of radiation from many angles at the brain tumor. Each beam isn't very powerful. But the point where the beams meet gets a very large dose of radiation that kills the tumor cells.

Radiosurgery can be used to treat brain cancers and benign brain tumors.

There are different types of technology used in radiosurgery to deliver radiation to treat brain tumors. Some examples include:

- **Linear Accelerator Radiosurgery**

Linear accelerator machines also are called LINAC machines. LINAC machines are known by their brand names, such as CyberKnife, TrueBeam and others. A LINAC machine aims carefully shaped beams of energy one at a time from several different angles. The beams are made of X-rays.

- **Gamma Knife Radiosurgery.**

A Gamma Knife machine aims many small beams of radiation at the same time. The beams are made of gamma rays.

- **Proton Radiosurgery.**

Proton radiosurgery uses beams made of protons. This is the newest type of radiosurgery. It's becoming more common but isn't available at all hospitals.

- **Chemotherapy**

Chemotherapy for brain tumors uses strong medicines to kill tumor cells. Chemotherapy medicines can be taken in pill form or injected into a vein. Sometimes the chemotherapy medicine is placed in the brain tissue during surgery.

Chemotherapy can be used to treat brain cancers and benign brain tumors. Sometimes it's done at the same time as radiation therapy.

Chemotherapy side effects depend on the type and dose of drugs you receive. Chemotherapy can cause nausea, vomiting and hair loss

- **Conclusion**

The case study on brain tumor management in pharmacy highlights the potential of advanced drug delivery systems and innovative therapeutic strategies to overcome significant challenges, such as the blood-brain barrier and drug toxicity. Through the use of targeted therapies like nanoparticles and liposomes, the study demonstrates improved drug efficacy and reduced side effects, offering a promising approach to treating brain tumors. This underscores the critical role of pharmaceutical research in developing effective, patient-centric treatments, paving the way for future clinical applications and advancements in oncology care.

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THE INFLUENCE OF KIDNAPPING TERROR ATTACKS ON EMPLOYEES' WELLBEING IN WAJIR COUNTY

Ahmed Adan Abdikadir[1], Eunice Gacheri Thiankolu[2]
[1]*School of Business and Economics, Mt. Kenya University*
[2]*School of Business, Kenya Methodist University*

ABSTRACT
Particularly in areas impacted by political instability, social unrest, or ongoing conflict, the effect of kidnappings and terror acts on employee wellness has grown in importance.Terrorist acts are taking place in many parts of the world and the bombing of government buildings, multinational companies, the kidnapping of passenger airplanes and ships; Diplomatic representations, airports, shopping centers, sometime the attack that attacks are conducted against the subway and train stations, government officials, the kidnapping of diplomats and businessmen, or in different ways, such as the assassination of these people and the confrontation of international community. In response to this wave of crime, the governments have put in place measures which include establishing the anti-terrorism police unit and increasing awareness of the public on the dangers of terrorism. Despite the effort, there are still major milestones to be made in the fight against terrorism. Therefore, the study sought to establish the effect of bombing attacks on employees' wellbeing in Wajir County. The main objective was to establish the effect of bombing attacks on employees' welfare. The study was guided by Rational Choice Theory. The target population for the study was top level management, middle level management and senior employees which consist of 200 employees in the Security Agencies. Stratified random sampling was used to sample individuals from the various groups; the study had a sample size of 60 respondents distributed equally among the three-government department. The study used primary data which was largely quantitative and descriptive in nature and a five-point questionnaire was the research instruments. Descriptive design and inferential analysis was used for data analysis. From the findings, there was a statistically significant relationship between kidnapping attacks and employees' wellbeing in Wajir County, Kenya ($P<0.05$). Based on the findings, it was recommended that more stringent policies and measures should be directed into reducing the kidnapping attacks in Wajir County and Kenya at large. Future Research gaps were suggested and will act as a reference point to other researchers on similar topics.

KEY WORD: *Kidnapping Attacks, Terrorism, Employee Wellbeing*

BACKGROUND OF THE STUDY

Particularly in areas impacted by political instability, social unrest, or ongoing conflict, the effect of kidnappings and terror acts on employee wellness has grown in importance. The frequency of these occurrences over the last few years has presented serious difficulties for governments, businesses, and organizations. Terrorist attacks occur all over the world, including bombings of government buildings, multinational corporations, kidnappings of passenger planes and ships, attacks on diplomatic representations, airports, shopping malls, and occasionally attacks on government officials, subway and train stations, diplomats, and businessmen. These attacks can also take various forms, including assassinations and confrontations with the international community (Santos & Tran (2023)

According to a UN Security Council study on terror cases worldwide, the Western world has experienced multiple significant terrorist strikes. Terrorists affiliated with Al-Qaeda struck hard in New York, London, and Madrid. The most well-known is the 9/11 attack, which took place in September 2001 and was carried out by the terrorist organization Al-Qaida in New York City and Washington, DC. Two planes crashed into the north and south towers of the World Trade Center in New York City, causing the building to collapse and destroying surrounding structures. Approximately 3,000 people were killed in the Yazidi communities bombing, which was a deadly car bomb attack. Suicide bombers detonated in the towns of Yazidi and Jazeera in August 2007, resulting in an attack that left an estimated 796 people dead and 1562 injured. In July 2006, a sequence of seven bomb explosions occurred on the suburban railway in Mumbai, resulting in 209 fatalities and 714 injuries. This was another significant incident in Asia.

Although a growing body of research has found that terrorism has an influence on the economy, little is known about how it affects the wellbeing of individuals. For example, Clark et al. (2020) investigated how the Boston Marathon bombing in 2013 affected people's well-being. The results showed that negative emotions increased considerably while happiness fell precipitously. Even if the effects only last for a week, they could have negative health and financial repercussions. Additionally, when terrorism occurs at a place of employment, where people spend a significant

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amount of their lives, survivors are severely affected. A person's habits, sense of purpose, and access to social and financial resources can all be adversely affected by workplace violence. At its core, the workplace is a social setting. Following the 2011 Oslo bombing, people who were exposed to terror were more likely to experience depression, PTSD, and take more sick days (Clark et al., 2020).

In East Africa, the attacks took place in Somalia, a lawless nation, Tanzania, and Uganda, which are neighbors. A number of people were killed and injured in a dual attack on the US embassy in Tanzania and Kenya in 1998. Over 70 people were killed and numerous others were injured in bombings that occurred in Kampala in 2010 at a location where the World Cup final was being screened. The Kenyan-run AMISOM army base at El-ADDE, Somalia, was attacked by Al Shabaab terrorists in January 2016, resulting in the deaths of over 100 soldiers, the destruction of the whole base, and the captivity of additional people.

Kenya has also been affected by this crime; prior to the 1970s, when the nation was struck by the first terrorist attack that targeted the Norfolk hotel, this occurrence was unusual. The US Embassy in Nairobi's core business center was the target of yet another significant attack on August 7, 1998. This resulted in hundreds of fatalities, hundreds of injuries, and extensive property damage. This crime is so heinous that it causes a great number of casualties. The attacks that have occurred in Nairobi and other regions of Kenya have all targeted places where people congregate, such as bus stops, places of worship, nightclubs, and even public transportation vehicles. These terrorist assaults have also affected government officials, especially security personnel. Following the abduction of two charity workers in the Dadaab refugee camps and three tourists in Lamu on October 16, 2011, Kenya dispatched troops under the name "Operation Linda Nchi" to southern Somalia in order to combat Al Shabaab, a fundamentalist organization with ties to Al Qaeda. Under the African Union Mission to Somalia (AMISOM), the Kenyan government stepped in and cooperated with the Ethiopian and Somali armies. Five people were killed and twenty others were injured in two attacks in 2011 by the terrorist organization Al Shabaab, one in a pub and the second near Nairobi's Machakos bus terminal (KNCHR, 2014).

The following instances of attacks that have happened and are documented show how equally impacted Wajir County, the study region, and the surrounding area are by the scourge of terrorism. Nearly 150 students who may become the nation's workers were killed and numerous more were injured when gunmen invaded Garissa University College in April 2015. The terrorists stated that they were retaliating against non-Muslims occupying Muslim territory and claimed to be from the insurgent organization Al-Shabaab. On 22 November 2014, gunmen attacked a bus traveling from Mandera to Nairobi, killing 28 persons, mostly teachers and government workers heading to Nairobi for the December holidays. On 2 December 2014 – Al-Shabaab militants attacked and killed 36 quarry workers, many of whom were non-Muslims, near the town of Mandera (Kenya Police Service annual crime report 2015).

The Role of International and Local Policy

National and international policies also play a significant role in influencing employee wellbeing in the context of kidnappings and terror attacks. Carter and Watson (2021) argue that governments and international organizations must prioritize the safety and wellbeing of workers in regions prone to such incidents, creating legal frameworks and protections for employees facing these risks. These policies should include insurance coverage for victims of kidnappings, as well as compensation for psychological trauma.

In regions where the threat of terrorism is constant, the implementation of public safety measures and the collaboration between businesses and government agencies can provide additional support for employee wellbeing. Governments can also collaborate with corporations to create crisis management protocols that ensure the timely and effective protection of employees during terror attacks or kidnappings.

LITERATURE REVIEW

Research has highlighted that prolonged exposure to terror attacks or the threat of kidnappings can lead to a chronic state of hypervigilance. Bonghan et al. (2022) found that employees in regions affected by frequent terror incidents often report a persistent sense of insecurity, resulting in significant decreases in job satisfaction and productivity. The study also pointed out that the continuous psychological toll can manifest in burnout, as employees struggle to manage their fear while maintaining professional obligations. According to a study by Cohen et al. (2021), employees in high-risk regions are particularly vulnerable to post-traumatic stress disorder (PTSD), depression, and other anxiety-related disorders following terror attacks or kidnappings. These conditions can impair cognitive functioning, decision-making, and emotional regulation, further diminishing overall wellbeing.

The impact of terrorism and abduction on physical health is often intertwined with the psychological effects. Stress and anxiety, triggered by fear of violence, can manifest in somatic symptoms, including headaches, gastrointestinal issues, sleep disturbances, and cardiovascular problems. Perkins and Vitiello (2020) conducted a study on expatriate workers in the Middle East and found that prolonged exposure to kidnappings and terror threats significantly elevated stress-induced health conditions. Employees reported higher rates of absenteeism due to illnesses linked to stress, with those involved in or exposed to violent incidents suffering from long-term physical ailments. Moreover, the stress response itself can contribute to a decrease in immune function, increasing susceptibility to illness. Jones et al. (2021) noted that employees in volatile regions who had experienced

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terror-related events showed elevated levels of cortisol, a stress hormone that can suppress immune responses, leading to frequent health problems and a diminished ability to recover from illnesses.

Beyond individual health concerns, kidnappings and terror attacks can have a significant impact on organizational dynamics. Following traumatic events, organizations often face challenges related to employee morale, trust, and cohesion. The fear generated by such events can lead to a breakdown in social support networks within the workplace, exacerbating feelings of isolation and vulnerability among employees. According to Santos and Tran (2023), companies operating in high-risk environments often report decreased employee engagement and increased turnover, as workers seek safer opportunities in less volatile regions.

From an organizational perspective, companies may need to implement costly and time-consuming security protocols and provide additional support services, such as counseling and mental health interventions. Ghosh et al. (2022) found that organizations that invest in comprehensive employee support systems, such as mental health care, flexible work arrangements, and crisis management plans, are more likely to retain employees and maintain productivity post-trauma. These measures not only promote psychological recovery but also foster a sense of organizational loyalty and stability, even in the aftermath of traumatic events.

Studies on the impact of terror activities on organizational employees' wellbeing in Wajir county, Kenya is very important as many lives were lost (death of Government workers and civilians), destructions of properties and more and more employees are quitting their jobs after terrorist attacks while others fear to seek employment in these areas. This drew a major security concern in the country and changed the perspective from which the government viewed terrorism. This suggests that institutions and organizations need to develop proactive anti-terrorism programs to address post-traumatic stress disorder, and prevention or evacuation strategies for employees in terrorism, conflict or post-conflict zones (Soomro et al.,2023). In response to this wave of crime, the Kenyan government has put in place measures which include establishing the anti-terrorism police unit and increasing awareness of the public on the dangers of terrorism. There are still major milestones to be made in the fight against terrorism though. These non-state actors have become sophisticated by the day hence calling for the change in policies and general approach to this kind of crime. Therefore, the study sought to establish the effect of bombing attacks on employees' wellbeing in Wajir County, Kenya.

According to Soomro et al., (2023) the current workplace environment of various organizations has positive association with satisfaction of employees which leads to employees' commitment to their work and hence better job performance. Many organizations find themselves managing employees in countries characterized by substantial security risks. One such risk is terrorism that directly and indirectly affects organizations, institutions and work places .Direct effects include the destruction of organizational environment and infrastructure, death or murder and/or the kidnapping of employees, or their families through terrorism attack in their work stations, while indirect effects include the loss of colleagues and work mates in an institution, interruptions in production and disturbances in supply of goods and services that affect livelihood.

THEORY

Psychological Stress Theory

The Psychological Stress Theory (Lazarus & Folkman, 1984) provides a key framework for understanding the impact of traumatic events like kidnappings and terror attacks on employee wellbeing. This theory posits that stress results from an individual's perceived imbalance between the demands placed on them and their ability to cope with those demands. It emphasizes the importance of cognitive appraisal (how individuals evaluate threats) and coping mechanisms (how they respond to those threats) in determining the outcomes of stress.

In the context of kidnappings and terror attacks, employees may experience acute stress or chronic stress depending on their exposure and proximity to these events. For employees directly involved or witnessing such traumatic incidents, the stress response can be overwhelming, leading to psychological distress, PTSD, and other anxiety disorders. For those indirectly affecteds uch as coworkers or individuals in high-risk areas, the constant threat of violence or abduction can trigger a sustained state of fear and hypervigilance, eroding mental health over time.

The theory is highly relevant to understanding employee wellbeing in this context because it helps explain how individuals interpret and respond to the threat of terrorism and kidnappings. Those who perceive these events as unmanageable or unpredictable are more likely to experience heightened stress, leading to negative outcomes like decreased job satisfaction, burnout, and lower productivity. Moreover, the theory suggests that the effectiveness of organizational responses (e.g., crisis management support, mental health services, or relocation options) can mediate these stress responses, potentially reducing the negative impact on employee wellbeing.

Thus, applying Psychological Stress Theory helps explain why and how employees' wellbeing is compromised in the face of kidnappings and terror attacks and underscores the need for targeted interventions to manage stress in high-risk environments.

Objective

To assess the effect of kidnappings attacks on employees' wellbeing in Wajir County.

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Null Hypothesis

$H0_1$ There is no statistically significant relationship between kidnappings attacks on employees' wellbeing in Wajir County.

DATA AND METHODS

Descriptive research is preferred because it is effective in depicting the relationship between the dependent and independent variables by gathering data and using visual aids for data presentation (Kothari, 2012).

Sampling Technique and Sample Size

According to Kothari (2015) a population consists of all items in any field of inquiry. The target population for the study was top level management, middle level management and senior employees which consist of 200 employees in the Security Agencies (provincial administration and NPS), Health and Education departments' and are seen as most appropriate to give out required information for the purpose of this study.

According to Connaway and Powell (2010) a sample is usually drawn because it is less costly and less time consuming to survey than the population, or it may be impossible to survey the entire population. Sample of 30% respondent of each category will be considered to provide a general view. Purposive sampling technique was used to select the ideal subjects for the study, the technique is appropriate as only those who are deemed to have information required for the study will be selected. Stratified random sampling was used to sample individuals from the various groups; the study had a sample size of 60 respondents distributed equally among the three-government department under study

Data Collection Tools and Procedure

The study used primary data which was largely quantitative and descriptive in nature. The study also employed focus group discussion guide as its data collection tools. McCusker *et al*., (2010), points out that, questionnaires are appropriate for studies since they collect information that is not directly observable as they inquire about feelings, motivations, attitudes, accomplishments as well as experiences of individuals. McCusker *et al*. (2010) observe that questionnaires have the added advantage of being less costly and using less time as instruments of data collection. The questionnaires were semi-structured in nature, with both open and close-ended questions. While the close-ended questions will guide the respondents' answers within the choices given, the open-ended ones were useful in obtaining a more detailed response essentially in cases where the researcher has no pre-determined options.

The researcher administered the questions to the relevant respondents in an effort to achieve the necessary information. The questionnaires were administered through a drop and pick later method because of the busy schedule of the target respondents. Pre-testing enables the researcher to modify and remove ambiguous items on instruments (Kothari & Garg, 2014). The developed research instruments were pre-tested in Garissa County as it has similar features with the area of study due to numerous terror attacks that happened in this area.

Response Rate

The study had targeted to collect data from a sample of 60 respondent distributed equally among the three-government department but the researcher managed to collect data from 44 respondents which displays a response rate of 74% of the sample which the study considered the response rate good.

Descriptive Analysis

Kidnapping Attacks variable that was assessed by five statements which were exposed through descriptive investigation and outcomes indicated in Table 1.

Table:1 Descriptive Analysis for Kidnapping Attacks Measures

	N	Mean	Std. Dev.
I feel safe and secure working in Wajir even with kidnappings attacks	44	3.851	.8820
I have experienced kidnappings attacks threat to my own life while working in Wajir County.	44	3.727	.8324
During kidnappings attacks, working environment is affected in Wajir County.	44	4.526	.5456
During kidnappings attacks, the employees' families are displaced resulting to their poor wellbeing	44	4.531	.9382
Kidnappings attacks have instilled a lot of fear to employees' hence affecting their wellbeing	44	3.912	.9486

Source: Research Data, 2018

Mainstream of the respondents were of the opinion that during kidnappings attacks, the employees' families are displaced resulting to their poor wellbeing in that it had the highest mean of 4.531. The statement that the kidnappings attacks makes working environment is seriously affected in Wajir County with a mean of 4.526. The lowest mean score was recorded by the statement that I have experienced kidnappings attacks threat to my own life while working in Wajir County with a mean of 3.807 followed by I feel safe and secure working in Wajir even with kidnappings attacks with a mean of 3.851. Kidnappings attacks have instilled

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a lot of fear to employees' hence affecting their wellbeing had a mean of 3.912.

Correlation Analysis

The correlation analysis was done to establish the association between the independent and dependent variable.

Correlation between Kidnapping Attacks and Employees' Wellbeing

The association between kidnapping attacks and employees' wellbeing was established using Pearson product moment correlation and results indicated on the table.

Table 2: Correlation between Kidnapping Attacks and Employees' Wellbeing

	Statements	1.	2.	3.	4.	5.
1.	I feel safe and secure working in Wajir even with kidnappings attacks	1				
2.	I have experienced kidnappings attacks threat to my own life while working in Wajir County.	.626**	1			
3.	During kidnappings attacks, working environment is affected in Wajir County.	.547*	.672*	1		
4.	During kidnappings attacks, the employees' families are displaced resulting to their poor wellbeing	.362*	.561*	.367*	1	
5.	Kidnappings attacks have instilled a lot of fear to employees' hence affecting their wellbeing	.368**	.631*	.649*	.364*	1

Source; Research Data, 2018

The association between the statements that during kidnappings attacks, working environment is affected in Wajir County and I have experienced kidnappings attacks threat to my own life while working in Wajir County had the highest, positive and statistically significant (r = .672, p < .01). This was followed by the correlation between kidnappings attacks have instilled a lot of fear to employees' hence affecting their wellbeing and during kidnappings attacks, working environment is affected in Wajir County (r = .649, p< .05) which was significant at .01 significant level. The lowest correlation was reported between the statements that during kidnappings attacks, the employees' families are displaced resulting to their poor wellbeing and I have experienced kidnappings attacks threat to my own life while working in Wajir County (r = .362, p> .01) which was followed by the correlation between kidnappings attacks have instilled a lot of fear to employees' hence affecting their wellbeing and I have experienced kidnappings attacks threat to my own life while working in Wajir County (r = .368, p> .01). All the measures of kidnapping attacks had positive and significant relationship among themselves.

Regression Analysis

Regression analysis was done to establish the relationship between Kidnappings Attacks and employees Wellbeing

Table 1 Regresion Results of Kidnappings Attacks on Employees Wellbeing

Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.446[a]	.199	.207	.31082

a. Predictors: (Constant), Kidnappings attacks

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.201	1	.201	1.314	.031[b]
	Residual	.612	4	.153		
	Total	.813	5			

a. Dependent Variable: Kidnappings attacks

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a. Predictors: (Constant), Employees' wellbeing

Coefficients [a]

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.668	2.174		1.687	.188
	Kidnappings attacks	.570	.616	.446	.925	.031

a. Dependent Variable: Employees' wellbeing

Source; Research Data, 2018

The regression results of this study show that kidnapping attacks had overall a significant effect on employees' wellbeing in Wajir County (β = .446, p-value = .031). The study outcome also shows that 19.9 percent of employees' wellbeing in Wajir County can be explained by kidnappings attacks (R square = .199). From the above regression results, $\beta \neq 0$ and p-value < .05, hence the study therefore concludes that kidnapping attacks had overall a significant effect on employees' wellbeing in Wajir County. The study results goes hand in hand with those of Kahan, (2016) who noted that terrorism affects people's daily lives no matter if they are directly affected or not. Terrorism prone area is not viable for investment thus loss or reduction of basic commodities, scarcity of goods and services in an area makes it experience food insecurity (as measured in US this refers to the social and economic problem of luck of food due to resources and other constraints. Food insecurity also means experience of discomfort to chronic food shortage to severe and life threatening lack of food (Global Sustainability Institute GSI). Food insecurity implies: uncertainty about future food availability and access; insufficiency in the amount and kind of food required for a healthy lifestyle, this leads to rise in price hence making life expensive to manage and this affects livelihood. The basic commodities especially food stuffs that are daily consumed and not available in a particular area will be forced to get from other areas thus it will have cost implication making cost of living in terrorism prone areas high. Some closely linked consequences of uncertainty, insufficiency and inaccessibility are assumed to be part of the experience of food insecurity.

SUMMARY, CONCLUSION AND RECOMMENDATIONS

Conclusion and Summary of the Study Findings

Summary of the Study Findings

The regression results of this study show that kidnapping attacks had overall a significant effect on employees' wellbeing in Wajir County. The association between the statements that during kidnappings attacks, working environment is affected in Wajir County and I have experienced kidnappings attacks threat to my own life while working in Wajir County had the highest, positive and statistically significant. This means that majority of the respondents felt that kidnappings attacks had an effect on the working environment hence affecting the employees' wellbeing in Wajir County. The study outcome also shows that employees' wellbeing in Wajir County can be explained by kidnappings attacks.

Conclusions

Founded on the fact that kidnapping attacks had overall a significant effect on employees' wellbeing in Wajir County, the study drew the conclusion that county government of Wajir should make more efforts in minimizing kidnapping attacks. The study outcome also shows that employees' wellbeing in Wajir County can be explained by kidnappings attacks. The study findings agree with those of Kahan, 2016 and Waxman, 2011 also notes that terrorism affects people's daily lives no matter if they are directly affected or not. Terrorism prone area is not viable for investment thus loss or reduction of basic commodities, scarcity of goods and services in an area makes it experience food insecurity (as measured in US this refers to the social and economic problem of luck of food due to resources and other constraints (Obayelu *et al.* 2015). Food insecurity also means experience of discomfort to chronic food shortage to severe and life threatening lack of food (Global Sustainability Institute GSI, 2011). Food insecurity implies: uncertainty about future food availability and access; insufficiency in the amount and kind of food required for a healthy lifestyle, this leads to rise in price hence making life expensive to manage and this affects livelihood. The basic commodities especially food stuffs that are daily consumed and not available in a particular area will be forced to get from other areas thus it will have cost implication making cost of living in terrorism prone areas high. Some closely linked consequences of uncertainty, insufficiency and inaccessibility are assumed to be part of the experience of food insecurity.

Recommendations

The study results showed that kidnappings attacks affect the employee wellbeing in Wajir County hence the study makes the recommendation that the County government should put more efforts in reducing the kidnappings attacks because they affect the employee wellbeing in Wajir County.

Suggestion for further research

The study suggests that a further study on other Counties which are affected by terrorism activities since this study concentrated mainly on Wajir County alone.

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A REVIEW ON: HIV AIDS

Dr. Swati S. Rawat[1], Dr. Sunil S. Jaybhaye[2], Mr. Sachin S Dighole[3]
Mrs. Aditi Pungale[4], Mr.Aajesh Bhaskar Andhale[5]
[1]Principal of Institute of Pharmacy, Badnapur, Jalna.
[2]Vice Principal of Institute of Pharmacy, Badnapur,Jalna
[3]Guide
[4]Co-Guide
[5]Student
Institute of Pharmacy, Badnapur , Jalna 431202

ABSTRACT
HIV/AIDS has always been one of the most thoroughly global of diseases. The humanimmunodeficiency virus (HIV) is a lent virus that causes HIV infection and AIDS. AIDS is a condition in humans in which progressive failure of the immune system allows life-threatening infections and cancers to thrive. Infection with HIV occurs by the transfer of blood, semen, vaginal fluid, breast milk. Within these bodily fluids, HIV is present as both free virus particles and virus within infected immune cells. HIV infects vital cells in the human immune system such as helper CD4 T cells, macrophages. HIV infection leads to low levels of T cells through a number of mechanisms, including pyroptosis of infected T cells. The symptoms of AIDS are primarily the result of conditions that do not normally develop in individuals with healthy immune systems. Most of these conditions are opportunistic infections caused by bacteria, viruses, fungi and parasites that are normally controlled by the elements of the immune system that HIV damages. When condoms are used consistently by a couple in which one person is infected, the rate of HIV infection is less than 1% per year. There is some evidence to suggest that female condoms may provide an equivalent level of protection.
KEYWORD: *Agriculture, AIDS, Climate change, Development, Hunger, Malnutrition, Nigeria, Poverty.*

INTRODUCTION

HIV stands for human immunodeficiency virus. AIDS stands for acquired immuno deficiency syndrome.HIVH-It infects only human beings and also transmitted between humans not from animals. It is not transmitted from bites of mosquitoes, bats or any other species.I-The body has immune system whose function is to protect our body from germs, infections etc. But a person suffering from HIV has inability to fight against diseases. However, immune system becomes deficient.V-Virus is a small, simplest thing which is in inactive form outside the body and becomes active when it goes inside human body. AIDSA-It is not inherited means it cannot be transmit from one generation to another. It is transmitted to healthy person by infected person.I-It weakens the immune system.D-Creates a deficiency of CD4+ cells in the immune system.S-It is a collection of diseases.HIV is a virus that causes AIDS. Normally, our body has immune system that attack viruses and bacteria. Immune system has white blood cells which protect us from infections. White blood cells contain CD4+ cells which is also known as helper cells or T cells. A person who is infected will be able to develop. These infections take advantage of body's immune system. These infections cause several health problems and even lead to death of a person. HIV has inability to protect against diseases and count of CD4 cells also decreases in HIV. There is no cure of AIDS but there are certain medicines which are use to slow down the diseases so you stay healthier for long time. There is no medicine to get rid of diseases . HIV is a virus that causes AIDS. Normally, our body has immune system that attack viruses and bacteria. Immune system has white blood cells which protect us from infections. White blood cells contain CD4+ cells which is also known as helper cells or T cells. A person who is infected will be able to develop. These infections take advantage of body's immune system. These infections cause several health problems and even lead to death of a person.

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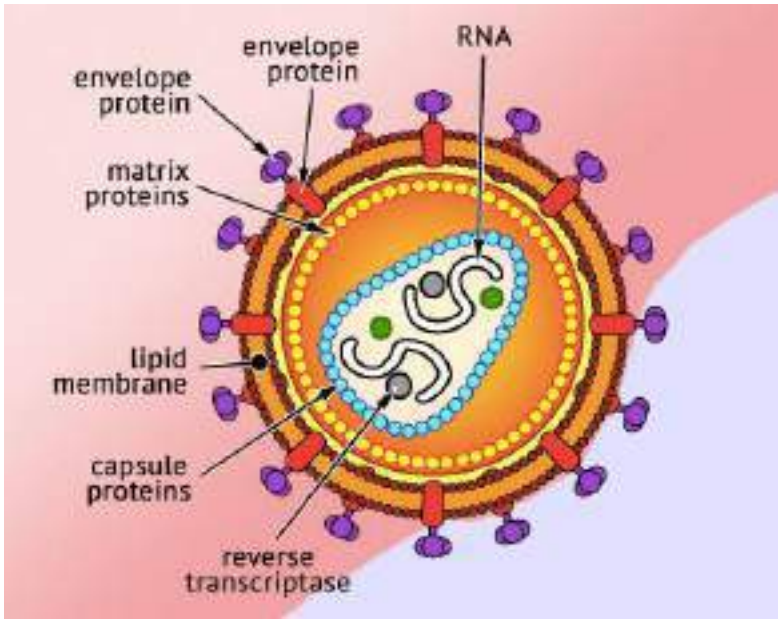


Fig.no.01

TRANSMISSION

HIV is transmitted principally in three ways: By sexual contact, by blood through transfusion, blood products or contaminated needles or by passage from mother to child. Although homosexual contact remains a major source of HIV within the United States, "hetero sexual transmission is the most important means of HIV spread worldwide today."Treatment of blood products and donor screening has essentially eliminated the risk of HIV from contaminated blood products in developed countries, but its spread continues among intravenous drug users who share needles. In developing countries, contaminated blood and contaminated needles remain important means of infection. Thirteen to thirty-five percent of pregnant women infected with HIV will pass the infection on to their babies; transmission occurs before as well as during birth. Breast milk from infected mothers has been shown to contain high levels of the virus also.HIV is not spread by the fecal-oral route; aerosols;insects; or casual contact, such as sharing household items or hugging. The risk to health care workers is primarily from direct inoculation by needle sticks. Although saliva can contain small quantities of the virus, the virus cannot be spread by kissing.HIV can be transmitted from an infected person to another through:

- Blood (including menstrual blood),
- Semen,
- Vaginal secretions,
- Breast milk.

DEFINITION OF HIV

HIV is known to be transmitted only through:

- Contact of infected blood, semen, or vaginal and cervical secretions with mucous membranes.
- Injection of infected blood or blood products.
- Vertical transmission (that is, from infected mother to fetus) and from mother to infant via breast milk.

INJECTION OF INFECTED BLOOD

HIV can be transmitted by infected blood getting directly into the bloodstream through intravenous, intramuscular, or subcutaneous injection. Blood-to-blood transmission occurs in the following ways:-

- Transfusion of contaminated blood and blood products and other blood recipients.
- Sharing of unsterilized hypodermic needles and syringes.

The risk of HIV Transmission is dependent on:

- The concentration of HIV in the infected fluid.
- The QUANTITY of fluid introduced into the body.
- The ACCESS of the infected fluid to the t4 cells.

Fluid with high concentration of HIV:

- Semen,
- Blood and blood components,
- Menstrual flow,
- Vaginal secretions,
  - Pre ejaculatory fluid
  - Breast milk.

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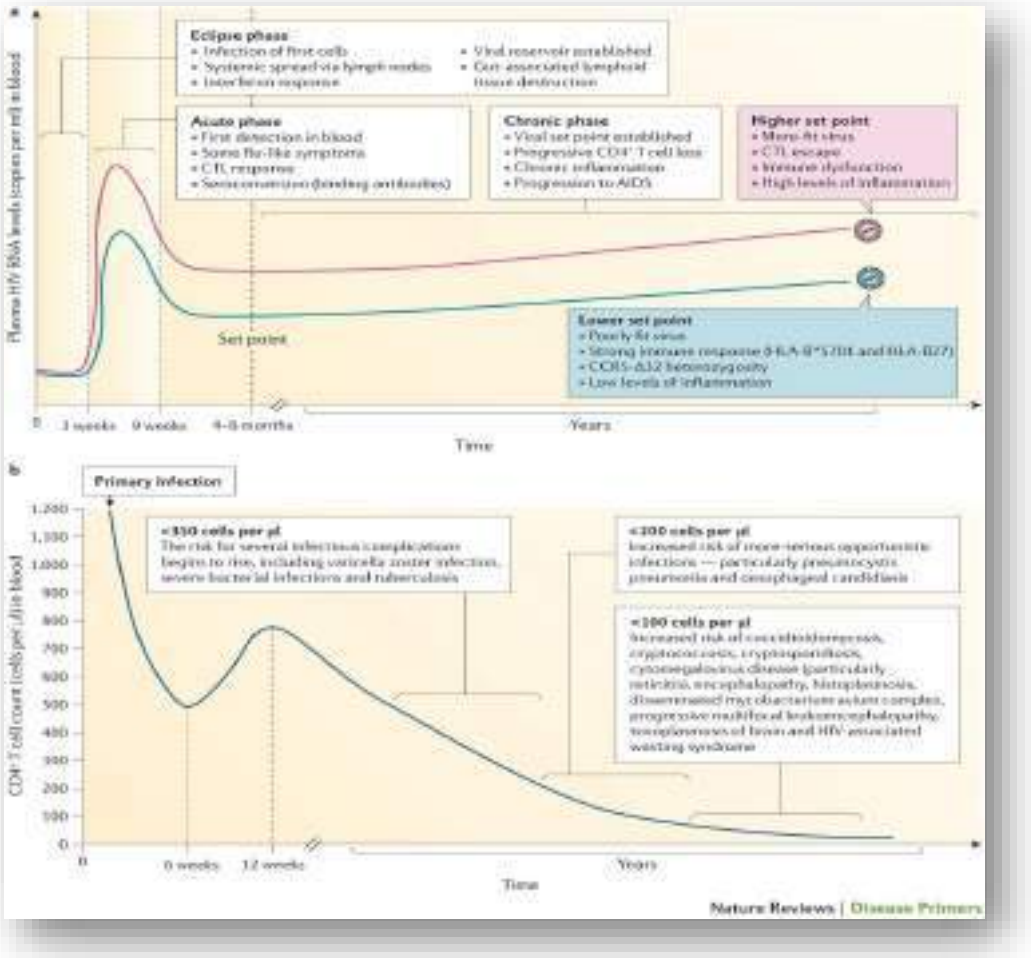


Fig.no.02

FLUIDS WITH LOW CONCENTRATION OF HIV

- Pus,
- Saliva,
- Tears,
- Urine,
- Feces,
- Vomiting,
- Nasal mucosa.

Entry to human cellsHIV is the only viruses which make new copies of itself inside the human cells. This process begins when this virus enters into cell that carries on its surface a protein that is cd4. The HIV virus stick to the cd4 receptor and allow them to fuse.HIV mainly infect immune cells i.e. T-helper cells that forms the body immune system. HIV infects more cells, therefore immune system becomes weak.ReversetranscriptionThere is an enzyme reverse transcriptase which helps in reverse Transcription. The main function of reverse transcriptase is conversion of viral RNA into DNA. After that DNA is transported to cell's nucleus where insertion of DNA is done by enzyme integrase.Transcription and translationNow, transcription takes place. HIV virus converts HIV virus into messenger RNA.

DISEASE STAGES

The natural history of HIV disease, has beginning inthe transmission of the virus to the individual death isdefined as a natural progression of the infection withoutantiretroviral therapy13 The HIV infection is character-ized by four phases: acute or primary infection, asymp-tomatic phase or clinical latency, initial or early symp-tomatic phase and AIDS 3. The acute phase is the period which correspondsfrom the transmission of disease to the formation of antiHIV antibodies, are observed with high levels viraemiamarked decline in CD4 + T cells and an increase in CD8+ circulating lymphocytes

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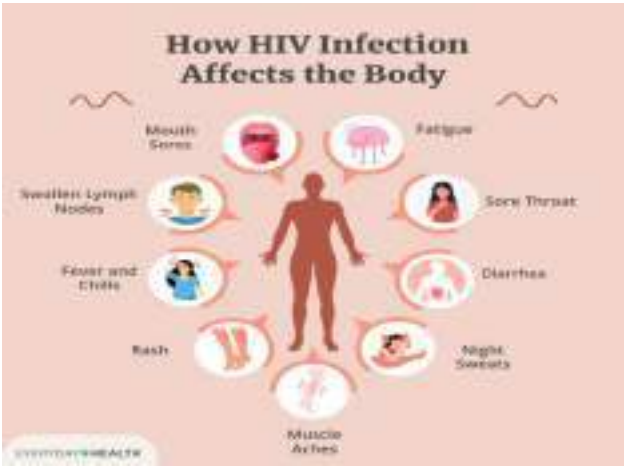


Fig.no.03

The most common symptoms are fever, sweating, malaise, myalgia, anorexia,nausea, diarrhea and pharyngitis non-exudative, andheadache, photophobia, meningism and maculopapularrash may occur neurological symptoms in a minority andaseptic meningitis, encephalitis, peripheral neuropathy isa polyneuropathy acute ascending known as Guil-lain-Barré syndrome. In some cases may occur aphthousulcers or esophagea.

The symptoms are self-limiting,and last an average of 14 days, their persistence may beassociated with more rapid progression to AIDS3. Acuteinfection is controlled only partially by the adaptiveimmune response and advances to the progressive infec-tion of peripheral lymphoid tissues. At this stage, HIVvirions penetrates the individual cells by fusion events, mediated by cellular receptor gp120/ gp411. After primary infection there is a second phase of thedisease, where the infected patient may remain asymp-tomatic for several years, may also have some very spe-cific symptoms such as persistent generalized lymphad-enopathy, fatigue, low-grade fever, night sweats, inter-mittent diarrhea and weight loss14. This phase of thedisease is called the HIV latency period where new vi-ruses are produced in low levels, only a few T cell hard-boring the virus, but the destruction of CD4 + T cellprogresses slowly in lymphoid tissues and the number ofsuch cells decreased progressively in blood. The bodycontinues to produce, however are destroyed with thesame speed with which they are produced. Over a periodof years, this continuous cycle of infection and death ofT cells and new infections lead to a steady decline in thenumber of CD4 + T cells in lymphoid tissues and circu-lating1 In early symptomatic phase, some symptoms presentnonspecific and variable intensity, the changes are nightsweats, weight loss and thrombocytopenia. The mostcommon opportunistic processes found in this phase areknown as oral and vaginal candidiasis, oral hairy leu-koplakia, gingivitis, aphthous ulcers, diarrhea, sinusitis,recurrent herpes simplex and herpes zoster3. The last stage of the HIV infection, AIDS, is charac-terized by drastic increase viraemia, increasing the rep-lication of the virus rapidly and without control. Presentscombinations of opportunistic infections, cancer, ca-chexia, renal failure and degeneration of the centralnervous system. The patient becomes susceptible to var-ious diseases due to marked decrease in CD4 + T cells,reaching very low levels. Many tumors that appear inindividuals with AIDS are due to viral and incapacity ofthe patient infected by HIV mount an immune responseagainst oncogenic viruses.

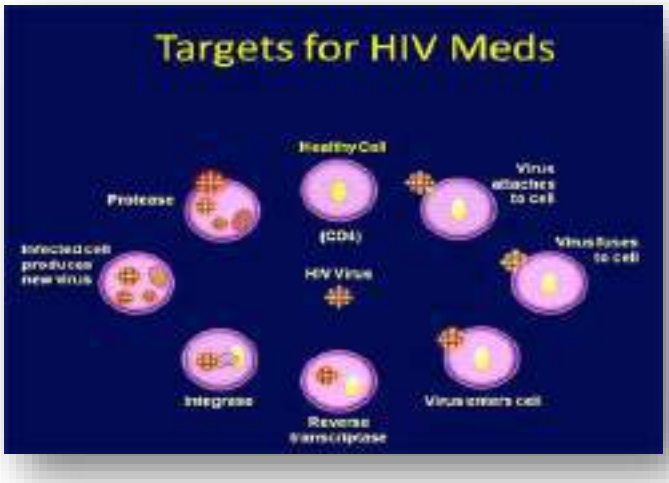


Fig.no.04

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SYMPTOMS

Many people who are living with HIV have no obvious signs and symptoms at all. Recent evidence shows that between 70% to 90% of people who become infected with HIV experience flu-like symptoms within a few weeks after infection. The most common symptoms are a fever, a rash and a severe sore throat all occurring at the same time. These symptoms in an otherwise healthy person may indicate recent HIV infection.HIV infected patients may get yeast infections (oral or vaginal) that do not go away or that occur often. Frequent and severe herpes infections that cause mouth, genital, or anal sores are also common.

Symptoms



Fig.no.04

- large lymph nodes or "swollen glands" that may be enlarged,
- for more than three months,
- frequent fevers and sweats skin rashes or flaky skin that does not go away,
- short-term memory loss,
- slow growth or frequent illness in children,
- cough and shortness of breath,
- seizures and lack of coordination,
- difficult or painful swallowing,
- confusion and forgetfulness nausea, cramps diarrhea or vomiting that do not go away,
- vision loss,
- Unexplained weight loss.

OBJECTIVES

1. Determine the stage of HIV and related comorbidities to ensure timely diagnosis and treatment for patients.
2. Apply the principles of antiretroviral therapy and prophylaxis for opportunistic infections to prevent and manage adverse effects.
3. Interpret HIV treatment guidelines to ensure cultural sensitivity and maintain confidentiality for individual patients and affected populations.
4. Collaborate with interprofessional team members to ensure continuity of care, improve patient outcomes for HIV prevention and treatment, and mitigate the risk of AIDS.

CAUSES

HIV is transmitted when bodily fluids containing the virus are shared between people, including:

1. Blood
2. Semen
3. Pre-Seminal Fluid
4. Vaginal Fluids
5. Rectal Fluids
6. Breast Milk

LABORATORY DIAGNOSIS

Following infection, antibodies to HIV are, on aver-age, 3 to 12 weeks in serum or plasma3 Essentially aredivided into four groups of tests for detection of HIV,known as antibody detection tests, antigen detection tests,culture technique, and the virus genome amplification assays. Routinely used in the initial screening antibody detection tests against the virus, known as Enzyme Linked Immuno Sorbent Assay (ELISA) is intended for the detection of antibodies, anti-p24, gp41 and gp120, and is considered a highly sensitive and specific test. For confirmation of positive ELISA test, it is necessary conduct the Western blot test (WB),which are detectedviral proteins3,16. In its second edition the technical manual for the di-agnosis of HIV infection currently is approved by Ordi-nance No. 29 of 17 December2013 The manual pro-vides STD and AIDS Department's policies for the di-agnosis to be amplified and are including people who are diagnosed and can start treatment soon after confirma-tion of diagnosis, contributing to quality of life of and reducing the likelihood of HIV transmission. The main purpose of this manual is to expand the possibilities for diagnosis and also mainly instruct healthcare profession- als to secure completion of the diagnosis of infection, comprising in its six flowcharts infrastructure that allow the diagnosis, enabling this in different locations and situations with laboratory infrastructure or not taking active responsibility to meet all looking for this diagno-sis17.

TREATMENTS

In November 1996, Brazil became the first country tomake available free of charge through the Unified HealthSystem (SUS), all drugs necessary for the treatment ofpatients living with HIV / AIDS18 Are currently used in Brazil, four classes of an-tiretrovirals, which are considered more potent and lesstoxic, divided as Nucleoside Reverse Transcriptase In-hibitors (NRTIs) Nucleoside Inhibitors No ReverseTranscriptase (INN-TR), inhibitors protease (IP), andIntegrase Inhibitors19. Antiretrovirals NRTIs are drugs that block the actionof the enzyme reverse transcriptase. Activation of nu-cleoside inhibitors of metabolites occurs in the firstphosphorylation. Due to difficulties in many moleculesmonophosphorylated be created is analogous drugs

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pos-sessing a nucleotide phosphate group in its structure,requiring only two phosphorylations to prevent tran-scription of RNA into DNA, and thus preventing viralreplication. Hoewver, the antiretroviral group NNRTIare considered as non-competitive binding to an allo-steric site of the enzyme. This interaction causes the ac-tive site responsible for the formation of the double helixof DNA, has restricted their mobility and flexibility,which results in a drastic reduction in enzyme efficien-cy20.Protease inhibitors (PIs) interfere in the last stage ofviral replication, preventing the formation of new viruses.

PREVENTION

According to the Department of STD, AIDS and Vi-ral Hepatitis the most efficient way of AIDS preventionis the use of condoms in all sexual relations, decreasingthe risk of transmission to 5%17, blood or blood products,semen, body fluids and breast milk of infected personshould be avoided for contacts unprotected . In pregnant women, for prenatal tests should be per-formed to detect viruses and if positive for HIV treat-ment must be performed in order to prevent contamina-tion of the embryo in order that vertical transmission, iefrom mother to child can occur often in utero or duringbirth, there is also the possibility of transmission throughbreast milk1. Health professionals can be contaminated throughoccupational transmission, generated by the accident atwork, where they can be injured with cutting and sharpinstruments contaminated with blood of patients withpositive serology for HIV. Some factors that may con-tribute occur occupational contamination, such as theextension and the depth of the wound, the presence ofblood in the instrument causing the accident and the pa-tient is a source with a high viral load with advancedimmunodeficiency signals. Control measures should beadopted in order to minimize the risk of transmission bythis type of contamination among which we highlight:the effective practice of biosecurity standards in invasiveprocedures to implement new technologies and the studyto determine the risk factors associated seeking theirelimination3. Routine screening for HIV in blood donors have sig-nificantly reduced the rich transmission this way. Tocontrol the epidemic by HIV effective prevention is ex-tremely important, adopting public health measures todecrease the use of contaminated needles used by intra-venous drug user and the use of condoms, even amongHIV-positive partners, avoiding reinfection of viralstrains resistant to drugs which can have serious com-plications health, and campaigns on HIV/ AIDS for pub-lic awareness.

CONCLUSION

Despite constant efforts of science in search of per-manent cure for HIV, yet we know that this outcome was not completed, totalling a high morbidity and mortality national and world, becoming, since its discovery, a ma-jor epidemic, can be considered a pandemic. The weak-ening and the weakness of the immune system occur by lysis or decrease in lymphocytes of type CD4 +, a cell that is part of the defences system, making the white blood cells, it causes the body becomes susceptible to opportunistic infections and/ or tumors, since these are responsible for organizing and directing the response by the aggressors attack. The adherence to antiretroviral therapy has provided better quality of life and has con- tributed to decrease the spread of HIV. However, pre-vention is still the best way to control the disease, since its spread is mainly through sexual contact, leading to many individuals to become vulnerable. The changes caused by the fact that HIV compromises the immune system, hence the importance of investments in research, awareness, government and popular actions, so there in the near future to reduce the epidemic and the much de-sired cure this disease.

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AI IN COMMUNICATION

Sulakshana Nishikant Bhatlawande [1], **Tejashree Bhushan Patil** [2]
Aaditya Pavaman Anavatti [3]
[1] *Lecturer, Department of E&C engineering, Y.B.Patil Polytechnic, Akurdi, Pune*
[2] *Lecturer, Department of E&C engineering, Y.B.Patil Polytechnic, Akurdi, Pune*
[3] *Student, Department of E&C engineering, Y.B.Patil Polytechnic, Akurdi, Pune*

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ABSTRACT
Artificial Intelligence (AI) is changing how we interact, providing new levels of efficiency, personalization, and innovation in communication. From chatbots and virtual assistants to advanced language processing and instant translation, AI tools are transforming both personal and professional communication. Through the use of machine learning algorithms and extensive data sets, AI can interpret and respond to human language with remarkable accuracy. This transformation enhances customer service, streamlines workflows, and bridges language gaps, fostering deeper connections in our increasingly interconnected world. As AI continues to advance, its influence on communication will redefine how information is shared and relationships are built.
KEY WORDS: *Artificial Intelligence, communication, Real-time translation.*

I. UNDERSTANDING ARTIFICIAL INTELLIGENCE
Artificial Intelligence (AI) involves replicating human cognitive functions in machines, enabling them to learn, reason, and solve complex problems. By using sophisticated algorithms and large data collections, AI systems perform tasks like speech recognition, visual analysis, decision-making, and translation. From simple, rule-based systems to complex machine learning models, AI can improve its performance over time, making it applicable in fields like automation, healthcare, finance, and customer service.

- **Types of AI**

AI can be classified in various ways depending on its functionalities and areas of application.

Capability-Based Classification:
Narrow AI (Weak AI): Specializes in a single task, such as speech recognition or facial detection (e.g., Siri or Alexa).
- *General AI (Strong AI)*: Theoretical AI that could perform any intellectual task a human can manage, though it currently does not exist.
- *Superintelligent AI*: A future concept of AI surpassing human intelligence across all areas, including creativity and strategic thinking.

2. Functionality-Based Classification
- *Reactive Machines*: Basic AI that reacts to inputs without memory, such as IBM's Deep Blue chess AI.
- *Limited Memory*: Can learn from past data for improved decision-making, used in self-driving cars.
- *Theory of Mind*: Hypothetical AI that would understand emotions and beliefs, enhancing social interactions.
- *Self-aware AI*: The concept of AI with self-awareness and consciousness, which remains theoretical.

II. HOW AI LEARNS AND ADAPTS
AI's learning process is rooted in machine learning, where algorithms are trained to recognize data patterns and make predictions. Here are key steps:
1. **Data Input**: AI is provided with large amounts of data (text, images, etc.) to learn from.
2. **Algorithm Training**: Various types of learning are employed:
   - *Supervised Learning*: Trained with labelled data, where the correct output is known.
   - *Unsupervised Learning*: Works with unlabelled data to discover patterns independently.
   - *Reinforcement Learning*: Learns through trial and error, receiving feedback to adjust its actions.
3. **Model Training**:
   The model fine-tunes its parameters to reduce prediction errors.
4. **Evaluation and Refinement**:
   The AI model is tested and improved to increase its accuracy and efficiency.

III. DEFINING COMMUNICATION
Communication is the exchange of information or ideas through methods such as speech, writing, or body language. Effective communication involves a sender conveying a message and a receiver interpreting it. Types of communication include:
1. **Verbal Communication**
   Spoken or written words, such as conversations, calls, emails, and reports.

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2. **Non-Verbal Communication**
   Body language, tone, and proximity cues.
3. **Visual Communication**
   Symbols, graphs, and images.
4. **Digital Communication**
   Texting, social media, and video calls.
5. **Interpersonal Communication**
   Face-to-face interactions.
6. **Mass Communication**
   Broadcasting information to large audiences through media.

IV. HOW AI IS IMPROVING COMMUNICATION

AI enhances communication in several ways:

1. **Language Translation**:
   Real-time translation tools break down language barriers, easing cross-lingual communication.
2. **Chatbots and Virtual Assistants**:
   Tools like Siri or Alexa handle customer questions and perform tasks using natural language processing.
3. **Speech Recognition**:
   Converts spoken language to text, supporting accessibility and improving efficiency.
4. **Sentiment Analysis**:
   AI interprets text to detect emotional tone, aiding businesses in responding more thoughtfully.
5. **Content Generation**:
   AI tools generate written content and personalize messages based on user preferences.
6. **Accessibility**:
   Features like text-to-speech and captioning assist individuals with disabilities.
7. **Enhanced Collaboration Tools**:
   AI-powered platforms like Microsoft Teams use real-time translation and meeting summaries to facilitate collaboration.

V. APPLICATIONS OF AI IN CUSTOMER SERVICE

AI streamlines customer service through:

1. **Chatbots**: Offering immediate answers to routine questions while allowing human agents to focus on more complex challenges
2. **Virtual Assistants**: Offering personalized support and recommendations based on user data.
3. **Automated Responses**: Ensuring customers receive quick, accurate information.
4. **Sentiment Analysis**: Understanding customer emotions to improve service strategies.
5. **Predictive Analytics**: Anticipating customer needs based on past behaviour.
6. **Speech Recognition**: Enabling transcription and CRM integration.
7. **Personalization**: Customizing interactions based on individual preferences.
8. **24/7 Availability**: Providing round-the-clock support, reducing wait times.

VI. EXAMPLES OF AI IN COMMUNICATION

1. **Grammarly**: An AI-driven writing assistant that analyses grammar, tone, and style to improve clarity and polish. Its algorithms adapt to individual writing styles, enhancing both casual and professional communication.
2. **Siri**: Apple's virtual assistant performs various tasks using voice commands, such as sending messages, setting reminders, and controlling smart home devices. Siri's ability to learn user preferences and provide tailored responses exemplifies AI's role in personalizing communication.

VII. CONCLUSION

AI has a profound impact on communication by enabling real-time translation, automating routine interactions, and enhancing personalized messaging. Through tools like chatbots, speech recognition, and content generation, AI increases efficiency, improves collaboration, and enhances accessibility. This technological evolution is reshaping communication, making it more dynamic, responsive and effective.

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REVIEW ON AYURVEDIC TREATMENT FOR ASTHMA

Dr. Sunil.S. Jaybhaye[1], Pooja.P. Ambhure[2], Aarti.G. Hingmire[3], Ashwini. R.Shelke[4] Bhagwat S.Gabale[5]

[1]*Department of Quality Assurance, Institute of Pharmacy, Badnapur*
[2]*Department of Pharmaceutics, Institute of Pharmacy, Badnapur,*
[3]*Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur,*
[4]*Faculty of Pharmacy, Institute of Pharmacy, Badnapur,*
[5]*Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur*

ABSTRACT

Over 230 million individuals worldwide suffer from asthma, an obstructive lung condition that significantly increases morbidity in patients of all ages. It is a diverse illness with a complicated phenomenology and pathogenesis. Variable airflow obstruction and airway hyper responsiveness are the condition's hallmarks, and the diagnosis is reached after a comprehensive history and physical examination. It's critical to recognize the severity of the illness, and treatment focuses on managing symptoms. Asthma is a prevalent inflammatory illness of the airways that contributes significantly to global hospitalization and medical expenses. Due to uneven adherence to established recommendations, there are significant differences in the diagnosis and management of acute asthma exacerbations. In addition to discussing standard and cutting-edge therapy options for refractory cases, we will also examine the evidence, guidelines, clinical presentation, risk factors, and management of acute asthma exacerbations. A summary of recent research and recommendations for the proper diagnosis and treatment of asthma are given in this article.Ayurvedic treatment is found to be beneficial over other treatments. Ayurvedic ingredients like saffron , clove ,nutmeg, paper longum and musk fenugreek are effective for the asthma.

KEYWORDS: *Bronchodilators, steroids, eosinophils, bronchial asthma.*

1.INTRODUCTION

The definition of asthma is a long-term inflammatory condition of the airways. Wheezing, dyspnea (shortness of breath), chest tightness, and coughing are among the recurrent symptoms of chronic inflammation, which is linked to airway hyper responsiveness (an exaggerated airway narrowing response to triggers, such as allergens and exercise). Episodes of symptoms are typically linked to a broad but fluctuating blockage of airflow in the lungs, which is typically reversible either on its own or with the right asthma medication.(1)

Chronic airway inflammation and constriction are hallmarks of asthma, a prevalent condition affecting both adults and children.(2,3) Overview Inflammation and airway narrowing are the hallmarks of asthma, a long-term respiratory disease that makes breathing challenging. It is a chronic illness that is heterogeneous and affects 300 million people worldwide. Asthma is a chronic illness that affects the airways in two ways: it causes inflammation and airflow restriction inside the lungs. Many patients exhibit insufficient disease control, which is leading to an increase in morbidity and adversely affecting health-related quality of life.(4,5,6) In terms of financial burden, it is estimated that asthma control and management account for 70% of the disease's costs; however, with proper care, the disease would improve asthma control and reduces.(7)Linked the expenses to the use of an anti-inflammatory drug used as a preventative measure to improve patient health. Particular training and a stronger commitment to the guidelines' advice with 420,000 deaths worldwide, bronchial asthma. commonly referred to as asthma, is the most prevalent chronic lung illness in children more than 80% of more than fatalities occur in developing nations (8,9) is an untreatable condition that needs to be carefully managed, high medical expenses, including acute ambulatory, emergency and hospital treatment, are caused by uncontrolled asthma.

The most prevalent chronic illness among children is still asthma. the majority of clinical guidelines, children with asthma fall into one of the following ages groups: Pre schoolers aged 2-5, teenagers aged 12-18, or children aged 5-12 (who are typically treated as adults)

The conventional theory of asthma holds that particular IgE and excessive T-helper cell type 2 (Th2) cell responses cause airway hyper responsiveness. Although this effectively describes the main processes of allergic asthma, the word "asthma" is Now used as a catch-all diagnostic for a number of different illnesses (endotypes) as well as different phenotypes (young atopic, obese middle-aged, and elderly), all of which show symptoms of chest tightness, coughing, and wheezing, along with variable airflow restriction.

Up until a few years ago, all asthma patients received the same course of treatment. But because this disease is complex, different people react differently to different treatments. Although the precise number of people with severe asthma is unknown, it is estimated to be between 5 and 10% of all

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asthmatics. Even with high-intensity therapy, patients with severe illness still experience refractory symptoms. This population has a glaring unmet need and is responsible for a large portion of asthma-related morbidity and mortality. In order to better understand the variability of asthma profiles, new attempts have been undertaken to break down asthma into its pathogenic components.

1. OBJECTIVE

- Use evidence-based asthma management techniques while taking into account the preferences and features of each patient.
- Regularly evaluate the severity, management, and risk of exacerbations of asthma at follow-up visits.
- Determine the classic signs of asthma, such as coughing, wheezing, and dyspnea.
- Works together with members of an interdisciplinary health care team to improve asthma treatment and patient outcomes.
- Control symptoms lessen asthma attacks, frequency and intensity
- Boost your standard of living allow people to live active, regular lives.

2. COMMON SYMPTOMS

- Wheezing, coughing, shortness of breath and chest tightness are common symptoms of asthma on people.The symptoms can be quite severe and can get worse at night or during exercise. Early detection of these symptoms can assist ensure prompt treatment.
- Fatigue that makes it tough to speak
- Cough secretions
- Swollen airways

3. CAUSES

- Smoking
- Environment
- Genetics
- Allergies
- Respiratory infection

4. DIAGNOSIS

Men and women of various ages can suffer from asthma, a condition affecting the lower respiratory tract. Although there is no one gold standard test for diagnosing asthma, there is much variation in the pathophysiology and clinical presentation of the condition, and clinical over diagnosis can happen, particularly in patients lacking spirometric proof.(10)

As a result, spirometry and a comprehensive history and physical examination are crucial for diagnosing asthma. A comprehensive medical history, physical examination, and objective evaluations of lung function (spirometry preferred) are required for the diagnosis of asthma.

The problem of bronchoprovocation When objective tests of lung function are normal despite the presence of asthma symptoms, testing and evaluation for indicators of airway inflammation may also be useful in the diagnosis of the condition.(11,12,13)

5. PATHOPHYSIOLOGY

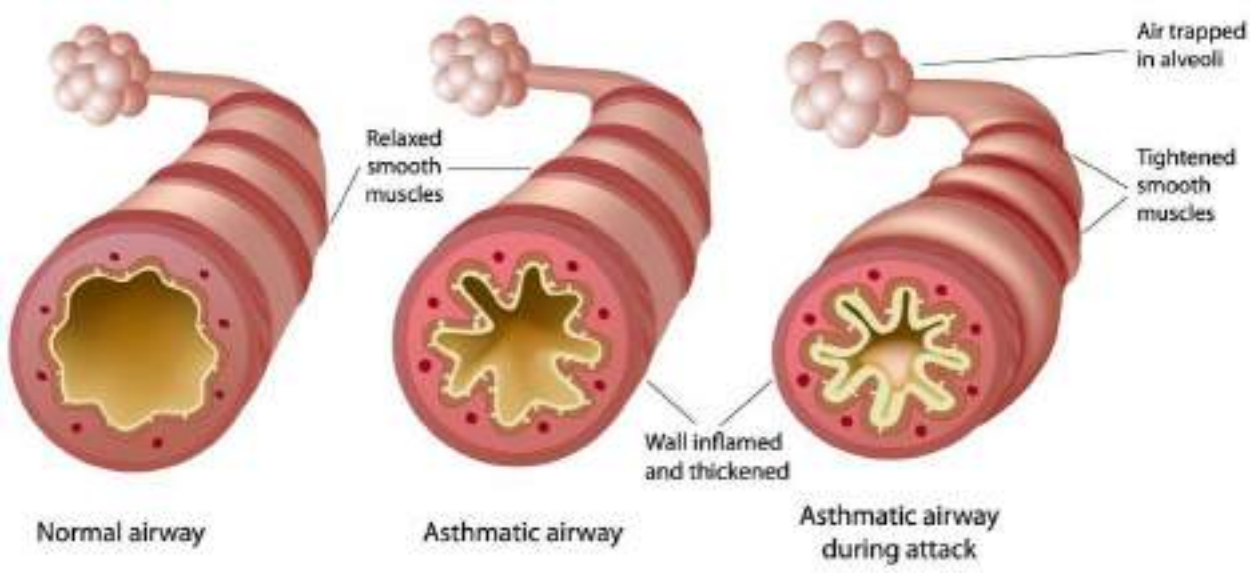


Fig. Asthma Pathophysiology

An asthma attack can occur in two stages, known as the early phase and the late phase. IgE antibodies, which are sensitized and secreted by plasma cells, start the early phase. Certain environmental stimuli, including the risk factors mentioned

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above, cause these antibodies to react. After that, IgE antibodies attach to basophils and mast cells with high affinity. The mast cells gradually de-granulate after releasing cytokines in response to an inhaled contaminant or risk factor. Mast cells release leukotrienes, prostaglandins, and histamine. These cells then tighten the airways by contracting the smooth muscle.(14)

Th2 lymphocytes are essential because they generate GM-CSF and a number of interleukins (IL-4, IL-5, and IL-13) that facilitate cell-to-cell contact and maintain inflammation. Eosinophils and basophils are aided in their survival by IL-3 and IL-5. IL-13 plays a role in hyperplasia, fibrosis, and remodeling.(15) The late phase, which takes place over the course of the following few hours, is characterized by the localization of eosinophils, basophils, neutrophils, and helper and memory T-cells to the lungs, which results in inflammation and bronchoconstriction. Additionally, mast cells are crucial for transporting late-phase reactants to the sites of inflammation.(16) Depending on the severity of the condition, it is essential to understand both of these pathways in order to target therapy and relieve both inflammation and bronchoconstriction. It's interesting to note that those with larger airways throughout time have longer disease durations since their airways are smaller.(17) Breathing becomes more difficult due to an occasional airflow restriction brought on by inflammation and bronchoconstriction.

One of the most important characteristics of asthma is airway hyperresponsiveness, which is an enlarged bronchoconstrictor response, typically to various stimuli. Airway hyperresponsiveness is caused by a number of different processes. Some theories include an increase in smooth muscle bulk in the airways or an increase in histamine from mast cells. The contractility of airway smooth muscle cells is further improved by elevated intracellular free calcium and vagal tone.(17) Bronchial provocation tests are performed to measure the degree of Airways hyperresponsiveness.(18) The presence of airway hyperresponsiveness is linked to a higher loss in lung function and an increased likelihood of developing and exacerbating asthma from infancy to adulthood, making this characteristic clinically significant.(19) Thus, early targeted treatment can be used to address hyperresponsiveness and asthma. When combined, these processes somewhat alter the lungs' compliance, making breathing more difficult.

A person may find it more and more difficult to breathe correctly when exudate, mucus, inflammation, and granular white blood cells inhabit the bronchiolar trees. The smooth muscle layer and lamina reticularis narrow as a result of an increase in the epithelium brought on by the amount of myofibroblasts, which produce collagen.(20) Consequently, the basement membrane thickens further. The cause of an individual's irreversible airflow restriction is thought to be airway remodeling.(21) Epithelial cells change into mesenchymal cells during remodeling, which results in an increase in the amount of smooth muscle. Tight connections cause epithelial cells to lose their functional polarity and cell adhesion, reformatting their cells to become mesenchymal cells.(18) Furthermore, by interacting with mast cells and releasing cytokines and TGF-B, eosinophils might worsen airway remodeling. If these airway remodeling mechanisms are not appropriately treated and maintained, they may be exacerbate asthma and worsen inflammation. (17)

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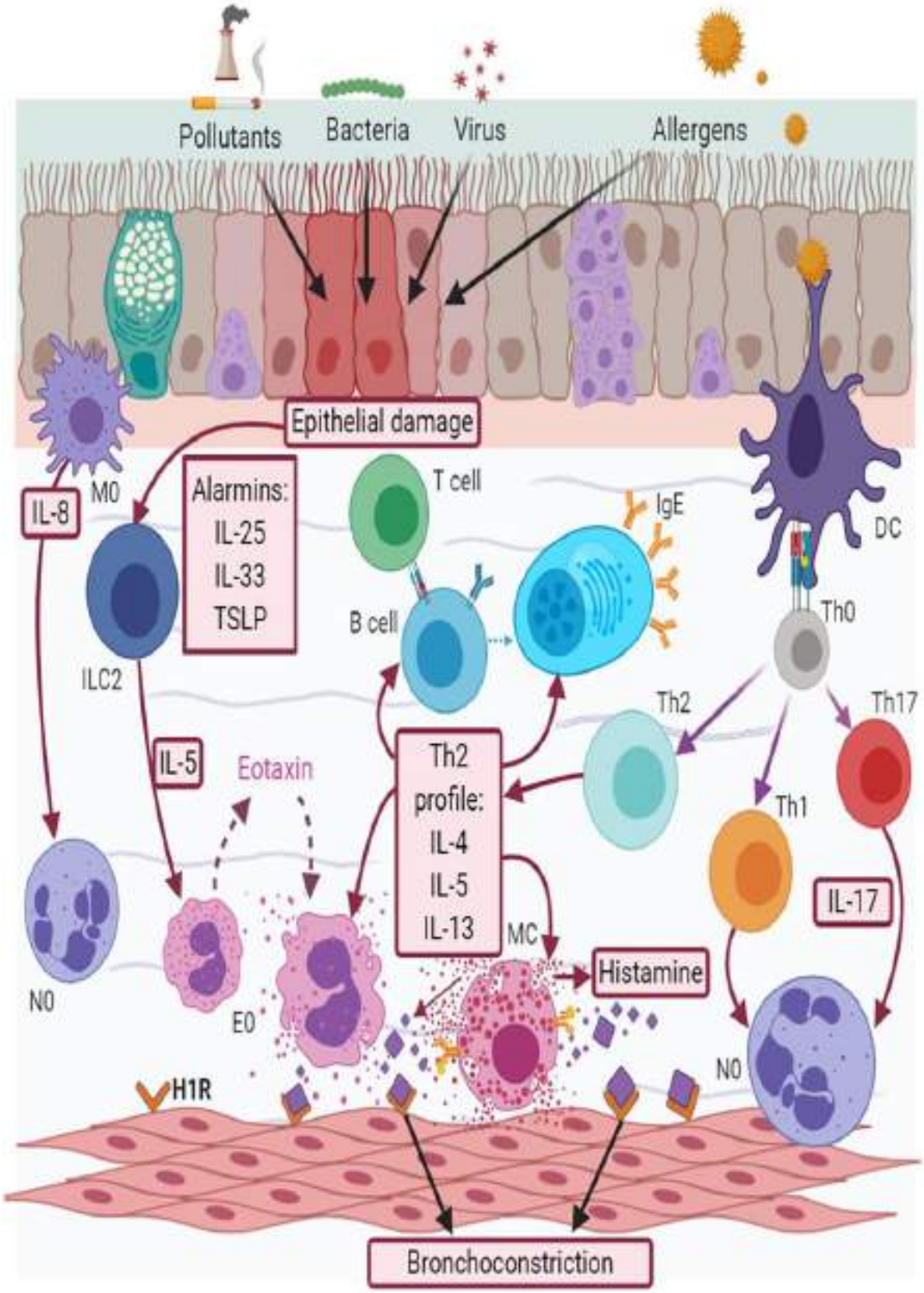


Fig. Pathophysiology of Asthma

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7.TREATMENT

Patients experiencing an acute asthma attack need to be evaluated and treated right away. Reducing airflow blockage, increasing breathing effort, and preserving tissue perfusion and oxygenation are the major objectives of treatment. Systemic steroids and serial or continuous short-acting bronchodilators are important pharmacological elements in acute asthma treatment.

Ayurvedic Treatment

Saffron, musk Fenugreek, clove, nutmeg, piper longum these ingredients are given into the same quantity, then grind it into powder form and mix it ginger juice and make a small pills.

Saffron

Synonyms: kesoar
Family: Iridaceae.
Saffron is believed to improve the asthma symptoms due to airway inflammation, hyper responsiveness and muscle contraction. it means relax the muscle contraction.



Fig: Saffron

Clove

Synonym: clove bud
Family: Myrtaceae
Use : Use of Clove and clove oil may help in asthma symptoms, such as wheezing, chest pain, difficulty breathing.



Fig: Clove

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Nutmeg
Synonyms: Myristica aromata
Family: Myristicaceae
Nutmeg reported to exhibit anti inflammatory effects in vivo in an asthmatic model by significantly reducing the expression of IL-4 and Th2 cell specific master transcription factor.



Fig: Nutmeg

Piper Longum
Synonyms: Chavica roxburghii Miquel
Family: Piperaceae
Study found that Piper longum can reduce airway inflammation and remodeling in asthmatic mice.



Fig: Paper Longum

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Musk Fenugreek
Synonyms: Methi, Methika
Family: Leguminaceae
Serum cytokine IL-4 levels significantly decreased when Fenugreek seed extract was used, while FEV1 and FEV1/FVC levels increased by 10%.the results of the study indicate that fenugreek seed aqueous extract may be utilized to treat moderate asthma because of its minimal adverse effects.



Fig: Musk Fenugreek

6. CONCLUSION

Asthma is a diverse disease affecting millions of individuals globally. It is characterized by fluctuating airflow restriction, airway inflammation, and hyper responsiveness. In order to manage asthma, it is critical to comprehend the many phenotypes and pathophysiology's and to provide individualized treatment that is appropriate for the patient's lifestyle and comorbidities. All above mentioned herbal ingredients like saffron ,clove,nutmeg, musk fenugreek, paper longum are found to be effective for asthma.

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INTEGRATION OF ART AND TECHNOLOGY: INNOVATIVE DEVELOPMENT OF CALLIGRAPHY IN THE ERA OF BIG DATA

Mo Xiaoli[1]; Ma Shenglong[1,2]
[1] *Zhaoqing University, Zhaoqing, Guangdong, 526061, China.*
[2] *Mongolian National University of Arts and Culture , Ulaanbaatar, 15140, Mongolia.*

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ABSTRACT
The development of art is closely linked to technological advancements. As a traditional Chinese art form, calligraphy is transformed into data in the era of big data, offering new possibilities and practical pathways for integration with technology. Under the influence of big data, the calligraphy database, educational platforms for calligraphy, the creation and authentication of calligraphy works, and calligraphy research have all been significantly impacted. Big data technologies enable the classification, storage, and retrieval of historical calligraphy works, delving into stylistic features and historical evolution. These advancements provide a rich foundation for the digital preservation of calligraphy, artistic creation and research, the establishment and development of educational platforms, and market analysis of calligraphy. However, the integration of big data and calligraphy also presents challenges, such as the redefinition of calligraphy and its stakeholders, the inability of AI-generated calligraphy to express human individuality, and risks associated with data pollution.

KEYWORDS: *Big Data; Calligraphy, Artificial Intelligence, Technology, Integration of Art and Technology*

1. INTRODUCTION
In an era of rapid advancements in information technology, big data has become a crucial driving force for societal progress and innovation. It has not only transformed the operational models of sectors such as commerce, finance, and healthcare but has also influenced people's lifestyles and production methods. Calligraphy, as a significant form of Chinese art, is a microcosm of ancient Chinese culture. Beyond being a form of Chinese character writing, calligraphy embodies profound cultural heritage and artistic value. It integrates aesthetics, philosophy, and history, carrying deep cultural connotations, aesthetic preferences, and artistic essence. It reflects the spiritual world and aesthetic pursuits of ancient Chinese scholars, along with their reflections on nature, society, and life. In the era of big data, calligraphy is inevitably influenced by these technological developments. The integration of calligraphy and big data technology provides a promising pathway for its advancement. This raises the question: how can calligraphy and big data effectively converge?

2. THE INTEGRATION OF BIG DATA AND CALLIGRAPHY
In an era of rapid advancements in science and technology, the intersection of art and technology has become a significant area of exploration. Technological progress has provided unprecedented opportunities for the evolution of traditional art forms. Calligraphy, as a quintessential representation of Chinese culture and art, plays a critical role in the preservation, inheritance, and development of national culture and artistry. In the age of big data, it finds itself at a pivotal stage of development. This technological framework not only offers novel tools for the preservation and dissemination of calligraphy but also opens innovative pathways for its education, creation, and research.

2.1 Calligraphy Databases
The development of any art form is closely tied to technological advancements. In the age of big data, technologies allow the visualization of calligraphy works to be preserved as images, forming comprehensive calligraphy data platforms. These platforms go beyond mere digitization for preservation and dissemination; they leverage cloud computing and the Internet of Things to expand functionality. Derived from calligraphy data platforms, digital systems such as online exhibition halls, communication forums, evaluation systems, and calligraphy character libraries have emerged. These tools facilitate learning, appreciation, and research of calligraphy works. Furthermore, big data analytics enable market trend analyses and consumer demand forecasting for calligraphy, helping artists and related organizations better position themselves in the market and create relevant works, ultimately driving the development of the calligraphy market.

Big data technologies also digitally classify and store information about calligraphers' lives and the history of calligraphy, making it accessible for research and learning by calligraphers and enthusiasts. One notable initiative in this domain was the 2007

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research project *Study of Indexing and Matching Algorithms for Calligraphy Character Images* led by Professor Jiangqin Wu at Zhejiang University. Funded by the National Natural Science Foundation of China, the project digitized calligraphy works preserved in museums—including those on paper, bamboo slips, and inscriptions—while developing algorithms for image indexing and matching to enable efficient retrieval of calligraphy images from large datasets. Similarly, the Chinese Academy of Sciences' Automation Institute developed a cloud-integrated calligraphy big data platform. This platform employs artificial intelligence (AI) technologies to provide intelligent services, such as resource sharing, collaborative creation, experiential exchange, and visual analysis, effectively integrating traditional and modern modes of calligraphy creation. It not only stores and shares historical calligraphy collections, individual character images, and instructional videos but also analyzes user behavior through big data to offer personalized learning recommendations (Yang et al., 2020).

The preservation and transmission of calligraphy are crucial for demonstrating its vitality. Different periods have adopted varying methods of transmission and protection, often shaped by technological advances in media (Fig. 1). During the Qin and Han dynasties, calligraphy was primarily transmitted by engraving on steles, but these inscriptions often suffered from weathering and loss, leading to significant degradation over time. In the Tang and Song dynasties, double-hook tracing on paper or silk became prevalent, offering accurate reproductions of original strokes and structures, though the method's technical complexity limited mass production. From the Song and Yuan periods onward, particularly during the Ming dynasty, the advent of block-printing techniques significantly enhanced the transmission and protection of calligraphy. However, repeated reprinting often led to distortion of the works, as evidenced by criticisms in Qing-era literature concerning the inaccuracies in *Yin Sou*. Today, advancements in computing, printing, and copying technologies allow for mass reproduction of works. The application of big data has fundamentally revolutionized the duplication and preservation of calligraphy, ushering in a digital era that replaces traditional engraving and tracing methods.

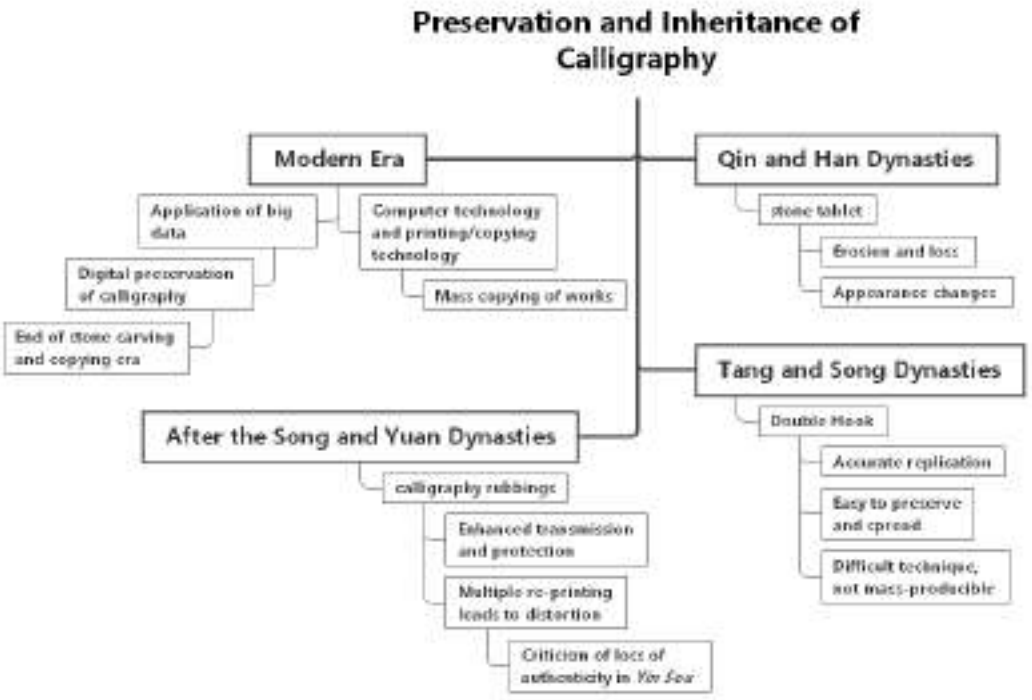


Fig. 1. Preservation and Inheritance of Calligraphy in Different Periods

2.2 Educational Platforms

"The method of learning calligraphy cannot achieve excellence without oral transmission and personal instruction" (Jie, 2013). In ancient times, learning calligraphy followed a limited pathway, primarily relying on oral instruction and hands-on teaching from a mentor, complemented by books on calligraphy techniques. With advancements in technology and the availability of abundant educational resources, the methods for learning calligraphy have expanded significantly. In addition to traditional mentor-apprentice transmission and technical manuals, online courses and live streaming have become accessible learning methods (Fig. 2). Big data further enhances the convenience and intuitiveness of calligraphy education, leading to the establishment of dedicated educational platforms.

Calligraphy education platforms leverage big data and artificial intelligence (AI) to develop teaching systems, intelligent classrooms, and interactive digital tracing tables. These tools, alongside virtual reality (VR) and augmented reality (AR)

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technologies, provide participants with an immersive teaching and learning experience. Such platforms address challenges related to the lack of conducive teaching environments and qualified instructors. For instance, Beijing Founder Electronics Co., Ltd. has developed a calligraphy education product known as *Founder Calligraphy*. By harnessing the power of big data and AI, *Founder Calligraphy* introduces a systematic interactive curriculum and cloud services tailored to the interactive relationship between teaching and learning. On the teacher's side, it enables the construction of a complete calligraphy teaching framework. On the student's side, it facilitates precise assessments, provides real-time feedback on writing issues, and recommends targeted learning plans.

Similarly, three undergraduate students at East China Normal University developed an intelligent calligraphy teaching system. This system, based on big data, incorporates a network character database containing thousands of famous inscriptions and handwritten scripts, as well as tens of thousands of images of pen-holding postures. It integrates technologies such as image processing, deep learning, augmented reality, and intelligent robotics (Chen & Wu, 2019).

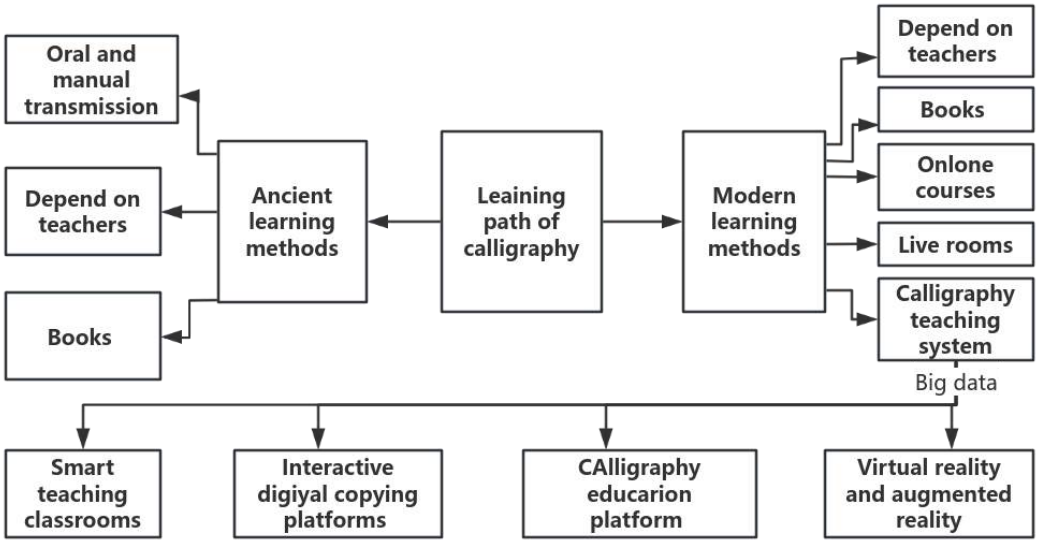


Fig. 2. The Learning Path of Calligraphy

Educational platforms for calligraphy utilize scientific and technological advancements to assist teaching. With rich educational resources, robust interactive capabilities, and personalized teaching and learning experiences, these platforms have been effectively applied to calligraphy education, significantly improving its overall quality.

2.3 Calligraphy Creation and Authentication Through Artificial Intelligence

As a pure art form, calligraphy is increasingly being analyzed as data. It has become a subject for data storage, analysis, and new creation by artificial intelligence (AI). Based on big data, AI utilizes deep learning algorithms to study a vast array of calligraphy works, assisting in the creation of calligraphy. It can simulate the characteristics of calligraphers' brushstrokes, character structures, and compositional styles to generate calligraphy pieces in specific styles. This capability enhances the efficiency and quality of calligraphy creation to some extent and introduces new forms of artistic expression and interactive experiences.

The capability of AI to create calligraphy lies in its ability to digitally convert the visual and stylized characteristics of calligraphy. These characteristics rely on the storage of calligraphy images and the construction of calligraphy databases. The digital transformation process is driven by the programming of writing software, which predefines writing styles, artistic aesthetics, and other keywords. The inputted textual content is then programmatically converted and output as calligraphy images. Essentially, AI operates under predetermined instructions, resembling a formulaic standardized production process (Wang, 2021). *Fig. 3* illustrates this process. This inherent attribute of AI results in its creations being formulaic, procedural, and rigid, lacking the personalized touch and expressiveness of human calligraphy creators.

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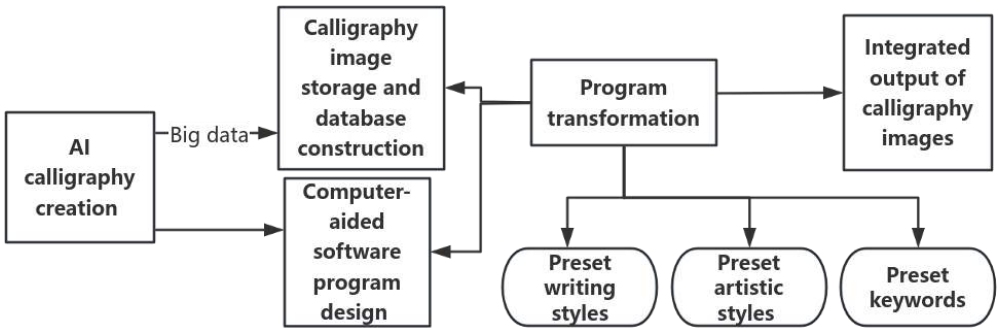


Fig. 3. The Process of AI Creating Calligraphy

AI also learns from the works of historical calligraphy masters, analyzing styles, brushstroke techniques, and compositional layouts through algorithms. These elements—style, brushwork, and composition—are the basis for authenticating the genuineness of a calligrapher's work and serve as essential criteria for stylistic periodization. Therefore, AI provides valuable tools for the authentication and chronological classification of calligraphy pieces.

2.4 Academic Research

In the era of big data, this technology has permeated various fields, transforming calligraphy into analyzable images and data. As a pure art form, calligraphy is increasingly subjected to data analysis. Big data technologies integrate vast resources related to calligraphy, including images, historical records, theories, designs, retrieval systems, and authentication tools. By employing big data analytics and storage, these resources are deeply mined and researched. One of the earliest applications of big data in calligraphy research was by the China Calligraphers Association during the 11th National Calligraphy and Seal Engraving Exhibition. This event employed statistical data to quantify the proportion of entries in each calligraphic style, which were then used to allocate quotas for each style and conduct preliminary evaluations accordingly. The association used the same method during the 12th National Calligraphy and Seal Engraving Exhibition. Beyond exhibitions, big data technologies are also applied to calligraphy education, the study of calligraphers, and historical periodization, offering a comprehensive and objective representation of the current state of calligraphy research in a data-driven manner.

With the proliferation of massive information and resources, calligraphy research has inevitably embraced the influence of big data. These technologies facilitate the handling of extensive datasets, simplifying the processes of collection, retrieval, and utilization for scholars engaged in academic research on calligraphy.

3. CHALLENGES AND ISSUES IN THE INTEGRATION OF BIG DATA AND CALLIGRAPHY

In the context of big data, the integration of art and technology has become an inevitable trend. "Calligraphy must resonate with the times; it should serve as an artistic conduit for societal development and technological progress, interacting with people's everyday lives, the internet, artificial intelligence, and more" (Chen, 2017). While big data provides numerous opportunities for the innovative development of calligraphy, it also introduces significant challenges.

3.1 Redefinition of Calligraphy

Calligraphy, traditionally defined as the art of writing Chinese characters, has always been considered a human endeavor. However, in the context of big data, artificial intelligence (AI) can now create calligraphy, produce works, and participate in teaching activities. This development appears to diminish the centrality of human agency in calligraphy, leading to a reevaluation of what constitutes calligraphy, the role of calligraphers, and the identity of educators in the field. This redefinition is not limited to calligraphy; other art forms have also been affected. For instance, in painting, AI can transform natural images into artistic renderings based on stylistic instructions.

In modern history, the introduction of the fountain pen to China during the Republican period marked the separation of practical Chinese writing from traditional brush calligraphy, with the pen replacing the brush for utilitarian purposes. However, artistic writing continued to rely on the brush. As long as one wielded a brush, the act was regarded as calligraphy. Today, AI is also capable of producing brush-written works. Can AI, then, be considered a calligrapher? Historically, calligraphy has been viewed as an expressive art form, embodying sentiments such as "to encircle soaring aspirations or to release pent-up emotions" (Zhang, 2014). AI's handwritten and generated works are contingent on pre-programmed instructions and preloaded data. From this perspective, AI cannot truly be recognized as a calligrapher.

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It is undeniable that AI-generated calligraphy works can sometimes be aesthetically impressive, even rivaling those of ordinary calligraphers. However, compared to high-level calligraphers, AI still exhibits significant shortcomings, often producing works that are formulaic and lack depth. While AI-generated works may pose a career challenge for average calligraphers, they also exacerbate the difficulty of sustaining calligraphy as a pure art form in modern society. Regarding whether AI can replace teachers in education, the answer is also negative. The mission of teaching is not just to impart knowledge but also to nurture individuals. In this respect, AI cannot replicate human care and empathy. Nevertheless, AI has made calligraphy education more diverse, intuitive, and engaging.

3.2 The Inability of AI-Generated Calligraphy to Express Human Individuality

Calligraphy is an art form that conveys personal emotion and character. However, AI, rooted in big data, lacks human sensibility. In its creative process, AI-generated calligraphy fails to express human individuality. "Individual expression exists in all forms of art, such as painting, sculpture, and architecture. However, the most intimate and authentic form of individual expression is writing. If we consider the ability to express individuality as the pinnacle of art, then among all forms of art, writing ranks the highest. Writing possesses the beauty of lines, light, force, and individuality, making it immensely valuable in art. Writing has strengths that other forms lack and can express what others cannot" (Xia, 2020).

AI creates art by utilizing writing software programmed with predefined styles, artistic features, and other keywords. The software processes input text into output calligraphy images based on a data-driven approach. Although this process can simulate certain individual traits, the resulting works inherently lack true individuality. In the realm of big data, AI-driven calligraphy creation does not authentically express human uniqueness.

The lack of individuality is not a problem unique to AI-generated calligraphy but a broader issue in AI-generated art. This limitation provides an opportunity for the continued development of traditional calligraphy and points to directions for the advancement of AI technology.

3.3 Caution Against Big Data Pollution

Big data technologies offer new perspectives and tools for the innovative development of calligraphy. The deep integration of big data and calligraphy ushers in a new phase of growth for this art form. However, while big data facilitates the advancement of calligraphy, it also requires vigilance against the risks of data pollution.

The processes of storing, analyzing, integrating, and generating calligraphy works through big data often rely on algorithms and AI systems. These involve program design, which, if flawed, can negatively affect the analysis and study of calligraphy. Furthermore, algorithms and AI-generated calligraphy works, as well as teaching videos, depend on vast amounts of image and textual data. Therefore, the accuracy of data collection, storage, and algorithm and program design is critical. Precautions must also be taken against the falsification or manipulation of images and texts in AI-generated works and videos.

The widespread adoption of big data has marginalized traditional calligraphy tools, with digital alternatives such as styluses and touch screens replacing brushes and paper. This shift in creative tools inevitably affects the writing habits of calligraphers, influencing their aesthetic principles. The unique ink textures and writing techniques of traditional calligraphy are difficult to fully replicate in digital formats, posing challenges to the preservation and transmission of this art form.

Additionally, big data simplifies the duplication and dissemination of calligraphy works. However, it raises concerns about copyright protection and the gradual erosion of uniqueness and artistic value in the digital replication process. Thus, while big data promotes innovative development in calligraphy, caution is needed to prevent data pollution. Protecting the traditional and unique aspects of calligraphy ensures that this art form can thrive in the digital age in a sustainable and authentic manner.

4. CONCLUSION

In 1940, the renowned Chinese painter Fu Baoshi stated in *A Brief History of Chinese Seal Carving*: "The fundamental source of Chinese art is calligraphy. Without a proper understanding and appreciation of calligraphy, one could say that all connections to Chinese art are severed. Chinese characters are composed of lines. Their structure, regardless of the complexity of the strokes or the style—seal, clerical, or other script—maintains an extraordinarily harmonious and tranquil balance within square or other defined shapes. This distinguishes them from the characters of other cultures. Within this consistent size, through focused observation and an innate sense of appreciation, the viewer can experience boundless imagination, infinite charm, and novel creativity through the varying strokes. Almost all forms of Chinese art have developed along this pathway" (Fu, Wan, Zhang, & Nanjing Museum, 2007). Fu Baoshi, who initially focused on seal carving and deeply studied calligraphy, had profound insights into the relationship between calligraphy and other Chinese arts. His statement aptly underscores that calligraphy is the source of Chinese art. As a vital component of traditional Chinese culture, calligraphy is not merely a form of character writing but a vessel carrying profound cultural heritage, aesthetic sensibilities, and artistic essence. Through calligraphy, one can glimpse the spiritual world and aesthetic tastes of ancient Chinese scholars and understand their reflections on nature, society, and life. This unique art form, cherished by the literati of ancient China, serves as a microcosm of Chinese culture.

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The integration of technology with other disciplines has advanced interdisciplinary research. Big data provides new opportunities for the innovation and development of calligraphy, influencing cultural heritage and educational practices while presenting associated challenges. Big data enables the digital preservation, artistic creation, education, cultural exchange, market analysis, and academic research of calligraphy, fostering its transmission and development in modern society. By embracing technology, calligraphy can advance further in the context of big data, ensuring its place as a vibrant and enduring art form.

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DEVELOPING CROSS-CULTURAL COMPETENCE IN MUSIC TALENT FOR CIVILIZATIONAL EXCHANGE AND MUTUAL LEARNING

He Ruimei
Music College of Zhaoqing University,Zhaoqing, Guangdong, China

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ABSTRACT
With the deepening of globalization, exchanges and mutual learning among different civilizations have become a crucial driving force for promoting global harmony and development. As an art form that transcends human language and culture, music plays a vital role in fostering communication and understanding between diverse civilizations. Against the backdrop of civilizational exchange and mutual learning, this paper explores the importance and necessity of cultivating cross-cultural competence in music talent. It further investigates implementation pathways and strategies, aiming to provide valuable insights and references for the field of music education.
KEYWORDS: *Civilizational Exchange and Mutual Learning; Music Talent; Cross-Cultural Understanding; Global Landscape; Musical Cultural Literacy*

1. INTRODUCTION
On March 27, 2014, President Xi Jinping, in his speech at the UNESCO headquarters in Paris, stated, "Civilizations become enriched through exchanges and vibrant through mutual learning. Civilizational exchange and mutual learning are crucial driving forces for the advancement of human civilization and the peaceful development of the world" (Central Compilation and Translation Bureau of the People's Republic of China, 2024). Deepening civilizational exchange and mutual learning is essential for eliminating barriers and misunderstandings between people, fostering emotional and intellectual connection, and strengthening the foundation of a shared future for humanity. As a universal and shared language of humankind, music possesses unique characteristics in its melodic expression, making it a global "language" with distinct cross-cultural exchange value. Music has played a unique role in fostering understanding and respect for cultural diversity through interaction among peoples of various nations. Therefore, cultivating the cross-cultural competence of music talent is of significant importance in advancing global civilizational exchange and enhancing confidence in Chinese culture.

2. THE IMPORTANCE OF CULTIVATING CROSS-CULTURAL COMPETENCE IN MUSIC TALENT
Over the past four decades of reform and opening-up, China's comprehensive national strength and international standing have undergone substantial enhancement, leading to increasingly close ties with the world. There is a growing global interest in understanding China—this Eastern nation's history, culture, and rapid development. Simultaneously, China must systematically and accurately comprehend the cultures of other nations to better integrate into the global community. Actively introducing Chinese musical culture, disseminating its distinctive sounds, and amplifying its voice have become integral to China's journey toward globalization. Amid the ongoing process of globalization, President Xi Jinping's Belt and Road Initiative has guided China into constructive engagement with the world. Strengthening the international communication capacity of Chinese musical culture and deepening exchanges and mutual learning between civilizations have become urgent imperatives.

2.1 Asserting Discourse Power: From "Other-Molded" to "Self-Molded"
Chinese musical culture bears a significant mission in amplifying the Chinese voice, narrating compelling stories about China, and presenting a genuine, multidimensional national image. However, merely mastering Chinese musical culture is far from sufficient to establish meaningful connections between Chinese and global musical cultures. Only by conducting in-depth studies of Western musical culture, the musical traditions of non-Western countries, and the history and current state of contemporary global music can a systematic and comprehensive understanding of world music be achieved. Cultivating exceptional cross-cultural understanding and communication abilities in music talent—specifically, the ability to grasp the aesthetic philosophy of Chinese music and the cultural significance of global music—is crucial. Thus, enhancing cross-cultural understanding and promoting the broad dissemination of Chinese musical culture are integral to fostering civilizational exchange and mutual learning between China and other nations (Li, 2019).

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Nonetheless, the dichotomous framework of "Western dominance and Eastern inferiority" and "Eurocentric cultural superiority" persists in the international music community. Consequently, Chinese music continues to face challenges of "imbalance" and "silence" within the global music ecosystem. Historically, the image of Chinese oriental music was often shaped by external biases or tailored to suit others' needs. For instance, early Western writings frequently described the vocal techniques of Chinese opera—such as Peking opera—as sounding "like a fishbone stuck in the throat" or "like a cat whose tail has been stepped on". Such depictions reflect how Western perspectives, from the "Sick Man of East Asia" stereotype to the contemporary "China threat" narrative, have imposed labels on China. These externally constructed images are neither inherent nor objective but rather are creative fabrications devised to denigrate others and elevate themselves by projecting a dominant posture over less affluent nations.

To transform the externally constructed image of China, Chinese musical culture practitioners must dare to "speak out", using the platform of Chinese music to shape the national image and assert a narrative of Chinese culture through their voices. Elevating the international communication efficiency of Chinese musical culture and aligning its global discourse power with China's comprehensive strength and international status has become a strategic imperative at the national level.

2.2 Shifting Perspectives: Balancing "Performing China" and "China Performing"

The mission of Chinese music talent has evolved from a sole focus on "performing China" to a balanced emphasis on "China performing". Similarly, it has shifted from merely enabling "China to understand the world" to facilitating "the world to understand China". This proactive approach seeks to "self-mold" a comprehensive, multidimensional, and authentic image of China for the world. Mastery of Chinese music, even in its diverse forms, is insufficient to establish meaningful connections between China and the global community. A deep understanding of Chinese music's history, culture, and contemporary context, alongside extensive research into the histories, cultures, and realities of foreign musical traditions, is essential for attaining a systematic and holistic grasp of world music. This necessitates the cultivation of cross-cultural competence in music talent—the ability to accurately comprehend both Chinese philosophical and cultural thought and the broader spectrum of global musical culture. The application of global music cultural perspectives to disseminate Chinese cultural thought internationally is a cornerstone for implementing China's international communication strategies and strengthening its global communication capabilities.

The report of the 19th National Congress of the Communist Party of China emphasized the need to "enhance international communication capacity, tell China's story well, present a real, multidimensional, and comprehensive China, and improve national cultural soft power". Successfully narrating China's story to foster a better global understanding of the nation hinges on cultural outreach. Music, with its capacity to "harmonize the world", offers a powerful medium for this purpose. Since the reform and opening-up period, Chinese music culture has transitioned from merely "going out" to deeply "going in" on the global stage. Moving from superficial outreach to meaningful, sustainable engagement represents a pivotal historical evolution. The future of Chinese music education hinges on finding ways to deepen and sustain this engagement, ensuring that global audiences not only hear but also understand China's voice and, through it, its culture (National Committee Member of the CPPCC, 2020).

A nation or people cannot thrive without a spiritual essence. Artistic endeavors are foundational in shaping and nurturing this essence. In recent years, China's cultural industry has experienced exponential growth, thriving domestically and extending its influence internationally. The global dissemination of Chinese music culture aligns with China's strategic response to globalization and its commitment to deeper reform and opening-up. Through music, artists convey the sounds of China, its cultural identity, and the achievements of the Communist Party of China in leading the people toward the realization of the Chinese Dream of national rejuvenation. Against the backdrop of today's complex international landscape, the balanced approach of excelling in both "performing China" and "China performing" carries profound and far-reaching significance.

2.3 Seizing Opportunities to Share China's Musical Voice with the World

Culture, as the soul of a nation and a people, is deeply rooted in their rich heritage, reflecting unique characteristics, identity, and value. Only by thoroughly understanding the origins and foundational elements of a nation's or people's culture can one develop an objective and insightful perspective on the world. Similarly, gaining an in-depth understanding of the music, history, and civilizations of different regions and nations globally—including their aesthetic values and audience preferences—is essential to establishing a comprehensive and systematic understanding of world music. Music, as a medium of exchange, enables emotional connection and fosters mutual trust and understanding. It bridges civilizational divides, transcends cultural conflicts through mutual learning, and moves beyond notions of civilizational superiority through coexistence.

Music assumes a pivotal role in human communication and integration. As a key means of interaction, it leverages the beauty of lyrics and melodies to relax audiences and enhance mutual cultural understanding. By sharing Chinese music with the world, the melodies and lyrics facilitate cross-cultural exchange, while the essence conveyed is rooted in Chinese cultural philosophy. Across the vast dimensions of time and geography in the history of music, musical language has recorded aesthetic philosophies from various periods, regions, and peoples, constituting a valuable asset for human civilization. Consequently, every

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possible opportunity must be seized to share China's musical voice globally.

Encouraging the integration of music with other art forms—such as dance, drama, and film—can inspire the creation of innovative and appealing works. These interdisciplinary creations can effectively showcase the diversity and inclusiveness of Chinese culture (Sheng, 2023). Cross-cultural musical exchanges break linguistic and geographical barriers, fostering global cultural dialogue and integration. Musical language plays a crucial role in facilitating international collaboration and cooperation, acting as a vessel for the exchange of ideas and cultural insights. Musicians fluent in two or more musical "languages" naturally become vital "guides" for cultural exchange, serving as bridges between diverse traditions (Gao, 2013).

3. USING MUSIC AS A MEDIUM FOR INTERNATIONAL DISSEMINATION OF CHINESE CULTURE

The report of the 19th National Congress of the Communist Party of China emphasizes, "Respect the diversity of world civilizations; use civilizational exchange to transcend barriers, civilizational mutual learning to overcome conflicts, and civilizational coexistence to surpass notions of superiority." This principle has established a new direction for the teaching and development of contemporary Chinese and global ethnomusicology (Zhang, 2018).

3.1 Music as a Medium

To effectively use music as a medium for the international dissemination of Chinese culture, profound knowledge of Chinese, world, and regional music is indispensable. It begins with an understanding of Chinese musical traditions and extends to a deep exploration of the cultural context and nuances of international audiences. This requires a comprehensive grasp of their worldview, values, historical perspectives, cultural outlook, thought processes, and discourse systems. Musical language is inherently interdisciplinary, built upon melodies and centered on culture. Studying and researching the melodies and lyrics of traditional Chinese music inevitably involves knowledge from disciplines such as politics, economics, history, philosophy, geography, and even natural and information sciences. This interdisciplinary approach often relates to the linguistic and historical cultural heritage of the target country or region and necessarily entails an understanding of their core values and ideologies.

Thus, music transcends its role as a mere communication tool; it becomes a critical "medium" that provides theoretical guidance and research support for the study of national and regional cultures. Through primary research on the music of a target nation or region, it is possible to absorb and integrate beneficial musical theories and academic achievements from across human history. This enables a thorough analysis of the value systems and discourse frameworks of other regions, nations, and ethnic groups, thereby better serving the state and supporting the global dissemination and promotion of Chinese music culture and values.

The cultivation of cross-cultural competence in music talent for civilizational exchange and mutual learning is an essential skill for all music professionals. This competence equips them to navigate the influx of new musical influences from abroad with clear discernment and critical thinking. It enables them to quickly, deeply, and accurately understand trends in international music, minimizing the disparity between Chinese and global music discourse systems. Moreover, it provides an opportunity not merely to understand other nations and regions but also to reevaluate and redefine the self from a Chinese perspective. By doing so, Chinese musicians can construct a comprehensive and systematic understanding of world music, contributing meaningfully to the progress of human civilization.

3.2 Research and Understanding of Foreign Cultures as the Basis for Successful International Dissemination of Chinese Thought and Culture

The rich diversity of human civilizations underscores the inherent value of each. Recognizing that every nation and ethnicity has a unique civilization is essential. Properly addressing the civilizations of different countries and peoples, as well as their traditional and contemporary cultures, requires continuous exploration and utilization of the outstanding ideas and extensive knowledge created by humanity. Only through this understanding can we better perceive the world, society, and ourselves, ultimately contributing to a brighter future for human society. Each country and nation possesses distinct ways of thinking and discourse systems, and understanding their historical and cultural backgrounds is crucial for grasping their national characteristics and the historical context of their citizens' spiritual worlds.

To truly achieve the desired effect of international dissemination of Chinese musical culture, it is necessary to ensure that the emotional resonance of music deeply touches global audiences. This requires an attitude of equality and respect toward other civilizations. Regardless of size or strength, every nation and ethnicity's musical culture deserves recognition and respect. As the saying goes, "There is no superior or inferior in musical culture, only diversity and regional distinctions. Fusion can only occur through exchange, and progress can only be made through fusion."

In terms of content, the dissemination of Chinese musical culture must fully account for cultural differences and involve an accurate understanding of the thoughts and cultures of relevant countries, regions, and ethnicities. This approach is vital for improving the ability to construct an international communication framework for Chinese music. Regarding dissemination methods, telling China's musical story requires first understanding and internalizing the essence of that story. Familiarity with the customs, psychology, and lives of the target audience allows

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performers to use musical expressions that resonate with local audiences. By bridging psychological distances with familiar modes of performance, the cultural and musical content can be communicated effectively. This approach makes the symbolic spirit of Chinese musical culture widely recognizable and fosters emotional resonance on a larger and broader scale (Li, 2023).

3.3 Precision in International Expression as the Core of Building China's Music Communication Capability

The dissemination of Chinese musical thought and culture abroad is rich in compelling stories, but what is lacking are methods and expressions that align with the cultural psychology of international audiences, touching their hearts with precision. This necessitates that China's international communication efforts, while rooted in its outstanding traditional musical culture, also draw on shared human values and the diversity of civilizations. A deeper understanding and comparison of musical cultures from other nations is essential to achieving integration in musical exchanges and transcendence in mutual interactions.

The Chinese people's aspiration for truth, goodness, and beauty aligns with the universal pursuit of a better life shared by people worldwide. For instance, in music, the West has *Romeo and Juliet*, while China has *The Butterfly Lovers (Liang Shanbo and Zhu Yingtai)*. Although numerous classic works in foreign art focus on the theme of love, their cultural contexts, artistic techniques, and forms of expression often resonate with *The Butterfly Lovers* in strikingly similar ways. Therefore, when appreciating these works, we must adopt an open mindset to understand and experience the themes of love and artistic charm they convey.

However, as humanity faces increasingly shared and severe challenges, these remind us of the necessity to respect the diversity of world civilizations and cultures. On October 25, 2021, during the 50th anniversary of the restoration of the People's Republic of China's lawful seat in the United Nations, President Xi Jinping stated, "Promoting the building of a community with a shared future for mankind does not mean replacing one system with another, nor one civilization with another. It involves countries with different social systems, ideologies, historical cultures, and development levels coexisting and sharing benefits, rights, and responsibilities in international affairs, finding the largest common ground to build a better world."

This perspective reflects China's approach of engaging with the world from a humanistic and global standpoint. By integrating Chinese practices into the global framework, it presents the world with a new perspective on civilization and development rooted in Chinese wisdom. This is China's contribution to the evolution of human civilization.

4. PATHWAYS TO CULTIVATING CROSS-CULTURAL COMPETENCE IN MUSIC TALENT

In the context of the new era, Chinese music talent faces the dual mission of transitioning from solely "performing China" to balancing it with "China performing", as well as shifting from "China understanding the world" to "the world understanding China". To achieve this transformation, a proactive approach toward "self-molding" a comprehensive, multidimensional, and authentic image of China is essential. Below are specific strategies to achieve this:

4.1 Building Platforms to Deepen International Exchange and Cooperation

Strengthening international exchanges and cooperation in music culture requires, at the macro level, establishing stable and long-term partnerships with foreign music academies, music groups, and art institutions. This includes jointly planning and implementing music exchange projects, facilitating mutual visits of artists and scholars for lectures, performances, and creative endeavors, as well as co-organizing music festivals and concerts. Encouraging interdisciplinary collaborations between music and other art forms—such as dance, theater, and film—can result in the creation of more innovative and captivating works, showcasing the diversity and inclusiveness of Chinese culture.

At the national level, implementing international music cooperation projects plays a critical role, with the Music Confucius Institutes serving as a prominent example. These institutes, as specialized branches of the broader Confucius Institute network, are key platforms for promoting Chinese musical culture. Through overseas courses, concerts, and lectures, they introduce the unique charm and profound depth of Chinese music to students and audiences worldwide. Furthermore, Music Confucius Institutes contribute to cultivating international music talent by partnering with foreign music schools to provide opportunities and platforms for learning Chinese music. Students at these institutes receive systematic Chinese music education while engaging directly with Chinese music teachers and artists, deepening their understanding of the essence and richness of Chinese music (Wang, 2016).

As an essential platform for international music exchange and cooperation, the Music Confucius Institutes create ample opportunities for collaboration between global musicians and institutions. By organizing events such as concerts, music festivals, and seminars, they facilitate cultural exchange and cooperation among musicians, promoting the diversity and integration of international music cultures. Collaborations between Chinese and international music schools further enhance the global influence of Chinese music education, highlighting its progress and development while opening doors for its continued international growth.

Additionally, these institutes encourage Chinese music talent to participate in multinational creative, performance, and research

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projects. Examples include collaborations with renowned international musicians, composers, and producers to develop music with cross-cultural appeal. Platforms such as international music festivals, competitions, and exhibitions are leveraged to promote Chinese music works and artists. Specialized concerts, exhibitions, and lectures further amplify the visibility of Chinese music culture and its artists globally (Wang, 2016). These initiatives not only increase international understanding and appreciation of Chinese music but also play a vital role in the global dissemination of Chinese music culture, fostering deeper exchanges and cooperation in international music and communicating the unique charm and cultural essence of Chinese music to global audiences.

4.2 Cultivating Internationally-Oriented Music Communication Talent

Enhancing the professional skills, cross-cultural communication abilities, and creativity of music talent can be achieved by strengthening music education, providing ample practical opportunities, and broadening international perspectives. This fosters the international development of music professionals. For instance, encouraging and supporting music talent to showcase their skills and strengths on global stages—by participating in international competitions, performances, and research projects—significantly boosts the global recognition and influence of Chinese music talent. Additionally, fostering collaboration and exchanges with the international music community offers more opportunities and resources for growth.

Building and managing music talent teams is also critical. Establishing specialized music groups and orchestras creates opportunities for greater collaboration and interaction among music professionals. Focusing on teamwork and internal coordination enhances the overall strength and competitiveness of such teams. By promoting international exchanges and cooperation, reinforcing local music education and innovation, narrating compelling stories about Chinese music, constructing a global Chinese music discourse, and cultivating internationally-oriented music talent, these efforts collectively drive the global dissemination and development of Chinese music. Ultimately, they allow the world to gain a more comprehensive, multidimensional, and authentic understanding of China and its musical culture.

4.3 Strengthening Local Music Education and Innovation

To reinforce the education and inheritance of Chinese traditional music, the music education system should prioritize the introduction of courses on traditional music, as well as the organization of traditional music lectures and concerts. These initiatives aim to cultivate students' love and appreciation for Chinese traditional music. Furthermore, music talent should be encouraged to explore diverse styles and forms of creative expression. By integrating various musical elements and styles, musicians can produce innovative and contemporary works.

Special attention should be paid to uncovering and revitalizing traditional Chinese musical elements, ensuring their transmission and development in modern music. This includes hosting training programs, seminars, and workshops to enhance the professional skills and teaching capabilities of music educators. Encouraging music teachers to actively engage in international exchanges and collaborations allows them to absorb advanced educational concepts and teaching methodologies from around the world. These strategies are key to strengthening local music education and fostering innovation.

4.4 Constructing a Chinese Music Discourse System

The music culture of every nation and ethnicity has its unique developmental trajectory. This serves as the foundation for corresponding ideas and conceptual systems, forming discourse systems with historical significance and contemporary relevance. Discourse and discourse systems exist to support discourse power. They reflect the systematic and distinctive features of academic research while possessing strong ideological characteristics. Building a mature and robust discourse system is directly related to the consolidation and enhancement of national discourse power. Therefore, the discourse system of Chinese music must be rooted in traditional Chinese music theory and knowledge systems while advancing the ability to interpret both China and the world through Chinese music theory and scholarship (Liu, 2018).

To achieve this, it is essential to enhance research in Chinese music theory by focusing on the origins, development, characteristics, and values of Chinese music, which will help develop a music discourse system with distinct Chinese characteristics. Collaboration and exchange with the international music community are equally important for absorbing cutting-edge research and theoretical advancements. Advancing music standards requires active participation in the formulation and promotion of international music standards, as well as collaboration with international music institutions to facilitate the standardization and normalization of Chinese music in global contexts. Integrating unique Chinese musical elements and forms of expression into international standards can further enhance recognition and influence on the global stage. Strengthening music criticism and evaluation is vital for elevating the quality and standard of Chinese music works through the development of professional music criticism and evaluation, with scholarly critiques and expert opinions playing a pivotal role in improving the overall caliber of Chinese musical compositions.

Cultivating cross-cultural competence in music talent for civilizational exchange and mutual learning requires a multifaceted approach. This includes deepening international exchanges and collaboration, strengthening local music education and innovation, telling compelling stories about Chinese music, constructing a Chinese music discourse system, and fostering internationally-oriented music professionals. These efforts collectively support the dissemination and development of Chinese music on the global stage, providing the world with a

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more comprehensive and nuanced understanding of Chinese music and its cultural heritage.

For music learners and communicators, maintaining a firm grounding in Chinese cultural identity and deeply understanding China's history and cultural traditions is essential. Only with this foundation can they develop accurate and comprehensive perspectives on global musical cultures based on Chinese theories and knowledge systems. This enables them to draw on the strengths of foreign musical cultures, adopt a critical and inclusive approach, and use music as a tool for research and exchange. In doing so, they can contribute to the construction of China's global music discourse system, presenting Chinese civilization in accessible and comprehensible ways, amplifying China's voice, and articulating the nation's role and relationship with the world.

5. CONCLUSION

In the face of an era characterized by unprecedented changes, despite peace and development being the overarching themes of our time, conflicts, diseases, and poverty continue to threaten global security. As a developing major power, China remains committed to keeping its doors open to reform and international engagement, further expanding these avenues. Music, as a medium for communication with the world, serves as a bridge to connect hearts and foster mutual understanding. Enabling the world to hear China's voice and comprehend its language and melodies is the mission of contemporary musicians and reflects the value of studying and researching music today. Cultivating cross-cultural competence in music talent for civilizational exchange and mutual learning is a crucial force in a nation's diplomatic engagement and a key medium for promoting and preserving its culture.

This endeavor must be rooted in a distinctly Chinese perspective, grounded in the nation's heritage. It requires music talent to possess both technical proficiency and interdisciplinary communication skills, comprehensive knowledge of Eastern and Western musical cultures, solid academic expertise in music, and a sharp innovative spirit. Additionally, it demands an expansive international outlook and a profound sense of national pride and cultural confidence.

China, with its five millennia of brilliant civilizational history, has ample reason to uphold its cultural confidence. By utilizing the enchanting language of music and the insights derived from related research, China can articulate the contemporary value of its traditional musical culture, explore shared human values, and present the enduring history and humanistic depth of Chinese civilization to the international community. This fosters deeper global understanding of contemporary Chinese music culture and supports sustained exchanges and mutual learning among the cultures of China and the world (Su, 2022).

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Author Biography and Contact Information

He Ruimei is a lecturer at Music College of Zhaoqing University, and a visiting scholar at the Institute of Area Studies, Peking University. She is also a member of the Center of International and Regional Studies of Zhaoging University. Her primary research areas include world ethnic music, Chinese ethnic and folk music, and international and regional studies.

Correspondence Address: He Ruimei, Cultural and Creative Park, Room A205, University Science and Technology Park, Zhaoqing University, Duanzhou District, Zhaoqing City, Guangdong Province, P.R. China. Postal code: 526061.

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EFFICACY OF BIOLOGICAL CONTROL AN INSTITUTIONAL ASSESSMENT OF NON-CHEMICAL TREATMENTS FOR PLANT DISEASES IN YOLA, ADAMAWA STATE, NIGERIA

Halliru Abdu[1], Mohammed Bako Yerima[2], Ahmed Bello[3]
[1]*Ph.D Federal College of Education Yola Department of Psychology*
[2]*Federal College of Education Yola Department General Studies*
[3]*Federal College of Education Yola Department General Studies*

ABSTRACT
Biological control has emerged as a sustainable alternative to chemical treatments for managing plant diseases, reducing chemical residues, and preserving the environment. This study assesses the efficacy of biological control methods employed by institutions in Yola, Adamawa State, Nigeria. It evaluates their implementation, outcomes, and challenges. Data were collected from experimental farms on plants characters and disease incidences. The findings reveal a high potential for biological agents, such as Trichoderma harzianum and Bacillus subtilis, in controlling key pathogens affecting tomatoes and maize. Recommendations focus on capacity building and government policy support to enhance the adoption of these eco-friendly measures.

KEYWORDS: *Biological control, plant diseases, non-chemical treatments, Yola, Adamawa State, sustainable agriculture.*

INTRODUCTION
Plant diseases pose a significant threat to global food security, with annual crop losses attributed to pathogens estimated at 20–30% (Savary *et al*., 2019). The overreliance on chemical pesticides for disease control has raised concerns regarding environmental degradation, human health risks, and the development of resistant pathogen strains (Oerke, 2020). Biological control, which employs natural antagonists like beneficial microorganisms and bio pesticides, offers a sustainable alternative aligned with ecological and economic goals (FAO, 2021).Yola, Adamawa State, is an agrarian hub in North-eastern Nigeria, where crops such as tomatoes and maize are staple agricultural commodities. Despite the increasing availability of BCAs globally, their adoption in this region is minimal due to various challenges, including low awareness, inadequate funding, and a lack of technical capacity among farmers and institutions. Previous studies, such as those by Olufemi *et al*. (2020), emphasize the potential of BCAs in mitigating fungal and bacterial diseases under Nigerian agro ecological conditions. However, empirical evidence from localized studies is sparse.

This study explores the institutional implementation of biological control methods in Yola. It assesses the efficacy of BCAs in managing plant diseases and identifies the barriers to their adoption. By integrating experimental results and institutional perspectives, the research contributes to the growing discourse on sustainable agriculture in Nigeria. Chemical pesticides have been the cornerstone of plant disease management for decades, yet their overuse has led to significant environmental and health concerns. Biological control offers a promising alternative, leveraging natural enemies and microbial agents to suppress plant pathogens. This approach aligns with global trends toward sustainable agriculture and the Sustainable Development Goals (SDGs), particularly Goal 2 (Zero Hunger) and Goal 15 (Life on Land) (FAO, 2021).

Adamawa State, with its diverse agro ecological zones and reliance on agriculture, faces a dual challenge: increasing agricultural productivity and mitigating the environmental impacts of chemical inputs. Despite the availability of biological control agents (BCAs) globally, their adoption in Yola remains limited. Studies such as those by Olufemi *et al*. (2020) have highlighted the potential of *Trichoderma spp*. and *Pseudomonas fluorescens* in managing fungal diseases in Nigeria, but localized evidence is scarce. This research aims to bridge this gap by assessing the efficacy of biological control methods in combating plant diseases in Yola. It explores the institutional landscape, implementation strategies, and outcomes of non-chemical treatments, focusing on key crops such tomatoes, peppers,and maize. The study contributes to understanding how institutional frameworks and practical applications intersect to shape the adoption and effectiveness of BCAs. It further provides actionable recommendations for stakeholders, including policymakers, researchers, and farmers, to enhance the sustainable management of plant diseases in the region.

AIMS AND OBJECTIVES
1. To determine the efficacy of selected biological control agents in reducing plant disease incidence and improving crop yield

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2. To provide actionable recommendations for improving the adoption and effectiveness of biological control in Yola.

MATERIAL AND METHODS

The study was conducted in Yola, Adamawa State, located in Northeaster Nigeria between July 2024 to November 2024. The region has a tropical climate with distinct wet and dry seasons. The study focused on field experiments within University institutions, research farms. Yola's climate, characterized by distinct wet and dry seasons, presents conducive conditions for both crop cultivation and pathogen proliferation (Tukur 2020).The experiment was conducted on research farms at Modibbo Adama University Yola between july 2024 to November 2024 using a Randomized Complete Block Design (RCBD).Treatments included: a. Control (untreated plots) b. Chemical fungicide (standard commercial product) c. *Trichoderma harzianum* (biological agent)d. *Bacillus subtilis* (biological agent)**Crops** sown wereTomatoes (*Solanum lycopersicum*) and maize (*Zea mays*). Pathogens used were: *Fusarium oxysporum* (tomatoes) and *Pythium spp*. (maize). Diseases were monitored weekly, and data on disease incidence, severity, and plant health were recorded for eight weeks.A randomized complete block design (RCBD) was used in the field experiment. Three biological control agents Trichoderma spp., Bacillus subtilis, and neem oil—were tested against three major plant diseases: Fusarium wilt, Late Blight, and powdery mildew. The control group involved untreated plants. Biological control agents used were Trichoderma spp, Commercial formulations of Trichoderma harzianum were obtained from a local agricultural supply store and Bacillus subtilis. A liquid formulation of Bacillus subtilis was used, which is commonly marketed for its disease-suppressive properties.Neem Oil Cold-pressed neem oil was sourced from a local supplier, known for its antifungal and insecticidal properties. Field experiments were conducted on tomato plants affected by Fusarium wilt, Late Blight, and powdery mildew. Treatments were applied at the recommended dosages and intervals.Trichoderma spp. was applied as a soil drench and Bacillus subtilis was applied as a foliar spray and Neem oil was applied as a foliar spray mixed with water.

DATA ANALYSIS

Data were analysed using SPSS software (version 26). ANOVA was performed to assess significant differences in disease severity and incidence across treatments. Means were separated using the Duncan Multiple Range Test (DMRT) at a 5% significance level.

RESULTS AND DISCUSSION

Efficacy of Biological Control Agents Trichoderma spp. significantly reduced disease severity in all three diseases tested, with the highest reduction observed in Fusarium wilt (35%) followed by powdery mildew (30%) and Late Blight (25%).Bacillus subtilis was also effective, particularly against Late Blight, with a 40% reduction in disease severity, while it showed moderate effects on Fusarium wilt (28%) and powdery mildew (25%).Neem Oil had the least effectiveness but still provided a noticeable reduction in disease severity, with an overall average of 15-20% reduction in all diseases.**Diseases Incidence.***Trichoderma harzianum*: 65% reduction in tomato disease incidence compared to control.*Bacillus subtilis*: 50% reduction in maize disease incidence compared to control. **Crop yield** BCAs increased tomato yield by 30% and maize yield by 20% compared to control plots. **Cost-Effectiveness** BCAs demonstrated a 25% cost reduction compared to chemical fungicides over the growing season. The findings underscore the potential of BCAs as effective and eco-friendly alternatives to chemical pesticides. Similar studies by Akande *et al*. (2020) corroborate these results, highlighting their role in reducing pathogen load and improving crop productivity and (Olufemi 2020). s

CONCLUSION AND RECOMMENDATIONS

Conclusion

Biological control methods are effective in managing plant diseases and improving agricultural productivity in Yola. Despite their advantages, adoption is limited due to institutional and technical barriers. Strengthening institutional frameworks and enhancing farmer education are crucial for integrating BCAs into mainstream agricultural practices.

Recommendations

1. **Training and Capacity Building**: Conduct workshops and field demonstrations for farmers and extension workers on the use of BCAs.
2. **Policy Support**: Develop government policies to subsidize and promote the production and distribution of BCAs.
3. **Research and Development**: Encourage localized research on BCA efficacy and production to adapt to regional agroecological conditions.
4. **Awareness Campaigns**: Launch campaigns to educate stakeholders about the environmental and economic benefits of biological control.

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PAPAYA LEAF EXTRACT IN DENGUE THERAPY OTHER HEALTH BENEFITS AND FORMULATION ADVANCES

Anita Kartik Gawande[1], Dr. Swati S. Rawat[2], Dr. Sunil S. Jaybhaye[3], Sachin S. Dighole[4], Aditi B. Pungle[5]

[1]*Student of Bachelor of Pharmacy*
[2]*Principal*
[3]*Vice Principal*
[4]*Assistant Professor*
[5]*Assistant Professor*
Institute of Pharmacy, Badnapur

ABSTRACT

Dengue is a viral mosquito-borne disease and is known to possess threat to public health on large scale. Carica Papaya leaf extract (CPLE) is a natural remedy that has demonstrated promising way to comb-act dengue symptoms by increasing platelet levels in dengue patient. This review also highlights PLE's efficacy in treating dengue, alongside its various health benefits, including Immunomodulation, Antioxidant activity, Anti-cancer and Anti-viral properties. Hepatoprotective and Gastroprotective effects, Cardiovascular health and Anti-diabetic potential. Various novel formulation strategies to enhance PLE's treatment efficiency and to overcome stability issues are under study which are discussed in short. Also highlights the existing challenges for use of papaya in health condition and required future research directions that will uncover potential of papaya leaf extract in medical science.

KEYWORDS: *Dengue, Papaya Leaf Extract (PLE), Dengue Fever, Antiviral Therapy, Thrombocytopenia, Natural Remedies, Cancer Prevention, Wound Healing, Nanotechnology*.

1.INTRODUCTION

Dengue is an arthro-pod infectious disease caused by bite of female aedes aegypti-flavirida virus. When a person is infected with one serotype of dengue then he develops life-long immunity for that particular serotype.

But if patient is affected with other serotype during the life-time then he is at the risk of developing dengue hemorrhagic fever, low blood pressure, vessel leakage, decreased platelets. A study revealed 390 million people were infected with Dengue. Four serotypes of dengue are DEN1, DEN2, DEN3, & DEN4.

Even though dengue effect such a big number of populations there is no determined or specified treatment or vaccine developed to treat and prevent dengue. The treatment for dengue is done on the basis of symptoms of particular infected person. As there is lack of proper treatment dengue is greatly affecting the human mortality rate.

Different studies have observed lower platelet count in Dengue infection the platelet count is lowered mainly due to DEN 2 serotype this is the one which causes thrombocytopenia. Not only for dengue there are several diseases which lack defined medication for their treatment. So Researchers and Developers exhibited effective use of natural plants in treatment of various diseases.

A study reveals effectiveness of Papaya leaf extract in treatment of dengue infected patient. There are certain evidences that can show treatment of thrombocytopenia occurred due to Dengue infection.

Some investigation demonstrated that lower platelet count of a dengue patient can be increased by giving the patient papaya leaf extract as a part of treatment.

Carica papaya leaf is a rich source of bioactive compounds it includes alkaloids, saponins, tannins, flavonoids, and glycosides. These phytochemicals confer numerous therapeutic properties, making papaya leaf a valuable natural remedy.

The leaf has been found to possess various active compounds which can help prevent and manage various diseases:

- Dengue
- Antibacterial
- Anti-inflammatory
- Antiviral
- Hypoglycemic
- Antitumor activities.

Overall, the therapeutic properties of Carica papaya leaf make it a promising natural solution for promoting overall health and well-being.

Taking into regard the widespread use of Carica papaya leaf some formulation approaches are being made by the researchers such as nano-emulsion, popping balls, green tea, Transdermal patches, edible oral emulsions. So as to increase its use in various health conditions and with improved patient compliance.

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2.OBJECTIVE

- A. Effective treatment for Dengue fever
- B. Enhanced platelet count and reduced bleeding risk
- C. Improved immune response and reduced inflammation
- D. Expanded understanding of PLE's health benefits
- E. Patient-friendly, efficient, and safe formulations of PLE.

3. DENGUE VIRUS

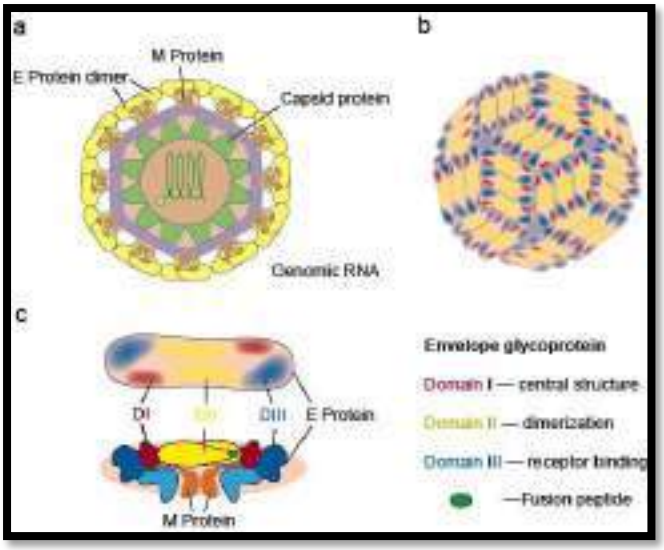


Fig (1) Structure of Dengue Virus

- Structure and Proteins of Dengue Virus
  - Family: Flaviviridae.
  - It is icosahedral virus
  - It is a small, rounded shaped virus with an outer protective layer.
  - The outer layer is enveloped by a fatty membrane.
  - Its size is approximately 500 Angstrom (50nm).
  - It has 4 serotypes: DEN1, DEN2, DEN3, & DEN4
  - It consists of 11 KB positive single standard RNA.

RNA contains instruction for development of two proteins of virus which are called structural and non-structural proteins. See figure 1.

- Structural proteins

E and M present on viral surface this are mainly required for developing of virus particles so that virus get ready for to be transferred in host cell. These are called binding blocks of virus.

- Non-structural proteins

It takes the responsibility of replication of virus genome it's translation and encapsulation and folding of viral proteins. These are called managers which oversee function of virus.

4.LIFE CYCLE OF DENGUE VIRUS

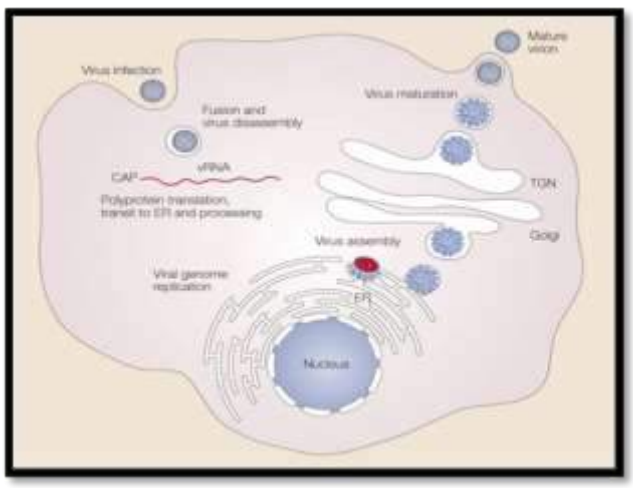


Fig (2) Life Cycle of Dengue Virus

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Dengue virus enters the host body after bite of an infected Aedes mosquito. Life cycle of virus include following stages like viral entry, replication, assembly, release.

- Life cycle begins as follows
- Attachment of host receptor protein and DEN virus on surface proteins of dendritic cells.
- Host receptor cell recognize it and bind with it. Protein E is essential for recognition of receptor.
- Entry of DEN virus in host cell take place
- At low PH endosomes and membrane fusion take place.
- Pores are formed on membrane
- DEN virus is released in cytoplasm of host.
- Protein synthesis take place.
- RNA replication, DEN virus replication mainly takes place in cells and organs including kidney, lymph nodes.
- Then it is followed by nucleic and capsid formation.
- Virus maturation take place.
- Release mature DEN virus particles.
- After 4 to 7 days of incubation of virus in host body symptoms of disease appear which are vomiting, rash, headache, high fever, muscle soreness. See figure 2.

5.THROMBOCYTOPENIA DUE TO DENGUE VIRUS INFECTION

During the dengue fever the platelet count of the patient falls rapidly and there is also a decrease in platelet production. Dengue virus 2 causes thrombocytopenia, it affects the platelet production in infected person. It targets the young platelet making cells called the Megakaryocytic progenitors.
According to some studies thrombocytopenia may be due to following reasons.

- Virus induced damaged to bone marrow
- Damage to cytokinin
- Platelet lysis

6.PAPAYA PLANT

It is a shrub, grown in most of the tropical and subtropical countries like Southern and Central Mexico, Brazil, Indian. See figure 3.



Fig (3) Papaya plant

Synonym: Papaya, Pawpaw, Kate.
Family: Caricaceae.

- ACTIVE CHEMICAL COMPOUNDS PRESENT IN PAPAYA LEAF EXTRACT

- Major phytochemicals

Carpaine, kaempferol-3, Papain, Cystain, Chymopapain, Tocopherol, Phenolic acids, Cyanogenic glucosides, Vitamin C. Carpaine, Dehydrocarpaine-1, Dehydrocarpaine-2, are majorly responsible to treat dengue.
Carpaine also gives anticancer and anthelmintic properties.

- Phenolic compounds

Caffeic acid, Quercetin.

- 7 flavonoids present are Quercetin, kaempferol-3 rutinoside, Quercetin-3, Quercetin 3-rutinoside, Kaempferol 3, Myricetin 3-rhamnoside.
- Vitamins and Minerals
  It contains vitamin C and minerals like iron, zinc, manganese, ascorbic acid, calcium, magnesium.
  Vitamins and minerals help to improve protein and immunity of individual person.
- Enzymes
  Enzymes like papain help to treat digestive ailments.
  Papain helps to treat digestive ailments.

7.METHOD TO PREPARE PAPAYA LEAF EXTRACT JUICE



Fig (4) Papaya Leaf Juice

- Collect and wash fresh papaya leaves.
- Chop leaves into small pieces.
- Combine 50g leaf powder, 50ml water, and 25g sugar
- Blend mixture and squeeze out liquid.
- Refrigerate extract for 24 hours.

8.MECHANISM OF PAPAYA LEAF EXTRACT

A study claims that papaya leaf juice can neutralize the dengue virus in blood and significantly reduce platelet clumping.
Alox-12 gene is essential for platelet type 12 lipo-oxygenase which mediate various functions of platelet cell.
Papaya leaf extract has been found to increase the production of an enzyme called ALOX 12 by 15 times.
Papaya leaf juice stimulates growth and maturation of cells that produce platelets called the megakaryocytes thus boosts platelet production and synthesis. It increases platelet production by increasing the PTAFR gene by 13.5 times
It's constituents like flavonoid and quercetin prevent replication of dengue virus by inhibiting NS2B and NS3 essential for DNA virus replication. It increases platelet and WBC count within 24 hours of administration.

9.CLINICAL EVIDENCES ON THE USE OF PAPAYA LEAF EXTRACT FOR DENGUE

- In Sri lank

The study included 12 patients with a low platelet count, less than 130,000/cu mm.

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But only 6 of them were diagnosed with Dengue. Patient were given two doses of Papaya leaf extract at 8-hour time gap.
And it was found that the patient platelet count and WBC was increased in 24 hours of administration with papaya leaf extract.

- In Pakistan

A truck driver was given 25 ml papaya leaf extract for 5 days and increase in platelet and WBC was observed in 2 days.

- In Indonesia

80 dengue patients were given C. papaya leaf extract capsule. They were divided in two groups one group was give C. papaya leaf extract and another group was given advanced medical treatment.
The patient who administered with C. papaya leaf extract tablet, showed a rapid increase in platelet count.

- In Malaysia

A study in Malaysia was conducted to analyze the mean platelet count difference in person suffering from dengue without administration of papaya leaf extract.
Two groups of patients were selected, one group was provided with papaya leaf extract and other group was the control group. There were no differences in mean platelet count of the two groups from 8 hours to 40 hours.
But after 40 hours the patient who were given papaya leaf extract showed marked increment in platelet count.

10.OTHER HEALTH BENEFITS OF CARICA PAPAYA LEAF EXTRACT

- IN TREATMENT OF CANCER

Scientists are trying to develop herbal based therapies to treat cancer. A patent claims that cancer cell growth can be reduced by administrating papaya leaf extract to cancer patient and improve patient health. And papaya leaf extract can be helpful in various cancer treatment such as lung, cancer, stomach, pancreatic, liver, ovarian, breast, blood cancer.
Some studies claim that papaya leave give anti-cancer property due to activation of caspase 3/ 7 which can induced cell death. Activating P53 a protein which is known to destroy damaged cells. Study revealed that papaya can treat prostate cancer cells by preventing them from dividing in S phase leading to cell death and prevent cancer growth.

- DIABETES

Some studies claim that Papaya leave extract can be an alternative to control diabetes the large-number of phytochemicals present in PLE and help to decrease secondary diabetes complications. PLE can show its antidiabetic activity by inducing pancreas to release more insulin and allows glucose to enter cell more efficiently it also slows down fatty acid production and decrease cholesterol production.

- AS AN ANTIOXIDANT

Study explained the water papaya leaf extract antioxidant activity found highest antioxidant activity.

- IN IMMUNOMODULATION

PLE gives notable immunomodulatory effects by regulating and balancing immune system in following manner it reduces TH2 response that reduces allergic reaction and increases TH1 response which is known to boost anti-cancer immunity. It can also increase production of useful cytokinin like IL 12 TNF and IFN-Y and decreases harmful cytokines like IL4 and IL2.

- AS A NEUROPROTECTIVE

During a study it was found that PLE can give neuro protective effect for Alumminium induced cognitive impairment in a animal model.

- TO TREAT DIGESTIVE DISORDERS

Some studies reveal that PLE tea and extracts can help to relieve blotting, gas, heartburn as it is rich in fiber and contains Papain a compound that breaks proteins and reduces inflammation and support gut health.

- AS AN ANTI-INFLAMMATORY

Papaya leaf has also given remarkably results as an anti-inflammatory agent it has shown reduction in internal and external inflammation, relieve pain. anti-inflammatory compound present are papain, flavonoids and Vitamin E that prevents damage to cells.

- TO PROMOTE HAIR GROWTH

Papaya may show hair growth and scalp health properties due to antioxidants present in it like flavonoids, Vitamin E, it has potential to reduce oxidative stress. It can even show antifungal properties by reducing dandruff causing fungus. But there are Limited evidence for use of Papaya leaf extract in hair growth.

- TO IMPROVE SKIN HEALTH

The key compound present in PLE helps to promote healthy glowing skin taken orally or applied topically. Papain can remove dead skin cells, unclogs, pores, reduces in grown hairs acne.

- TO TREAT MENSTRUATION PROBLEM

PLE can be used to treat irregular menstruation.

- IN ULCER TREATMENT

It helps to treat ulcer when consumed orally.

- ROLE IN INCREASING SHELF LIFE OF PLATELETS.

Researches have been discovering to use papaya leaf extract to improve the quality of platelet during its storage. PLE contains active compounds like Tannins, Alkaloids, flavonoids, oleic acid. It reduces platelet damaging during storage. Patelet lessions are controlled with beerly Hexane extract of PLE. Hexane extract of PLE shows maximum antimicrobial activity and prevent bacterial contamination. No microbial growth was observed in storage platelets with hexane extract it helps to extent platelets shelf life up to 7 days and maintain platelet quality and blood safety and Tannins present in PLE is responsible activity.

11.NEW FORMULATION ADVANCES OF PAPAYA LEAF EXTRACT TO TREAT DENGUE

The bitter test limits its use and becomes unpleasant for patient to consume.
So researches are trying to developed new formulations to use papaya leaf extract to treat dengue
Some of this are:

- Papaya leaf extract edible o/w emulsion.
  - Fresh papaya leaf edible o/w emulsion. (FPL)

In a study fresh papaya leaves extract were mixed with virgin coconut oil and whey protein as surfactant stable fresh papaya leaf emulsion was obtained by Tarnary Phase diagram (TPD).

- Saponins modified papaya leaf extract emulsion.

The bitter taste of papaya leaf extract is due to the presence of saponin in it. Saponin reduction method helps to reduce the bitter taste of papaya leaf extract and helps to develop a suitable formulation.

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So papaya leaf extract with reduced saponin content were mixed with virgin coconut oil and whey protein as surfactant to develop a suitable papaya leaf extract edible emulsion of reduced bitter taste.

Both emulsions were formulated by using Tarnary phase diagram method. Effective dosage of both emulsions were two tablespoons twice a day for three consecutive days.

After exposure of BEAS-2 B cells to both emulsion an increase in cell viability was observed and it increased with time from 24 hour to 48 hours and 100% at 72 hours.

- Silver Nano Particles based on Papaya leaf extract.

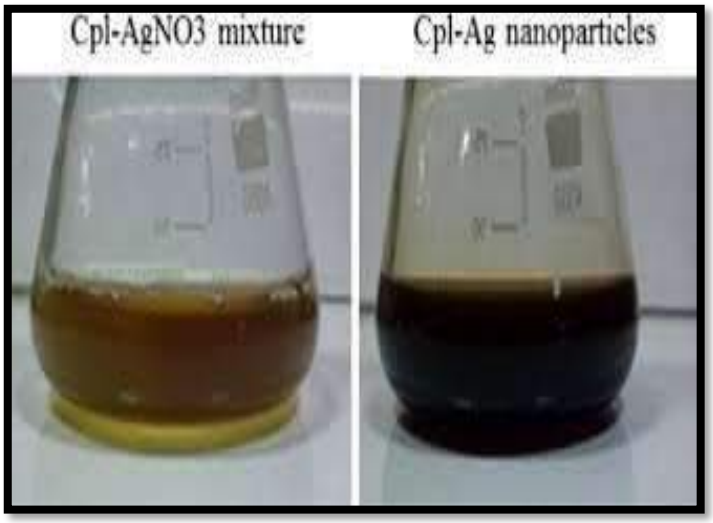


Fig (5) Papaya Silver Nanoparticles

- A study formulated papaya-based silver nanoparticles and other three formulations of papaya. PNP demonstrate antiviral activity against DEN 2 serotype of dengue virus under various conditions such as pretreatment co-treatment and post treatment.
- But the more appreciable effect was found in post infection treatment it was observed that PNP showed 100% reduction activity DEN 2 virus levels this describe the PNP has potential to completely eliminate DEN 2 virus.
- In another study Papaya leaf extract silver nanoparticles were made from Papaya Leaves using a special liquid methanol showed 90% inhibitory activity on DEN 2 during the in- vitro study. Figure 5 papaya leaf silver nanoparticles.

- Carbonation of Papaya leaf juice.
  A new way to consume papaya leaf extract for treating dengue was introduced such as carbonation of Papaya leaf juice as papaya leaves are unstable and unpleasant to consume. This innovative way improves stability and makes it more viable.
- Popping balls of papaya extract for pediatric dengue cases.



Fig (6) Papaya Leaf Popping Balls

During a study scientist developed popping balls of Papaya leaf extract by Spherification method to treat pediatric patient of dengue associated thrombocytopenia.

This were found easy to take, easy to swallowed, showed high drug release up to 91% and stability for 3 months.

They were determined to be a kid friendly approach to boost platelet count in thrombocytopenic pediatric patient and as an alternative to solid dosage forms. See figure 6.

12.CHALLENGES AND LIMITATIONS

Papaya leaf extract has given a positive impact in Dengue treatment by increasing the platelets level or platelets count as per the result of clinical trials conducted till date.

The result might be influenced by factors of which we are unaware and accurate results are necessary to make correct decisions. Biased result can lead to wrong decision. So more information is required to trust the result.

The increase in platelet count may be not as much required or less which is not clinically significant. Larger research trials are not conducted for use of PLE in Dengue treatment.

Papaya leaf extract even today is not approved by clinical official and US FDA to manage dengue fever. The papaya leaf extract remains unapproved due to lack of quality study.

The research carried out by Asian countries and the outcoming of this research may not work for other countries and people with different genetic profile, as environment and genetics influence the treatment.

- To get proper benefits from papaya leaf extract:
  - Larger clinical test must be conducted.
  - Ensure bias-free research program.
  - Also investigate long term advantages.

13. FUTURE DIRECTION AND RESEARCH

National agency and food control must provide complete support to increase products of papaya leaf extract and create an easy way for formulation registration.

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Traditional medicines are not regarded as main treatment option due to lack of sufficient scientific proofs. However traditional medicines were and are used for treatment by various communities who cannot approach modern medicines.

There is a vast necessity to conduct various research trials to established 12th standard proof to incorporate traditional medicine role in disease treatment. One such traditional medicine is Papaya leaf extract.

14.CONCLUSION

Papaya leaf extract has emerged as a promising natural, safe, effective remedy for treating dengue fever. Studies have consistently shown that the extract increases platelet count, reduces symptoms, and accelerates recovery. Clinical trials and case studies have demonstrated the efficacy and safety of papaya leaf extract in treating dengue patients. The bioactive compounds present in papaya leaves, such as papain, alkaloids, and flavonoids, exhibit immunomodulatory, anti-inflammatory, and antioxidant properties. Further research and development of novel formulations will pave the way for its widespread adoption as a complementary therapy for dengue fever. Further research and development are necessary to fully unlock its therapeutic potential.

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SYSTEMATIC REVIEW ON PREFORMULATION STUDIES AND RECENT TRENDS

Hatkar A. D.[1*], Taro S. S.[1], Jaybhaye S.S.[1], Phoke S. V.[1]
[1]*Department of Pharmaceutics, Institute of Pharmacy, Badnapur, Jalna- 431203 (MS), India.*
[*]*Corresponding Author*

ABSTRACT

Preformulation studies carried out by various research scientists are reviewed. Preformulation begins after literature search of similar type of compounds to provide and understand (i) the degradation process, (ii) any adverse conditions relevant to the drug, (iii) bioavailability, (iv) pharmacokinetics and formulation of similar compound and (v) toxicity. Preformulation influences (a) selection of the drug candidate itself, (b) selection of formulation components, (c) API & drug product manufacturing processes, (d) determination of the most appropriate container closure system, (e) development of analytical methods, (f) assignment of API retest periods (g) the synthetic route of the API, (h) toxicological strategy. Preformulation studies give directions for development of formulation in choice of drug form, excipients, composition, physical structure, helps in adjustment of pharmacokinetic and biopharmaceutical properties, support for process development of drug substance support for PAT (Process Analytical Technology) (critical process parameters),produce necessary and useful data for development of analytical methods.

KEYWORDS: *Preformulation, partition coefficient, dissolution rate, polymorphic*

I. INTRODUCTION [1,2]

After drug discovery, with a background of physical, chemical and derived powered properties of the drug molecule, the drug has to be formulated in the form that can suitably be administered. The first phase of physic-chemical data collection on drug substances, evaluating potential salts the and excipient suitability, prior to formulation, is known as preformulation. Preformulation is the interface between new drug entity and formulation development. It also provides road map for formulation development. Preformulation involves the application of bio pharmaceutical principles to the physic chemical parameters of the drug with the goal of designing an optimum drug delivery system. Preformulation studies are an important tool early in the development of both API and drug products. Preformulation testing is the first step in the rational development of dosage forms of a drug substance. Preformulation investigations are designed to deliver all necessary data especially physicochemical, physico- mechanical and bio pharmaceutical properties of drug substances, excipients and packaging materials.

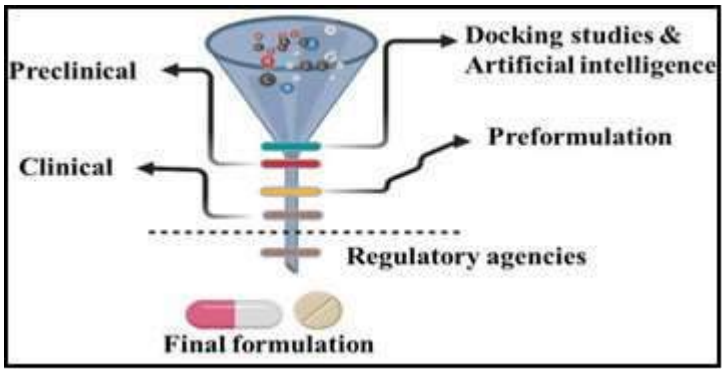


Figure No 01: Stages of Preformulation studies.

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Objectives

1. To develop the elegant dosage forms (stable, effective & safe}
2. It is important to have an understanding of the physical description of a drug substance before dosage form development.
3. It is 1st step in rational development of a dosage form of a drug subt before dosage form development.
4. It generates useful information to the formulator to design an optimum drug delivery system.

Goals

1. To establish the physico-chemical parameters of new drug substance.
2. To establish the physical characteristics
3. To establish the kinetic rate profile.
4. To establish the compatibility with the common excipient.
5. To choose the correct form of a drug substance.

Advantage

1. Preformulation studies help the drug development and evaluation process save resources while bolstering the scientific basis of the guidelines
2. Raise the bar for public safety.
3. Improve the caliber of the product
4. Assist in the adoption of new technology

Disadvantage:

1. Ionosphere is incorrect because resistance results from a spherical particle.
2. Crystals with needle-like shapes have a tendency to obstruct the aperture hole.
3. Compound dissolution in an aqueous conducting media.
4. Particle stratification within the suspension

II. PREFORMULATION PARAMETERS[3,4]

A. Physical characteristics

1. Organoleptic properties
2. Bulk characteristics
   - Solid state characteristics
   - Flow properties
   - Densities
   - Compressibility
   - Crystalline
   - Polymorphism
   - Hygroscopicity
3. Solubility analysis
   - Ionization constant(Pka)
   - Partition co-efficient
   - Solubilization
   - Thermal effect
   - Common ion effect(Ksp)
   - Dissolution
4. Stability studies
   - Solution-state stability
   - Solid-state stability
   - Drug-excipients compatibility

B. Chemical characteristics

- Hydrolysis
- Oxidation
- Photolysis
- Racemization
- Polymerization
- Isomerization

1. **Organoleptic properties:** A typical preformulation program should begin with the description of the drug substance. The color, odour and taste of the new drug must be recorded using descriptive terminology. It is important to establish a standard terminology to describe these properties in order to avoid confusion among scientists using different terms to describe the same property. A list of some descriptive terms to describe the most commonly encountered colors, tastes and odours of pharmaceutical powders is provided in table.

Table No 1: Terminology to Describe Organoleptic Properties of Pharmaceutical Powders.

Colour	Odour	Taste
Off-white	Pungent	Acidic
Cream yellow	Sulfurous	Bitter
Tan	Fruity	Bland
Shiny	Aromatic	Intense

2. **Bulk characteristics:** It is needed to identify all the solid forms that may exist as a consequence of the synthetic stage such as the presence of polymorphs. Bulks properties such as particle size, bulk density, surface morphology may be changed during the development process and to avoid mislead predictions of solubility and stability which depends on a particular crystalline form.

- **Solid state characteristics:** Powders are masses of solid particles or granules surrounded by air (or other fluid) and it is the solid plus fluid combination that significantly affects the bulk properties of the powder.

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It is perhaps the most complicating characteristic because the amount of fluid can be highly variable. Physical characteristics of the particles, such as size, shape, angularity, size variability and hardness will all affect flow properties. External factors such as humidity, conveying environment, vibration and perhaps most importantly aeration will compound the problem.

- **Flow properties:** The flow properties of powders are critical for an efficient tableting operation. A good flow of the powder or granulation to be compressed is necessary to assure efficient mixing and acceptable weight uniformity for the compressed tablets. If a drug is identified at the preformulation stage to be "poorly flowable," the problem can be solved by selecting appropriate excipients. In some cases, drug powders may have to be precompressed or granulated to improve their flow properties.
- **Angle of Repose**: The maximum angle which is formed between the surface of pile of powder and horizontal surface is called the angle of repose. For most pharmaceutical powders, the angle-of repose values range from 25 to 45°, with lower values indicating better flow characteristics.

a) Densities

The ratio of mass to volume is known as density

Types of density:

- Bulk density: It is obtained by measuring the volume of known mass of powder that passed through the screen.
- Tapped density: It is obtained by mechanically tapping the measuring cylinder containing powder.
- True density: It actual density of the solid material.
- Granule density: may affect compressibility, tablet porosity, disintegration, dissolution

b) Compressibility: "Compressibility" of a powder can be defined as the ability to decrease in volume under pressure and "compactability as the ability of the powdered material to be compressed into a tablet of specified tensile strength.

c) Crystallinity: Generally most of drugs exist in solid state. Very few are in liquid state like valproic acid and even less in gaseous form like some general anesthetics. A crystal structure is a unique arrangement of atoms in a crystal. Physical properties affected by the solid-state properties can influence both the choice of the delivery system and the activity of the drug, as determined by the rate of delivery. Chemical stability, as affected by the physical properties, can be significant. A crystalline particle is characterized by definite external and internal structures

The various crystal forms are categorized into six distinct crystal systems based on symmetry.

- cubic (sodium chloride)
- tetragonal (urea)
- hexagonal (iodoform)
- rhombic (iodine)
- monoclinic (sucrose)
- triclinic (boric acid)
- Trigonella (crystal meth

d) Polymorphism: Many drug substances can exist in more than one crystalline form with different space lattice arrangements. This property is known as polymorphism. The different crystal forms are called polymorphs. When polymorphism occurs, the molecules arrange themselves in two or more different ways in the crystal; either they may be packed differently in the crystal lattice or there may be differences in the orientation or conformation of the molecule at the lattice sites.

Methods to Identify Polymorphism

- Optical crystallography
- Hot 0stage microscopy
- X- Ray Diffraction method
- NMR technique
- FTIR technique.
- Microcalorimetry
- Thermal methods
- Melting point determination

e) Hygroscopicity: Many compounds and salts are sensitive to the presence of water vapour or moisture. When compounds interact with moisture, they retain the water by bulk or surface adsorption, capillary condensation, chemical reaction and, in extreme cases, a solution (deliquescence). Deliquescence is where a solid dissolves and saturates a thin film of water on its surface. It has been shown that when moisture is absorbed to the extent that deliquescence takes place at a certain critical relative humidity, the liquid film surrounding the solid is saturated. This process is dictated by vapor diffusion and heat transport rates.

Hygroscopicity can be classified as:

- Deliquescent
- Very hygroscopic
- Hygroscopic
- Non-hygroscopic

Class I: Non-Hygroscopic At relative humidity below 90%, there are almost no moisture increases. Furthermore, after a week of storage at above 90% relative humidity (RH), the rise in moisture content is less than 20%.

Class II: Mildly Hygroscopic At relative humidity below 80%, virtually little moisture increases. The increase in

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moisture content after a week of storage at above 80% RH is less than 40%.

Class III: Moderately Hygroscopic At relative humidity below 60%, moisture content does not grow more than 5% after storage. The rise in moisture content after a week of storage at above 80% RH is less than 50%.

Class IV: Very Hygroscopic At relative humidity as low as 40–50 percent, moisture might increase. After a period of storage, the moisture content of the product increases.

3. Solubility Analysis: An important Physical-chemical property of a drug substance is solubility, especially aqueous solubility. A drug must possess some aqueous solubility for therapeutic efficacy in the physiological P H range of 1 to 8. For a drug to enter into systemic circulation, to exert therapeutic effect, it must be first in solution form. If solubility of drug substance is less than desirable, than consideration must be given to increase its solubility. Poor solubility (< 10mg/ml) may exist incomplete or erratic absorption over PH rang 1-7 at 37°C. However, knowledge of two fundamental properties is mandatory for a new compound

i) Intrinsic solubility (Co)
ii) Dissociation constant (Pka).

a) Ionization Constant(PKA)

Many drugs are either weakly acidic or basic compounds and, in solution, depending on the pH value, exist as ionized or un-ionized species. The un- ionized species are more lipid-soluble and hence more readily absorbed. The gastrointestinal absorption of weakly acidic or basic drugs is thus related to the fraction of the drug in solution that is un- ionized. The conditions that suppress ionization favor absorption. The factors that are important in the absorption of weakly acidic and basic compounds are the pH at the sit e of absorption, the ionization constant, and the lipid solubility of the un- ionized species.

Determination of Pka:

- Potentiometric Titration
- Spectrophotometric Determination
- Dissolution rate method
- Liquid-Liquid Partition method

b) Partition Coefficient:

The lipophilicity of an organic compound is usually described in terms of a partition coefficient; log P, which can be defined as the ratio of the concentration of the unionized compound, at equilibrium, between organic and aqueous phases:

Methods of finding Partition coefficient:

- Shake-flask method
- Chromatographic method.
- Counter current and filter probe method.
- Tomlinson's filter probe method.
- Microelectrometrictitratation method
- Automated instrument is now available.

c) Solubilization: For drug candidates, with either poor water solubility or insufficient solubility for projected solution dosage form, preformulation study should include limited experiments to identify possible mechanism for solubilization.

Methods for Increasing Solubility:

- Change in pH
- Co-Solvency
- Dielectric Constant
- Solubilization by Surfactant
- Complexation
- Hydrotropy
- Chemical Modification of drug

d) Common Ion Effect:

A common interaction with solvent, which often overlooked, is the common ion effect. The addition of common ion often reduces the solubility of slightly soluble electrolyte. This salting out results from the removal of the water molecule as the solvent due to competing hydration of other ions. So, weakly basic drug which are given as HCL salts have decreased solubility in acidic (HCL) solution.

e) Dissolution: In many instances, dissolution rate in the fluids at the absorption site, is the rate limiting steps in the absorption process. This is true for the drug administered orally in the solid dosage forms such as tablet, capsule, and suspension as well as drug administered I.M. in form of pellets or suspension

f) Stability studies

- **Solid State Stability Studies:** Solid state reactions are much slower and more difficult to interpret than solution state reactions, due to a reduced no. of molecular contacts between drug and excipient molecules and to the occurrence of multiple phase reactions.
- **Solution State Stability Studies:** It is easier to detect liquid state reactions as compared to solid state reactions. For detection of unknown liquid incompatibilities, the program set up is same as solid dosage forms. Following conditions be evaluated in studies on solutions or suspensions of bulk drug substances:
  - Acidic or alkaline pH.
  - Presence of added substances- chelating agents, stabilizers etc.
  - High Oxygen and Nitrogen atmospheres
  - Effect of stress testing conditions

g) Drug-Excipient Compatibility Studies: In the tablet dosage form the drug is in intimate contact with one or more excipients; the latter could affect the stability of the drug. Knowledge of drug-excipient interactions is therefore very useful to the formulator in selecting appropriate excipients. This information may already

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be in existence for known drugs. For new drugs or new excipents, the preformulation scientist must generate the needed information. A typical tablet contains binders, disintegrants, lubricants, and fillers. Compatibility screening for a new drug must consider two or more excipients from each class. The ratio of drug to excipient used in these tests is very much subject to the discretion of the preformulation scientist.

Analytical techniques used to detect Drug Excipient Compatibility:

1) Thermal methods of analysis
   I. DSC- Differential Scanning Calorimetry
   II. DTA- Differential Thermal Analysis
2) Accelerated Stability Study
3) FT-IR Spectroscopy
4) DRS-Diffuse Reflectance Spectroscopy
5) Chromatography
   I. SIC-Self Interactive Chromatography
   II. TLC-Thin Layer Chromatography
   III. HPLC-High Pressure Liquid Chromatography
6) Miscellaneous
   I. Radiolabelled Techniques
   II.Vapour Pressure Osmometry
   III. Fluorescence Spectroscopy

B. Chemical characteristics

1. **Hydrolysis**: It involves nucleophilicattack of labile groups eg: lactam ester amide imide. When the attack is by the solvent other than water, then it is known as solvolysis. It generally follows 2nd order kinetics as there are two reacting species, water and API. In aqueous solution, water is in excess so the reaction is 1st order. Conditions that catalyze the breakdown are Presence of hydroxyl ion, hydride ion, divalent ion and heat, light, ionic hydrolysis, solution polarity and ionic strength, high drug concentration. Hydrolysis can be prevented by Adjusting the PH.As most of the potent drugs are weakly acidic or weakly basic in nature.
2. **Oxidation:** It is a very common pathway for drug degradation in liquid and solid formulations. Oxidation occurs in two ways
   1. Auto- oxidation
   2. Free radical chain process.

   Antioxidants are of two types based on Solubility. Oil soluble and Water soluble. Oil Soluble Antioxidants are Free radical acceptors and inhibit free radical chain process eg: hydroquinone, propylgallate, lecithin whereas Water soluble Antioxidants Oxidizes itself and prevents oxidation of drug Eg: sodium metabisulphate, sodium bisulfate, thioglycolic acid, thioglycerol.
3. **Reduction:** is a relatively more common pathway of drug metabolic process. Hepatic microsomescatalyze diverse reductive chemical reaction* and require NADPH for this purpose. Azo and nitro reduction is catalyzed by cytochrome P450.Chloral hydrate is reduced to its active metabolite trichloroethanol by alcohol dehydrogenase. Reduction of prednisolone and cortisone results in the formation of their active metabolites hydrocortisone. Azo dyes used as coloring agents in pharmaceutical products or food are reduced to form amines in the liver and by the intestinal flora.
4. **Photolysis:** Electronic configuration of drug overlaps with the spectrum of sunlight or any artificial light where energy is absorbed by the electron resulting in excitation. As they are unstable, they release the acquired energy and return to the ground state by decomposing the drug. The phenomenon where molecules or excipients which absorb energy but do not participate themselves directly in the reaction but transfer the energy to others which cause cellular damage by inducing radical formation is known as photosensitization.

III.PREFORMULATION CONSIDERATION IN DEVELOPMENT OF SOLID DOSAGE FORMS[4,5]

The majority of medications today are sold and delivered in solid dosage forms. Nearly 70% of the medications that are delivered are in solid forms. Pharmaceutical businesses choose it because of its great safety and inexpensive price. The pre-formulation phase of drug development is when the physicochemical characteristics of the drug substance are identified. It is crucial that a drug material be chemically and physically defined before being turned into a dosage form. Pre-formulation influences the selection of the drug candidate, the components of the formulation, and the manufacturing process of the drug product, as well as the creation of analytical methodologies and toxicological testing strategy. The physical and chemical stability of the investigated API has an impact on it. It affects the pharmacological action, delivery method, and route of administration. Studies often focus on amorphous forms, polymorphism, and crystal morphology. Also evaluated are the API's solubility, salt form, melting point, and dissolution. Research done before developing solid dosage formsThe following parameters should be investigated:

Organoleptic characteristics

- Surface area, shape, and size of the particles
- Liquidity
- Disintegration
- The membrane's permeability, ionization constant, and partition coefficient
- Polymorphism and crystal characteristics
- Density, wettability, and so on.
- Studies on stability

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IV. PREFORMULATION CONSIDERATION IN DEVELOPMENT OF PARENTERAL DOSAGE FORMS [6,7]

The word "parenteral" comes from the Greek word's"para" and "enteron," which both indicate intestine. The method of administration is injection. Among the parenteral dosage form's pre-formulation investigations are

1. Bulk characterisation includes factors such as Crystallinity, polymorphism, and particle size.
2. Solubility research, which takes into account the partition coefficient, common ion effect, and pka determination.
3. Solid-state stability and solution stability are both included in the stability analysis.
4. Spectroscopy: The material is characterised using UV, IR, and X-ray diffraction techniques as well as spectrophotometers.
5. Microscopy: In this approach, a sample is inspected under a microscope to learn more about a drug molecule's shape, thickness, particle size, etc.
6. Chromatography: Analytical data are obtained using TLC

V. RECENT NEW INNOVATION IN PREFORMULATION STUDIES[8,9]

1. Advanced Imaging Technologies

These technologies, such as Nano tomography and tetrahertz spectroscopy, can help characterize amphorus solid dispersion (ASDs) at sub micro level. The two main aspects of preformulation assessment are saturation solubility and stability, which inherently depend on active pharmaceutical ingredient's (API's) properties and the added excipients used in the formulation. A tremendous amount of research has been conducted in the past few decades, which mainly emphasized the amorphous advantage of APIs, the selection of proper excipients, and the prediction of the physical stability of ASDs. In the past, traditional methods employed a large amount of API material to determine these properties. Considering recent advances, several material-sparing methods were developed for initial preformulation assessment. As specified in the available literature, the difference in free energy is one of the notable properties that helps to understand the advantage of solubility for the amorphous form over the crystalline form. The higher the free energy of the amorphous form, the better its solubility.

2.SUBA™ Technology (Via Spray Drying Process):

The oral bioavailability of poorly soluble active ingredients is enhanced by the patented SUBATM technology, with superior bioavailability. The main objective behind developing this technology relies on improving bioavailability, reduction in dose, mitigating inter and intra-patient variation, enabling more predictive clinical response based on dose, and obtaining clinical levels of activity in the blood stream. For the very first time, this process was used on the well-known, poorly soluble compound BCS class II compound Itraconazole. The FDA-approved prescription drug Itraconazole has a long history of safe and successful usage in treating severe fungal or yeast infections in people. The novel SUBATM process produces amorphous Itraconazole dispersed in a polymer matrix instead of a conventional crystalline form. This approach utilizes spray-drying with enteric polymer to increase active ingredient solubility in the gastrointestinal system to achieve "super bioavailability" in comparison to traditional formulations. In this technology, API was spray-dried using a novel amorphous pH-dependent enteric polymer HPMC Phthalate.

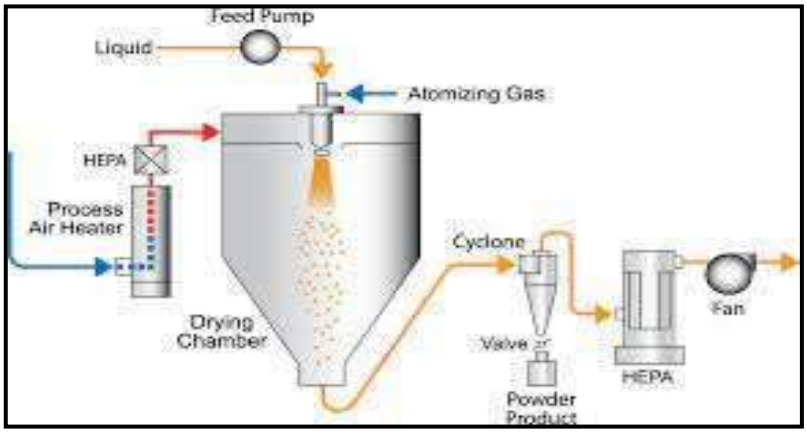


Figure No 2: SUBA™ Technology (Spray Drying Process)

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3.Deep Learning Algorithms: These algorithms can be used be to predict stroage stability tablet defects, particle flow ability, and drug dissolution profiles.

Applications

- Predicting material properties
- Optimizing formulation composition
- Identifying potential toxicities
- Designing controlled release systems
- Modeling pharmacokinetics and pharmacodynamics

Benefits

- Improved accuracy and efficiency
- Ability to handle complex data
- Enhanced decision-making
- Reduced experimental costs and time
- Better understanding of complex relationships

Materials

- Small Molecules (APIs, Excipients)
- Polymers (Natural, Synthetic)
- Proteins (Therapeutic Proteins)
- Peptides (Therapeutic Peptides)
- Organic Compounds (Intermediates, Impurities)
- Biomaterials (e.g., collagen, gelatin)
- Nanomaterials (e.g., nanoparticles, nanotubes)

4.In Silico Tools

These tools can be used to make molecular stimulation predictions and understand interaction between formulation components at a molecular level.

Benefits

- Reduced experimental costs and time
- Improved accuracy and reliability
- Enhanced decision-making
- Increased productivity
- Better understanding of complex relationships

Applications

- Predicting drug solubility and bioavailability
- Optimizing formulation composition
- Modeling pharmacokinetics and pharmacodynamics
- Identifying potential toxicities
- Predicting stability and shelf-life

5.3D Printing and Additive Manufacturing

3D printing and additive manufacturing are revolutionizing preformulation technology by enabling:

Benefits

- Personalized medicine: patient-specific dosing and formulation
- Complex geometries: creating intricate structures for controlled release
- Multi-material printing: combining different materials for optimized performance
- Rapid prototyping: accelerating formulation development and testing
- Increased precision: improving dosage accuracy and uniformity

Applications

- Tablets and capsules: printing customized dosage forms
- Implants: creating complex geometries for sustained release
- Transdermal patches: printing precise drug-loaded patches
- Ophthalmic inserts: creating customized inserts for eye care
- Inhalation devices: printing complex structures for pulmonary delivery

Materials

- Polymers (e.g., PLA, PVA)
- Pharmaceuticals (e.g., APIs, excipients)
- Ceramics
- Metals
- Biomaterials (e.g., collagen, gelatin)

VI.ROLE OF ARTIFICIAL INTELLIGENCE IN PREFORMULATION STUDIES [10]

A large, multidisciplinary discipline known as artificial intelligence gives machines the ability to think, learn, and reason. Artificial intelligence has two subsets: machine learning and deep learning. Scientists frequently integrate computer-added drug design tools with artificial intelligence, powered decision-making at crucial stages of drug discovery programs Deep learning-based artificial neural networks and machine learning-based expert systems are currently very well-liked for predicting interactions between drugs and their targets as well as physicochemical properties, quality, stability, toxicity, safety, and biological activity of formulations. Medical diagnostics, epidemic breakouts, and individualized treatments are all examples of how AI is used in the healthcare industry. The healthcare industry pursues exceptional advancements with the help of AI tools for example Adaptive neuro-fuzzy inference system (ANFIS) performance is satisfactory for excipients selection hence the AI-based algorithms made drug research simple and shorten the drug discovery and development timelines. In-silico models found their way as successful tools for determining drugs' aqueous solubility's. These factors include molecular size, molecular shape, and hydrogen bonding capacities.

VII.CONCLUSION[11]

Impacts of Preformulation: Preformulation affects the choice of the drug candidate, formulation elements, manufacturing processes for API and drug products, choosing the best container closure system, development of analytical methods, API retest intervals, API synthetic route, and toxicological strategy.

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Preformulation studies help establish the scientific basis for the guidance, offer regulatory release, conserve resources during the drug development and evaluation process, raise public safety standards, raise product quality, make it easier to use new technologies, and aid in the development of regulatory and policy decisions. Preformulation studies offer guidelines for formulation development, including modifications to pharmacokinetic and biopharmaceutical characteristics, excipients, content, and physical structure of the medication. A pharmaceutical preparation cannot be created without first undertaking preformulation studies, as this review article's findings from earlier investigations show.

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DOCTRINE OF PRESUMPTION UNDER INDIAN LEGAL SYSTEM: AN ANALYSIS

Dr. Brijinder Bhushan
Assistant Professor, BKSM Law College, Jalalabad (E) Dharmkot, Dist. Moga, Punjab

ABSTRACT

Under The Bharatiya Sakshya Adhiniyam,2023 enforcement of presumption is widely unexplored area. Even from the point of view of its application it has many consequences for the manner in which we understand concept of 'burden of proof' of prosecution and defence. Inclusion of dramatic rise in 'reverse onus' clauses seen by current penal legislations, though these persuasive burden of proof placed on accused shows raising a presumption of guilt. In depth study of these even till today, the questions of when and how such a burden shift and when such clauses are valid remain unresolved. Views of researchers and academicians on presumption provides some insight into working of presumptions in civil proceedings. Though there is no detailed study on how they would apply in proceedings of criminal in nature, quite possible due to not foresee then. However, presumptions criminal in nature are reality today and insufficient authoritative case law in India required a depth study of The Bharatiya Sakshya Adhiniyam,2023.

I. INTRODUCTION

Mostly criminal law of India is criticized on the basis that it does not set out to find out truth but is merely on arrangement of contest between prosecution and defence in which judges acts like an umpire. During discovering of truth accused and witnesses are called by the judges for examination to whom supplementary questions can even be asked. The criminal procedure does not set out to find out whether the accused did it but only provide whether it is proved beyond reasonable doubt that he did it[i].

In criminal proceedings includes doctrine that it is better to run the risk of sparing the accused than to condemn the innocent or in other words it is better that ten guilty persons escape than that one innocent suffer[ii]. Other settled principle that accused must be considered innocent unless and until proved guilty by the prosecution in a public trial during which having all the guarantees necessary for his or her defence[iii].

Humanistic and progressive approach demands that rights of the suspected accused should not be violated by the act of the state. Extreme emphasis on the protection of one interest is bound to have an adverse impact on the other. Therefore, to maintain balance between the two interests, task is entrusted to the judiciary to find dividing line so as to harmonize the two interests without ever emphasizing one to the detriment of the other[iv].This primary study focuses upon the applicability of the provisions of presumption under different statutes.

II. MEANING OF PRESUMPTION

Presumption may be defined as wherein the absence of actual certainty of the truth or falsehood of a fact or proposition an inference affirmative or non-affirmative of that truth or falsehood is drawn by a process of probable reasoning from something which is taken for granted. This presumptive evidence has obtained a restricted legal importance and is used to designate an inference affirmative or non-affirmative of the existence of some fact drawn by judicial tribunal by a process of reasoning from some matter of fact either judicially noticed or admitted or established by legal evidence to the satisfaction of the tribunal[v].

According to Celebrated work- Wigmor- Law of Evidence, " A presumption is a principle which attaches to one evidentiary fact of certain consequences as to the duty of production of the other evidence by the opponent[vi].

Helman observed that 'presumption' word has been very loosely used. He differentiates the definitions as are –
(a) Basic fact means the fact or group of facts giving rise to presumption or justifiable inference.
(b) Presumption when basic fact exists the existence of the another fact must be assumed whether or not the other fact may be rationally found from the basic fact.
(c) Justifiable inference when a basic fact exists the existence of the presumed fact may be inferred. This is also sometimes called a presumption of fact or again, a permissive presumption[vii].

For the use of presumption in legal system its effects states that "a legal presumption is a rule of law which creates an artificial probative relation or recognizes a naturally existing probative relation between two specific facts, one of which is proved and the other unproved"[viii].
Ordinarily, presumptions consist a relationship between one fact or group of facts the basic facts and another fact or set of facts, the presumed facts. Presumed facts include the basic facts. The implication of strength varying with presumption. During the existence of presumption certain advantages accrue to the person for proving the basic facts which would not accrue in the absent of these. Degree of advantage depends upon the meaning in which this 'presumption' term is used.

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The full bench of Allahabad High Court has been laid down that "under The Bharatiya Sakshya Adhiniyam,2023 only the inferences which a logical and reasonable mind normally draws. Facts and circumstances are codified under The Bharatiya Sakshya Adhiniyam from where the inferences follow. Where the law allows the raising of a presumption the court can by reason of Section 2(1) of the Act raise the presumption for the purpose of proof of a fact. Wherever the presumption is available in one or the other section then it can be raised by the court under that particular section. It all depends upon the circumstances available in each case as applicable to a particular document or person[ix].

Presumptions are helps to arguments and reasoning which considers the truth of certain facts for the purpose of some given inquiry. These are based on general experience or probability of any types or merely on convenience and policy. These may be appearing in arguments or evidence. By assuming its existence, it is taken for granted. By applying it legitimately designates rule or proposition which still leaves open to further inquiry and casts duty upon the party against whom they relate. Therefore, these are closely related to subject of judicial notice by providing the basis of many of those spontaneous recognitions of specific facts or conditions which make up that doctrine. Although presumption for the time being full-fill the result of both evidence and argument but are not themselves either argument or evidence. It would be as true so as to say that an instance of judicial notice is evidence, as to say that a presumption is evidence[x].

III CLASSIFICATION OF PRESUMPTION

Under Indian legal system there are two types firstly, Presumptions of law and secondly presumption of fact along with these some are rebuttable and irrebuttable presumptions for which the courts are bound by statue and some time by other binding authority to set up certain conditions which the courts are bound to take up beforehand a priori to consider the evidence in the case or part of a case to which these presumptions apply. On the other hand, presumptions of fact are not necessarily taken up at the beginning of the consideration of a case or any specific part of it. In reality these are assumptions of Fact which we at any stage of a case.

These presumptions are created by some policy of law to full-fill some judicially felt need or to complete objective recognised as desirable by judiciary. According to Bohlen "The force of each presumption and its effect as shifting the burden of producing evidence depends upon the nature of need or purpose which has led to the recognition of that presumption[xi].

Presumptions of Law

These presumptions are discovered either upon the principle of justice or nature's law or the experience of human conduct and affairs along with the connections ordinarily found to exist between certain things. This type also includes those rules which in certain cases either forbid or disputable with any ulterior inquiry. The one fact being proved the other it's uniform concomitant is universally and safely presumed. Greenleaf states "Uniformly experienced connection which leads to its recognition by the law without other proof the presumption" however having more or less force in proportion to the universality of the experience. This distributes presumption of law into two classes namely, conclusive and disputable.

This presumption is also said to be artificial presumption where one fact is presumed to exist if any other fact is proved, although the proved fact is not in itself direct evidence of the presumed fact. The basis for such policy is ordinarily either the experience of making evidence a customary or probable relations between the proved fact and the presumed fact or simply a rule of convenience or public policy. The classical presumption of law that death after seven year's absence[xii].

One important effect of this presumption is to invoke a rule of law and thereby compelling the jury to reach at the conclusion in the absence of evidence to the contrary from the opponent. If the opponent leads sufficient to satisfy the jury's requirement of same evidence, then this presumption disappears and case is free from any rule in jury's hand[xiii].

Since these presumptions are legal fictions and are designated for the sake of justice and convenience based upon wide human experience of connected fact proved and the fact to be proved. These are parts of adjective law through which these finds application in practice[xiv].

Presumptions of Fact

These presumptions explain that an inference can be find from the other facts that are known. It is based upon reasoning. It is a probable inference which common sense draws from circumstances ordinarily occurring in such cases. In these major premise is not a rule of law, they belong equally to any and every subject matter and are to be judged by the common propositions and the validity of arguments. Greenleaf stated "These are depending upon their own natural force and efficacy in generating belief or conviction in the mind as derived from those connections which are shown by experience, irrespective of any legal relations[xv].

This is not referring to propositions but to arguments also not to assuming but inferring during leading of evidence which can only be brought to bear on the matter at issue through a process of reasoning, the inference called a presumption of fact and evidence through which inference drawn is known as presumptive evidence. These are also some time regarded as merely permissive inferences. Moreover, these do not possess the artificial nature like presumption of law. Therefore, both these presumptions are not the species of a common genius[xvi].

The effect of these two presumptions is that when the existence of a person, a personal relationship or state of things is once established by proof, the law presumed that the person, relation or status of things continues to exist as before, until the contrary is shown or until a different presumption is raised from the nature of the subject in question[xvii].

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IV PRESUMPTIONS UNDER INDIAN STATUTE

In Indian legal system presumption is basically applied in various statutes and the courts by taking the help of this administer the justice. These statutes discussed in detail as are-

Presumption Under Prevention of Money Laundering Act, 2002

Section 22 and 23 of this Act explains about the principle of presumption. In spite of phrase 'shall be presumed' used under sub-sec. (1) explain that no way is left with the special court in respect of such records which are found in control and possession of any person during survey, search, produced or seized means this presumption covered only documents/records/writing included in clauses (i) to (iii) of sub-section (1). This type of presumption resembles with Section 2(1)(l) of The Bharatiya Sakshya Adhiniyam,2023 i.e 'shall presume' and is rebuttable. But this presumption holds good till it is rebutted by the aggrieved person. Also there is parity of transaction between indigenous documents/records and records received from the foreign countries. In both of these cases the nature of presumption is under sub-section 1 and 2 of Section 22 of the said Act.

In the same way when the money laundering included many transactions and out of which one or more is or are proved to be linked with money laundering, in this situation for the purpose of adjudication or confiscation or trial of money laundering offence under Section 18 be presumed that the remaining transactions are interconnected or associated with money laundering unless the contrary proved. It is also mandatory under the Act that burden of proof lies on the person who claims that the proceeds of the crime alleged to be involved in money laundering. Although in case of records and properties which are found in possession or control of any person in the course of survey or search under Section 16, 17and 18 of Prevention of Money Laundering Act, a presumption is raised that such documents or property belongs to such person and the contents of such records are true and further signatures and any part of such records in hand-writing of such person along with the records in property are absolute and the onus to prove the same otherwise lies on such person[xviii].

Presumption Under Prevention of Corruption Act, 1988

According to this enactment when any person has accepted or obtained for himself or for any other person any gratification or valuable thing from any other person then it shall be presumed that bribe has been accepted by that person for any consideration or otherwise unless the contrary is proved by the accused. This presumption is presumption of law and rebuttable in nature along with it is mandatory for the court to raise this presumption in every case before it[xix].

It is observed that legislature personally realised that experience in courts proved how it is different to bring home to the accused persons in the charge of bribery by noting that evidence adduced in support of the charge generally be treated as tainted evidence and therefore, it is not very easy to establish the charge of this offence beyond reasonable doubt. It is felt by the legislature that evil of corruption amongst public servants posed a serious problem and need to be effectively rooted out in the interest of effective and clean environment. Therefore, the legislature enacted Section 20 for raising the presumption as soon as the condition precedent prescribed by it is satisfied[xx].

This presumption is also applicable to Section 31 of The Prevention of Corruption Act, 1988 and is inserted to relieve the burden of proving motive in accepting said gratification. Also it cannot be invoked at the stage of investigation[xxi]. Therefore, presumption cannot be brush aside during the consideration of framing of charge by the court under Section 268(1) of The Bharatiya Nagarik Suraksha Sanhita,2023[xxii].

Presumption Under Protection of Children from Sexual Offences Act, 2012

Under this enactment Section 29 and 30 deals with the doctrine of presumption. When a person prosecuted for committing, abetting or attempt to committing offence under Section 3, 5,7and 9 of POCSO Act, 2012 then court must raise presumption that person has committed the offence under Section 29 unless the contrary is proved by the accused. Therefore, this is rebuttable presumption. In the same way under Section 30 when for any offence under this Act requires culpable mental state of the accused then the court shall presume the existence of mental state[xxiii].

Presumption Under Narcotic Drugs and Psychotropic Substances Act, 1985

The doctrine also applicable under Section 35 in which the court shall presume the existence of culpable mental state of the accused along with, it provides defence to the accused to prove the fact that he had no such culpable mental state in relation to the act charged as an offence in that prosecution. Therefore, it is rebuttable presumption. Along with it under Section 54 presumption regarding possession of illicit articles can only be raised after the prosecution has proved that accused was found to be in possession of contraband in search conducted according to the mandate codified under Section 50 of the Act. Therefore, search conducted in violation of this provision does not provide the prosecution to raise presumption under this Act. In certain cases presumption as to documents also raised under Section 66 of this Act[xxiv].

Presumption Under Negotiable Instrument Act, 1881

In the category of economic offences also this doctrine of presumption is applicable under Section 139 of the Negotiable Instrument Act by presuming that holder of cheque received it for the discharge in whole or part of any debt or liability until the contrary is proved by the person against whom the complaint filed under Section 138 of Negotiable Instrument Act. Therefore, the nature of presumption is rebuttable under this special Act[xxv].

Presumption Under Juvenile Justice Care and Protection Act, 2000

Under this enactment under Section 49 presumption and determination of age. If the person is juvenile on the date of commission of offence, he or she shall be treated as juvenile in accordance with the provisions of the Act for all purposes during inquires and trials although that person ceases to be

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juvenile during the inquires or trials means it continued to juvenile. Therefore, to assume that provisions of this Act apply on the date of inquiry or trial appears to be wrong[xxvi].

V. REVIEW OF LITERATURE

Book on **Law Relating to Dowry Prohibition, Cruelty and Harassment**[xxvii] successfully counters the various facets of presumption and brings out the applicability of presumption under different statutes. Along with it also discusses that legislation alone cannot eradicate the deep rooted social problem of dowry. In reality a strong propaganda should be started against the evil by all responsible individuals in the society.

Book titled **Law Relating to Dowry, Dowry Death, Cruelty to Women and Domestic Violence**[xxviii] provides detailed account of gender inequalities throughout the world. Gender security concerns each and every member of the society and forms the very basis of a just society. The author rightly pointed out the prerequisite for inviting presumptions and makes the readers to understand the legislative dynamism between Section 85The Bharatiya Nyaya Sanhita, 2023 and Section 4 of Dowry Prohibition Act, 1961.

Handbook on **Prevention of Corruption Act, 1988**[xxix] is helpful in understanding the concept of presumption under this special Act. Detailed explanation regarding the difference between the presumption under The Bharatiya Sakshya Adhiniyam,2023 and presumption under Prevention of Corruption Act been given along with in this scope and nature of presumption also discussed.

Book titled **Law of Evidence**[xxx] was recognised from its inception both in India and abroad as a work of unique learning. It stands in the first row of the legal literature of India and is known for his clarity and lucidity. Along with this it focuses on the entire law of evidence in the light of latest judicial pronouncements and statutory amendments. One can pay heed to this book as it provides every important case law in reference to presumption.

Book titled **The Law of Evidence**[xxxi] is a simple and emphatic commentary and describes each concept in an ambiguous manner regarding presumption in the scope of large body of case law. Scholar views also explained in the light interpretation of courts with regard to presumptions. The author also explains the scope of presumption in references with cases of suicide by married women and consent in certain rape cases. Therefore, this commentary is helpful in examining the subject matter in public interest.

Book titled **The Law of Evidence**[xxxii] is one of the oldest commentaries on the law of evidence. It has compelled relook at some of the fundamental conceptions of criminal justice system and strong relook at the conventional principles of criminal justice system such as the presumption of innocence, the standard proof beyond reasonable doubt, the right to silence and the authority of the state to detain without trial.

Book titled **Principles of the Law of Evidence**[xxxiii] is based upon the contribution of the judiciary for the development and growth of the subject. This book galore the effect of the seven years' absence of a person. It also explains how strong the presumption of marriage and what strong evidence is needed to demolish such presumption. It also helpful in understanding the concept of presumption of termination of marriage against run away husbands.

Article titled **The Public Face of Presumption**[xxxiv] discusses that how the presumptions are considered as second best inferential tool allowing us to reach conclusions, if we must under conditions of limited information. This article both surveys recent approaches to the critical analysis of presumptions in law, philosophy and discourse studies alongwith offers an account of how we might begin to think about this other public face of presumption.

Article titled **Presumption Are They Evidence**[xxxv] to invite an examination of the rule applied by some courts that rebuttable legal presumptions are evidence. This rule applicable in California, Vermont and elsewhere that rebuttable presumption is evidence which may be "weighed" by the jury or judge, with or against evidence in order to find an operative part. The author suggests that the real test of whether a presumption is evidence can be made only when evidence is introduced by an adversary that contradicts the fact presumed. Obvious the question is a pertinent one and the answer is important in the practical administration of justice.

Articled titled **Evidence: Presumptions As Evidence- An Reply**[xxxvi] mainly discussion of the question whether presumptions and inferences are evidence prompts further comment on this problem. In this it is explained that presumptions are a short cut for standard inferences from judicially noticed evidence. For legal purposes they are evidence. They are treated as secondary to direct evidence alongwith admitted and excluded in accordance with the rules of primary and secondary evidence. These presumptions are mostly excluded where the bearing of the facts on which they rest is more remote.

Article **The Effect of Rebuttable Presumptions of Law Upon the Burden of Proof**[xxxvii] term presumption is used in various senses but only one form the rebuttable presumption of law is true rule of evidence and its only effect is to shift the burden of producing evidence alongwith the vast study of these rebuttable presumptions also know about the probable consequences of it.

Article **Presumption of Innocence: Where Does India Lie**[xxxviii] claims that the low rates of conviction of accused offender is due to the tedious and long drawn criminal procedure laid down in various statutes. The legislators find shifting the burden of proof on the accused to show his innocence is a simple solution. The number of statutes which shift the burden of proof on the accused are not in few number. One of which is Terrorist and Disruptive Activities (Prevention) Act (TADA).

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Article **Cyber Terrorism and Dilution of the Doctrine of Presumption of Innocence: Formal Victory or A Real Defeat**[xxxix] attempted to make depth examinations which explores the potential of cyber threat. This has emerged as a necessary evil because of profound changes brought by the digitalization convergence and continuing globalization of computer networks. Cyber security has threatened various human rights particularly right to privacy, right to information and right to presumption of innocence. The counter terror legislations using presumption clauses directly denying the celebrated principal of presumption.

VI. JUDICIAL APPROACH

Judiciary also play a pivotal role in interpretation and evolution of the provisions of rule of presumptions under The Bharatiya Sakshya Adhiniyam, 2023 by passing various decisions through numerous statutory enactments are as –

In *Super Threading India Pvt. Ltd. v. Presiding Officer Labour Court Ludhiana*[xl] Special reference is made to Section 11 of Industrial Disputes Act, 1947 and Section 27 of the General Clauses Act, 1897. It was held that presumption of service of notice is a rebuttable presumption. When neither acknowledgement nor unserved envelope received back then notice is deemed to be served. However, this presumption of service of notice cannot be extended to that extent to defeat the claims of person who contends specifically that notice was not served to him.

In *Sultan Singh v. State of Haryana*[xli] reference is made to Section 118 The Bharatiya Sakshya Adhiniyam, 2023 and Section 80 The Bharatiya Nyaya Sanhita,2023. It was held that presumption under Section 118 of The Bharatiya Sakshya Adhiniyam, 2023 is attracted only in case of suicidal or homicidal death and not in case of accidental death. Also, according to Section 80 of The Bharatiya Nyaya Sanhita, 2023 when death of bribe is due to burning and is within seven years of marriage at matrimonial home and death is not by accident but under circumstances other than normal the presumption can be rightly invoked under the said provisions.

In *Laila v. Muhammed Ali*[xlii] It was held that if a child is born on the first day of marriage then it will be presumed under Section 116 The Bharatiya Sakshya Adhiniyam,2023 that child was legitimate. Presumption can be rebutted by showing that prior to marriage there was no access between spouses. It is important to note here that if child is born during pregnancy of valid marriage i.e spouses had access to each other then there is presumption of legitimacy of child even if wife undergoes DNA test and report is negative.

In *Nepal Singh v. State of Haryana*[xliii] the Supreme court culled out the general principle regarding power of the appellate court while dealing with an appeal against an order of acquittal under Section 419 The Bharatiya Nagarik Suraksha Sanhita,2023 Where an appellate court, however, must bear in mind that in case of acquittal there is a double presumption in favour of the accused, Firstly, the presumption of innocence is available to him under the fundamental principal of criminal jurisprudence that every person shall be presumed to be innocent unless proven guilty by a competent court of law. Secondly, the accused having secured his acquittal, the presumption of his innocence is further reinforced, reaffirmed and strengthened by the trial court.

In *Yashpal Raghav v. State (Delhi)*[xliv] the court discusses the presumption under the prevention of corruption Act, 1988. The court explained that presumption is an inference of a certain fact drawn from other proved facts. While inferring existence of a fact from another, court is only applying a process of intelligent reasoning which mind of a prudent man would do under similar circumstances. Presumption is not final conclusion to be drawn from other facts. But it could as well as final if it remains undisturbed later.

In *Masthan Singh v. State of Punjab*[xlv] observed that the dacoity had taken place at the house of complainant .The presumption under Section 119 The Bharatiya Sakshya Adhiniyam,2023 would be attracted. As such, conviction recorded by the trial court under Section 317(3) i.e recovery of stolen property from accused stands fully established.

In *Baldev Singh v. State of Punjab*[xlvi] on examining the facts the court paid heed to Section 2 and 4 of Dowry Prohibition Act, 1961, Section 118 The Bharatiya Sakshya Adhiniyam,2023 and Section 105 The Bharatiya Nyaya Sanhita,2023. The court discussed that the expression 'soon before' is very relevant where Section 118 The Bharatiya Sakshya Adhyniyam,2023 and Section 80 The Bharatiya Nagarik Sanhita,2023 are pressed into service.

In *M/S Kumar Exports v. M/S Sharma Carpets*[xlvii] the Supreme court in order to determine the question whether offence punishable under Section 138 of the Negotiable Instrument Act, 1881 is made out against the appellant laid it necessity to examine the scope and ambit of presumptions to be raised as envisaged by the provisions of Sections 118 and 139 of the Act.

In *Union of India v. Sanjeev V. Deshpande*[xlviii] the apex court of India held that there is no presumption of innocence in favour of the accused, if the offence is committed under the Narcotic Drugs and Psychotropic Substances Act, 1985. It was held that Section 37 of the said Act departs from the long established principle of presumption of innocence in favour of an accused person until proved otherwise.

VII CONCLUSION

Under The Bharatiya Sakshya Adhiniyam,2023 presumptions have a wider scope as they not only providing help to victim but also giving direction to the case. Simultaneously, these are also aid to the judiciary to provide quick and complete justice to the society. As like the right of accused to defence or to keep silent as defence, the courts have right to make or not to make these statutory presumptions as a rule of evidence. Generally, the percentage of decisions is very high in which the victim is negatively affected due to the present law of the principle of presumption. Another, as a result of rise in modernization, education, financial security and radical feminist, people have misused the law in various cases such as sexual offences, dowry cases, kidnapping, outrage modesty of women and many more.

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This all causes due to the fact that the women are still considered to be the weaker section and therefore the courts are more inclined towards the women. Therefore, perspective of the state and its agencies needs to be change from that of protecting the women who are indulged in making false attempts due to the need of hour. Moreover, law reformers must consider and recognize this situation and necessary ways must be adopted in order to minimize the misuse of principles of presumptions by those for whose benefit it was framed. Finally, principle of presumption of innocence is not expressly specified as a constitutional right, the onus lies on the courts to confer it with the position it deserves. Irrespective of the position taken by the legislature, reverse burden should not be accepted by the judiciary when the law allows the conviction to accused without existence of reasonable doubt as to if they committed the crime for which they have been charged. Because they are not courts of law, but justice too.

* *Assistant Professor, BKSM Law College, Jalalabad (E) Dharmkot, Dist. Moga, Panjab University Chandigarh.*

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A REVIEW ON AI USING PHARMACY DISCIPLINE

Mr.Abhishek R. Vanjare[1*], Dr. Swati Rawat[2], Dr. Sunil S. Jaybhaye[3], Ms.Ashwini. J.Bahir[4], Mr.Sharad.P.Kanhere[5]

[1]*Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Dist. Jalna.*
[2]*Faculty of Quality Assurance, Principal, of Institute of Pharmacy, Badnapur, Dist. Jalna.*
[3]*Faculty of Pharmaceutical Science, Vice Principal, Institute of Pharmacy, Badnapur, Dist. Jalna.*
[4]*Faculty of Pharmaceutical Analysis ,Institute of Pharmacy, Badnapur, Dist. Jalna.*
[5]*Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Dist. Jalna.*

ABSTRACT

Artificial Intelligence (AI) focuses in producing intelligent modelling, which helps in imagining knowledge, cracking problems and decision making. Recently, AI plays an important role in various fields of pharmacy like drug discovery, drug delivery formulation development, polypharmacology, hospital pharmacy, etc.

Artificial intelligence (AI) has emerged as a powerful tool that harnesses anthropomorphic knowledge and provides expedited solutions to complex challenges. Remarkable advancements in AI technology and machine learning present a transformative opportunity in the drug discovery, formulation, and testing of pharmaceutical dosage forms. By utilizing AI algorithms that analyze extensive biological data, including genomics and proteomics, researchers can identify disease-associated targets and predict their interactions with potential drug candidates. This enables a more efficient and targeted approach to drug discovery, thereby increasing the likelihood of successful drug approvals. Furthermore, AI can contribute to reducing development costs by optimizing research and development processes.

KEYWORD:*Artifical Intilligence, Type, Advantages, disadvantages, Technology,Pharmacology,Pharmacokinetics,Pharmacodyanani, Pharmacovigilance, Machine learning, Future.*

INTRODUCTION

- **Artificial Intelligence**

Artificial intelligence is a field of science concerned with building computers and machines that can reason, learn, and act in such a way that would normally require human intelligence or that involves data whose scale exceeds what humans can analyze.

AI is a broad field that encompasses many different disciplines, including computer science, data analytics and statistics, hardware and software engineering, linguistics, neuroscience, and even philosophy and psychology.

On an operational level for business use, AI is a set of technologies that are based primarily on machine learning and deep learning, used for data analytics, predictions and forecasting, object categorization, natural language processing, recommendations, intelligent data retrieval, and more.

- **How does AI work?**

While the specifics vary across different AI techniques, the core principle revolves around data. AI systems learn and improve through exposure to vast amounts of data, identifying patterns and relationships that humans may miss This learning process often involves algorithms, which are sets of rules or instructions that guide the AI's analysis and decision-making. In machine learning, a popular subset of AI, algorithms are trained on labeled or unlabeled data to make predictions or categorize information.

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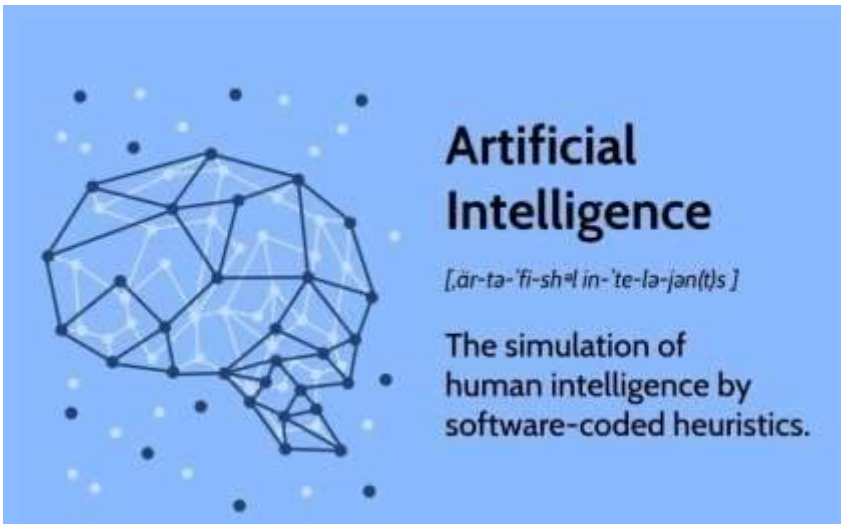


FIG: 1.

- **Types of Artificial Intelligence**

Artificial intelligence can be organized in several ways, depending on stages of development or actions being performed.

For instance, four stages of AI development are commonly recognized.

1. **Reactive Machines:** Limited AI that only reacts to different kinds of stimuli based on preprogrammed rules. Does not use memory and thus cannot learn with new data. IBM's Deep Blue that beat chess champion Garry Kasparov in 1997 was an example of a reactive machine.
2. **Limited Memory:** Most modern AI is considered to be limited memory. It can use memory to improve over time by being trained with new data, typically through an artificial neural network or other training model. Deep learning, a subset of machine learning, is considered limited memory artificial intelligence.
3. **Theory of Mind:** Theory of mind AI does not currently exist, but research is ongoing into its possibilities. It describes AI that can emulate the human mind and has decision-making capabilities equal to that of a human, including recognizing and remembering emotions and reacting in social situations as a human would.
4. **Self Aware:** A step above theory of mind AI, self-aware AI describes a mythical machine that is aware of its own existence and has the intellectual and emotional capabilities of a human. Like theory of mind AI, self-aware AI does not currently exist.

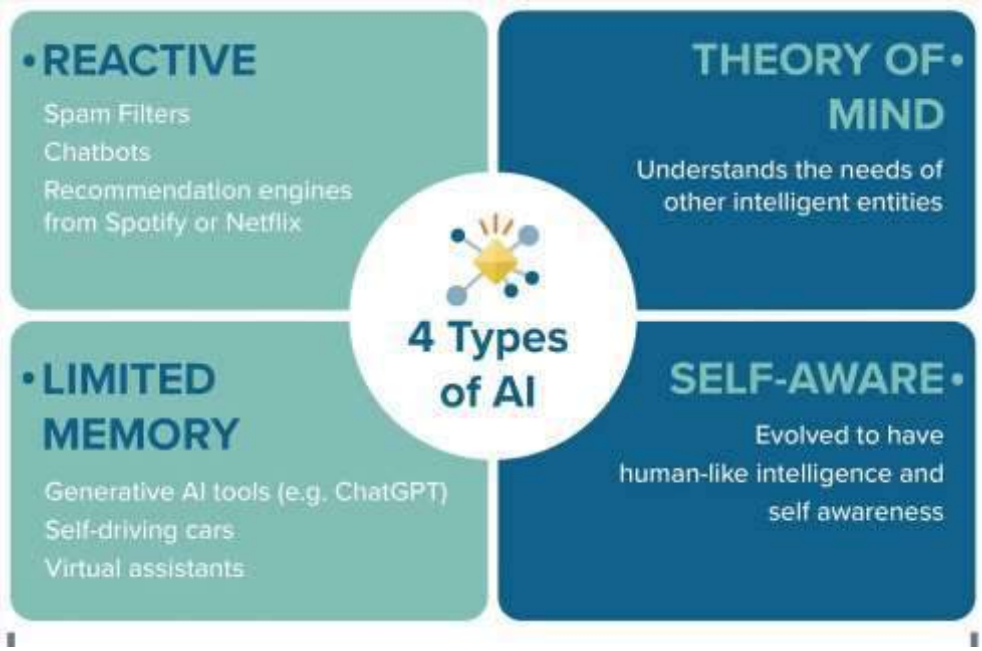


FIG: 2.

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- **Advantages of AI technology**

Error minimization: AI assists to decrease the errors And increase the accuracy with more precision. Intelligent robots are made of resistant metal bodies And capable of tolerating the aggressive atmospheric Space, therefore, they are sent to explore space.

Difficult exploration: AI exhibits its usefulness in the Mining sector. It is also used in the fuel exploration Sector. AI systems are capable of investigating the Ocean by defeating the errors caused by humans.

Daily application:AI is very useful for our daily acts And deeds. For examples, GPS system is broadly Used in long drives. Installation of AI in Androids Helps to predict what an individual is going to type. It also helps in correction of spelling mistake

Digital assistants: Now-a-days, the advanced Organizations are using AI systems like 'avatar' (models of digital assistants) for the reduction of Human needs. The 'avatar' can follow the right Logical decisions as these are totally emotionless. Human emotions and moods disturb the efficiency Of judgement and this problem can be overcome by The uses of machine intelligence.

Medical uses:In general, the physicians can assess the Condition of patients and analyze the adverse effects And other health risks associated with the medication With the help of AI program. Trainee surgeons Can gather knowledge by the applications of AI Programs like various artificial surgery simulators (for examples, gastrointestinal simulation, hear Simulation, brain simulation,) etc.[2]

- **Disadvantages of AI technology**

Expensive: The launch of AI causes huge money Consumption. Complex designing of machine, Maintenance and repairing are highly cost effective. For the designing of one AI machine, a long Period of time is required by the R&D division.AI machine needs updating the software programmes, Regularly. The reinstallations as well as recovery Of the machine consume longer time and huge Money.

No replicating humans: Robots with the AI technology Are associated with the power of thinking like human And being emotionless as these add some advantages To perform the given task more accurately without Any judgement. If unfamiliar problems arise, robots Cannot take the decision and provide false report.
No improvement with experience: Human resource Can be improved with experiences. In contrast, Machines with AI technology cannot be enhanced With experience. They are unable to identify Which individual is hard working and which one is Nonworking.

No original creativity: Machines with AI technology Have neither sensitivity nor the emotional Intelligence. Humans have the ability to hear, see, Feel and think. They can use their creativity as well As thoughts. These features are not achievable by the Uses of machine

Unemployment: The widespread uses of AI technology In all the sectors may cause large scale unemployment. because of the undesirable unemployment, Human workers may lose their working habits and Creativity.[2]

PHARMACEUTICAL TECHNOLOGY

AI for Drug Discovery:AI has revolutionized drug research and discovery in numerous ways. Some of the key contributions of AI in this domain include the following:

.Target Identification: AI systems can analyze diverse data types, such as genetic, proteomic, and clinical data, to identify potential therapeutic targets. By uncovering disease-associated targets and molecular pathways, AI assists in the design of medications that can modulate biological processes.

Virtual Screening: AI enables the efficient screening of vast chemical libraries to identify drug candidates that have a high likelihood of binding to a specific target. By simulating chemical interactions and predicting binding affinities, AI helps researchers prioritize and select compounds for experimental testing, saving time and resources.

Structure-Activity Relationship (SAR) Modeling: AI models can establish links between the chemical structure of compounds and their biological activity. This allows researchers to optimize drug candidates by designing molecules with desirable features, such as high potency, selectivity, and favorable pharmacokinetic profiles.

De Novo Drug Design: Using reinforcement learning and generative models, AI algorithms can propose novel drug-like chemical structures. By learning from chemical libraries and experimental data, AI expands the chemical space and aids in the development of innovative drug candidates.

Optimization of Drug Candidates AI algorithms can analyze and optimize drug candidates by considering various factors, including efficacy, safety, and pharmacokinetics. This helps researchers fine-tune therapeutic molecules to enhance their effectiveness while minimizing potential side effects.

Drug Repurposing: AI techniques can analyze large-scale biomedical data to identify existing drugs that may have therapeutic potential for different diseases. By repurposing approved drugs for new indications, AI accelerates the drug discovery process and reduces costs.[4]

PHARMACOLOGY OF DRUG USING AI

- **Pharmacology Of Drug After Formulation**

Prediction of Dug Release through FormulationThe prediction of drug release certainly has the potential for stable quality control. Drug release studies are performed through in vivo and in vitro methods, which are treated as fundamental technologies regularly evaluated or tested during product development. The release of the drug from oral solid dosage forms is based on the

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contribution of critical material attributes along with the processing parameters. Some of the common factors affecting drug release include compaction parameters such as the pressure used for tablet hardness setting, geometric aspects of the tablets, and drug loading characteristics. Many analysis techniques, including spectrophotometric analysis methods, have been implemented, or drug release studies are usually required for extensive analysis



FIG: 3

- **Application of AI for the Detection of Tablet Defects**

The application of AI in the detection of tablet defects has revolutionized quality control processes in pharmaceutical manufacturing. AI algorithms and computer vision techniques are employed to analyze images of tablets, enabling the automated and efficient detection of defects such as cracks, chips, discoloration, or variations in shape and size. By training AI models on large datasets of labeled images, the system learns to accurately classify and identify different types of defects, achieving high levels of precision and recall. Conventional methods, such as X-ray computed tomography, have been used to analyze the internal structure of tablets, but they are still time-consuming and affect the demand for the rapid production of tablets. Deep learning is implemented along with X-ray tomography to detect tablet defects. Ma et al.

explored the application of neural networks for tablet defect detection with the help of image analysis completed through X-ray tomography. These researchers have manufactured several batches of tablets by using excipients such as microcrystalline cellulose along with mannitol. The prepared batches were analyzed with the help of the so-called image augmentation strategy. Three different models were used during the same research, including UNetA, which is applicable for the identification of distinguished characteristics of tablets from those of bottles. Module 2 was used for the identification of individual tablets with the help of augmented analysis. The internal cracks in the internal structure of the tablet were analyzed with the help of UNetB. Such UNet networks have been used to check tablet defects with better accuracy and thus provide ease of identification of defects with significant reductions in time, financial costs, and workload . This AI-powered detection not only improves the speed and accuracy of defect identification but also reduces the dependence on manual inspection, minimizing human errors and subjective judgment. The real-time monitoring capabilities of AI systems ensure the prompt detection of defects, facilitating timely intervention and preventing the release of faulty tablets into the market. Ultimately, the integration of AI into tablet defect detection enhances product quality, increases productivity, and ensures the safety and efficacy of pharmaceutical products.[5]

AI FOR PHARMACODYNAMIC AND PHARMACOKINETICS

Drug development is a complex process that involves several stages, including drug discovery, preclinical studies, clinical trials, and regulatory approval. Pharmacokinetics and pharmacodynamics are crucial aspects of drug development, as they determine the optimal dosage, administration route, and safety of a drug in the body Traditional experimental methods for pharmacokinetics and pharmacodynamics studies can be time-consuming and expensive and may not always provide accurate predictions of drug efficacy and safety.

Traditionally, pharmacokinetics and pharmacodynamics studies have been conducted using experimental methods such as animal studies and human clinical trials. These methods have critical challenges, such as ethical concerns, sample size, and interindividual variability. Furthermore, these studies may not always provide accurate predictions of drug pharmacokinetics and pharmacodynamics in humans. To overcome these limitations, computational models and AI methods have been developed to predict drug pharmacokinetics and pharmacodynamics in a faster, more cost-effective, and more accurate manner.

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AI has shown tremendous potential in the fields of pharmacokinetics, pharmacodynamics, and drug discovery [With the advent of powerful computing and machine learning algorithms, AI has emerged as a valuable tool for predicting and optimizing drug pharmacokinetics and pharmacodynamics. Although the challenges of large data and reliable datasets are hard to ignore, AI can open new doors in PKPD studies and their impact on therapies.

- **AI Approaches in Polypharmacology**

Now a day, 'one-disease-multiple-targets' concept governs over the 'one-disease-one -targets' concept for the advanced realization of pathological process in various disorders at their molecular basis. The phenomenon of 'one-disease-multiple-targets' is known as polypharmacology.110 There are numerous and useful databases, for examples, PubChem, KEGG, ChEMBL, ZINC, STITCH, Ligand Expo, PDB, Drug bank, Supertarget, Binding DB, etc, which are accessible for the accomplishment of a variety of important and useful information related to the structure of crystals, chemical features, biological properties, molecular pathways, binding affinities, disease concern, drug targets, etc. AI also helps to discover the databases to sketch polypharmacological molecules/agents

- **Pre-Clinical Research**

New target discovery and toxicity prediction AI can contribute to address unmet medical needs by enhancing and accelerating identification of new molecular targets (genes or proteins). Access to large pharmacokinetics (PK) and pharmacodynamics (PD) datasets, from previous preclinical and clinical research (including from failed trials), is needed to develop and train effective and reliable algorithms that generate new stable molecules with real treatment potential. Lack of published PK/PD data, for competitive or proprietary reasons, is a significant hurdle to achieve full potential of AI in new drug discovery.

Several AI methodologies for safety prediction are described. In fact, software is available to predict drug toxicity based on target information. Efficient toxicity predictions have the potential to replace in vitro and animal models as the traditional pre-clinical approach.Additionally, the models can be used as risk-management and prioritization tools in development pipelines, by providing early indication of high-risk compounds flagged with significant safety concerns.

As in other AI fields, model interpretation can be challenging, especially given the high level of uncertainty in early phases of research. Understanding model features and underlying biological mechanisms is key for interpretability and confidence in predictions.

Clinical Trial Research

- **Protocol Design and Reporting**

AI systems extract valuable patterns of information to inform and enhance trial design. The SPIRIT-AI extension provides reporting guidelines for clinical trials evaluating interventions with an AI component. These guidelines enhance transparency, consistency, and interpretability by improving protocol reporting and providing evidence-based recommendations for addressing essential elements.

- **Patient Selection and Recruitment**

AI-assisted techniques and digital transformation enable precise patient identification, optimize cohort composition, and enhance recruitment and retention rates in clinical trials. Automation and ML use large datasets, including electronic health records and omics data, to make intelligent predictions and streamline patient selection. This results in improved trial enrollment and retention, ultimately enhancing the efficiency of clinical trials.

- **Investigator and Site Selection**

AI technologies aid in selecting high-functioning investigator sites for clinical trials. They identify target locations, qualified investigators, and priority candidates while ensuring compliance with Good Clinical Practice requirements. AI also helps collect and collate evidence to satisfy regulators regarding study timelines, data quality, and integrity, improving the trial process.

- **Monitoring and Management of Clinical Trials**

AI algorithms analyze real-time patient data, ensuring trial integrity and identifying adverse events. Automation and ML optimize data collection, improve quality, and enable real-time monitoring for higher trial success rates. AI enhances patient monitoring, medication adherence, and retention through data automation, digital assessments, and real-time insights from wearable technology, enhancing engagement and retention.

- **Image Analysis and Biomarker Computation**

AI techniques enable automated and precise medical imaging analysis, facilitating the identification of patterns, abnormalities, and disease-specific biomarkers. Integrating AI with imaging biomarker analysis pipelines improves image-based evaluations' accuracy, consistency, and efficiency in clinical trials.

- .**Intelligent Data Collection and Management**

AI streamlines data collection and management in clinical trials, accelerating the process. Collecting data through automated processes and utilizing this for AI algorithms minimizes errors, extracts relevant information from diverse sources, and data becomes efficiently structured and organized. Real-time access to data enhances analysis and decision-making, expediting trials and improving efficiency.[6]

- **AI in Pharmacology**

In the application of machine learning, deep learning methods (e.g.convolutional neural network), and natural language processing AI has brought about a

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groundbreaking transformation in various stages of drug discovery, development (including the discovery phase, clinical trial phase, and post-marketing surveillance) and precision medicine[7]

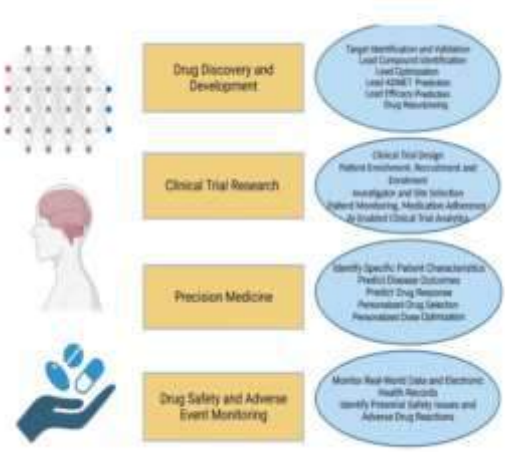


FIG: 4

Artifical Intelligence in Pharmacovigilance

- **Artifical Intelligence in Pharmacovigilance**

PV was designed mainly for patient safety who are limited exposed to treatment drugs during clinical trials and research. This makes it possible to observe drug profiles for a prolonged period and use. It also includes certain groups such as geriatric population, racial groups, pediatric population and pregnant women, and also the incomplete data from long-term drug exposure makes it mandatory to perform PV studies. The approval of life-saving drugs such as anticancer drugs, antitubercular, and antiretroviral drugs is based on fast track system so these drugs could be easily available for the patients and PV performs the assessment, communication of the risk, and effectiveness of these medications.

In developing countries, PV is still a new concept with low preference. Worldwide the countries are raising the issues in concern for the need of systems to monitor the safety of drug postmarketing.[8] Reporting of adverse drug reaction (ADR) is mainly done through spontaneous reporting or by pharmacoepidemiological methods that use systematic collection and analysis of adverse events (AE) associated with the use of drugs. It is also done by Adverse Drug Reaction Monitoring Centres and marketing authorization holder (MAH) industries to solve emerging problems, record signals, and communicate to minimize or prevent harm

Nowadays, drug safety is a major threat after launching the new drug to the market. During the clinical trial or after marketing, the major source of erosion is unpredictable toxicities that cause morbidity and mortality from normal dose of the drug. As per the record from 2008 to 2017, the Food and Drug Administration (FDA) approved 321 novel drugs. At the same time FDA, AE Reporting System has reported a total of >10 million AE reports in which 5.8 million were recorded as serious, and 1.1 million were death reports.

ADR data need to be collected by license holder that should be from pharmaceutical company and submitted to the local drug regulatory authority. The most important operation in PV industry is detection and reporting of ADRs, coding of AE in technical terms, preparing safety individual reports, assessment of seriousness, and relationship with suspected drug. All of these depend on the human interference, which is time-consuming; and hence, the detection of ADRs requires a new technology. A multinational pharmaceutical company in collaboration with a professional services company has developed an AI and ML system to facilitate the processing and maintenance of quality and compliance standards. The globally available data are so vast that it cannot be analyzed manually where AI becomes useful to track them. AI techniques play a significant role in the area of drug design and identification of AEs of pharmaceutical products.

Benefits of Artificial Intelligence in Pharmacovigilance

- The most important benefits of AI are reduced cycle times. Due to this method, the processing is spontaneous
- Improve the quality and accuracy of the information
- AI can handle or manage diverse types of incoming data formats
- It can be used for the identification of ADRs
- AI is useful to reduce the burden and time of case processing
- AI tools extract the information from the adverse drug event form and evaluate the case validity without the workforce.[8]

Machine learning

- **Machine learning for target identification**

The typical drug discovery requires identifying target proteins with casual aspects of pathophysiology and a plausible framework. Misunderstanding of target protein information may lead to modulation in the disease information, and in this sense, target selection is a mandatory step.

Evidence of successful drug response will be considered and subsequently, lead efficiency in the randomized clinical trial tends to the identification of prominent drug targets. The ML algorithm predicts the unseen biological happenings, events, and problems developed a computational model for predicting the morbidity and druggable genes on a genome-wide scale. That model has been widespread in reducing the laborious experimental procedures and identifying the putative molecular drug targets linked with disease mechanisms. Here, this classifier is modelled to uncover the biological rationale from a data-driven view. The main classification features are mRNA expression, gene essentiality, occurrence of mutations, and protein–protein network interactions.

The meta-classifier analysis results initiated from 65% of known morbid gene recovery and 78% of unknown druggable gene recovery. The decision tree (DT) and uncover rules inspect

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the parameters that include the membrane localization and regulation of multiple transcription factors to identify biological traits [This can also exhibit understanding and designing the Biosystems principles by applying the reverse engineering methods. Volk et al. applied the ML methods to model the challenges at DNA, protein, specific pathway levels and process them for the genome and cellular communities. Jeon et al. stated and developed a Support Vector Machine (SVM) method to analyse the genomic variety and systematic data set to distinguish the protein based on homologs or likelihood for drug binding in breast cancer cases, pancreatic cancer, and ovarian cancers.

Momoshina et al. applied the same concept of identifying the drug target in the complicated disease by using the biomarker discovery approachin muscle tissue to detect the druggable targets considering the molecular basis of human ageing. In this approach, the SVM model is contracted with linear kernel and deep feature selection to find the gene of expression linked with ageing. This model also evaluates the gene expression samples from Genotype-Tissue Expression (GTEx) project and has obtained a 0.80 accuracy level[10.1]

- **Machine Learning For Imaging Analysis**

ML approaches are used in investigatory screens and automated or robotic image acquisition and investigations. For example, the potent inhibitors against the β2 adrenoceptor target and radiological binding assay through novel molecules are screened based on ability to interfere with radiolabels ligand with binding affinityThis acute effect of small molecules may cause the alteration in the surface plasma resonance (SPR) detected in the receptors. This tendency allows the selection of small molecule inhibitors processed into the lead optimization stage But this process is laborious and a long approach, and therefore, alternative methods such as phenotypic screening are highly focused.

At this stage, ML-based analytics are applied to identify complex phenotypes that have tended to increase the efficiency of the small molecule. Another technique, namely advanced imaging, is a mechanism applicable to finding the phenotypes and perturbation of small molecules, and this method is known to enhance prediction. More broadly, imaging can be composed of two camps:

1. Typically called phenotypic screening, which targets the predefined phenotypes of intracellular signalling molecules associated with the disease mechanism.
2. The various subcellular structures with antibodies, infective or chemical agents, and fluorescent dyes categorize their responses.[11.]

Artifical Intelligence Future

- **AI today (and in the Near Future)**

Currently, AI systems are not reasoning engines ie cannot reason the same way as human physicians, who can draw upon ‘common sense’ or ‘clinical intuition and experience’.12 Instead, AI resembles a signal translator, translating patterns from datasets. AI systems today are beginning to be adopted by healthcare organisations to automate time consuming, high volume repetitive tasks. Moreover, there is considerable progress in demonstrating the use of AI in precision diagnostics (eg diabetic retinopathy and radiotherapy planning).

- **AI in the medium term (the next 5–10 years)**

In the medium term, we propose that there will be significant progress in the development of powerful algorithms that are efficient (eg require less data to train), able to use unlabelled data, and can combine disparate structured and unstructured data including imaging, electronic health data, multi-omic, behavioural and pharmacological data. In addition, healthcare organisations and medical practices will evolve from being adopters of AI platforms, to becoming co-innovators with technology partners in the development of novel AI systems for precision therapeutics.

- **AI in the long term (>10 years)**

In the long term, AI systems will become more intelligent, enabling AI healthcare systems achieve a state of precision medicine through AI-augmented healthcare and connected care. Healthcare will shift from the traditional one-size-fits-all form of medicine to a preventative, personalised, data-driven disease management model that achieves improved patient outcomes (improved patient and clinical experiences of care) in a more costeffective delivery system.[10]

CONCLUSION

The integration of Artificial Intelligence (AI) in the pharmacy discipline has revolutionized the field, transforming the way medications are discovered, developed, and delivered. AI's applications in pharmacy practice, research, and education have demonstrated significant potential in improving patient outcomes, streamlining clinical workflows, and enhancing the overall quality of care

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AUTHOR PROTOTYPE IN MEMOIR WORKS

Ubaydullayev Normuhammad
Associate Professor of the Uzbek-Finnish Pedagogical Institute, Doctor of Philosophy in Pedagogical Sciences

ANNOTATION
With biographical and autobiographical works, the diary shares many similar and different characteristics. Features such as the fact that the hero of the work with the author is a non-woven person, his existing personality in real life, the fact that the events being described relate to the life of the author make these two scrolls closer.
KEYWORDS. *Memoiric scroll, author-prototype, biographical and autobiographical works, artistic-aesthetic affectation, memory, memorabilia, memorabilia, Diaries.*

MEMUAR ASARLARDA MUALLIF PROTOTIPI

Ubaydullayev Normuhammad
O‘zbekiston-Finlandiya pedagogika instituti dotsenti, pedagogika fanlari bo‘yicha falsafa doktori

Annotatsiya. Biografik va avtobiografik asarlar bilan kundalik o‘zaro bir-biriga o‘xshash va farqli xususiyatlarga ega. Muallif bilan asar qahramonining to‘qima bo‘lmagan bir kishi ekanligi, uning real hayotda mavjud shaxsligi, tasvirlanayotgan voqea -hodisalar muallif hayotiga taalluqli ekanligi kabi xususiyatlar bu ikki bitikni o‘zaro yaqinlashtiradi.
Kalit so‘zlar. *Memuar bitik, muallif-prototipi, biografik va avtobiografik asarlar, badiiy-estetik ta’sirchanlik, xotira, esdaliklar, yodnomalar, kundaliklar.*

АВТОР ПРОТОТИП В МЕМУАРНЫХ ПРОИЗВЕДЕНИЯХ

Убайдуллаев Нормухаммад, доцент узбекско-Финляндского педагогического института, доктор философии по педагогическим наукам

Аннотация. Повседневное взаимодействие с биографическими и автобиографическими произведениями имеет как сходные, так и разные характеристики. Такие особенности, как тот факт, что автор и герой произведения-это один и тот же человек без ткани, его реально существующая личность, то, что описываемые события относятся к жизни автора, сближают эти два произведения.
Ключевые слова. *Мемуарное письмо, автор-прототип, биографические и автобиографические произведения, художественно-эстетические впечатления, воспоминания, мемуары, мемуары, дневники.*

At the same time, there are also significant differences between them that are clearly visible. Biographical and autobiographical works are written for publication, while diaries are personal observations of the author's own experiences and do not intend to be published. The style of expression of a biographical work meets the requirements of the artistic style, while in a diary, the conversational style is considered to be the priority. In an autobiographical work, the events described reflect the spirit of the era. In it, the path traveled is viewed from the perspective of today. In a diary, there is no large chronological distance between the time when the events described occurred and the time when they were written about. This prevents the author from seeing his life as a whole, that is, the life path traveled by the author does not become an object of aesthetic perception for him. In a biographical work, artistic and aesthetic expressiveness is strong. The reader who reads it develops a

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subjective attitude towards the facts of reality. The diary does not affect the majority, but only the author himself, because it serves him, but rather serves to remind the author of the events that occurred in his daily life.

"Specialists consider autobiographical work to be a borderline genre, that is, a genre that intersects with other genres," says the "Dictionary of Literary Studies"[1]. Autobiographical work has many similarities with memoirs. However, while the author of a memoir is interested in the people he met, the events he witnessed or participated in, the author of an autobiographical work focuses on the history of the formation of his relationship with reality, the traces they left in his soul and mind. There is also a difference between biographical and autobiographical works and works of an autobiographical nature. First of all, it should be said that any literary work contains elements of autobiographical nature. Because the work is born on the basis of the author's life experience: it is natural that certain events that occurred in the life of the creator, situations that he witnessed, and thoughts that arose under the influence of these are absorbed into the text. In an autobiographical work, biographical elements take precedence, and the literary texture is given little space. As in works of fiction with a real prototype, a memoir is an author-prototype, on the basis of which the image of another person is created[2]. G. Ghulam's story "Shum Bola" belongs to such works.

When conducting an educational (didactic) analysis of a particular work in the process of literary education, when students' attention is drawn to interesting and important events or attitudes about the life and personality of the author of the work, they learn the writer's attitude to life, worldview, ideals and gain a deeper understanding of the essence of the work being studied.

The use of memoirs is also common in works of the biographical genre. This aspect is clearly visible in the work of academician N. Karimov "Abdulla Qodiriy himself, in memory of his comrades and contemporaries"[3]. The work contains autobiographical information about Abdulla Qodiriy's own life, as well as the memoirs of his son Habibullo Qodiriy and a number of other contemporary writers. Abdulla Qodiriy's thoughts on his own work are presented in the form of the memoirs of his son Habibullo Qodiriy.

In particular, the work cites the memoirs of Habibulla Qodiriy: *"In one of our conversations, my father recounted the history of writing the novel "Bygone Days" as follows: "My father, who lived almost half his life in the khanate and witnessed many past events, used to tell me interesting memories when I was young. These memories aroused my interest in history. Then I got acquainted with many book sources about the history of those times. When I got the hang of writing, I had a desire to create a larger work based on Western novels about our past. There were so many historical events in my head, they seemed to boil, they did not give me peace. But I could not imagine how to organize these events into a single thread, to put them on paper. I thought and searched for a long time..." Also, the memory of Abdullah Qodiri is used: "I, the writer, never got bored of the stories of "Bygone Days" from my late father, no matter how many times I heard them, only one part bored me. Today, when I took up this "Bygone Days" in my pen, I was forced to skip that part that bored me. Indeed, who among us does not know the quarrel between relatives? When Zainab was very upset, she would go to her relatives' houses and eat their food..."*

It is characteristic that in autobiographical works, events are mainly narrated in a consistent order from the point of view of chronology, while in memoirs, thoughts are not presented systematically. The author of the memoir simply tells the story of the event that he remembers. The author's participation plays an important role in the memoir. For example, in the memoirs of the Uzbek writer Gayrati, an incident related to Abdulla Qodiriy is described as follows: *"In 1924-1925, I worked and edited in the first printing house in the old Jova neighborhood. I participated in the publication of parts 1-2 of "Bygone Days". The manuscript of the novel gradually fell into our hands with the clear signature of Abdulla Nasirov, who worked in the "Turon" library. My brother Abdullah himself often came to the printing house and helped with the printing... ...It must have been in the summer of 1925, when I left the printing house and worked as a teacher and a freelance correspondent for the magazine "Mushtum"...The publication of "Bygone Days" was like a thunderclap in the middle of the night, and lightning ripped through the veil of night. Just as an unexpected thunderclap at night shakes the universe and wakes up living beings, so too did the work of Abdullah Qodiriy wake up the sleepy people."*

Sometimes the dates of the events being narrated are not clearly indicated in the memoirs. The author remembers the events of the past in a tentative manner. This is the case, as in the excerpt above, in the memoir below: *"It was probably the mid-twenties, I was studying in Tashkent, at the Olka Uzbek educational institution. After class, we would follow the senior students to some library in the city... There were also many books published in Azerbaijan and Tatarstan at that time... In those days, "Bygden Kunlar" suddenly appeared on the scene. I remember how the publication of this novel had a lightning-fast effect."*

When memoirs are about a specific artist, they mention memorable events related to the work created by that artist. Most of the authors of memoirs are also people involved in artistic creation. Sometimes memoirs also mention events related to the daily activities of the writer in question, which serves to more vividly reflect the character traits of the artist, his attitude towards others, in short, his human image.

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OVERVIEW ON: NUTRACEUTICAL, ARE MEDICINE OR HEALTH FOOD IN THE TREATMENT OF HUMAN DISEASES

Phoke S. V[1]*, Kayande P. R[1], Jaybhaye S. S[2]
[1]*Department of Pharmaceutics, Institute of Pharmacy, Badnapur, Jalna- 431203 (MS), India.*
[2]*Department of Quality Assurance, Institute of Pharmacy, Badnapur, Jalna- 431203 (MS), India.*
[*]***Corresponding Author***

ABSTRACT
Nutraceuticals have received significant attention because of their supposed safety and potential nutritional and therapeutic effects". The concept of nutraceuticals was stared from the review in U.K., Germany and France which determined that diet is rated more highly by consumers than exercise or genetic factors for completing good health. Due to this, the nutraceutical market has become a million dollar manufacturing at a global level. The era of development of nutrients as medicines in the pharmaceutical world is of great importance and draws attention of scientists and researchers toward the significant benefits. The history and detection has explored many facts about the curiously profound therapeutic happenings of such agents. As a result, interdisciplinary approaches are now been applied to design and develop various dosage forms to deliver these herbal products relative to their applications. The entire world is rebellious diseases characteristic of the modern age such as obesity, osteoporosis, cancer, diabetes, allergies, and dental problems. With a global increase in the pervasiveness of obesity, both nutrition and exercise play key roles in its anticipation and treatment. Nutrients, herbals and dietary supplements are major constituents of nutraceuticals which make them instrumental in maintaining health, act against various disease conditions and thus promote the quality of life. Using food products to encourage health and cure disease is celebrated. Currently most of the drug molecules available in the formulations were anciently used in their crude form.

KEY WORDS: *Nutraceuticals, interdisciplinary, anticipation, instrumental, ncourage*

I. INTRODUCTION

A nutraceuticals word is comprises of 'Nutrient' and 'Pharmaceuticals'. According to AAFCO, 1996, 'Nutrient' means a feed constituent in a form and at a level that will help, support a life of human being or animal while 'Nutraceutical' means any non-toxic food component that has scientifically proven health benefits including prevention and treatment of disease. Products isolated or purified from food are sold in medicinal forms not usually associated with food. A nutraceutical have a physiological benefit that it provides protection against chronic diseases. [1, 2] The link between food and health was established long ago. Hippocrates once said, "Let food be thy medicine and medicine be thy food." Traditional medicine in Europe, Asia, Africa and pre-Columbian America is rife with examples of foods used to prevent and cure disease. Under the influence of rationalistic Western medicine, however, food has come to be viewed chiefly as a source of nutrition (that is energy, protein and fat) to the exclusion of other purposes. Yet as changing demographics accelerate the proliferation of chronic diseases, a growing body of evidence suggests that targeted nutrition using naturally occurring substances might be able to stabilize or even cure many of the most challenging health problems. The term "Nutraceutical" was coined by combining the terms "Nutrition" and "Pharmaceutical" in 1989 by Dr Stephen DeFelice, Chairman of the Foundation for Innovation in Medicine. "Nutraceutical" is a marketing term developed for nutritional supplement that is sold with the intent to treat or prevent disease and thus has no regulatory definition. Hence a "nutraceutical" is any substance that may be considered a food or part of a food and provides medical or health benefits, encompassing, prevention and treatment of diseases. Such products may range from isolated nutrients, dietary supplements and diets to genetically engineered "designer" foods, herbal products and processed foods such as cereals, soups and beverages. [3]

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Table No.01: Fortified Foods With Their Ayurvedic Nutraceuticals

Fortified Foods	Ayurvedic Nutraceuticals
Calcium Enriched Edli	Antioxidants and bone density enhancer
Probiotic fortified yogurt	Curcumin
Buttermilk	Green tea extract
Omega-3-fortified health drinks and baby foods	Fish oil, Brahmi, Senna, Lutein Sugar free ayurvedic supplement

Global market for nutraceutical vitamin ingredients will increase 6 percent annually to over $13 billion in 2014. Due to imbalance and deficiencies in national medical delivery system, it keeps large number of population dependent on natural and alternative medicines in India. Popularity of Indian Ayurvedic therapies boost the export opportunities for formulations based on ashwagandha, haldi, ginger, tulsi etc. Vitamin D will see the fastest growth in demand due to increasing clinical evidence of swine flu, cancer, and other preventive medicine benefits. Global demand for herbal and non-herbal extracts is increasing continuously. Green tea for weight loss and cancer treatment, while Ginkgo biloba for improving cognitive function, has been widely used as nutraceuticals. Glucosamine generate strongest growth in demand due to its usefulness on treatment of Arthritis. The nutraceutical industry in the US is about $ 86 billion. This figure is slightly higher in Europe and, in Japan, represents approximately a quarter of their $6 billion total annual food sales – 47 % of the Japanese population consumes nutraceuticals11.

Global market for nutraceutical vitamin ingredients will increase 6 percent annually to over $13 billion in 2014. Due to imbalance and deficiencies in national medical delivery system, it keeps large number of population dependent on natural and alternative medicines in India. Popularity of Indian Ayurvedic therapies boost the export opportunities for formulations based on Ashwagandha, haldi, ginger, tulsi etc. Vitamin D will see the fastest growth in demand due to increasing clinical evidence of swine flu, cancer, and other preventive medicine benefits. Global demand for herbal and non-herbal extracts is increasing continuously. Green tea for weight loss and cancer treatment, while Ginkgo biloba for improving cognitive function, has been widely used as nutraceuticals. Glucosamine generate strongest growth in demand due to its usefulness on treatment of Arthritis. The nutraceutical industry in the US is about $ 86 billion. This figure is slightly higher in Europe and, in Japan, represents approximately a quarter of their $6 billion total annual food sales – 47 % of the Japanese population consumes nutraceuticals.[4]

Concepts of Nutraceuticals [5]

In the pharmaceutical progress process, it is a condition to have clinical test results from animal tests and studies, for authentication of the effects. On the other hand, in the case of nutrition, there was no verification method for foods in averting diseases in the past. In recent years however, as food conformation has been scientifically proven to cause lifestyle-related diseases, and has become a social issue.

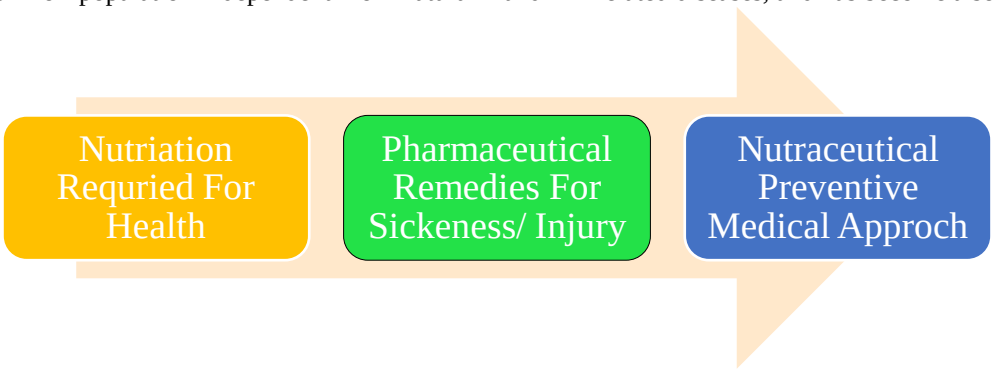


Figure 01: Concept of Nutraceuticals Benefits 0f Nutraceuticals

History & Rediscovery of Nutrients as Nutraceuticals

"Food may possess the ability to prevent diseases or treatment of ailment" this belief is couple of centuries old-proclaimed by our ancestors. The ancient writings and artworks of Egyptians, Romans, and Greek civilizations depicted the medicinal and spiritual applications of plants. The idea arose 3000 years ago when Hippocrates developed a relationship between food for health and therapeutic applications of it. The principal truth depicted in his statement that "Let food be thy medicine and medicine be thy food" is widely applied nowadays. Thus, from such finding, it could be believed that our nature and surroundings have much of the natural therapies to offer. One such finding presents the botanicals, which are in use from ancient times for the treatment of cancer. Similarly, there are many plant derived chemotherapies which consist of Vinca and Taxus brevifolia species to treat cancer and related problems. Furthermore, Ginseng has been another such traditional drug which is in use from past 2000 years in China. It was from the time of Liang dynasty of China that the chemotherapy features of ginseng were discovered and applied even in today's time. From the documented history, Egyptians identified the medicinal importance of coriander, fennel, juniper, cumin, garlic, turmeric,

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thyme, curry, and dried mint found in pyramids. The value of such medicinal sources was so high that even cinnamon was considered more precious in comparison to gold in Egypt. Due to the explored properties of plants, the Roman emperor Heliogabalus made use of cinnamon, clove, and pepper in meals which are used in cuisines and soft drinks until present time. In addition, there were many other plants and food additives identified such as honey and certain vitamins. Honey has always been given prime importance since ancient period. It was referred in Sumerians tablet writing as one of the remedies for health problems. According to Bible, the wise Solomon has said. [6, 7]

II. CLASSIFICATION AND CATEGORIZATION OF NUTRACEUTICALS

The aim of achievement of maximal state of well-being is alarmingly increased with the introduction of nutraceuticals. The term nutraceuticals, itself is a wide class which include many categories and subcategories under it. To understand the applications, the nutraceuticals are needed to be classified. The classification into various classes depending on their uses are:

a) Traditional nutraceuticals
b) Nontraditional nutraceuticals
c) Fortified nutraceuticals
d) Recombinant nutraceuticals
e) Potential and established nutraceuticals
f) Phytochemicals
g) Herbals
h) Functional foods
i) Dietary supplements and dietary fibers
j) Probiotics and prebiotics.

Traditional Nutraceuticals

The category consists of the food which does not undergo any manual changes. The components are natural and are having some potential which are actively involved in health benefits. Lycopene, a constituent of tomatoes is an example of this category.[8.9]

Nontraditional Nutraceuticals

Boosting of nutritional content by addition of nutrients, dietary components for improvement of quality of nutrition comprise this category of nutraceuticals. Beta carotene enriched rice is an example of this class. [8, 9]

Fortified Nutraceuticals

Fortification of food components is the process of addition of micronutrients (essential trace elements and vitamins) to food for enhancing the effectiveness and nutritional value. Its example includes milk fortified with cholecalciferol used in Vitamin D deficiency. [10, 11]

Recombinant Nutraceuticals

It involves the application of biotechnology and genetic engineering in the production of energy providing foods such as yoghurt and cheese or extraction of bioactive components by enzymatic or fermentation technology. Gold kiwifruit is genetically modified for a high level of ascorbic acid, Carotenoids, and Lutein and Zeaxanthin. [10, 11]

Potential and Established Nutraceuticals

Potential nutraceuticals hold an assurance of medicinal benefits. These nutraceuticals have become established medicines only after sufficient data demonstration and clinical testing for their efficacy and safety. All nutraceuticals are potential nutraceuticals but all potential nutraceuticals are not established ones. [12]

Phytochemicals

These are the chemical constituents of plants with distinct biological action. These are been reported to have active components which exerts their effects toward the metabolism and biochemical reactions in living beings and thus, provide health benefits. [13]

Herbals

The herbs possessing medicinal values to be implicated in treatment and prevention of ailments are been included in the class. Botanical products may consist of fresh plant used or any part such as dried leaf, fruit, stem, seeds, roots, or concentrated extract. [14]

Dietary supplements and dietary fibers

A dietary supplement is a product which comprises a supplementary dietary ingredient added as a remedy to deficiencies or diseases. The inclination toward dietary supplements has raised many folds to improve health, fitness, tonic to delay aging, improve performance, and body building. A dietary ingredient is one which enhances the food and its nutritional assessment. Vitamins and minerals as dietary supplements exist in multiple ingredients or single ingredient products in the market. Demand of dietary supplements is alarmingly increasing in developing countries such as Brazil, China, India, and Russia and it has already reserved its place in developed parts of many countries. Dietary supplements other than vitamins and minerals also involve herb, botanicals, amino acids, pure extracts, concentrate or combination of number of ingredients gland extracts, and organ tissues. [15]

Functional Foods

Functional foods are the source of absolutely necessary nutrients providing more than the quantities required for maintenance, growth, and development. The term is specially retained for food or food components that carry the evidence to provide an advantageous factors for health beyond basic nutrition. The class of functional food includes many further subclassed such as cereals, legumes, and fermented food. The potentiality of the functional food including cereals such as rice, corn, wheat, millets, sorghum, and buckwheat has been found in many ways to eliminate the risk of coronary heart disease, tumor incidence, and lowering of blood pressure. Similar to cereals, legumes are the other subclass of functional foods which form a chief element in traditional and modern dietary patterns. These are highly

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nutritious and rich in biologically valuable proteins, bioactive peptides, and amino acids. [16]

III. NUTRACEUTICALS AND DISEASES

1. **Diet Related Diseases**
   In Western societies, the incidence of diet-related diseases is progressively increasing due to greater availability of hyper caloric food and a sedentary lifestyle. Obesity, diabetes, atherosclerosis, and neurodegeneration are major diet-related pathologies that share a common pathogenic denominator of low-grade inflammation. Functional foods and nutraceuticals may represent a novel therapeutic approach to prevent or attenuate diet-related disease in view of their ability to exert anti-inflammatory responses. In particular, activation of intestinal T regulatory cells and homeostatic regulation of the gut micro biota have the potential to reduce low-grade inflammation in diet-related diseases. [17]
2. **Diabetes**
   Ethyl esters of n-3 fatty acids may be beneficial in diabetic patients. Docosahexaenoic acid modulates insulin resistance and is also vital for neurovisual development. Lipoic acid, an antioxidant, for treatment of diabetic neuropathy. Dietary fibers from psyllium have been used for glucose control in diabetic patients and to reduce lipid levels in hyperlipidemia. [18]
3. **Obesity**
   Obesity is a global public health problem and is defined as accumulation of unhealthy amount of body fat. It is a well-established risk factor for many disorders like angina pectoris, congestive heart failure (CHF), hypertension, hyperlipidemia, respiratory disorders, renal vein thrombosis, osteoarthritis, cancer and reduced fertility. [19]
4. **Heart attack and lung cancer**
   Corn's contribution to heart health lies not just in its fiber, but in the significant amounts of folate that corn supplies. Corn maintains the homocysteine, an intermediate product is an important metabolic process called the methylation cycle. Homocysteine is directly responsible for damage of blood vessel heart attack, stroke, or peripheral vascular disease. [20]
5. **Alzheimer's disease**
   β-carotene, curcumin, lutein, lycopene and turmerin may exert positive effects on specific diseases by neutralizing the negative effects oxidative stress mitochondrial dysfunction, and various forms of neural degeneration. [21]
6. **Cancer**
   Flavonoids which block the enzymes that produce estrogen reduces the estrogen-induced cancers. Prevent prostate/breast cancer a broad range of phyto-pharmaceuticals with a claimed hormonal activity, called "phytoestrogens" is recommended. Soyfoods source of isoflavones, curcumin from curry and soya isoflavones possess cancer chemopreventive properties. Lycopene concentrates in the skin, testes, adrenal and prostate where it protects against cancer. [22]
7. **Anti-inflammatory activities**
   Curcumin (diferuloylmethane) which is a polyphenol of turmeric possesses anticarcinogenic, antioxidative and anti-inflammatory properties. Top of Form Beet roots, cucumber fruits, spinach leaves, and turmeric rhizomes, were reported to possess anti-tumor activity. Gamma linolenic acid (found in green leafy vegetables, nuts, vegetable oils i.e. evening primrose oil, blackcurrant seed oil and hemp seed oil, and from spirulina, cyanobacteria) are used for treating problems with inflammation and auto-immune diseases. [23]

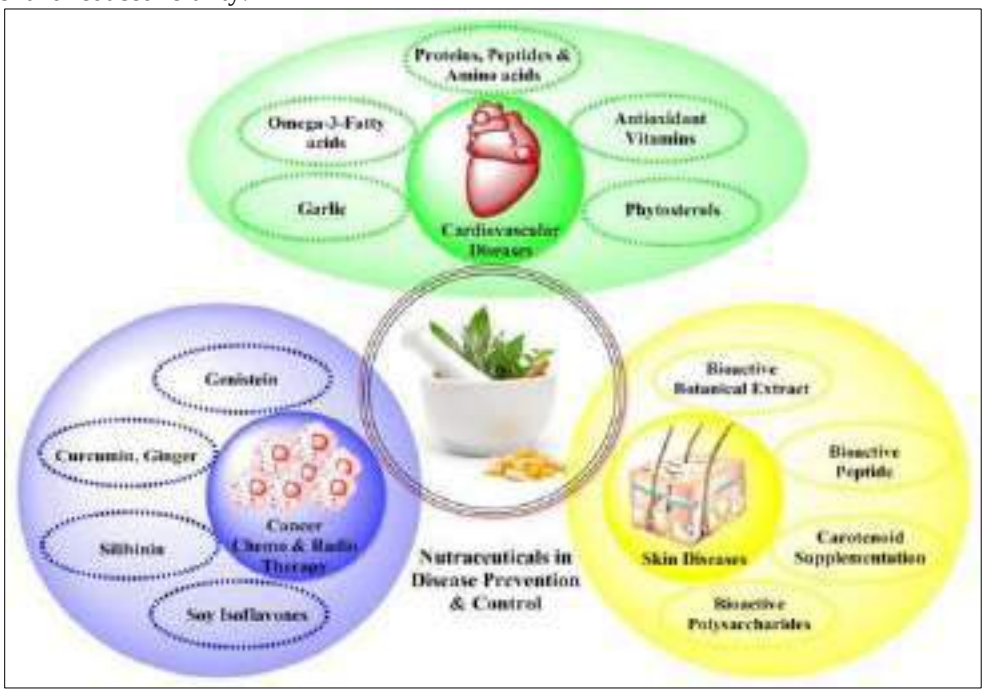


Figure 02: Nutraceuticals in prevention of Disease

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IV. ADVANCEMENT IN DRUG DELIVERY SYSTEMS WITH MEDICATED HERBS

The increasing preferences of consumers to eat healthy food products and the nutraceuticals showing up to be favorable in preventing as well as curing many diseases impelled scientists and researchers to look for efficient delivery systems. The use of novel drug delivery system to deal with the efficacy issues of the products is drawing more and more attention of the researchers.

- **Liposomes**
  Liposomes are the spherical vesicles composed of phospholipids consisting lipid bilayer. These are spherical in shape and can be formulated using cholesterol and natural phospholipids. Liposomes are also preferred to be an advanced delivery system for nutraceutical products. Intranasal quercetin liposomes is one of the examples which have been reported to enhance the penetration of quercetin through blood brain barriers and increase the therapeutic anticancer efficacy of the product. Similarly, buccal liposomal formulation of silymarin has also been proved to offer hepatoprotective effect with enhanced bioavailability of the product resulting into better therapeutic response. The antigout topical liposomal preparation of colchicine has also been proven very effective in the treatment of gout. [24, 25]
- **Phytosomes**
  Phytosomes are the complex of phospholipids and the biologically active ingredients. Oral formulation of Ginseng Phytosomes, prepared using phospholipid Complexation has been found to overcome the problem related to the low solubility of Ginseng and results in the increased absorption in the body which enhances the therapeutic effect of Ginseng as an immunomodulator. Oral phytosomal preparation of Hawthorn (Flavonoid) having cardioprotective and antihypertensive properties has also been reported to offer enhanced efficacy. Quercetin, possessing the properties of an anticancer as well as an antioxidant compound was also subjected to the oral preparation of Quercetin phytosomes providing better therapeutic efficacy of the drug. [26]
  better therapeutic efficacy of the drug. [26]
- **Microspheres**
  Microspheres are the spherical vesicular particles falling within the diameter range of 1-1000 μm. Due to their small size, microspheres can be ingested or injected, can be adjusted to any desired release profile and can also exhibit site-specific as well as organ targeted drug delivery. Intravenous preparation of camptothecin (natural product) loaded microspheres, formulated using oil-in-water evaporation method has been reported to provide prolonged anticancer effect. [27]

V. FORMULATION CHALLENGES [24,25]

Drug interactions may be described as the situation when the activity of one active constituent is affected due to presence of other constituents. It may be food–drug interaction or drug–drug interaction. The pharmacological response may alleviate, lessen or induce side effects.

a) **Garlic (alicin)** exhibits a hypotensive property and a hypocholesterolemic effect, acts as an anti-inflammatory agent and possess anti-bacterial as well as anti-fungal properties. When it is administered with anticoagulants (such as warfarin), it may lead to increased bleeding. With hypoglycemic drugs, such asinsulin or glipizide, it may cause hypoglycemia. With protease inhibitors (such as indinavir or saquinavir), garlic decreases their blood levels and effectiveness.

b) **Green tea** (polyphenols) improves mental alertness and thinking. It is also used to treat a plethora of other medical conditions, including Crohn's disease, Parkinson's disease, cardiovascular disease, diabetes, hypotension, chronic fatigue syndrome (CFS), tooth decay, kidney stones and skin conditions. Consuming green tea with stimulant medications could have dangerous consequences, such as elevated heart rate and blood pressure. Bortezomib (Velcade) may not be as effective against some cancers if used with green tea. Consuming green tea may reduce the effectiveness of warfarin.

c) **The leaf extract** of Gingko biloba is effective in the treatment of Alzheimer's disease and other forms of dementia, Raynaud's syndrome, peripheral vascular disease, vertigo and dizziness, premenstrual syndrome (PMS) and improving color vision in people with diabetes. Ginkgo, when administered with anticoagulants/with NSAIDs, it may increase the risk of bleeding. When administered with anticonvulsants, it may reduce the effectiveness in preventing seizures.

d) **Kava root** (kava-lactones) medicine, native to South Pacific, is used to calm anxiety, stress and to treat insomnia. It is also used in the treatment of attention deficit hyperactivity disorder (ADHD), depression, migraines and other headaches, chronic fatigue syndrome (CFS), epilepsy, psychosis, common cold and other respiratory tract infections, muscle pain, tuberculosis and cancer prevention. Kava is applied to the skin for some skin disorders such as leprosy, to promote wound healing. It is also used in urinary tract infections (UTIs), pain and swelling of the uterus, menstrual discomfort and hot flushes in women with menopause. It is also used as pain reliever in toothaches. When co-administered with barbiturates and benzodiazepines, it may prolong or intensify their effects

e) **Chamomile (tea extract)** is used as tea or dietary supplement for stomach cramps, to treat irritation from chest colds. It is also used for slow healing wounds, abscesses, gum inflammation, and skin conditions such as eczema, chickenpox and diaper-rash. The risk of bleeding increases when it is co-administered with anti-coagulants.

VI. CONCLUSIONS AND FUTURE PROSPECTS

To conclude, nutraceuticals area potentially growing sector and are engaged in both the fields, either medical treatment or nutrition so as to assure integrated medical assistance. These act as potential dietary supplements, prevention of diseases such as CVD, the support and treatment of various types of cancer, and

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other healthcare benefits. It is also advantageous over other therapies in terms of cost. The studies reveal the fact that nutraceuticals exert different types of biological activities in mechanized manner. These properties ultimately lower the age related and chronic diseases. Presently, large numbers of such potential nutraceuticals are undergoing the phases of research and development. The marketing graph of nutraceuticals is also rising all over the world. The market values reported depicts the public behavior of giving more emphasis on the use of nutraceuticals which ultimately is related to the brighter scope of nutraceutical industry.

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A REVIEW ON QUALIFICATION OF LABORATORY EQUIPMENT

Gaurav S Kulwant[1], Dr. Swati Rawat[2], Dr. Sunil Jaybhaye[3], Mr. Yogiraj Muley[4], Mr. Sandip Phoke[5]

[1]*Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Dist. Jalna.*
[2]*Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.*
[3]*Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.*
[4]*Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.*
[5]*Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.*

ABSTRACT

This project focuses on the qualification of laboratory equipment used in the pharmaceutical industry, emphasizing the importance of ensuring reliability, accuracy, and compliance with regulatory standards. The qualification process encompasses installation qualification (IQ), operational qualification (OQ), and performance qualification (PQ), which collectively verify that equipment operates as intended and meets specified requirements. Through systematic testing and documentation, this project evaluates critical equipment, including spectrophotometers, chromatographs, and balances. By adhering to industry guidelines, such as those set forth by the FDA and ICH, this qualification ensures that laboratory results are reproducible and trustworthy, ultimately contributing to the safety and efficacy of pharmaceutical products. The outcomes of this project highlight best practices for equipment qualification, fostering a culture of quality in pharmaceutical laboratories.

Qualification as a part of validation is the task performed to identify or check that utilities, equipment and Ancillary systems are capable of operating within limits for their intended use. Equipment qualification is a key Element in the pharmaceutical quality system. In recent times regulatory agencies are more focusing on Qualification of equipment. Qualification of the equipment starts from design of the equipment based on the User requirement specification and functional requirement specification. The review article provides Information on Design Qualification which is done to identify whether the proposed design of facilities, system And equipment is suitable for intended purpose, Installation Qualification which is done to check whether the Equipment is built and installed in compliance with design specification, Operational Qualification in which the Process parameters shall be challenged to assure that product meets all requirements and finally Performance Qualification to demonstrate that the process will produce acceptable product consistently under normal Operating conditions

KEY WORDS : *Qualification, equipment, Regulatory requirement , calibration*

1.INTRODUCTION

QUALIFICATION

It refers to activities undertaken to demonstrate that utilities and equipment suitable for their intended use and performing properly.

It is the action of providing that process work correctly and consistently any equipment and produces the expected result.

DEFINATION

It is the action of providing, and documenting that equipment or ancillary system ↓ are properly installed, work correctly and accurately lead to the expected results."

Qualification is a part of validation but individual qualification steps alone do not constitute process validation.

Qualification of Analytical instrumentation is essential for accurate and precise measurement of Analytical data. (if instrumentation is not qualified, all other work based upon the use of that instrumentation is suspect

It proof that new equipment is fit for its intense purpose. This is achieved by fully defining all of the required characteristics of the measuring system and then proving that the selected equipment meet these requirements before using it for analysis characteristics of the measuring system and then proving that the selected equipment meet these requirements before using it for analysis.

reduced likelihood of incorrect test result as the equipment Performance has been Proved to be suitable for its intended Purpose both before it is used for test Sample analysis and during its working life.

Documentation can act as a checklist for determine and rectifying the source of any measuring problem

Equipment qualification Plays a fundamental role in a laboratory quality system as it assists the development and validation of suitable test methods and helps identity the quality Control and quality assurance measured that will be required to ensure that test measurements are fit for Purpose.

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- equipment qualification ensures that equipment is capable for generating test measurement

2.PHASES OF QUALIFICATION

Qualification of equipment has been grouped into 8 phases-

1. Design Qualification (DQ)
2. Installation Qualification (IQ)
3. Operational Qualification(OQ)
4. Performance Qualification (PQ)
5. Verification Qualification (VQ)
6. Safety Qualification (SQ)
7. Maintenance Qualification (MQ)
8. Re-Qualification

(1) DESIGN QUALIFICATION (DQ)

It is the documented verification that the proposed design of the facilities, system and equipment is Suitable for intended purpose.

DQ should be performed existing equipment is being used for new process. When new equipment is being per chased

DQ serves as precursor to defining equipment IQ and OQ. Has it been designed and selected correctly?

(2) INSTALLATION QUALIFICATION (IQ)

It is documented evidence that the premises, supporting utilities, the equipment Have been built and installed in compliance with design specifications.

It verifies that the equipment has been installed in accordance with manufacturers recommendation in a proper manner and Plaid in an environment suitable for intended purpose.

It involves the co-ordination efforts of the vendor, the operating department and the project team. Has it been built or installed correctly?

(3)OPERATIONAL QUALIFICATION(OQ)

OQ is the process of demonstrating that an instrument will function according to its operational specifications Which result in product of predetermined requirements.

Does it work correctly?

(4) PERFORMANCE QUALIFICATION (PQ)

qualification Plays a fundamental role in a laboratory quality system as it assists the development and validation of suitable test methods and helps identity the quality

•After IQ and OQ the instrument continued suitability for its intended use is provided through performance qualification.

•It refers to establishing evidence that the process, under anticipated conditions, consistently produces a product which meet all predetermined requirements.

Equipment Qualification also Documents regular performance checks Conducted throughout the equipment's operational life. As well as being a regulatory requirement for some industries, Equipment Qualification gives the following benefits to all analyst:

Proof that new equipment is fit for its intended purpose. This is achieved by fully defining all of the required characteristics of the measuring system and then proving that the selected equipment meets these requirements before using it for analysis.

A template for troubleshooting any problem that may occur whilst the conductivity measuring system is in service. The Equipment Qualification documentation can act as a checklist for determining and rectifying the source of any measuring problems. Equipment Qualification plays a fundamental role in a laboratory's quality system as it assists the development and validation of suitable test methods and helps identify the Quality Control and Quality Assurance measures that will be required to ensure that test measurements are fit for purpose. Equipment Qualification ensures that measuring equipment is capable of generating test measurements that are fit for purpose.

(5) VERIFICATION QUALIFICATION (VR)

The documented verification that the equipment And system, as connected together, still in the state Of art and actually leads to the expected results and User requirements.

(6) SAFETY QUALIFICATION (SQ)

The documented verification that the equipment And system as installed or modified, comply with The safety requirements of process, facility and Personnel.

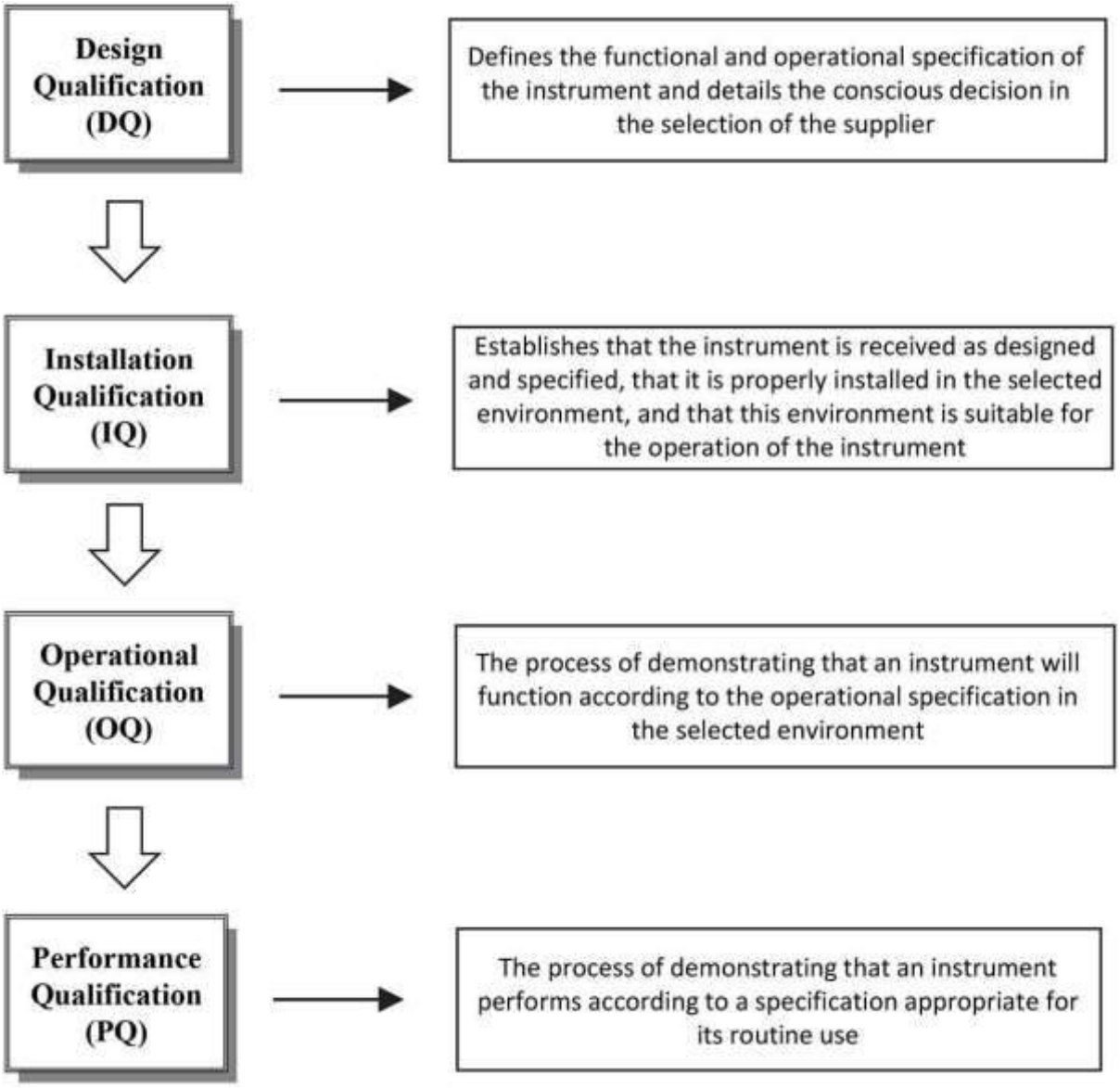
(7) MAINTENANCE QUALIFICATION (MQ)

The documented verification that the proposed Maintenance program of the equipment and system Is suitable for the intended purpose.

(8) RE-QUALIFICATION (RQ)

The documented verification that the systems, as Connected together, are still performing Satisfactorily. Re-qualification is required as an Outcome of relocation, major modification and due To ageing.

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3. NEED FOR CALIBRATION

Calibration can be called for :
•With a new instruments
• When a specified time period is elapsed
•When a specified usage (operating hours)

4 REGULATORY GUIDELINES

The ICH Q7a guideline demonstrates that facilities, System, equipment and utilities are properly Qualified and maintained to assure data and Product integrity. Additional guidance is provided by PIC/S: "While it is not possible to undertake the Details of neither an Installation Qualification for Established equipment nor the detailed approach For an Operational Qualification, nevertheless there Should be data available to support and verify the Operating parameters and limits for the critical Variables of the operating equipment. Additionally, The procedures such as calibration, cleaning, Preventative maintenance, operating procedures And operator training for the use of the equipment Should be documented and in use kept as standard Operating procedures (SOPs)

4.1GUIDELINES FOR EQUIPMENT QUALIFICATION

Equipment design, size and location, equipment shall be of appropriate design ,adequate size and suitably located to facilities operations, Cleaning and maintenance

4..2 EQUIPMENT CONSTRUCTIONS

-Equipment material of Construction not be reactive with product.
-Lubricants /Coolant shall not come into Contact with Product to alter the quality of the product

4.3QUALIFICATION OF EQUIPMENT GENERALLY INCLUDE THE FOLLOWING ACTIVITIES

-Based on the specific uses of equipment Construction materials operating Principles and performance characteristics is done
-In compliance with the design specifications, verification of Utility systems equipment are built and installed,

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-Verifying that equipment operates in accordance with the process requirements in all anticipated operating range

5. QUALIFICATION OF LABORATORY EQUIPMENT

5.1 FRIABILITY TEST APPARATUS

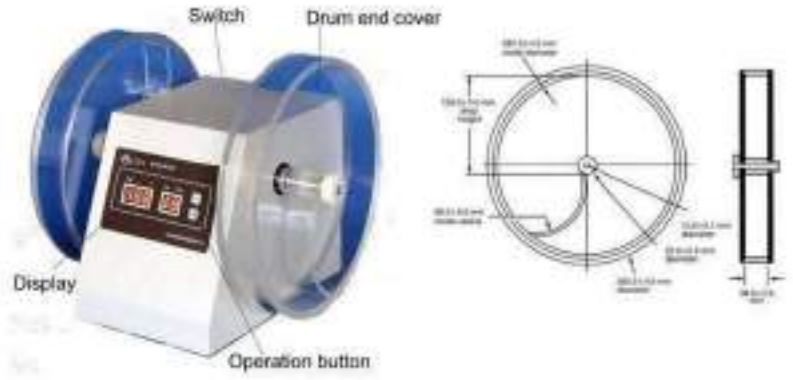
Friability is the condition of being friable, describes the tendency of a solid substance to break into smaller pieces under duress or contact, especially by rubbing.

Friability is defined as the % weight loss by tablets due to mechanical action during the test

Minimum weight loss of the tablet should not b NMT 1 %

Friability is usually measured by use of Roche or tumbler test.

Applicable for compressed uncoated tablet & tended to determine the strength of tablet during transportation & storage the tablets should retain its shape & size.



This testing involves repeatedly dropping sample of tablets over a Fixed time, using a rotating wheel .The result is inspected for broken tablets and the percentage of tablet mass lost through chipping.

PROCEDURE

-Switch on the power supply.

-Set the RPM to 25 and start the machine Simultaneously with the stop watch. Count the

Actual rotations and not the time required for the

-Similarly set the RPM to 100 and note the time Required and actual rotations.

-**Apparatus is in proper working condition if,**

- Time required for 25 rotations is 1 min ± 05 Sec.
- Time required for 100 rotations is 4 min ± 20 sec.

-Record the observation in the calibration record.

-Affix a “Calibration Status” label on the Instrument.

- In case of any discrepancy, report the Observations to QC manager / QA Manager and Notify the defect to Eng. Department. Affix an ‘UNDER MAINTENANCE” label on the Instrument.

Frequency: Once in a month and after each Maintenance job.

5.2 DISSOLUTION TEST APPARATUS

DISSOLUTION

"The process by which a known amount of drug substance goes into solution per unit of time under standardized conditions."

Dissolution testing is used as a qualitative tool to provide measurements of the bioavailability of a drug as well as to demonstrate bioequivalence from batch-to-batch.



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INSTALLATION QUALIFICATION
PROCEDURE
-Details of the Equipment
-Supplier or Manufacturer Name & Address
-Equipment Name, Make & Model No.
-In-house Equipment Code No.
-Location

INSTALLATION PROCEDURE
Site Inspection, Environmental Conditions and Prerequisite Parts Identification List
-Validation of Physical Parameter
-SOPS
-Computerized System

ACCEPTANCE CRITERIA
-Fulfil the Selection Criteria & its Purpose of Application
-Material of Construction and Name of the Manufacturer & Supplier shall be as mentioned in the Purchase order
-Meet pre-selected design Parameters
-Equipment Manual shall be provided
-Utilities of recommended capacities are to be provided.

CONCLUSION
The equipment shall be considered qualified for installation provided it meets all the parameters mentioned in the acceptance criteria.
After receiving installation report, it shall be evaluated & released for operational qualification, provided installation report is evaluated & the equipment is found meeting all parameters of acceptance criteria**.**

OPERATIONAL QUALIFICATION
PROCEDURE:
•Power ON Check
•Lift Movement Check
•Temperature Accuracy
•Accuracy of Shaft Rotation
•Control of Paddle Wobbling

ACCEPTANCE CRITERIA
All operating inputs provided on the equipment when tested shall successfully comply to their intended use & meet tolerance limit given by the manufacturer.
Perform successfully when operated as per SOP.
Critical indicators provided on the equipment are calibrated.
Equipment when operated shall not produce any abnormal sound or show any discrepancy in its smooth operation.

CALIBRATION Of Dissolution Test Apparatus

PART 'A'
The instrument shall be calibrated for RPM and Temperature.
For Temperature Calibration :
Measure the temperature of the water bath and of Each jar with a calibrated thermometer and Compare the result against the digital display on the Apparatus.
Acceptance Criteria: 37°C ± 0.5°C

For RPM Calibration
Calibrate the apparatus at 50 and 100 RPM. Compare the RPM shown on the digital display of The apparatus with the RPM measured with a Stopwatch or Taco meter.
Acceptable criteria: ± 1 RPM – for 50 RPM
± 2 RPM – for 100 RPM

Part 'B' Apparatus Suitability Test Disintegrating Type
-Use USP dissolution calibrator disintegrating Type 50 mg prednisone tablets.
-This USP Dissolution Calibrator is provided For the Apparatus Suitability Test in the
General chapter of USP 24 or as per the Method specified in the documents received Along with the respective lot of the tablet.
-Do not expose the tablets to excessive Humidity. Store in dry, cool place.
-Dissolution Media: Distilled water 500 ml.
-Using a membrane filter, with stirring for About 5 minutes.
-Weigh accurately about 10 mg of prednisone Reference standard (already dried on 105°C)For 3 hour into a 100 ml volumetric flask and Dissolve in 5 ml of ethanol. Make up to Volume with distilled water.
-Dilute 10 ml of the solution to 50 ml with Distilled water.
-Conduct the suitability test at conditions Mentioned in the certificate of tablets using Apparatus I and II.
-After completion of the dissolution time Withdraw filter and aliquot of the solution.
-Heat the medium with gentle stirring, to About 45° C, immediately filter under vacuum Discard the first 2 ml of solution and measure the concentration of prednisone at 242 nm against the absorbance of prednisone USP reference standard solution.
- The apparatus is suitable if each of the individual calculated values for each apparatus at all indicated speeds are within the specified ranges.

5.3 QUALIFICATION OF HARDNESS TESTER
HARDNESS (crushing strength):
It is the load required to crush the tablet when placed on its edge.
If the tablet is too hard, it may not disintegrate in the required period of time. And if the tablet

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Monsanto tester



Pfizer tester

is too soft, it will not withstand the handling during subsequent processing such as coating or packaging.
Some of devices used to test tablet hardness are:

1. Monsanto tester
2. Strong-cobb tester
3. Pfizer tester
4. Erwika tester

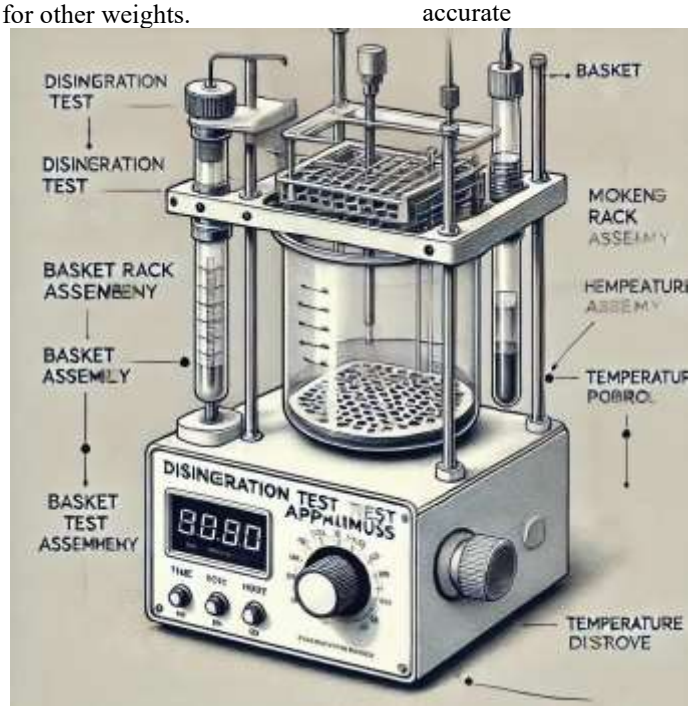
PROCEDURE

•Take out the force gauge to be calibrated and hold vertically up.
•Adjust the zero on the force gauge.
•Standard Weights are then applied to the hook of force gauge and measure the tension of the spring on the force gauge.
•When I kg of standard weight is applied, scale on the force gauge should also show 1 kg tension produced from the initial point where pointer is adjusted.
•Adjust the zero on the force gauge again.
•Follow the same procedure for other weights.
•The test to be carried out for 1.0 kg. 2.0 kg, 5.0 kg. 10.0 kg. 20.0 kg & 30.0 kg standard weights.
Tolerance: ± 0.25 kg/±0.1 kg
Frequency: Once in 6 months.

Maintenance / Repair When the instrument does Not comply with the requirement specified above; The instrument should be labelled as "Out of Calibration" and should get repaired / serviced.
After repairing / servicing the instrument before Taking for use, the instrument must be calibrated as Per the above-mentioned procedure.

5.4 QUALIFICATION OF DISINTEGRATION TEST APPARATUS

For a drug to be readily available to the body, it must be soluble and form solution. For most tablets, the first important step toward solution is break down of the smaller particles or granules, a process called disintegration.Disintegration Tester is designed for the accurate



estimation of disintegration time of tablets as per IP/USP standards. The instrument is designed to test two batches of six tablets. Simultaneously.

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USER REQUIREMENTS AND SPECIFICATIONS (URS) OF DISINTEGRATION TEST APPARATUS

•Operating criteria must be adequate.
•Easy maintenance.
•Equipment should not disseminate dust.
•Low cost.
•Spares should be available
•Non reactive surface.
•Audio visual indicators for system status.
•Printer attachment facility.

OPERATIONAL QUALIFICATION

After completions of successful installation qualification initiate the actual operation to ensure that machine is operating within specification.
Check the operation qualification parameters against their specifications.
Document the deviation details.
The quality head and the department head shall decide whether deviation is acceptable or not.

CALIBRATION FOR NUMBER OF OSCILLATIONS PER MINUTE

Take a pre-calibrated stopwatch. Operate the Apparatus as per SOP. Start the apparatus and Stopwatch simultaneously and count the number Of oscillations per minute.
Repeat the same for five times and note down The number of oscillations per minute for each Time.
The oscillations per minute shall be within the Limit of 29 to 32 through a distance of 53 to 57 Mm throughout the period of operation. Record The observation.

CALIBRATION FOR TEMPERATURE

-Switch on apparatus and press key.
-Turn on the heater by pressing 'ON' key.
-Set the bath temperature by pressing scroll Keys.
-Wait till the temperature of beaker A and beaker B attain the set value.
-Screen shall show the set temperature of bath And the temperature of beaker A and beaker B. -Take a pre-calibrated thermometer and check The temperature of beaker A and beaker B.
- Record the observation.

TIMER CALIBRATION

-Set the timer for '30 minutes' and start the Equipment and stop watch simultaneously. Note
Down the stop watch reading immediately when the equipment stops and note down the observation.
- observed time should not deviate by '+1min' of set time

SEIVE INTEGRITY TEST

Check the 'integrity' of woven stainless steel Cloth (sieve) attached to the base plate of each Basket with a pre-calibrated Vernier calliper. The Sieve has weave squares of aperture of 1.8 – 2.2 mm and wire diameter of 0.57 to 0.66 mm. Note the observations.
Affix the 'CALIBRATION STATUS' tag duly filled And signed on the equipment after completion of Calibration.
If the instrument is out of calibration then affix 'UNDER MAINTENANCE' tag and inform to
Maintenance department.
The frequency for calibration of Disintegration Test apparatus shall be after every one month Or after every maintenance work.

5.5 QUALIFICATION OF TAP DENSITY TESTER

The tapped density is an increased bulk density attained after mechanically tapping a container (graduated measuring cylinder) containing the powder sample.
The tap density of a material(powder) can be used to predict both flow properties and its compressibility.

URS FOR TAP DENSITY TESTER

Operating criteria must be adequate.
•Easy maintenance.
•Equipment should not disseminate dust.
•Low cost.
•Non reactive surface.
•Capacity(100ml,250ml)



Tap Density Tester

•The test can be performed in 2different modes.
USP mode
User Mode
• any possible separation of mass during tapping down.

DESIGN QUALIFICATION (D.Q)

The DQ outline the key features of the system designed to address the user requirement, regulatory compliance and selection rationale of a particular supplier.
The following are the key considerations for DQ:
•Physical dimensions of the equipment and accessories.
•Suitable operating environment of the instrument.
•Health and safety requirement.

INSTALLATION QUALIFICATION

Details of the Equipment

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- Equipment name, made by & model no. Shall be noted down.
- Location for the installation equipment shall be checked.

Utilities required shall be listed down.
Any deviation observed while following above procedure should be informed for corrective action.

INSTALLATION PROCEDURE

After checking all the specifications as mentioned in the selection criteria, service engineer shall commission the equipment.
Authorized validation team shall carry out installation

OPERATIONAL QUALIFICATION

After completions of successful installation qualification initiate the actual operation to ensure that machine is operating within specification.
•Check the operation qualification parameters against their specifications.
•Document the deviation details.
•The quality head and the department head shall decide whether deviation is acceptable or not.

PERFORMANCE QUALIFICATION

Measure the tapping height(3mm or 14mm) with A ruler
Obtain calibrated cylinder(250mL or other Volume) from qualified supplier Measure the length of the cylinder
Set the count number and start tapping Count the tapping number using a stopwatch Setting to 1 minute, check the allowed tap Number error range as per specific international Standard. Weigh the tapping device including the cylinder

6.CONCLUSION

The qualification of laboratory equipment is a critical aspect of ensuring accuracy, reliability, and compliance in scientific research and industrial processes. By implementing systematic qualification protocols, including design qualification (DQ), installation qualification (IQ), operational qualification (OQ), and performance qualification (PQ), laboratories can mitigate risks, meet regulatory standards, and maintain data integrity. The continuous review and requalification of equipment further support long-term performance and adaptability to evolving technological and regulatory requirements. Emphasizing a robust qualification framework enhances laboratory efficiency and fosters confidence in experimental outcomes, making it a cornerstone of quality management in laboratory environments.

The purpose of the use of analytical instruments Is to generate reliable data. Manufacturing is Mainly depends on the performance of the Equipment. Consistent performance of the Equipment is only possible when the equipment is Properly qualified, verified and maintained. Equipment Qualification's components of fully Defining the equipment's required performance, Ensuring that suitable equipment is selected and Ensuring that the equipment's performance is Consistently of the required standard have many Benefits for the analyst:

Incorporating continuous monitoring, periodic maintenance, and requalification further extends the operational lifespan of equipment and ensures its adaptability to evolving technological advancements and regulatory changes. Additionally, leveraging digital tools and automated systems in qualification processes has the potential to improve efficiency, reduce human error, and foster proactive issue resolution.

In conclusion, the qualification of laboratory equipment is not merely a regulatory requirement but a strategic approach to achieving operational excellence and fostering innovation in scientific research. By prioritizing thorough qualification protocols and embracing emerging technologies, laboratories can maintain high standards of accuracy, reliability, and compliance, ultimately contributing to the advancement of their respective fields.

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A REVIEW ON CLEANING VALIDATION: CLEANING METHOD DEVELOPMENT

Saurav B. Sahare[1], Dr. Swati Ravat[2],Dr.Sunil Jaybhaye[3],Mr.Yogiraj Mule[4], Saurabh Bondre[5]

[1]*Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Dist. Jalna*
[2]*Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna*
[3]*Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna*
[4]*Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna*
[5]*Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna*

ABSTRACT

Cleaning validation is a critical process in the pharmaceutical and biotechnology industries, ensuring that equipment and facilities are adequately cleaned to prevent cross-contamination and ensure product quality. This abstract discusses the importance of cleaning validation protocols, the methodologies employed, and the regulatory guidelines governing the process. It highlights key steps, including risk assessment, selection of appropriate cleaning agents, and the validation of cleaning procedures through analytical methods.Additionally, the abstract addresses the challenges faced during validation, such as variability in residue limits and the need continuous monitoring. Emphasizing a risk-based approach, this paper outlines best practices to achieve compliance with industry standards while safeguarding patient safety and product integrity. The findings underscore the necessity of robust cleaning validation as an integral part of quality assurance in manufacturing environments.

1.INTRODUCTION

Cleaning validation is an essential component of quality assurance in the pharmaceutical and biotechnology industries. It ensures that equipment and facilities are free from residues that could compromise product quality or patient safety. With increasing regulatory scrutiny and the complexity of modern manufacturing processes, effective cleaning validation protocols are critical to maintaining compliance with Good Manufacturing Practices (GMP). The primary goal of cleaning validation is to demonstrate that the cleaning process effectively removes residues, including active pharmaceutical ingredients (APIs), cleaning agents, and potential contaminants. This is particularly important in multi-product facilities, where the risk of cross-contamination is heightened. A validated cleaning process not only protects product integrity but also builds consumer trust in pharmaceutical products.This introduction outlines the key elements of a successful cleaning validation program, including risk assessment, selection of cleaning methods, and analytical techniques for residue detection. It emphasizes the need for a systematic approach that aligns with regulatory requirements and industry best practices, ensuring that all aspects of the cleaning process are thoroughly validated and documented. By implementing a robust cleaning validation strategy, manufacturers can mitigate risks, enhance operational efficiency, and ultimately contribute to improved patient outcomes.

2.CLEANING VALIDATION

- Cleaning means to make any article, piece of equipment and area free from dirt, marks, or any unwanted matter.In pharmaceutical industry there is a great need of cleaning of equipment apparatus and processing area. The improper cleaning can lead to contamination and cross contamination. Pharmaceutical products can be contaminated by various materials such as residue of previously used active pharmaceutical ingredients, raw material, cleaning agents and dust particles.

The main objective of GMP consists of prevention of contamination and cross contamination of materials. Therefore a perfect cleaning method is required for avoiding the possibilities of contamination and cross contamination, for this a validated program is required, this program is known as cleaning validation. “Cleaning validation is documented evidence which assures that cleaning of equipment, piece of equipment or system will obtain pre-determined and acceptable limits”. Cleaning validation helps in analytical investigation of a cleaning procedure. The Purpose of cleaning validation is to verify the efficacy of the cleaning methods for removal of residues of previous product, preservatives, or cleaning agents and microbial contaminants.
Cleaning validation fulfills the requirement of regulatory bodies and maintains product quality and safety of consumers

2.1ADVANTAGE OF CLEANING VALIDATION

• Assurance of quality & safety.

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Government regulations. Product integrity,
Microbial integrity,
Cross-contamination integrity,
Batch integrity,
Equipment reuse,
Reduction of quality costs
Importance and purpose of cleaning validation
Cleaning validation is Not only is it required to comply with regulations, but also it is necessary to satisfy customer's requirements.
It ensures the safety, identity, purity, and strength of the product which are the basic prerequisites of cGMP (Current Good Manufacturing Practice).
It provides manufacturers with enough confidence that internal control is well established

2.2TYPES OF CONTAMINATION

1. Cross contamination with active ingredient contamination of one batch of Product with significant levels of residual ingredient from previous batch can not be tolerated, in addation to the obvious problem posed by subjecting consumers of patients to unintended Contaminants potential Clinically significant Synergistic interaction between pharmacolo -gically active chemicals are a real concern
2. contamination with unintended materials or compounds. While inert ingredients used in drug Products crre generally recognized as safe for humon consumption the routine use maintenance and cleaning of equipment's Provide the potential contamination with such items and Chemical. As equipment parts, lubricant cleaning agents.
3. microbiological contamination maintenance cleaning and storage condition may provide aduentitious microorganisms. With the opportunity to proliferate within the processing equipment.

2.3TYPES Of VALIDATION

1. Process Validation: Confirms that manufacturing processes consistently yield products meeting predetermined specifications and quality attributes.
2. Cleaning Validation: Ensures that cleaning processes effectively remove residues from equipment to prevent cross-contamination.
3. Equipment validation in the pharmaceutical industry ensures that manufacturing and testing equipment consistently performs according to specifications and regulatory requirements. It typically involves several key components

2.4CLEANING VALIDATION PROTOCOL

1. The cleaning validation protocol include
2. The objective of validation process, responsibilities for performing and approving the validation stady
3. Description of the equipment to be used. W the interval between the end of production
4. The interval between the end of production and the beginning of the cleaning procedure
5. cleaning Procedure Cleaning Procedure to be used for each product and manufacturing sistem or piece of equipment
6. Analytical method including the limit of detection and the limit of quantitation of those methods or reference to them
7. when revalidation will be required

3.TYPES OF CLEANING

"Cleaning Type A" in a pharmaceutical context typically refers to a specific cleaning validation process designed to ensure that equipment used in manufacturing does not contaminate products with residues from previous processes.

1. Purpose

Prevent Cross-Contamination: Ensures that residues from one product do not affect another, particularly in multi-product facilities.
Regulatory Compliance: Meets regulatory standards set by agencies like the FDA and EMA.

1.Scope

Equipment and Surfaces: Involves cleaning of manufacturing equipment, containers, and surfaces that come into contact with products.
Cleaning Agents: Use of approved cleaning agents that do not leave harmful residues.
1. Cleaning Process
Pre-Cleaning Assessment: Evaluate the Cleaning Type B" in the pharmaceutical industry typically refers to a more stringent cleaning process compared to Cleaning Type A, often used for equipment that processes highly potent or sensitive products.

1.Purpose

Prevent Cross-Contamination: Particularly crucial for highly potent active pharmaceutical ingredients (APIs) and products.
Regulatory Compliance: Ensures adherence to strict regulations and guidelines set by regulatory agencies.
Scope
Equipment and Facilities: Focuses on cleaning equipment that handles potent compounds or sterile products, including tanks, mixers, and filling lines.
Cleaning Agents: Utilizes validated cleaning agents that effectively remove residues without leaving harmful traces.
Cleaning Process
Risk Assessment: Conduct a thorough risk assessment to identify potential contamination sources and define critical control points.
Detailed Cleaning Procedure: Develop comprehensive standard operating procedures (SOPs) that include:
Specific cleaning agents and concentrations.
Step-by-step cleaning instructions.
Recommended contact times and temperatures.

2. Validation
Cleaning Validation Studies: Perform rigorous validation to demonstrate the cleaning process effectively removes residues. This includes:

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Swab and Rinse Sampling: Collect samples from equipment surfaces and cleaning solutions.
Analytical Testing: Utilize techniques such as HPLC, LC-MS, or UV spectroscopy to quantify residues.
Acceptance Criteria: Establish stringent acceptance criteria based on product toxicity, permissible limits, and historical data.

3.Monitoring and Re-evaluation
Routine Monitoring: Implement ongoing monitoring of cleaning effectiveness, including periodic sampling and testing.
Change Control Procedures: Any modifications in equipment, cleaning agents, or processes require re-validation to ensure continued efficacy.equipment and identify potential residues.
Cleaning Procedure Development: Establish standardized procedures detailing the cleaning steps, agents used, and contact times.
Execution of Cleaning: Implement the cleaning procedure as per the defined protocol Validation Sampling and Testing: After cleaning, samples are taken to test for residual contaminants. Common techniques include:
Swab Sampling: Collecting samples from surfaces.
Rinse Sampling: Testing the cleaning solution used for rinsing.
Acceptance Criteria: Define acceptable limits for residual levels, often based on toxicological data or historical data.
Documentation: Detailed records of the cleaning process, including dates, personnel involved, and results of testing.
Monitoring and Re-evaluation Regular Reviews: Periodic re-evaluation of cleaning processes and validation to ensure continued efficacy and compliance.
Change Control: Any changes in products, equipment, or processes necessitate a re-validation of cleaning procedures.

4.CLEANING OF EQUIPMENT

• Instructions for Cleaning of Equipment: The equipment is cleaned with the help of the respective SOP of cleaning that particular equipment using a suitable nylon brush and cleansing agent. Then the cleansing agent is removed with potable/raw water and later rinsed with demineralized water. Compressed air or Clean dry lint-free cloth is used to dry the equipment. After completion of the cleaning activity, the "CLEANED" status label is then labeled by the production personnel and attached to the equipment after that the QA personnel shall verify only after inspecting the equipment visually for cleanliness. Line clearance of equipment should be made by visually examining the equipment and should be found satisfactory if not found then repeat the clean for the same.

There are two types of cleaning procedures for equipment used in manufacturing

Type A Cleaning Procedure for equipment Type B Cleaning Procedure for equipment

Type- A Cleaning Procedure For Equipment: All the parts of the equipment are dismantled and transferred to the washing area cleaned out of place (COP). In the washing area, the dismantled parts of equipment shall be cleaned with a cleansing agent (i.e. 0.5% w/w SLS) or other cleaning aids as per the procedure. Mentioned in their respective SOPs of cleaning of equipment. Equipment having non dismantled parts should be cleaned in place (CIP) as per their SOPs for cleaning. The washing/rinsing water sample should be collected after visual verification by production chemists and QA and then sent to Quality Control along with a sample request for determination of the residual drug and cleansing agent.

Type B cleaning for Equipment: It having some following conditions likei) Batch to the batch changeover of the same product having the same strength. ii) Same color and same flavor iii) Batch to batch changes over but from lower strength to higher strength. iv) After completion of the batch.
v) After minor breakdown vi) Cleaning is done after completion of preventive maintenance work if product contact parts are not contaminated, touched, or disturbed. vii) After any major breakdown where product contact parts are contaminated. viii) After completion of preventive maintenance work.
Type B cleaning procedure for equipment: All gross accumulations from equipment and area are removed. Then the equipment should be cleaned without dismantling and dust from the previous product is removed with the help of a vacuum cleaner. Then equipment shall be mopped with a clean moist lint-free cloth (moist with demineralized water) and later with a clean dry cloth.

5.CLEANING VALIDATION PROGRAM

a. Selection of cleaning Level (Type)
b. Selection of cleaning method
c. Selection of sampling method d) Selection of the scientific basis for the contamination limit
d. Selection of defeat case related to the equipment Selection of defeat case related to the product
e. stablishing the storage period after cleaning
f. Selection of analytical method

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6.SELECTION OF CLEANING METHOD

1. Manual cleaning
2. Semi-automatic procedures
3. Automatic procedures
4. CIP (Clean-in-place)
5. COP (Clean-out-of-place)

6.1MANUAL CLEANING METHOD

- It is difficult to validate.
- For this detailed cleaning procedures are necessary, • A high-quality training program is essential.
- The risk which is involved in manual cleaning process are as follows: Proper washroom design with drying, protection, and storage requirements
- Detailed cleaning SOPs are required. Training of cleaning operators is mandatory.

6.2CLEAN-IN-PLACE (CIP) METHOD

- Equipment cleaning is performed in place without disassembling
- The process of cleaning is controlled manually or by an automatic program
- It is a very reproducible cleaning method.
- Can be validated readily.

6.3CLEAN-OUT-OF-PLACE (COP) METHOD

Disassembled parts of the equipment are cleaned or the process of cleaning is performed in a central washing machine.

The washing machine also needs validation like ultrasonic activity, cycle time, temperature, cleaning operation sequence, detergent quantity dispensed, etc.

6.4 CLEANING PROCEDURES

Standard cleaning procedures for every piece of equipment and process should be prepared. It is important that the equipment design is figured out in detail in combination with the product residues which are to be removed, the available cleaning agents and cleaning techniques, when determining the most beneficial cleaning procedure for the equipment. Cleaning procedures should be sufficiently and properly detailed to avoid the possibility of any inconsistencies during the cleaning process. Following parameters are being considered during cleaning procedures.

6.5EQUIPMENT PARAMETERS To Be Evaluated

1. Identification of the equipment to be cleaned.
2. Duficult to clean areas.
3. Property of materials
4. Ease of disassembly.
5. Mobility

RESIDUES TO BE CLEANED

1. Cleaning limits.
2. Solubility of the residues.
3. Length of campaigns.

7.CLEANING AGENT PARAMETERS TO BE EVALUATED

1. Preferable materials that are usually used in the process.

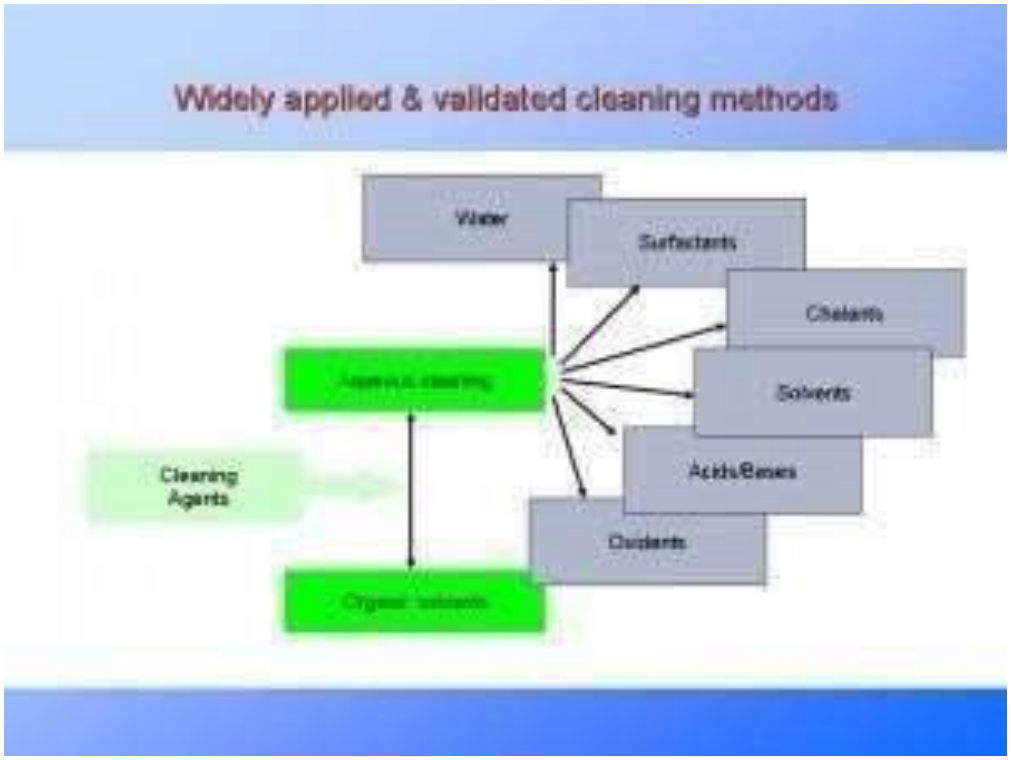
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2. Detergents available (as a general guide, minimal use of detergents recommended unless absolutely required).
3. Solubinty properties
4. Envuonmental considerations
5. ealth and safety considerations.

8.CLEANING AGENT SELECTION

Cleaning agents fall into several broad categories,

1. Water
2. Solvents.
3. Commodity chemicals.
4. Formulated cleaning agents.



- Water: It is the universal solvent. If water alone will efficiently clean the product without undue time or physical effort to remove the residues, by all means water should be employed alone. For many, however, the water alone requires an unacceptable increase in time to get the cleaning finished. So other approaches must be screened.
- Solvent: These are basically applied in processes where solvent usage is already called for by the manufacturing process. For example, mother liquors are used as the solvents for cleaning of APIs. As the mother liquor is already known to dissolve the primary residue. There is little risk in using it for cleaning
- Commodity Chemicals Here, chemicals such as NaOH can be used for cleaning as well. Like their solvent counterparts, there can be hazard issues, effluent issues associated with these materials. Their typically high basicity or low acidity, however, often makes them helpful in inactivation processes. However these chemicals do not have the detergency of a formulated cleaning agent and they can be difficult to rinse, taking larger volumes of water to rinse free from systems than would a formulated cleaning agent.
- Formulated Cleaning Agent: Is the largest class of cleaners. This category consists of solvent based formulations and aqueous formulations. Typically formulated cleaning agents can include one or more alkalinity or acidity sources, sequestrants, surfactants builders, chelants and either a solvent or water. For industrial uses, unlike consumer-use products, these materials are prepared to be low foaming and therefore are more easily rinsable and are appropriate for high delinquency or high turbulence cleaning

9.EVALUATION OF CLEANING

- Visual Cleaning Test: All parts of equipment that are in direct contact and Clen-contact with products should be visually checked and verified for cleanliness. Spiking Test: This test validates that equipment has been thoroughly
- Cleaned, no residue should be visible in a volatile solvent, a diluted series of the worst case is prepared and applied to the test equipment surface, which is similar to the sample surface (eg. 25 cm^2). The active compute quantity should be evenly dispersed on the test equipment's surface, test should be carmed out with various concentrations while simulating the identical test conditions with an approximate volume. After that, the solvents are evaporated and compared to the test surfaces of the equipment to determine the visual limit of detection. However, light intensity, surface properties, and operator or operator-initiated method handling can all influence this limit.

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- Bracketing or Worst Case Rating in the pharmaceutical industry, when we are dealing with two or more similar products and the same process is being used, there is no requirement to validate individual equipment for the same product, to minimize the number of the validation; a single study is taken into consideration for the worst-case or bracketing approach of validation is used. This approach is based on a scientific rationale with appropriate justification. First, the grouping of substances/ products or equipment is done for similar products manufactured in the same equipment.

Substances can be grouped as follows

1. Grouping by Product: The formulations are grouped based on the dosage form for example if a company has 5 tablet formulations, 5 ointment formulations, and 5 liquid formulations. They are categorized into 3 groups, these groups can be further classified into subgroups like tablets can be classified into 2 subgroups based on the manufacturing procedure Likewise, ointment and liquid formulation can also be classified into subgroups. After establishing formulations, the group and subgroups worst case' of each group is determined.

2. Grouping by Substances: The products are grouped or categorized as they are produced in the same train substances with the same cleaning procedure. Then they are categorized into subgroups as they are produced in the same train substances with very low therapeutic dose and/or low batch sizes or with very low/high acceptable daily exposure (Then subgroups to be formed based on the cleaning process). Once the product groups have been established the next step is determining the 'worst case representative of each group and cleaning validation of the same.

10.ANALYSIS OF CLEANING VALIDATION SAMPLES

There are various analytical techniques available that can be used in cleaning validation (Heinig et all, 1998)20, But selecting the appropriate analytical tool depends on a variety of factors (Maurya, 2016); (Govind et al., 2018)21; (Nassani, 2005)22; (Yang et al., 2009)23. The most important factor is to determine the specifications or parameters to be measured (Kaiser et al., 1999124. The limit should always be established before the selection of the analytical tool (LeBlanc, 1998)25;(Fourman et al., 1993)26 Specific and non-specific methods: A specific method detects unique compounds in the presence of probable contaminants. Ex: HPLC. Non-specific methods: These are those methods that identify any compound that produces a fixed response Ex: Total Organic Carbon (TOC), pH and conductivity.

Others Techniques includes;

Thin layer chromatography (TLC): TLC is broadly used for the qualitative of surfactants Atomic absorption spectroscopy (AAS): AAS (atomic absorption spectroscopy) is used for the determination of inorganic contaminants.

Bioluminescence: This is useful for biologicals. This type of analysis usually uses ATP- bioluminescence.

Optically stimulated electron emission (OSEE): In some cases the limits of residue are so low that they can't be detected by conventional methods. OSEE is a very sensitive method that can be used in both qualitative and quantitative manner in this regard.

Portable mass spectrometer: Portable mass spectrometer can be used to find ultra sensitive measurements and identification of the residue (Bosdorf et al., 1996)27; (Read, 1985)2; (Henrich, 1992)29; (Raghavan et al.), 2000)30; (Davidson et al., 1999)

Additional Techniques: Apart from the above mentioned techniques the biopharmaceutical industries apply a wide range of techniques These includes:

Enzyme-Linked Immunosorbent Assay (ELISA)

Limulus amebocyte lysate (LAL) technique plate (96-or 384-wells). The multi-well plate supplies the solid surface to immobilize the antigen. Immobilizations of the analytes promote separation of the antigen from the rest of the components in the sample. This attribute makes ELISA one of the easiest assays to perform on multiple samples simultaneously. The Limulus Amebocyte Lysate test is approved in international pharmacopoeias as it is the method for identifying bacterial toxins/contamination both in the raw materials used for the synthesis of medicines and for the final products. This test is also useful for the cosmetics industry and in food production as it is the method approved by the FDA (Food and Drug Administration) for the identification of pyrogens .

11.THE REGULATORY BASIS FOR PROCESS VALIDATION

FDA regulatory experts established that there was a legal foundation for needing process validation once the concept of being able to forecast process performance to fulfil user needs arose. The ultimate legal authority is Section 501(a)(2)(B) of the FD&C Act, which states that a drug is deemed to be adulterated if the methods used in, or the controls utilised in its manufacture, processing, packing, or storage do not comply with CGMP, or were not managed or administered in accordance with CGMP. It must be guaranteed that the medicine will meet the act's safety criteria, as well as that it will have the identity, strength, and quality and purity qualities that it purported or was represented to have. Because active pharmaceutical ingredients are likewise considered medications under the act. that provision of the act establishes the foundation for process validation requirements for both finished pharmaceuticals and active pharmaceutical components. The 21 CFR 210 and 211 CGMP standards for finished pharmaceuticals were created to enforce the act's obligations. Despite the lack of a definition under these regulations.

11.1APPROACH TO PROCESS VALIDATION

Stage 1: Process Design: During this stage, knowledge gained from development and scale-up activities is used to define a commercial manufacturing process.

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Stage 2: Process Qualification: During this stage, the method design is estimated to see if the process can be replicated and turned into a viable product.
Stage 3: Ongoing Process Verification: Throughout ordinary production, constant assurance is received that the process is under control.



12.CONCLUSION

Validation is the most commonly used term in the fields of medication research, manufacturing, and completed product specification. For the industry. Consistency and reliability of a verified process to deliver a quality product are critical. Quality assurance procedures must be utilised throughout the manufacturing process, not only at the end, to ensure that the product is of highQuality. Process validation entails a series of activities that take place throughout the product and process lifecycle.From the study, it can be stated that with the help of cleaning validation any department of the pharmaceutical industry can achieve a high degree of assurance regarding the cleaning, with this we can minimize any kind of contamination or cross-contamination which may be any residue of the previous

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PREDICTION OF OPTIMAL BATTERY CAPACITIES FOR SOLAR ENERGY SYSTEMS

Thota Pallavi, Anooja Ali
PG Student, Associate Professor, School of Computer Science and Engineering, Reva University, Bengaluru, India

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ABSTRACT

Solar energy using photovoltaic cells is a highly feasible solution for modern renewable-powered residential buildings in terms of cost reduction of utility bills. The installation of solar PV systems and the (BESS) battery energy resource is the most popular energy cost minimization solution and will continue to increase rapidly. The size of the battery depends on the various energy profile factors and load profile factors. The energy profile factors include Annual energy consumption, Accumulated Energy, Energy Utilization from Grid, and Energy Injected into the grid. And the load profile factors are Average Load, Peak Load, Median Load, and Rated Photovoltaic power. The project aims at predicting the battery size by analyzing a dataset comprising the above-mentioned energy profile factors and load profile factors using machine learning techniques. Optimal sizing of the BESS is an essential prospect for nZEBs. Currently, the price of BESS is very high; therefore, in many countries, governments and grid operators offer several incentives to consumers. However, the cost of BESS is also expected to drop in the coming years. For classification, the project employs two distinct classifiers: Gaussian Naive Bayes (GNB) and Bernoulli Naive Bayes (BNB). By applying these classifiers within a supervised learning framework, the project leverages statistical methods to iteratively improve prediction accuracy

KEYWORDS: *Bernoulli Naive Bayes, Gaussian Naive Bayes, Prediction, Solar PV systems,*

I. INTRODUCTION

Prediction of battery size by analysing a comprehensive dataset that includes both energy profile and load profile factors, using advanced machine learning techniques to derive insights and classify data patterns effectively. Energy profile factors consist of metrics such as annual energy consumption, accumulated energy, energy utilization from the grid, and energy injected back into the grid, which provide a detailed picture of energy flows [1]. Load profile factors, including average load, peak load, median load, and rated photovoltaic power, reflect the load behaviour and demand characteristics. Together, these features offer a holistic view of the energy usage and generation patterns, which serve as inputs for predicting battery size. For classification, the project employs two distinct Naive Bayes classifiers: GNB and BNB

The Gaussian Naive Bayes classifier assumes a Gaussian distribution of continuous variables, comparing neural activations to the means and variances across different stimulus conditions, enabling it to produce a condition label with respect to battery size. This method is particularly effective for data that follows a normal distribution, making it suitable for continuous-valued features like energy and load profiles. The Bernoulli Naive Bayes classifier, on the other hand, is ideal for binary-valued data, applying Bernoulli distribution assumptions to variables that are either present or absent [2]. It's particularly effective for Boolean or categorical data, and here it enhances predictive performance on certain binary factors within the dataset. By applying these classifiers within a supervised learning framework, the project leverages statistical methods to iteratively improve prediction accuracy. This approach allows the machine learning models to make informed classifications or predictions regarding battery size by recognizing and categorizing specific patterns and relationships within the energy and load data. The integration of these classifiers offers flexibility in handling a mix of continuous and binary features, which aids in robust battery size prediction, benefiting applications in energy storage and grid management systems [3].

1.1 Problem statement

The sizing of batteries in a residential solar system is currently quite complex and homeowner-unfriendly. Therefore, this project seeks to bridge that gap by developing a user-friendly machine learning tool that analyses homeowner data for prediction of the optimal battery size, thus improving decision-making while maximizing efficiency for residential solar power. The growing popularity of residential solar power systems creates a demand for a user-friendly tool to optimize battery sizing. This project bridges this gap by developing a machine learning-based tool for homeowners. The tool leverages readily available data on photovoltaic installations and domestic load profiles to predict the ideal battery capacity for each unique system. This homeowner-centric approach empowers users with data-driven insights, maximizing efficiency, minimizing energy waste, and ultimately promoting informed decision-making regarding battery storage for their solar power systems. Machine learning algorithms have shown promising results in prediction [4].

The increasing popularity of residential solar power systems is thus in need of a user-friendly tool optimizing the size of the battery. This project fills the gap by developing a tool based on machine learning for the homeowner to compute the optimal battery capacity for every unique system through available data about photovoltaic installations and domestic load profiles.

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This homeowner-centric approach empowers users with data-driven insights, maximum efficiency, minimal loss of energy, and ultimately sophisticated decision-making regarding battery storage for their solar power systems [5].

1.2 Outcome of the Research

This project will develop a predictive model that predicts optimal capacities of batteries to be used in solar energy systems, basis the energy and load profile factors. This would capture key patterns in energy use and demand through using Gaussian and Bernoulli Naive Bayes classifiers so that proper sizing of a battery is ensured. This method will further optimize storage, save waste, depend less on the grid, and saves all costs incurred by oversized and undersized batteries. By enhancing the efficiency of solar energy storage, the model supports environmental sustainability goals in the form of higher adoption of renewable energy. Its adaptability also assists the grid operators in achieving a stable grid through integrating distributed energy resources.

2. LITERATURE REVIEW

Background and motivation of the introduction the research background relates to the development of an optimized model for sizing residential solar battery systems to address the state-of-the-art challenge in realizing accurate prognostication of battery capacity for better energy efficiency and reduction of dependency on the grid. This research primarily articulates a problem statement regarding the need to have readily available data-driven tools for guidance by homeowners in bringing savings and sustainability. The use of technology available with machine learning should focus on designing intuitive and effective solutions for residential solar energy storage.

Few researchers explored the optimization of energy storage schedules for batteries in photovoltaic (PV) grid-connected near Zero EnergyBuildings (nZEBs) using linear programming techniques. This study addresses the critical challenge of enhancing energy efficiency and reducing operational costs in nZEBs by strategically managing the storage and usage of solar-generated electricity. Through the implementation of a linear programming model, the research demonstrates how optimal battery scheduling can significantly improve the energy performance of PV systems in grid-connected buildings.

The European Environment Agency (EEA) on climate change provides an extensive analysis of climate data, greenhouse gas emissions, and the environmental impacts of climate change, highlighting key findings and trends within the European context (European Environment Agency, 2019). The paper by Ahmadiahangar et al. (2020) introduces a battery sizing tool for nearly Zero Energy Buildings (nZEBs), using data on energy consumption, solar irradiance, battery performance, building specifications, and grid electricity prices to optimize battery capacity and enhance energy efficiency [3].

Jawad et al. (2021) propose a robust optimization technique to minimize energy costs in cloud data centers, utilizing datasets that include energy consumption, workload patterns, electricity prices, server performance metrics, and environmental factors. This study contributes to the field by addressing the critical issue of energy efficiency in cloud computing, providing valuable insights and methodologies for reducing operational costs [6].

Huo et al. (2021) conduct a comprehensive analysis and optimization of external Venetian blind shading systems for nearly zero-energy buildings (nZEBs) across different climate regions in China. Their study draws upon datasets encompassing regional climate data, building energy consumption patterns, shading device specifications, building characteristics, and simulation results, contributing valuable insights into enhancing energy efficiency and thermal comfort in nZEBs [7]. Few researchers examined the design feasibility of a net-zero energy neighborhood in Qazvin, drawing upon datasets encompassing energy consumption patterns, renewable energy potential, building characteristics, cost data, and environmental factors. This study contributes valuable insights into the potential for sustainable urban development and energy self-sufficiency in the region.

3. METHODOLOGY

Current sizes of batteries for residential solar systems come with significant problems in making choices of storage capacity, including the dimensioning thereof, such as high costs and low efficiency. The paper further discusses the most recent developments in machine learning techniques that have increased the accuracy in predicting the optimal size of batteries. Lastly, the survey indicates and discusses ongoing research on the integration of data-driven approaches to enhance energy efficiency and reliability in residential solar applications [8]. It has provided the rationale for the project focus: to develop a machine-learning-based battery sizing tool. The modules developed and integrated by the project form a predicting tool for determining the size of residential solar energy systems' battery, thus making proper predictions. The predictions made by the tool are also accurate and reliable because there will be light on issues among the parties involved [9].

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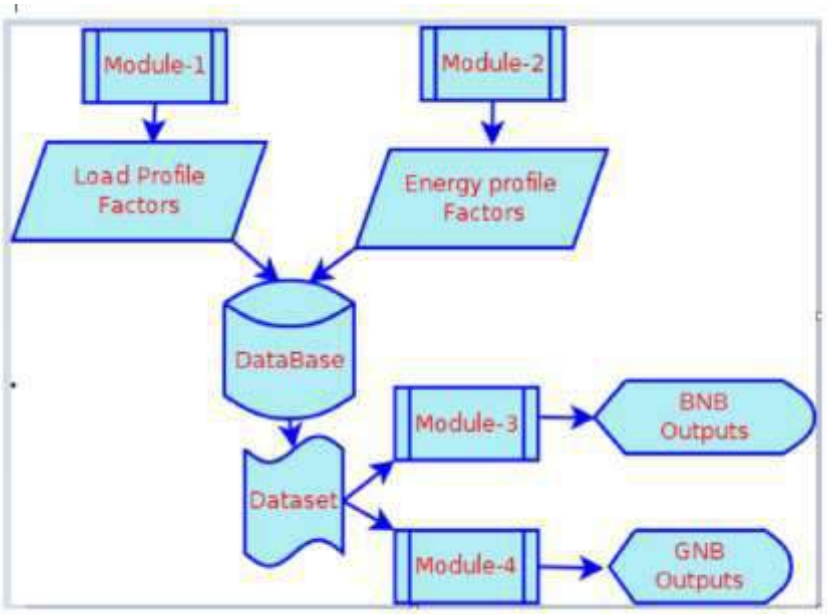


Fig 1: System Architecture

The diagram illustrates system elements and their interactions. The project consists off our main modules: Load Profile Factors Module: Function: Adds load profile factors to the database. Components: User interface, database connection, data validation. Energy Profile Factors Module: Function: Adds energy profile factors to the database. Components: User interface, database connection, data validation. Bernoulli Naive Bayes Classification Module: Function: Runs BNB classification on the dataset. Components: Data preprocessing, classification implementation, result storage. Gaussian Naive Bayes Classification Module: Function: Runs GNB classification on the dataset. Components: Data preprocessing, classification implementation, result storage

3.1 Data Collection

Collect data on factors involving energy and load profiles, such as photovoltaic installations, household energy usage, solar generation, grid usage, and also data points like average load, peak load, and rated photovoltaic power [10]. These data points are highly crucial for developing a good battery capacity forecast.

3.2 Data Preprocessing

Data must be cleaned and preprocessed for it to appropriately handle missing values, normalize features, scale features, and transform categorical data. This gets data ready for the training process of the machine learning model.

3.3 Feature Selection

Identify the most relevant features for predicting battery capacity. This would be done through statistical testing, correlation analysis, or feature importance - the scores would show which factors most strongly influence battery sizing. The model would be either Gaussian Naive Bayes, Bernoulli Naive Bayes, or any other algorithm that fit the characteristic found in their data. They have to choose models that can actually work appropriately and handle continuous and categorical data [11].

3.4 Model Training and Validation

Train selected models on the training dataset and validate them on the validation set to measure their performances [12]. Hyper parameters are fine-tuned using cross-validation techniques or any other effective cross-validation for the 7better accuracy of prediction.

4. EXPERIMENTS AND RESULTS

Results show that machine learning models, especially Gaussian and Bernoulli Naive Bayes classifiers, may predict optimal battery capacities for solar energy systems with high accuracy and are more effective than traditional sizing methods in predicting models for efficiency [13].

4.1 Performance Evaluation Techniques

Collect historical data on how the house has used energy vis-à-vis the photovoltaic panels, which would interact with the grid at different times. Use techniques like regression and decision trees to model and predict the size of the BESS based on energy usage and generation patterns. Perform load profiling to ascertain the peak, average, and typical energy demands of the building [14].

Implement energy management algorithms, for instance, model predictive control or reinforcement learning that can take advantage of forecasted solar generation and energy demand to optimize the charging and discharging schedule of the battery bank. Assess economic feasibility, including probable energy savings, initial investment, and available incentives or subsidies. Most of the key metrics for the analysis of the performance of BESS include self-consumption, self-sufficiency, peak shaving, round-trip efficiency, and battery degradation. Provide lifecycle cost analysis of the equipment, including the resultant maintenance and replacement costs as well as the revenues from any potential grid services. Regulatory compliance should be ensured, and the system should be optimized for both technical performance and economic viability [15].

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4.2 Evaluation Steps

- GNB Gaussian naive Bayes classifier is a probability distribution and has the effect of comparing neural activation to the means and variances of activation in different stimulus conditions. The output of the classifier is a condition label [16].
- GNB classifier on the testing data as 86.23. And in the first set, we have given 0 as nothing but a low battery size same as 1 is a medium battery size and 2 is a high battery size
- Bernoulli Naive Bayes. BernoulliNB implements the naive Bayes training and classification algorithms for data that is distributed according to multivariate Bernoulli distributions; i.e., there may be multiple features but each one is assumed to be a binary-valued (Bernoulli, boolean) variable.
- The BNB classifier obtained an accuracy of the BNB classifier on testing data is around 36.3013. Here the prediction on the first, second, the third set is 2, and 2 is the high battery size.
- This includes a thorough evaluation of the work carried out and brings out the contributions from the study. The discussion shall logically lead to inferences and conclusions and scope for possible future work.

5. CONCLUSION

This data-driven project, which sets a promising course for the economic use of sun energy, has already reached its research goals, and to some extent is already being used in one or more households. The proper use of the system to be installed, the sizing and size of the battery and even the cost of the total system are considerable in preventing this problem. For solar power producers and especially for battery manufacturers, the project delivers actual insights about consumers' needs and behaviour in housing. This information shapes an efficient manufacturing policy and decreases the amount of excess capacity. Result: products that are both low-cost and longer-lasting in life. In short, this application aimed at preventing waste energy in a responsible way, and the contribution made toward energy efficiency and further energy conservation. Reducing their energy consumption and smart energy storage solutions are a way to contribute to a faster global transition to the use of renewable sources of energy, paving the way for a greener, more sustainable future.

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ATTITUDE OF COLLEGE STUDENTS TOWARD ICT INTEGRATION IN EDUCATION IN WEST BENGAL

Newton Das[1], Dr. Samir Chattopadhyay[2]
[1]*Research Scholar, Department of Education, Jadavpur University, Kolkata-700032*
[2]*Assistant Professor, Department of Education, Jadavpur University, Kolkata-700032*

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ABSTRACT
The present study aims to explore the attitudes of college students in West Bengal toward ICT integration in education. Students' attitudes were assessed to variables such as gender, locality, and the type of streams. The study involved a sample of 298 students from 3 colleges across one district. A descriptive survey method with a quantitative approach was employed. An attitude scale specifically designed for college students was employed to gather data, and the analysis utilized methods such as mean scores, standard deviation, and t-tests. The findings indicate that college students generally have a favourable attitude toward ICT integration in education. Additionally, significant differences were observed in attitudes based on gender and locality. A significant difference in attitudes was observed between male and female students, apart from this, the difference between science and arts is found. The study highlights the importance of raising awareness about the benefits of ICT in education by implementing innovative programs and initiatives in colleges. Such efforts could encourage students to adopt ICT tools more effectively, enhancing their overall learning experience.

KEYWORDS: *Attitudes, ICT Integration, College Students.*

INTRODUCTION
In the 21st century, ICT skills are crucial for information literacy and lifelong learning. The emergence of a new generation of students with a natural affinity for ICT makes it a vital tool in modern education. ICT integration enhances learning and teaching quality, prepares students for responsible citizenship, and fosters creativity and innovation. ICT provides flexibility in learning, allowing students to study at home or other locations. It encourages autonomy and promotes self-directed learning behaviors. Positive attitudes towards ICT are crucial for successful integration into education. School environments significantly influence students' attitudes, and attitudes shape how they utilize computers in education. This study aims to explore college students' attitudes towards ICT integration in West Bengal, examining how these attitudes impact their engagement with ICT as a learning tool.

The rapid integration of Information and Communication Technology (ICT) into education has transformed teaching and learning processes, offering new opportunities for enhancing educational outcomes. ICT integration in education enables access to a wealth of information, fosters collaborative learning, and equips students with critical digital skills for the 21st century. College students, as primary stakeholders in higher education, hold unique perspectives on ICT adoption, which directly impacts their academic performance and preparedness for the digital economy.

Globally, studies have indicated that attitudes toward ICT significantly influence its adoption in educational settings. The Technology Acceptance Model (TAM) highlights that perceived usefulness and ease of use are pivotal in shaping attitudes and behaviors toward technology usage (Davis, 1989). Recent developments in TAM, such as the Unified Theory of Acceptance and Use of Technology (UTAUT), incorporate additional dimensions like social influence and facilitating conditions, further refining our understanding of technology adoption in education (Venkatesh et al., 2003). In the context of higher education, these models underscore the role of students' attitudes in determining the success of ICT integration, particularly when linked to collaborative learning and self-directed education (Keskin et al., 2016; Burhan-Horasanlı, 2022). In India, and specifically in West Bengal, ICT integration in education has been a focal point of policy initiatives. Despite significant advancements, challenges such as unequal access to digital resources and varying levels of digital literacy among students persist. Research highlights that college students' attitudes toward ICT are influenced by factors such as their prior exposure to technology, the quality of ICT infrastructure in educational institutions, and the perceived relevance of digital tools to their academic goals (Wang et al., 2022).

Recent empirical studies reveal that positive attitudes toward ICT integration are linked to enhanced academic outcomes, such as improved problem-solving skills, increased engagement, and greater adaptability to technological advancements (Rahimi & Tafazoli, 2022). Furthermore, ICT promotes flexible learning environments, enabling students to learn at their own pace and collaborate across geographical boundaries (Shodin, 2013). However, challenges such as resistance to change, lack of adequate training, and disparities

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in digital access need to be addressed to maximize the potential of ICT in education (Granic & Marangunic, 2019). This research aligns with global efforts to bridge the digital divide and enhance the effectiveness of ICT in educational contexts.

THE RATIONALE FOR THE STUDY

The integration of Information and Communication Technology (ICT) in education is crucial for enhancing accessibility, quality, and developing digital skills. However, students' attitudes play a significant role in their adoption and utilization of these technologies. In West Bengal, challenges like the digital divide, inadequate infrastructure, and digital literacy disparities persist. Understanding students' attitudes is essential for tailoring educational strategies and creating equitable, technology-enabled learning environments.

REVIEW OF RELATED LITERATURE

Valencia-Medina et al (2024) Integration of ICT in Attitudes and Knowledge of University Students. To assess the relationship between ICT knowledge and attitudes among university students in business programs. Cross-sectional quantitative research with a sample of 150 students, employing factor analysis and correlation measures. Students demonstrated moderate knowledge of ICT and neutral attitudes toward its integration. There were no significant differences in perceptions between different student groups, highlighting the need for targeted awareness programs. **Graham et al (2020)** Exploring Teachers' Integration of ICT Using UTAUT Framework. To analyze the factors influencing mathematics teachers' attitudes and practices in integrating ICT. Quantitative study utilizing the Unified Theory of Acceptance and Use of Technology (UTAUT). Performance expectancy, effort expectancy, and facilitating conditions were found to significantly influence teachers' attitudes. Teachers with constructivist beliefs demonstrated higher confidence in ICT use. Barriers included a lack of technical support and training. **Nachimuthu (2020)** Attitude of Teacher Educators of B.Ed Colleges Toward ICT. To study the attitudes of teacher educators in self-financed B.Ed colleges in West Bengal. A descriptive survey using a questionnaire with 32 participants from six colleges in the Purulia district. Most teacher educators had favorable attitudes toward ICT, with no significant gender-based differences in attitudes. **Singha (2020)** Attitudes of Student-Teachers Toward Online Learning. To analyze how male and female student-teachers perceive online learning. Descriptive survey among arts and science student-teachers in rural and urban settings. Gender and location did not significantly affect attitudes, indicating similar perceptions of online learning tools.**Ahmed et al (2019)** Barriers to ICT Integration in Higher Education Classrooms. To explore the challenges faculty members face in ICT adoption. Quantitative approach using surveys across various academic ranks and institutions. Perceived barriers, such as lack of training and infrastructure, significantly affected ICT adoption. However, gender and years of experience did not impact attitudes. Providing equitable access to resources was recommended. **Daher et al (2018)** Mathematics Teachers' ICT Integration as an Innovative Practice. To examine the influence of attitudes and self-efficacy on ICT adoption in teaching mathematics. An experimental study analyzing changes before and after a training program. Teachers' attitudes improved significantly, and self-efficacy increased due to hands-on ICT training. This reinforced their commitment to using ICT tools in classrooms. **Ullah (2018)** Attitudes Toward ICT Integration in Teacher Education. To assess the effectiveness of ICT tools in improving teaching-learning processes among teacher educators. Mixed methods combining questionnaires and interviews across multiple institutions in Purulia. Positive attitudes were noted, though there was some hesitance in adopting online tools due to limited face-to-face interaction. **Roy et al. (2017)** ICT Awareness among College Teachers in West Bengal. To evaluate ICT awareness among college faculty members. Survey of 150 teachers across urban and rural colleges using structured questionnaires. High levels of ICT awareness were observed, particularly in urban colleges, though challenges like infrastructure gaps persisted. **Das (2016)** Effectiveness of ICT in Enhancing Education Quality in West Bengal Colleges. To determine how ICT integration affects teaching quality in undergraduate colleges. Cross-sectional study involving faculty and students, with ICT tools as a primary variable. ICT was positively correlated with improved learning outcomes, but implementation issues, such as inadequate training, were reported These studies highlight a general trend of favorable attitudes toward ICT integration in education among both students and educators in West Bengal, though challenges such as infrastructure, training, and access persist. **Kar et al. (2014)** Attitude of University Students towards E-learning in West Bengal. To assess the attitudes of university students toward e-learning.Survey method with a stratified random sample of 308 students from universities like Jadavpur and Visva-Bharati. Students generally exhibited a high attitude toward e-learning, with no significant differences based on gender, study stream, or residence.

STATEMENT OF THE PROBLEM

The researcher conducted the study entitled **"ATTITUDE OF COLLEGE STUDENTS TOWARD ICT INTEGRATION IN EDUCATION IN WEST BENGAL"**

OBJECTIVES OF THE STUDY

- To find out the gender difference regarding the attitudes of college students towards ICT integration in education.
- To find out the locality difference regarding the attitudes of college students towards ICT integration in education.
- To find out the stream differences regarding the attitudes of college students towards ICT integration in education.

THE HYPOTHESIS OF THE STUDY

H_{01}: There is no significant difference between the attitudes of male and female college students toward ICT integration in education.

H_{02}: There is no significant difference between the attitudes of rural and urban college students toward ICT integration in education.

H_{03}: There is no significant difference between the attitudes of arts and science college students toward ICT integration in education.

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H_{04}: There is no significant difference between the attitudes of rural male and rural female college students toward ICT integration in education.

H_{05}: There is no significant difference between the attitudes of urban male and urban female college students toward ICT integration in education.

METHODOLOGY OF THE STUDY

- **Method:** The present study is based on the Descriptive survey method.
- **Population of the study:** All the college students of south 24 parganas districts comprised the population of this study.
- **Sample and Sampling Procedure:** college students constitute the population for the present study. Samples of 298 students are selected through purposive sampling from three (3) colleges.
- **Tool:** The researcher developed a tool entitled "Attitude of College Students Toward ICT Integration in Education scale" to collect data for this study. This was a five-point Likert-type scale consisting of 30 items.

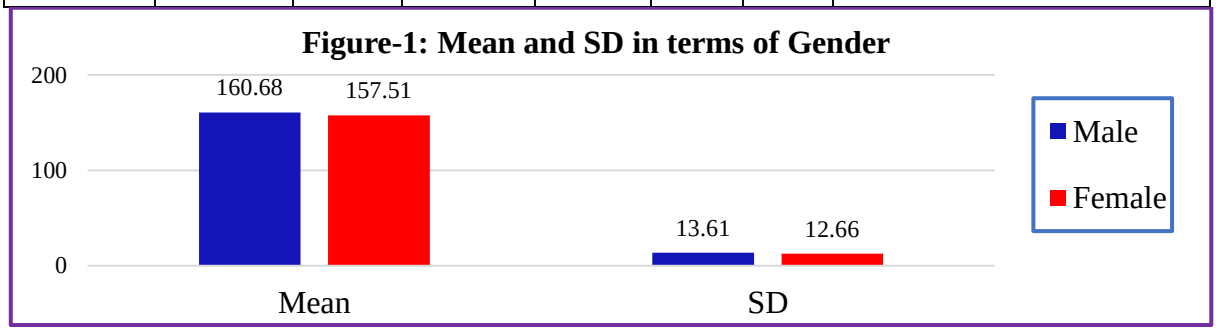
DATA ANALYSIS AND INTERPRETATION

The pattern of analysis followed the requirements outlined in the statement of objectives and hypotheses.

Hypothesis 1.

H_{01}: There is no significant difference between the attitudes of male and female college students toward ICT integration in education.

Variable	Group	N	Mean	SD	df	't' value	Level of significance
Gender	Male	125	160.68	13.61	296	2.07	Significant at 0.05 level
	Female	173	157.51	12.66			

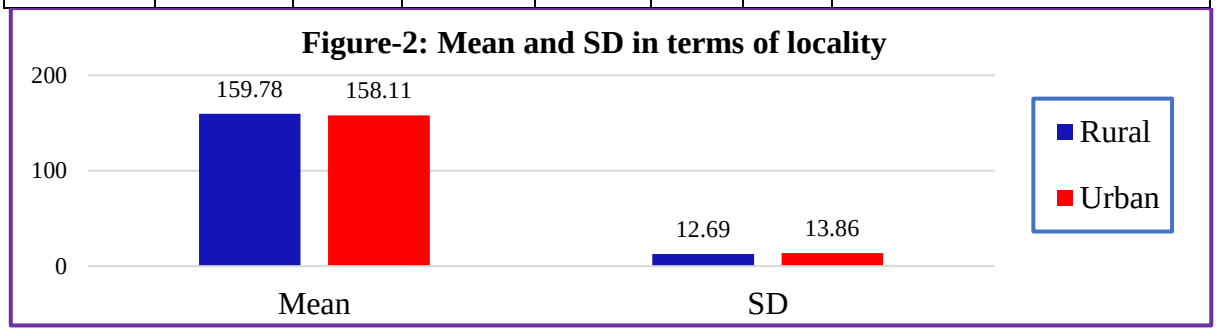


The value is significant. The corresponding null hypothesis is rejected. So, the researcher concluded that there is a significant difference in ICT integration scores between the male and female college students.

Hypothesis 2.

H_{02}: There is no significant difference between the attitudes of rural and urban college students toward ICT integration in education.

Variable	Group	N	Mean	SD	df	't' value	Level of significance
Locality	Rural	167	159.78	12.69	296	1.08	Not Significant at 0.05 level
	Urban	131	158.11	13.86			



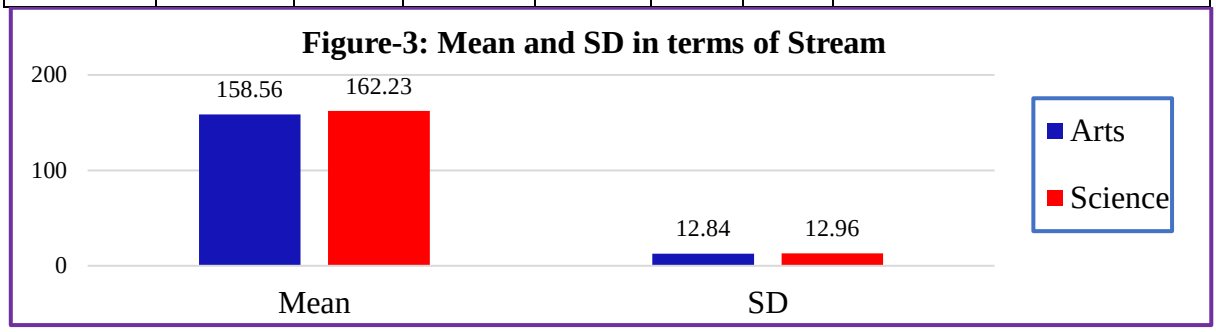
The value is not significant. The corresponding null hypothesis is accepted. So, the researcher concluded that there is no significant difference in ICT integration scores between the rural and urban college students.

Hypothesis 3.

H_{03}: There is no significant difference between the attitudes of arts and science college students toward ICT integration in education.

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Variable	Group	N	Mean	SD	df	't' value	Level of significance
Streams	Arts	194	158.56	12.84	296	2.34	Significant at 0.05 level
	Science	104	162.23	12.96			

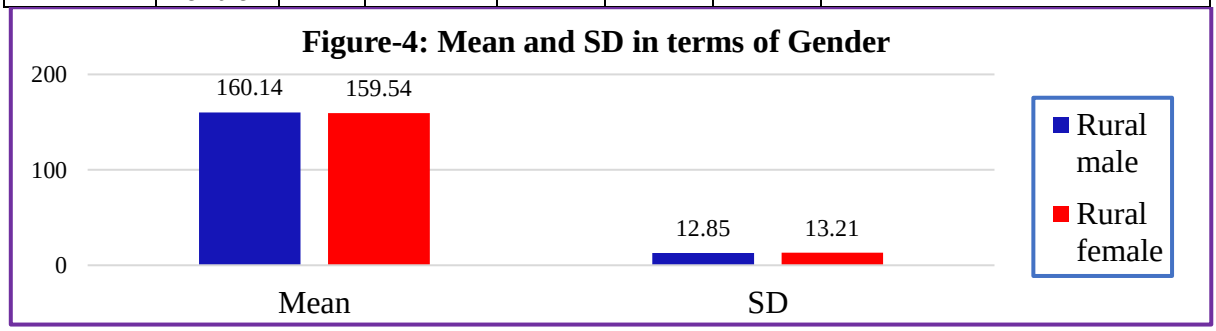


The value is significant. The corresponding null hypothesis is rejected. So, the researcher concluded that there is a significant difference in ICT integration scores between the arts and science college students.

Hypothesis 4.

H_{04}: There is no significant difference between the attitudes of rural male and rural female college students toward ICT integration in education.

Variable	Group	N	Mean	SD	df	't' value	Level of significance
Gender	Rural Male	61	160.14	12.85	165	0.29	Not Significant at 0.05 level
	Rural Female	106	159.54	13.21			



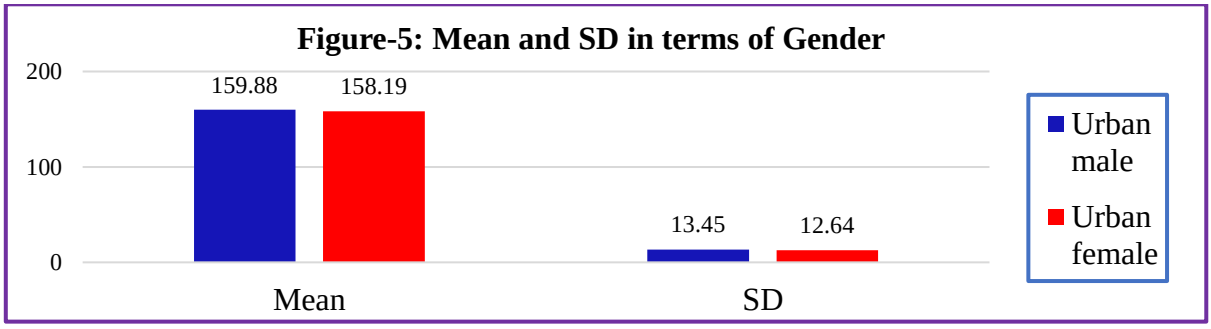
The value is not significant. The corresponding null hypothesis is accepted. So, the researcher concluded that there is no significant difference in ICT integration scores between the rural male and rural female college students.

Hypothesis 5.

H_{05}: There is no significant difference between the attitudes of urban male and urban female college students toward ICT integration in education.

Variable	Group	N	Mean	SD	df	't' value	Level of significance
Gender	Urban Male	55	159.88	13.45	129	0.74	Not Significant at 0.05 level
	Urban Female	76	158.19	12.64			

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The value is not significant. The corresponding null hypothesis is accepted. So, the researcher concluded that there is no significant difference in ICT integration scores between the urban male and urban female college students.

DISCUSSION

The attitudes of college students in West Bengal towards ICT integration in education are positive, highlighting the transformative potential of technology in enhancing learning and teaching processes (Das, 2016). However, challenges such as infrastructure deficiencies, socioeconomic disparities, and insufficient digital literacy training hinder the effective integration of ICT in education. Traditional teaching practices often conflict with ICT-based methods, with urban colleges adopting ICT more readily due to better infrastructure and resources. The COVID-19 pandemic has also influenced attitudes (Daher et al, 2018) with concerns such as screen fatigue and reduced interpersonal engagement emerging. To maximize the potential of ICT integration, targeted interventions, such as investments in infrastructure, equitable access to technology, and digital literacy programs, are essential. Further research and innovative approaches are crucial for ensuring ICT integration enhances the educational landscape in West Bengal (Singha,2020).

The study also revealed that male students have more positive attitudes toward ICT integration in education than female students and rural students exhibit higher attitudes than urban students. Moreover, it was found that science students have more positive attitudes toward ICT integration in education than arts students. It can be concluded that rural male students have slightly higher attitudes toward ICT integration in education than rural female students. Furthermore, the study revealed that urban male students exhibit slightly higher attitudes toward ICT integration in education compared to urban female students.

CONCLUSION

The integration of Information and Communication Technology (ICT) in education has gained global attention, with India being among the countries working to enhance their educational systems through technological advancements. In West Bengal, the attitudes of college students towards ICT integration are generally positive, but they are influenced by factors such as prior exposure to technology, the quality of ICT infrastructure, and the perceived relevance of digital tools to academic objectives. Students with more access to digital technologies and higher levels of digital literacy are more likely to embrace ICT tools in their learning. However, there are challenges in the successful integration of ICT in higher education institutions in West Bengal. The quality and availability of ICT infrastructure remain significant barriers to widespread adoption. Urban colleges in West Bengal have higher levels of ICT awareness, while rural colleges struggle with inadequate access to digital resources and insufficient technical support. This digital divide has led to discrepancies in how students from different geographical locations perceive the usefulness of ICT in their education.

Moreover, many students still face challenges in fully utilizing digital tools due to a lack of sufficient training and support. Research shows that when students feel confident in their ability to use ICT, they exhibit more positive attitudes and higher levels of engagement with the technology. Unfortunately, many institutions have insufficient or not tailored training and professional development programs for students, limiting the impact of ICT on their educational experiences. To overcome these barriers, it is essential to invest in improving ICT infrastructure, particularly in rural areas, and provide students with the necessary tools and skills to navigate digital technologies effectively. Additionally, creating a more inclusive environment that ensures equitable access to ICT resources for all students, regardless of their socio-economic background, will be crucial in promoting the widespread adoption of ICT in higher education.

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GOOD WAREHOUSING PRACTICE

Mr.Akshakumar Sahebrao Wathore[1] , Dr.Sunil S. Jaybhay[2] , Mr.Yogiraj Muley [3]
[1]*Student of Bachelor of Pharmacy, Institute of Pharmacy , Badnapur ,Jalna .*
[2]*Department of Principal, Institute of Pharmacy, Badnapur , Jalna .*
[3]*Department of Chemistry, Institute of Pharmacy ,Badnapur ,Jalna*

ABSTRACT

Good Warehousing Practices (GWP) are essential to ensure the efficient, safe, and compliant storage and distribution of goods. This includes implementing standardized procedures for inventory management, storage conditions, product handling, and quality assurance. GWP aims to optimize warehouse operations, reduce waste, prevent product damage, and ensure regulatory compliance, particularly in industries like pharmaceuticals, food, and manufacturing. Key elements of GWP include maintaining clean and organized storage areas, employing skilled personnel, conducting regular audits, and adhering to safety standards. By focusing on these practices, businesses can improve operational efficiency, reduce costs, and ensure that products reach their destination in optimal condition, thus fostering customer satisfaction and regulatory compliance.

Rice is the important food crop in the world and has become a staple food for more than half of the world's population. PT Agrobisnis Banten Mandiri (PT ABM) is a food distribution center in Banten Province that especially handles rice products. It is a must that a warehousing and distribution system be designed for quality assurance and food safety. This system is known as Good Warehouse Practices (GWP) dan Good Distribution Practices (GDP). This research aimed to study the implementation of the system, GWP and GDP, on rice

KEYWORD : *Warehouse layout, Stock Rotetion, Inventory Mangement, Shipping, etc*

1.INTRODUCTION

Good Warehousing Practices (GWP) refer to a set of standardized guidelines and procedures that ensure the safe, efficient, and compliant storage, handling, and distribution of goods. Effective warehousing is crucial to supply chain management, as it directly impacts inventory control, product quality, cost efficiency, and overall customer satisfaction. With the increasing complexity of global supply chains and rising customer expectations, the importance of maintaining high standards in warehousing operations has never been greater. GWP encompasses a wide range of practices, including proper storage conditions, product segregation, inventory management, employee training, and adherence to regulatory requirements. By implementing these best practices, businesses can mitigate risks such as product contaminatidamage, and stock discrepancies, while also optimizing warehouse space and improving operational performance. In industries such as pharmaceuticals, food, and consumer goods, where regulatory compliance and product integrity are

2. TYPE OF GOOD WAREHOUSING PRACTICE

2.1 Public Warehouse

Description : A warehouse that is owned and operated by a third-party service provider and available for rent by businesses. Public warehouses provide storage space, handling, and logistics services.

deal For Small to medium-sized businesses that don't want to invest in their own facilities.

Key Features Flexible space, short-term or long-term rentals, and shared facilities with other businesses.

2.2 Private Warehouse

Description: A warehouse owned or leased by a company for its exclusive use, typically to store its own inventory.

Deal For: Large businesses or enterprises with consistent storage needs and significant volume.

Key Features: Control over operations, location flexibility, and potential for customization.

2.3 Distribution Center (DC)

Description: A specialized warehouse designed for the rapid sorting, packing, and distribution of goods to retail locations or customers. It is often used in e-commerce and retail sectors.

Ideal For: Retailers or companies with high volumes of goods to distribute quickly.

Key Features :High throughput, automated systems for sorting and packing, efficient outbound logistics.

2.4 Fulfillment Center

DescriptionA type of warehouse that focuses on fulfilling orders, particularly in the e-commerce sector. These warehouses are designed for quick picking, packing, and shipping directly to customers.

Ideal For: E-commerce businesses that sell directly to consumers.

Key Features: Integration with online ordering systems, efficient pick-and-pack operations, direct-to-customer shipping.

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2.5 Climate-Controlled Warehouse

Description: A warehouse that maintains specific temperature or humidity conditions to store sensitive goods such as perishable foods, pharmaceuticals, or chemicals.

Ideal For: Businesses dealing with temperature-sensitive or perishable items.

Key Features: Refrigerated or climate-controlled environments, 24/7 monitoring, strict temperature regulations.

2.6 Bonded Warehouse

Description: A warehouse authorized by customs authorities where imported goods can be stored without paying customs duties until the goods are released for sale or shipment.

Ideal For: Importers or businesses involved in international trade.

Key Features: Customs-controlled, duties and taxes deferred until goods leave the warehouse, suitable for international trade.

3. MATHODOLOGY OFF GOOD WAREHOUSING PRACTICE

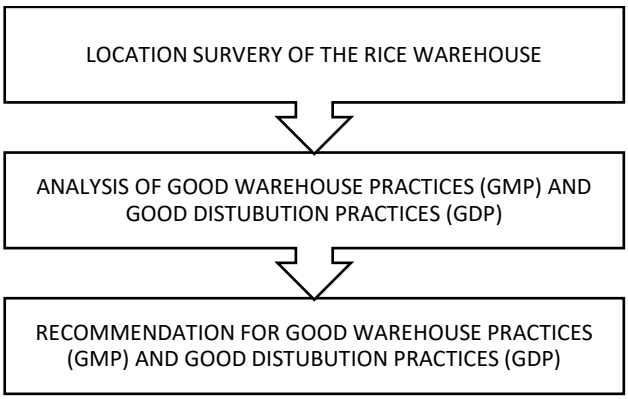
This research was conducted in September-October 2021 at PT. Agrobisnis Banten Mandiri (PT. ABM) as a warehouse and distribution center located on Jl. Raya Cilegon, Drangong, Taktakan, Serang City, Banten Province. The research method used is a descriptive method with a qualitative approach. This qualitative research describes and explains clearly and in detail the answer to the researcher's problem [4].

Implementation of GWP and GDP on Rice Product Case Study 47

Location survey of the rice warehouse

Analysis of Good Warehouse Practices (GWP) and Good Distribution Practices (GDP) (condition existing)

Recommendations for Good Warehouse Practices (GWP) and Good Distribution Practices (GDP)



A warehouse typically consists of several key areas, each serving a distinct purpose to ensure efficient storage, handling, and distribution of goods. Here are the main areas in a warehouse:

3.2 Receiving Area

Purpose This is where goods are received from suppliers or manufacturers. It includes unloading docks and staging areas where goods are inspected, sorted, and entered into inventory.

Key Activities Inspection, unloading, checking shipments for damage, updating inventory systems.

3.3 Storage Area

Purpose The space where goods are stored after they've been received, typically organized by product type or demand frequency.

Key Activities Shelving, racking, palletizing, and organizing inventory for efficient retrieval.

3.4 Picking Area

Purpose Where products are picked in response to customer orders or internal requisitions. It's typically organized to facilitate easy access to high-demand items.

Key Activities Order picking (manual or automated), sorting orders, assembling items for shipment.

3.5 Packing Area

Purpose Once items are picked, they are moved here for packaging, labeling, and preparing for shipment.

Key Activities Packaging, labeling, final inspection, creating shipment documentation, and preparing items for dispatch.

3.6 Shipping Area

Purpose This area is where goods are staged before being shipped out. It includes shipping docks where goods are loaded onto trucks or other transport modes.

Key ActivitiesLoading trucks, final checks on shipments, coordination with carriers for outbound transportation.

3.7 Returns Area

Purpose A designated area for handling returned goods from customers or suppliers.

Key Activities Inspecting returned products, restocking, returning to inventory, or disposition (repair, disposal).

3.8 Cross-docking Area

PurposeThis area allows goods to be transferred directly from receiving to shipping with minimal storage time in between.

Key Activities Sorting and redirecting incoming goods to outgoing trucks without prolonged storage.

3.9 Bulk Storage Area

Purpose A dedicated section for storing large quantities of products that are not picked frequently or are stored in bulk, such as raw materials or seasonal goods.

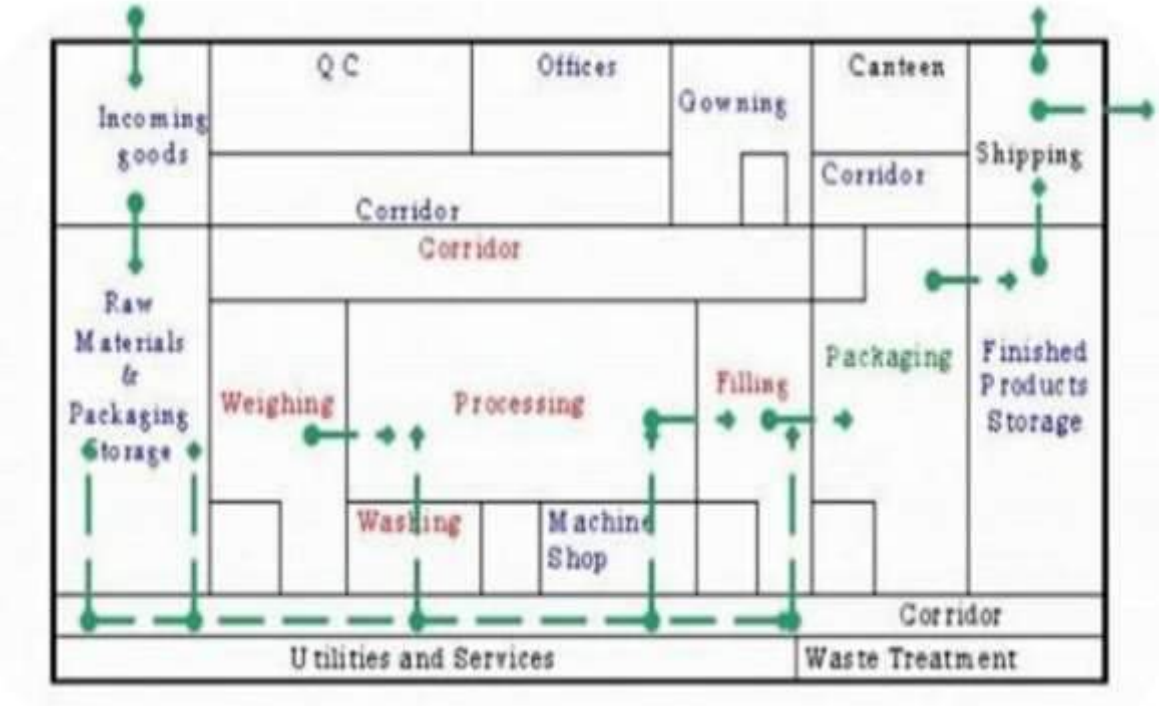
Key Activities Storing large or bulk items, typically on pallets or in crates.

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3.10 Temperature-Controlled Storage (Cold Storage) Area

Purpose For perishable or temperature-sensitive goods, such as food, pharmaceuticals, or chemicals.

Key Activities Maintaining a controlled environment (cold or frozen) for sensitive goods.



4. OBJECTIVE

The objective of good warehousing practices is to ensure the efficient, safe, and cost-effective management of inventory, while maintaining high standards of quality, security, and compliance. Key goals include

4.1 Optimizing Space Utilization

Ensuring that warehouse space is used effectively to store goods, allowing for easy access, inventory tracking, and minimal waste of space

4 .2 Ensuring Inventory Accuracy

Implementing systems and processes that maintain accurate inventory records, preventing stockouts or overstocking and minimizing errors in stock counts.

4.3.Improving Operational Efficiency

Streamlining workflows, from receiving goods to order fulfillment, to reduce lead times and operational costs

4.4 .Enhancing Safety and Compliance

Adhering to health and safety regulations, implementing safety protocols, and ensuring the warehouse meets legal and industry standards.

4.5 Reducing Damage and Lose

Protecting goods from damage during storage and transit through proper handling, secure storage practices, and regular maintenance of equipment.

4.6 Ensuring Quality Control

Monitoring goods to ensure they meet quality standards, reducing the likelihood of defective products reaching customers.

4.7 Facilitating Timely Distribution

Ensuring that products are readily available for efficient picking, packing, and shipping to meet customer demand on time.

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5. WORLD HEALTH ORGANIZATION (WHO) GUIDELINES (GWP)

provides guidelines for Good Warehouse Practice (GWP) primarily in the context of the storage and distribution of pharmaceutical products and medical supplies. These guidelines ensure that the integrity, quality, and safety of the products are maintained throughout their storage and handling process. The WHO's recommendations focus on various aspects such as proper conditions, safety measures, and best practices for storage to prevent contamination, damage, or loss of products.

5.1 Storage Conditions

Temperature Control Pharmaceutical products, especially vaccines and biologics, often require specific temperature conditions (e.g., refrigerated or frozen). Warehouses must have systems in place to monitor and maintain these conditions.

- Humidity Control Some pharmaceutical products are sensitive to humidity and must be stored in dry conditions.
- LightingStorage areas should be well-lit to ensure safe handling of products, but direct sunlight or excessive heat should be avoided.

5. 2 Security and Safety : protect sensitive product from tempering unathorized acces it measures can implamented

5.3 Access Control

The warehouse must have restricted access, and only authorized personnel should be allowed entry. This is especially critical for controlled or high-value drugs.

5.4 Security System

Surveillance cameras, alarms, and secure locks should be in place to prevent theft or tampering with the products.

5.5 Fire Safety

Fire safety measures such as fire extinguishers, sprinklers, and emergency exits should be properly maintained. The warehouse should also have a fire risk assessment in place



5.6 Inventory Management

Stock Rotation: Use a First Expired, First Out (FEFO)or First In, First Out (FIFO)system to ensure older stock is used or dispatched first, reducing the risk of expired products being distributed

Regular Stock Checks Regular physical stock counts and reconciliation with records are essential to ensure the accuracy of inventory

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Labeling All products should be clearly labeled with essential information, including expiration dates, batch numbers, and storage conditions

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Regular Stock Checks Regular physical stock counts and reconciliation with records are essential to ensure the accuracy of inventory

Labeling All products should be clearly labeled with essential information, including expiration dates, batch numbers, and storage conditions.

5.7 Handling and Documentation

Good Handling Practices Employees should be trained in proper handling techniques to avoid damage, contamination, or mix-ups.

Documentation and Records All warehouse activities should be documented, including the receipt, storage, movement, and dispatch of goods. Accurate records help trace the product's history and ensure compliance with regulations.

The International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) provides global standards and guidelines that apply to the pharmaceutical industry, including aspects related to Good Warehouse Practice (GWP). While the ICH guidelines do not specifically cover Good Warehouse Practice (GWP) in isolation, they are often integrated with other regulatory frameworks such asGood Distribution Practice (GDP) and Good Manufacturing Practice (GMP).

However, several ICH guidelines are relevant to GWP, especially when it comes to storage, handling, and distribution of pharmaceutical products, ensuring that product quality, safety, and efficacy are maintained throughout the supply chain. These guidelines provide broad principles and requirements that indirectly affect warehouse operations.
ICH Guidelines Related to GWP:
ICH Q7: Good Manufacturing Practice for Active Pharmaceutical Ingredients (API).

6. ICH GUIDELINES FOR GOOD WAREHOUSING PRACTICE

CH Q7 provides guidelines for the manufacturing of active pharmaceutical ingredients (APIs), including storage conditions, and packaging requirements to ensure the quality of APIs throughout the supply chain. Proper storage is critical to preventing contamination or degradation of APIs before they are used in the production of finished pharmaceutical products.

6.1 Storage Conditions

API storage must be in a controlled environment to prevent exposure to extreme temperatures, humidity, light, or contaminants.

6.1.2 Inventory Management

The API warehouse must be organized in a way that ensures the proper rotation of stock (FIFO or FEFO) and prevents mix-ups or cross-contamination.

6.1.3 Labeling and Documentation

ducts, including batch numbers, expiration dates, and storage instructions, is essential for traceabilPharmaceutical Quality System

6.1.4 Relevance to GWP

ICH Q10 emphasizes the importance of apharmaceutical quality system, which includes effective management of warehouse practices. This system ensures that all activities related to storage, distribution, and handling align with quality standards

6.1.5 Quality Management

Warehouse operations must be integrated into a broader quality management system, ensuring proper documentation, handling, and reporting of any deviations.
Continuous Improvement: Warehouse operations should be regularly reviewed and improved to ensure compliance with evolving regulatory standards and best practices.

6.1.6 Quality Risk Management

Relevance to GWP: ICH Q9 outlines a risk-based approach to quality management, which is applicable to warehouse operations to minimize the risk of product damage, contamination, or improper storage conditions.

6.1.7 Risk Assessment

Warehouses should conduct risk assessments to identify potential hazards related to temperature, humidity, handling procedures, and other environmental factors.
Control Measures: Mitigation strategies should be implemented, such as using temperature-controlled storage for sensitive products and ensuring proper segregation of incompatible materials.
Good Clinical Practice (GCP)

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6.1.8 Documentation and Traceability

Proper records must be maintained to ensure that clinical trial materials can be traced through the supply chain and that they meet the necessary storage conditions.

Impurities in New Drug Substances and Products

6.1.9 Relevance to GWP

ICH Q3 provides guidance on controlling impurities in drug substances and products, which can be affected by improper storage or handling in the warehouse. For example, exposure to excessive light, moisture, or heat can lead to the formation of impurities in drugs.

6.1.10 Environmental Controle

Warehouses should maintain appropriate environmental conditions to prevent the formation of impurities in sensitive pharmaceutical products.

6.2 Quality Assurance

The warehouse should operate as part of an integrated pharmaceutical quality management system, ensuring that products are stored, handled, and distributed in compliance with relevant regulations.

Regular audits and inspections of warehouse practices should be conducted to ensure ongoing compliance.

6.3 Risk Management

Risk assessments should be performedto identify potential hazards related to storage conditions, handling processes, and contamination risks.

Appropriate control measures (e.g., temperature monitoring, inventory control) should be in place to mitigate risks to product quality.

6.4 Documentation and Traceability

Accurate records of product movement, storage conditions, and handling procedures should be maintained at all times.

Documentation should include temperature and humidity logs, batch numbers, expiration dates, and details of any product recalls or deviations.

6.5 Proper Storage Conditions

The warehouse must maintain proper environmental conditions (e.g., temperature, humidity, light exposure) based on the specific requirements of the stored products.

Storage systems should prevent contamination, cross-contamination, or damage to products, ensuring that products are stored in clean, well-organized spaces.

6.6 Training and Personnel

Warehouse personnel should receive appropriate training in Good Warehouse Practices, including safe handling, storage conditions, and quality control procedures.

6.7 Regulatory Compliance

Warehouses must comply with both local regulations and international standards for pharmaceutical storage and distribution.

The warehouse operations should align with global frameworks such as Good Distribution Practice (GDP) and Good Manufacturing Practice (GMP) which often incorporate ICH principles.

7. IMPOTANT OF GOOD WAREHOUSING PRACTICE

7.1 Inventory Management

Proper warehousing ensures that inventory is org anized and easily accessible, minimizing the risk stockouts, overstocking, and errors. This leads to more accurate stock levels and better order fulfillment.

7.2 Product Safety and Quality

Implementing good warehousing practices ensures that products are stored under appropriate conditions, reducing the risk of damage, spoilage, or contamination. This is especially critical for perishable goods or sensitive materials.

7.3 Time Management

By using efficient layouts, clear labeling systems, and automation technologies (where applicable), warehousing can streamline picking, packing, and shipping processes, reducing lead times and improving customer satisfaction.

7.4 Customer Satisfaction

Fast, accurate, and reliable order fulfillment is critical to customer satisfaction. Good warehousing practices support these outcomes, enhancing a company's reputation and leading to repeat business.

7.5 Scalability

As a business grows, having well-established warehousing practices in place makes it easier to scale operations without sacrificing efficiency or increasing costs.

8. FUNCTIONS OF WAREHOUSING

8.1 Receiving and Recording of goods

While receiving the goods it is the responsibility of the warehouse
department to check and verify the goods that are coming into the warehouse by weighing the shipper
coming in and counting the same. The correctness and quantity of the goods coming in should be
verified at the time of receipt and recorded in a document. It should be mutually agreed and signed
between the person transferring the goods and the personreceiving the goods.

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8.2 Storage

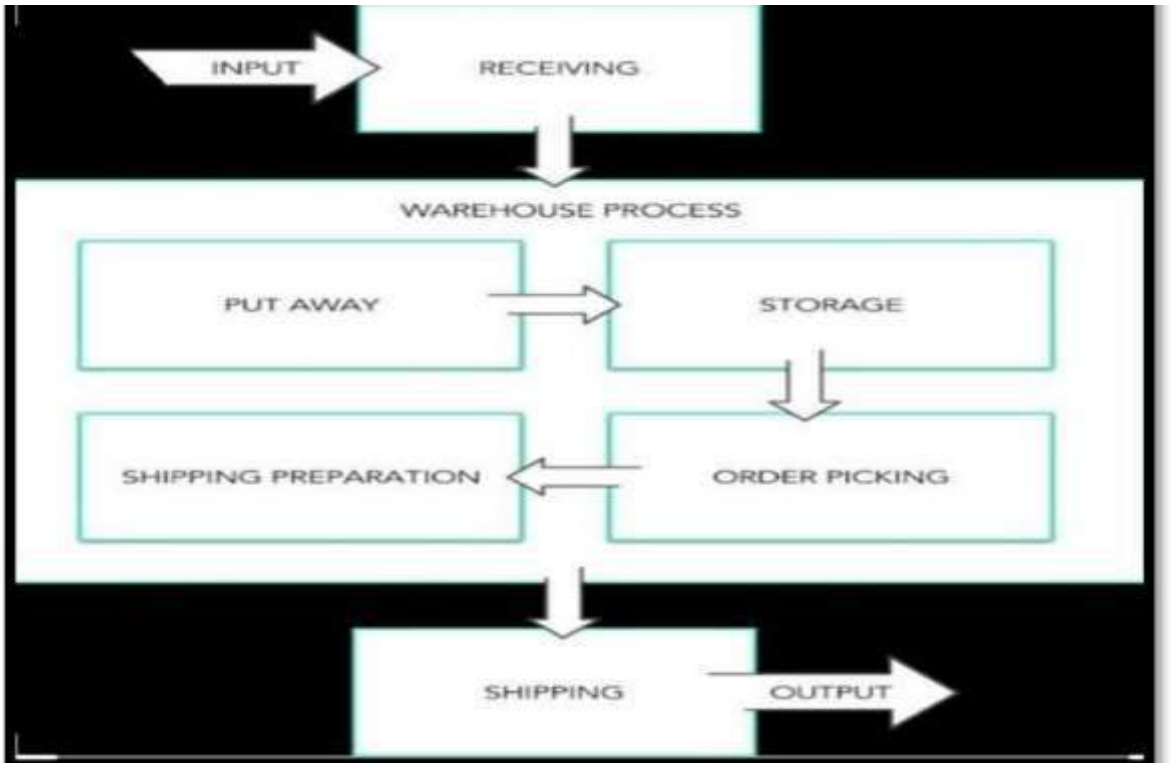
Major function of storage is to ensure that the product is protected and stored in a manner to ensure that the goods are easy to identify and as per the category. It is advisable to have zoning concept where the products can be stored as per the zone.

8.3 Order Picking

After the receipt of the order the line manager shall ensure that he has picked the same order as indicated in the picking list and the same batch member should appear in all the documents i.e., the invoice, the picking list and the delivery note.

8 .4 Distribution

The line manager hand over the goods to the packers who verify the goods against the delivery note and do the necessary marking on the shippers as per the customer. It is the responsibility of the loading supervisor to check the vehicle and confirm that it is matching as per the requirements and is clean and tidy for loading pharmaceutical goods.



9. PRINCIPLE OFF GOOD WAREHOUSING PRACTICE

9.1 Inventory Management

Implement effective inventory tracking systems, such as barcode scanning or RFID, to ensure accurate stock levels, minimize errors, and avoid stockouts or overstocking.

Regularly perform stock counts (e.g., cycle counting) to verify inventory accuracy.

9.2 Safety and Compliance

Adhere to safety regulations and standards to prevent accidents, including clear signage, proper safety equipment, fire exits, and regular training for staff.

Ensure proper labeling of hazardous materials and compliance with local and international regulations (such as OSHA or ISO standards).

9.3 Material Handling

Use appropriate handling equipment (forklifts, conveyors, pallet jacks, etc.) to reduce physical strain on workers and improve operational efficiency.

Ensure workers are trained in proper material handling techniques to prevent injuries and damage to goods.

9.4 Temperature and Environment Control

For sensitive goods (e.g., perishable items, pharmaceuticals), ensure temperature and humidity control systems are in place, along with regular monitoring to maintain the required conditions.

Ensure adequate ventilation, lighting, and cleanliness in the warehouse environment.

9.5 Quality Control

Establish procedures for inspecting goods upon receipt to ensure they meet quality standards and specifications.

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Implement quality checks at various points during storage and before dispatch to minimize errors and returns.

9.6 Technology and Automation: Utilize warehouse management systems (WMS) to improve real-time inventory tracking, order fulfillment, and warehouse processes.

Consider automation technologies (robotics, AI, etc.) to streamline operations and reduce human.

10. STOCK MARKET OF GOOD WAREHOUSING PRACTICE

10.1 Optimized Inventory Management

Using automated systems (like WMS) to track stock levels, reducing overstocking or stockouts.

10.2 Efficient Layout Design

Ensuring a logical flow for receiving, storing, and picking goods, which minimizes time and effort.

10.3 Technology Utilization

Implementing tools such as barcode scanners, RFID, and warehouse management software to improve accuracy and tracking

10.4 Regular Audits and Maintenance

Conducting regular audits to ensure inventory accuracy and maintaining warehouse equipment to prevent downtime.



11. STAFF OF GOOD WAREHOUSE PRICTICES

11.1 Warehouse Manager

Oversight: Ensure the overall operation of the warehouse meets GWP standards.

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11.2 Compliance

Ensure staff adhere to regulatory requirements and safety protocols.

11.3 Training:Organize training programs for warehouse staff to educate them on GWP, including inventory control, temperature management, and proper handling of goods.

11 .4 Receiving Staff

Inspection: Check incoming goods for quality, accuracy, and compliance with documentation.



11.5 Storage Conditions

Ensure that received goods are stored under proper conditions, including temperature, humidity, and handling.

11 .6 Documentation

Accurately record goods received and update inventory systems.

11.7 Warehouse Operators

Inventory Management: Organize and rotate stock in a manner that ensures FIFO (First-In-First-Out) or FEFO (First-Expired-First-Out) principles

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11.8 Labeling

Properly label products with batch numbers, expiration dates, and storage conditions.



11. 9 Handling

Handle goods safely to prevent damage and contamination

11. 10 Quality Control Inspectors

Goods Inspection: Ensure that products meet quality standards before they are shipped.

Sampling: Randomly sample items to ensure batch consistency and quality.

Documentation: Record inspection results and report non-compliance issues.

11.11 Safety and Compliance Officers

Safety Protocols: Ensure that staff follow safety guidelines, including the proper handling of hazardous materials and equipment.

Health & Safety Audits: Conduct regular safety audits to identify risks and ensure compliance with workplace safety standards.

Regulatory Compliance: Stay updated on regulations (e.g., FDA, GMP, ISO) relevant to warehousing and ensure

12 . CHARACTERS OF GOOD WAREHOUSE

12.1 Properly cleaned.
12.2 Good preservation of drugs & equipments.
12.3 Provide safety for staff & stocked goods.
12.4 Control of air, light, humidity & temperature.
12.5 Products to be purchased according to needs.
12.6 Order the destruction of unsuitable products.
12.7 Promote rational use of pharmaceutical products.

13. MAINTANANCE OF GOOD WAREHOUSE PRICTICES

13.1 Any building used in the manufacture, processing, packing, or holding of a drug product shall be maintained in a good state of repair.
13.2 Deterioration of buildings not only presents a poor image of the facility, it can also impact on product quality.
13.3 Cracks and holes in walls, floors, or ceilings can provide access for insects, rodents, birds, dirt, or microorganisms
.13.4 They can also hinder cleaning and sanitation, thereby
13.5 Floor cracks can also become a safety hazard for people or even dislodge materials from trucks.
13.6 The ingress of water from roof leaks can cause significant

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13.7 damage to materials and equipment, give rise to electrical failures and fires and result in damage to the basic structure of the building

14. RULES FOR GOOD WAREHOUSING PRACTICE

14.1 Systematic storage of the delivered goods.
14.2 Use air circulation & protection against rodents.
14.3 Keeping a space at least 50cm between the rows of pellets walls.
14.4 Providing each products have only one specific place.
14.5 On shelves clear labeling of products should be there.
14.6 Adequate space should be provided for each goods.
14.7 Provide separate stoke card for each products.
14.8 All boxes in stock should be closed.
14.9 Flammable products should stored in separate place

15. GENERAL GUIDE LINES FOR GOOD WAREHOUSE PRICTICES

15.1 Materials received against specific supply devices
15.2 Each such consignment have written documents (delivery Chelan)
15.3 All materials received by responsible persons
15.4 materials to be checked for cleanliness & package integrity
15.5 Damaged container separated & reporting immediately

16. PROCUREMENT OFF EQUIPMENT IN WAREHOUSE

16.1 Points to be noted before purchase of an equipment:
16.2 Latest technology
16.3 of maintenance & repair facility, with minimum down time
16.4 Post warranty repair at reasonable cost
16.5 Upgradeability
16.7 Reputed manufacturer
16.8 Availability of consumables.
16.9 Low operating cost



17. PREVENTIVE MAINTENENCE GOOD WAREHOUSE PRICTICES

17.1 Purchase with warranty spares.
17.2 Safeguard the electronic equipments with: (as per guidelines)
17.3 Voltage stabilizer, UPS
17.4 Automatic switch over generator
17.5 Requirement of electricity, water, space, atmospheric conditions, etc. Must be taken into

18. CONSIDATION FOR GOOD WAREHOUSING PRACTICE

18.1 Well equipped maintenance cell must be available
18.2 Monitoring annual maintenance contracts, [AMC]
18.3 Maintenance cell
18.4 Communications between maintenance cell & suppliers of the equipment
18.5 Follow-up of maintenance and repair services Repair of equipment

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19. DISPOSAL

19.1 Circulate to other units, where it is needed
19.2 Return to the vendor, if willing to accept
19.3 Sell to agencies, scrap dealers, etc
19.4 Auction
19.5 Local destruction

20. PREMISES, WAREHOUSING AND STORAGE

Precautions must be taken to prevent unauthorized persons from entering storage areas. Employees should comply with the company policies to mention a safe, secure and efficient working environment. Storage areas should be of sufficient capacities to allow the orderly storage of the various categories of pharmaceutical products namely commercial and non-commercial products, products in quarantine, and released, rejected returned or recalled products as well as those suspected to the counterfeits. Storage areas should be clean and free accumulated waste and vermin. If sampling is performed in the storage area, it should be conducted in such a way as to prevent contamination or cross contamination. Adequate cleaning procedures should be in place for the sampling areas. Radioactive materials, narcotics or other hazardous, sensitive and or dangerous pharmaceutical products, as well as products presenting special risks of abuse, fire or explosion should be stored in dedicated areas that is subject to appropriate additional safety and security measures A system should be in place to ensure that the pharmaceutical products due to expire first are sold and or distributed first. Exceptions may be permitted as appropriate provided that adequate control are in place to prevent the distribution of expired products.Storage conditions for pharmaceutical products should be in compliance with the recommendation for the manufacturer. Equipment used for monitoring of storage conditions should also be calibrated at defined intervals. Stock discrepancies should be investigated inaccordance with a specified procedure

21. VEHICLES & EQUIPMENTS FOR GOOD WAREHOUSE PRICTICES

These are used to distribute, store or handle pharmaceutical products should be suitable for their purpose and appropriately equipped to prevent exposure of the products to conditions that could affect their stability and packaging integrity and to prevent contamination of any kind. Where feasible considerations should be given to adding technology such as Global Positioning System (GPS), electronic tracking devices and engine kill buttons to vehicles, which would enhance the security of products while in the vehicle. Where special storage conditions (e.g. Temperature/ Relative humidity), different from or limiting the expected environmental conditions are required during transportation, these should be provided, checked, monitored and recorded. All monitoring records should be kept for the shelf life of the product distributed



22. RAW MATERIAL HANDLING SYSTEM (RMHS) IN A WAREHOUSE

f processes and equipment used to move, store, and protect raw materials:
Equipment

RMHS equipment can include conveyors, stacker cranes, automatic guided vehicles, and robotic delivery systems.
RMHS processes can include quality control checkpoints, real-time inspection, and just-in-time inventory manageme Location Raw material warehouse are often near manufacturing area

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23. TRANSPORTATION FOR GOOD WAREHOUSING PRACTICE

Cross-Docking

Transferring goods directly from an incoming delivery to an outgoing shipment, which eliminates the need for warehousing.

Batch picking

Allows the picker to travel to one pick location to fulfill multiple orders, which reduces travel time and congestion.

Advance shipping notification (ASN)

Using electronically transmitted ASNs can help avoid inefficiency in the distribution center.

Synchronize transport schedules with warehouse activities

Using a transportation management system (TMS) and warehouse management system (WMS) together can optimize warehouse operations.

Use automated systems

Automated systems can receive products, put them away, pick them for orders, and ship them to the customer.

Cycle counting

Regularly counting inventory throughout the year can keep back-office systems accurate and the warehouse organized.

Replenishment



AS/RS systems can reduce the time needed to pick up goods, minimize risk to warehouse

24.SANITATION FOR GOOD WAREHOUSING PRACTICE

Written sanitation programmes should be available. These should include validated cleaningprocedures for premises and equipment, a quality standard for water, instructions for hygienewhen manufacturing and handling goods, and instructions relating to the health, hygienicpractices, and clothing of personnel and the disposal procedures for waste materials andunusable residues. Eating, smoking, and unhygienic practices should not be permitted in manufacturing areas.There shall be written procedures for use of suitable rodenticides, insecticides, fungicides,fumigating agents and cleaning and sanitizing agents. Cleaning procedure to be followed, including equipment and materials

and Discussion

25.TRANSPORTATION AND WAREHOUSING FOR RAW MATERIAL

Here are some best practices for transportation and warehousing:

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Regularly counting inventory throughout the year can keep back-office systems accurate and the warehouse organized.
Replenishment
Implementing effective replenishment strategies can improve operational efficiency, customer satisfaction, and inventory control.
Use automated storage and retrieval systems (AS/RS)
AS/RS systems can reduce the time needed to pick up goods, minimize risk to warehouse workers, and save floor space.
Use compact storage systems Compact equipment like forklifts, hand trucks, pallet jacks, and electric stackers can save warehouse space.

26. CONCLUSION

good warehousing practices are essential for the efficient operation of any supply chain. They not only help ensure the safety and quality of goods but also improve operational efficiency, reduce costs, and enhance customer satisfaction. Implementing proper inventory management, optimizing storage space, maintaining safety standards, and using technology to track and manage products are key components of effective warehousing. By continually assessing and improving these practices, businesses can stay competitive, reduce errors, and streamline their operations for long-term success.

The implementation of good distribution practices (GDP) and good warehouse practices (GWP) at the agro-hub needs to be improved with the design of duties and responsibilities on warehousing and distribution. It is necessary to pay attention to routine hygiene procedures, room layout settings, and storage conditions on a regular basis. In regard to tools and transportation means, it is necessary to schedule maintenance, maintain cleanliness, and maintain usage schedules so as not to interfere with the warehousing
and distribution process. Documentation must be performed in complete. Product receipt, delivery, and stock must be recorded. Self-inspection of processes, tools, transportation,and products is required.

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   European Medicines Agency (EMA) – Good Distribution Practice (GDP) Guidelines
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The GMP guidelines from PIC/S include detailed requirements for the storage, handling, and transportation of pharmaceutical products. This includes ensuring proper environmental controls, managing inventory, and maintaining records for traceability.

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FORMULATION OF ESSENTIAL OIL BASED ON SOLID PERFUME

Mr. Abhishek Aniruddha Todkar[1]*, Dr. Swati Rawat[2], Dr. Sunil S Jaybhaye[3], Ms. Pooja Ambhure[4], Ms. Ashwini Shelke[5]

[1]*Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Jalna.*
[2]*Departmet of Principal, Institute of Pharmacy, Badnapur, Jalna.*
[3]*Department of Quality Assurance, Institute of Pharmacy, Badnapur, Jalna.*
[4]*Department of Pharmaceutics, Institute of Pharmacy, badnapur, Jalna.*
[5]*Department of Faculty, Institute of Pharmacy, Badnapur, Jalna.*

ABSTRACT

This study explores the formulation of a natural solid perfume utilizing essential oils of Jasmine (Jasminum grandiflorum), Lemon (Citrus limon), and Cedarwood Oil. The combination of these oils is aimed at creating a balanced fragrance profile with floral, citrus, and woody notes. The solid perfume base is composed of beeswax and Almond oil, which provide a stable structure for the fragrance while enhancing skin moisture. Jasmine oil contributes a rich, sweet floral scent, Lemon oil offers a refreshing citrus burst, and Cedarwood oil imparts a warm, woody depth. The final product is a sustainable, portable, and long-lasting fragrance solution suitable for personal use. The formulation demonstrates an effective method for blending essential oils in a solid, easily-applied form that captures. the aromatic qualities of the ingredients while being eco-friendly and skin-safe.

KEYWORDS : *Solid Perfume, Jasmine Oil, Lemongrass Oil, Beeswax, Evaluation, etc.*

1.INTRODUCTION

Solid perfume is becoming increasingly popular for its convenience, sustainability, and unique application method. Unlike liquid perfumes, which typically rely on alcohol as a base, solid perfumes are made with a combination of oils, waxes (like beeswax or soy), and essential fragrance oils. This blend allows the scent to cling to the skin more subtly and longer, as the wax and oils slowly release the fragrance over time. This means solid perfumes tend to have a more intimate, personal scent experience compared to the often stronger, more volatile sprays of liquid perfumes. Another major benefit is their portability. Solid perfumes are easy to carry in small tins or sticks, making them ideal for travel or on-the-go use. They don't leak, spill, or break easily like glass bottles, and they don't require a sprayer, which adds to their low-maintenance nature.

The application process is also more controlled. Users can swipe the solid perfume directly onto pulse points such as the wrists, neck, or behind the ears without the risk of over spraying or over-applying. The fragrance is activated by body heat and is usually more subtle and long-lasting, as it doesn't evaporate quickly like alcohol-based liquids. This makes it perfect for those who prefer a less overpowering scent or want a fragrance that evolves throughout the day.

From an eco-conscious perspective, solid perfumes are a more sustainable choice, as they often come in minimalist or recyclable packaging. The ingredients in these perfumes tend to be more natural as well, with many brands opting for cruelty-free, vegan, and environmentally friendly formulations. In this study, a solid perfume was formulated using a combination of natural waxes, oils, and essential oils. The solid perfume was prepared by melting the wax and oil, adding the essential oil, and pouring the mixture into a container to solidify. For those who want to delve deeper into fragrance, solid perfumes also allow for more customization. Since they come in smaller quantities, users can experiment with layering different scents, creating a unique fragrance that's perfectly suited to their preferences. Furthermore, they tend to be priced more affordably than high-end liquid perfumes, making them an accessible luxury for many. Overall, the ultimate appeal of solid perfumes lies in their combination of practicality, sustainability, and subtle yet enduring fragrance, making them a smart and stylish choice for fragrance lovers.

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2.FRAGRANCE WHEEL



3.WHY PERFUME ARE REQUIRED

-It promotes cleanliness and personal care.
-Smelling good conveys the idea of personal care While also representing good vibes.
-Wearing specific scents while performing various tasks may aid in recalling specific events and activities.
-Smelling good boosts confidence.
-Overall, it not only improves health but also relieves stress and promotes a happy lifestyle

4.OBJECTIVES

1.Portability – Easy to carry and apply anywhere.
2.Convenience – Mess-free, no need for sprays.
3.Long-lasting – Subtle, longer-lasting scent.
4. Discreetness – Ideal for personal, intimate fragrance application
5.Eco-friendly – Often uses minimal or sustainable packaging.



5.HISTORY

Solid perfume dates back to ancient Egypt, where it was made from natural ingredients like resin and myrrh, often for religious or personal use. The Romans and Greeks used balms and unguents, blending oils with herbs for fragrance. In the Middle Ages, solid perfumes were often carried in pomanders—scented spheres filled with spices and herbs. During the Renaissance and Victorian eras, solid perfumes were popular among the wealthy, often presented in decorative containers. In the 20th century, liquid perfumes overtook solid forms, but solid perfumes have since made a comeback due to their portability and natural ingredients, becoming trendy and eco-friendly options today.

6.THE EVOLUTION OF PERFUME

The first known perfumer was a woman named Tapputi from Mesopotamia. Over time, the knowledge of perfume-making spread from one civilization to another, eventually reaching Europe. Europeans further developed the process and introduced the concept of "modern scents," which involved essential oils in an alcohol solution, first bottled in the late 1300s and called "Hungary water" after learning the method from the Hungarians. Today, modern technology has refined the process even more, with perfume companies employing scientists and chemists to create sophisticated products.[6]

7.THE IMPORTANCE OF PERFUME

1.Self-expression – Reflects personality and style.
2.Confidence – Boosts self-esteem and presence.
3.Memory – Evokes emotions and memories.
4.Cultural value – Tied to traditions and status.
5.Impression – Leaves a lasting impact on others.
6.Mood enhancement – Influences emotions and well-being.
7.Aesthetic appeal – Adds luxury and beauty.

8.BENEFITS OF SOLID PERFUME

1.Travelling
2.Absent alcohol
3.Compact and Practical
4.No Leaking
5.Being considerate of others



9.RESEARCH AND CONCEPT DEVELOPMENT

• Do a literature survey, and read articles related to solid perfumes, the ir me its, and their demerits.
• Determine the desired characteristics of the solid perfumes.
• Introduce the purpose and scope of your project

Formulation Design

• Select the base ingredients, including essential oil, and beeswax.

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• Consider the desired properties, such as its chemical constituents.
• Determine the color range and develop pigment blends.

Production

• Identify local suppliers for the ingredients and packaging materials.
• Purchase ingredients and packaging materials in small quantities.
• Develop the formulation of the solid perfume using selected ingredients
• Develop a formulation by combining the selected ingredients
Laboratory testing:
• Create small-scale batches of solid perfumes formulations based on the initial design.
• Perform compatibility tests and stability studies on the ingredients.
• Evaluate the texture, color, scent, and overall performance of each formulation.

Optimization and Adjustments

• Analyze the results of the initial testing and make necessary adjustments.
• Modify the formulation to improve properties like spread ability, and adherence.
• Conduct additional testing, such as microbial and safety assessments.

Packaging

Design simple and cost-effective packaging options for presentation purposes. Create labels or mock-ups that showcase your branding concept.
Highlight the key features and benefits of your solid perfume formulation in your report.

Quality Control

Implement quality control measures during the formulation process to ensure consistency.
Document the quality control procedures you followed and explain their importance in your report.

Report Writing

Document the entire process, including research, formulation development, testing, adjustments, and results.
Include relevant scientific principles, theories, and references to support your findings.
Present your analysis of the formulation's performance and highlight any unique featuresor innovations.

10.METHODOLOGY

INSTRUMENT

1.Porcelain dish.
2.Stirrer
3.Tong.
4.Beaker
5.Burner
6.Tripod stand
7.Water bath
8.Container to fill finish product



Fig : Instrumentation

11.INGREDIENT (MATERIAL)

Bees Wax

When secreted by the bee, the pure beeswax is almost white; only after contact with honey and pollen it assumes a variably intense yellowish color and turns brown after about four years, because it contains the cocoon.
In recent years, beeswax has been shown to have antimicrobial properties when combined with other natural ingredients.



Lemon Essential Oil

Lemon oil as a main or base essential oil for our solid perfume
Lemon oil is obtained from Cymbopogon flexuosus Stapf.(fam-Poaceae) The oil is used in perfumery, soaps, and cosmetics and as a mosquito repellent.
A solvent extraction method and a low-temperature distillation method are mainly used for extraction .
Chemical Constituents Lemon oil is the principal source of citral (68—85%) from which ionone is derived.



Jasmine Essential Oil

Jasmine oil is a highly aromatic essential oil extracted from the flowers of the Jasminum species, primarily Jasminum grandiflorum (Spanish jasmine) and Jasminum officinale (common jasmine). It is well known for its sweet, exotic floral fragrance and has a long history of use in perfumery,

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aromatherapy, and skin care. Below is detailed information on various aspects of jasmine oil

Mainly Jasminum grandiflorum and Jasminum officinale. Known for its rich, sweet, floral and exotic scent, jasmine oil is prized in aromatherapy, perfumery and skincare for its numerous therapeutic, emotional and beauty benefits.



Cedarwood Essential Oil

Cedarwood oil is an essential oil extracted from the wood, roots, or leaves of the cedar or juniper tree. It has been used for centuries for its aroma, medicinal and therapeutic properties.

Cedarwood is a very important ingredient in perfumes. Its smell is woody, warm, and light smoky, which gives the perfume a dark and stable aroma. Cedarwood is used in a variety of ways, especially for men, in perfumes with a unique and complex smell.



12.METHOD OF PREPARATION

- 10 grams of beeswax and 1 ml of almond oil were taken in beaker of 100 ML.

Melt the wax with sweet almond oil heat the mixture on a water bath here we used a water bath. The bath temperature require is below $100°C$.

- Once this Mixture has liquefied, remove it from heat

15 drops of Jasmine essential oil, 10 drops of Lemongrass essential oil and 10 drops of Cedarwood essential oil were mixed simultaneously in another beaker of 50 ml.

-Apply the perfume by robbing a finger on the product to liquefy it, then rub your finger on the area you want to be Scented.

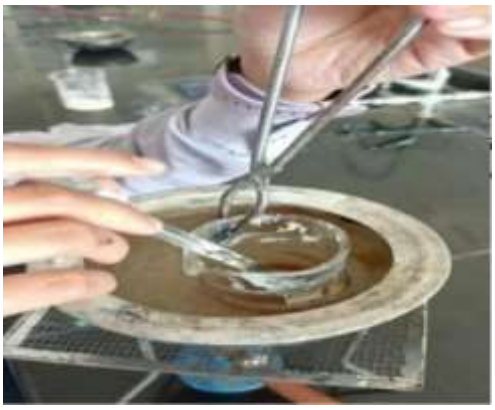


Fig : Heating of beeswax



Fig : Colour and texture Of solid Perfume

13.EVALUATION TESTS

Determination of Homogeneity

The formulations were tested for homogeneity by touch and visual appearance, means that the ingredients of a semi-solid compound need to be evenly distributed throughout the product.

Organoleptic test

The organoleptic test was a method of testing that made use of the five human senses. Color, aroma, appearance, moisture, comfort, and homogeneity are all factors to consider, evaluation means the study of drugs using the organs of the senses. It refers to the methods of analysis like color, odor, taste, size, shape, and special features. suchas touch, texture, etc.

Determination of Spread ability

Spread ability may be expressed by area extent to which the topical application spreads when applied to the parts of the skin that is affected. A sample of known weight was applied to a known area and the spread ability factor was determined.

Determination of Solubility

The solubility of the formulation was checked in different mediums. measures the solubility of solid drug compounds in liquid immersions

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Determination of Absorption

The amount of formulation absorbed in a given area was observed. kin absorption is a route by which substances
can enter the body through the skin
Determination of the Type of Smear
It was determined by applying the solid perfume on the skin surface of a human volunteer. After applying solid
perfume, the type of smear or film formed on the skin was checked.

Determination of Emolliency

Slipperiness, emollience, and amount of residue left after applying fixed amounts of cream were checked.

Determination of Physical Appearance

The physical appearance of solid perfume was inspected visually against a dark background.After feel
The nature of the skin texture on the applied area was assessed after the application of the formulation.

Ease of Removal

The ease of removal of the cream applied was determined by washing the applied part with tap water.

Irritancy Test

An area was marked on one dorsal part of the hand. The prepared solid perfume was applied and the time was noted down. It was continuously monitored for any kind of irritancy or allergic reactions at regular time intervals for 24 hours.

PH Evaluation

The pH guideline for topical preparations in contact with the skin was between 4 and 8.The pH value was predicted to be neither excessively acidic nor too alkaline, since both might cause discomfort and flaky skin. The final solid perfume was tested using universal pH paper and had a pH of 6. This pH level was shown to be safe for topical preparation for human skin application.

Stability Testing

Solid Perfume Product Stability Test The stability test was designed to evaluate product attributes by examining
the product's physical durability under various conditions. For four weeks, solid perfume was tested at room temperature by noting changes in texture, color, and scent.



Fig : How to Apply

14.RESULT AND DISCUSSION

Properties	Observation	Inference
Colour	Whitish	White
Odour	Jasmine scent	Refreshing and Jasmine smell
Appearance	Uniform	Formulation has uniform
Roughness	Absent	Formulation is smooth
Texture	Smooth and uniform	Formulation is uniform and smooth in texture

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15.ORGANOLEPTIC ASSESSMENT

The organoleptic evaluation of the prepared formulation revealed the following details about its color, odor, appearance, texture, etc. The formulation was found to be pleasant, smooth, and acceptable.

16.SUMMARY

Overall, the study highlights the potential of solid perfumes containing essential oils as a natural and sustainable alternative to traditional perfumes, and suggests avenues for further explorationin this field.

17.CONCLUSION

There have been significant advancements in the development of new scents and odours. Still, these advancements fall suddenly when it comes to modifying the composition of scents.

Solid spices have been on the request for a long but are still fairly unknown owing to their severity. Ambrosial composites in cosmetics in solid form aren't new, but solid spices lag behind them in terms of fashion ability.

Solid incense products showed unity and physical stability during 2 months of observation at room temperature.
This solid incense's optimal composition was supposed to produce a new form distinct from liquid traditional spices.

Due to the possibility of significant toxin and antipathetic responses, essential canvases are generally utilised in dilute form. Each uprooted essential oil painting has a unique medicinal benefit, and the maturity of them contain scents.

They're also employed in aromatherapies due to the sweet quality of their unpredictable composites. Because of its mobility and storehouse convenience, solid incense retains its fashion ability.

It's also suitable for individualities who aren't at ease with the request's veritably perfumed scents. The incense's smell may be modified to one's preference, and so the intensity of the aroma may vary across the population. Solid incense is one of those less delved areas about which little definitive information is available.

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FORMULATION AND EVALUATION OF HERBAL HAIR OIL

Abhimanyu Arjun Wagh[1], Dr. Swati S. Rawat[2], Dr. Sunil S. Jaybhaye[3], Ms.Pooja Ambhure[4], Ms. Ashwini Shelke[5]

[1]Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Dist. Jalna.
[2]Faculty of Pharmaceutics, Principal of Institute of Pharmacy, Badnapur, Dist. Jalna.
[3]Faculty Of Quality Assurance, Vice Principal of Institute of Pharmacy, Badnapur, Dist. Jalna.
[4]Faculty Of Pharmaceuticals Analysis, Institute of Pharmacy, Badnapur, Dist.Jalna.
[5]Faculty Of Pharmaceuticals Analysis, Institute of Pharmacy, Badnapur, Dist. Jalna.

ABSTRACT

Herbal hair oils are often safer and have fewer side effects compared to synthetic products. This study focuses on creating a herbal hair oil using natural ingredients like alma, hibiscus, bhringraj, jatamansi, raw garlic, muskmelon seeds, morning, curry leaves, guava leaves, papaya leaves, methi, mimosa pudica, and spring onion. The herbal oil was prepared using a boiling method, combining these ingredients in different formulas.

All the formulations were found to reduce hair fall and provide additional benefits, such as preventing dandruff, improving blood flow to the scalp, strengthening hair roots, preventing premature greying, and fighting fungal infections.

The oil was tested for properties like appearance, thickness, stability, acidity, pH, and texture. The results showed no sedimentation or grittiness, and the oil had appealing qualities similar to standard values. The findings of this study are discussed and reported in this

INTRODUCTION

Hair plays a vital role in human life, serving both aesthetic and functional purposes. In India, traditional practices have long emphasized the preparation of hair oils infused with various hair growth-promoting herbs. Indian women, renowned for their long, shiny, and healthy hair, have incorporated hair care as an integral part of their self-care rituals. The Charaka Samhita, a definitive text on Ayurvedic medicine, highlights the significance of regular oiling of the hair and scalp for maintaining hair health and preventing hair loss. This daily practice, tailored with suitable herbal ingredients, has been preserved and continues to be followed even today.

Hair oil formulations are widely used to address common hair problems such as dandruff, hair fall, and split ends. Additionally, these preparations help cool the scalp, promoting luxurious hair growth for both men and women.

Various oils, such as coconut oil, almond oil, sesame oil, and others, serve as excellent carriers for herbal infusions, enhancing the therapeutic properties of the formulations. By combining traditional knowledge with modern techniques, herbal hair oils offer a holistic approach to hair care, blending nourishment, protection, and therapeutic benefits.

Among natural remedies, hair oils have become indispensable in addressing various hair concerns and promoting overall hair health. Almond oil, castor oil, and onion oil are widely applied to the scalp, often blended with herbal ingredients. However, coconut oil is considered the most effective base due to its superior absorption into hair strands, affordability, and compatibility with herbal infusions. Coconut oil, enriched with herbal ingredients, is widely recognized as a proven method for promoting hair growth and addressing hair issues.

Hair acts as the first line of defense against the sun's harmful UV rays, further emphasizing the need for proper care. Hair care products are formulations designed to cleanse, enhance texture, and address issues such as discoloration, damage, and lack of nourishment. Herbal cosmetics are highly favored due to their minimal adverse effects and the easy availability of natural ingredients. In recent years, the incorporation of herbs into hair care cosmetics has increased significantly, gaining recognition over synthetic

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ALTERNATIVES

Synthetic hair oils are made using artificial substances and are typically used to provide shine, excellent conditioning, and frizz control. However, natural hair oils are rich in vitamins, minerals, and fatty acids, which are vital for nourishing scalp cells and promoting healthy hair growth. When applied, these oils allow essential nutrients to penetrate the scalp and hair, aiding in regeneration and fortifying hair strands.

Beyond nourishing the scalp, hair oiling provides additional benefits such as hydration, strengthening, and protection from external damage. Oil massages also enhance hair growth by stimulating hair follicles and improving blood circulation to the scalp. The primary purpose of oiling is to condition the scalp, offering a foundation for healthier, stronger, and more vibrant hair.
Herbal formulations, derived from plant-based sources, serve multiple purposes as cosmetics, conditioners, restorative treatments, and tonics. Different types of hair oils, such as coconut, castor, and almond oil, cater to various needs like hydration, dandruff control, split-end repair, and premature greying prevention. These oils can be incorporated into hair care routines in diverse ways, underscoring their universal appeal.

Hair oiling, a traditional practice of massaging oil onto the scalp, has gained global popularity due to its ability to increase moisture, luster, and shine while replenishing nutrients lost during frequent washing. It also prevents hair disorders such as baldness, hair discoloration, and excessive hair fall. Hair care products, including oils, play a pivotal role in giving stressed hair a healthy appearance and addressing common hair-related disorders, making them an integral part of daily self-care routines.

Hair care products are formulations designed to cleanse, enhance the texture, alter the color, and revitalize stressed or damaged hair. These products aim to nourish hair, improve its health, and provide a vibrant and healthy appearance. Among these, hair oils stand out as essential formulations used for addressing a variety of hair disorders.

Hair oils are particularly effective in treating conditions such as baldness, excessive hair fall, and discoloration. They work by nourishing the scalp, strengthening hair roots, and promoting regeneration, making them indispensable in maintaining hair health and combating common hair-related issues.

Hair fall and dryness of hair are common issues that can be effectively addressed through the proper use of hair oils. The addition of pleasant fragrances in these oils enhances their appeal and popularity. Non-sticky herbal hair oils, when applied correctly, not only provide a cooling effect to the brain but also add luster, softness, and a smooth flow to the hair.

Hair Structure and Growth Phases Hair consists of three main parts:
Bulb: A swelling at the base, originating from the dermis.

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Root: The part of the hair beneath the skin surface.
1: The visible hair above the skin surface.
Hair growth occurs in cyclic phases:
Phase: The growing phase lasting 2–6 years.
Catagen Phase: A short transitional phase lasting 2–3 weeks.
Telogen Phase: The resting phase lasting 2–3 months.

Benefits of Herbal Hair Oils

Herbal hair oils moisturize the scalp, reverse dryness, and promote normal hair growth by providing essential nutrients to maintain sebaceous gland function. The plant-based ingredients used in these oils are rich in bioactive compounds like flavonoids, polyphenols, saponins, tannins, vitamins, proteins, minerals, and ricinoleic acid. These constituents contribute to hair growth, nourishment, and overall hair health.

Herbal hair oils strengthen the hair, enhance its texture, and deeply hydrate the scalp, helping to eliminate dandruff. They smoothen the hair, impart a healthy shine, and repair damage by increasing blood circulation to the scalp. Regular application of herbal oils also reduces hygral fatigue—the swelling and drying caused by excessive water absorption and evaporation.

Additionally, herbal hair oils protect hair follicles from damage caused by surfactants by filling the gaps between cuticle cells. Scalp massages with these oils promote exfoliation, which can reduce hair fall and improve overall scalp health, ensuring strong and resilient hair.

Herbal hair oil formulations offer high-quality solutions for hair and scalp care. They provide essential nutrients to maintain the normal functioning of sebaceous glands and promote natural hair growth. Unlike synthetic alternatives, these formulations leverage bioactive ingredients from herbs, reducing side effects and enhancing both personal hygiene and the healthcare system.

Significance of Herbal Hair Oils:

1. Natural Composition: Herbal ingredients ensure minimal or no side effects, making them safe for regular use.
2. Nutritional Benefits: Provide vital nutrients that improve scalp health and maintain healthy, attractive hair.
3. Broad Applications: Enhance overall personal care and hygiene through their natural and therapeutic properties.

Evaluation of Formulation

Evaluation is critical to understanding the effectiveness and quality of herbal hair oil formulations. It helps identify strengths, areas for improvement, and ensures the product meets its intended goals.
The following tests are typically performed:
Acid Value Test: Measures the amount of free fatty acids.
Saponification Test: Determines the molecular weight of the oil. pH Test: Ensures the formulation is scalp-friendly.
Viscosity Test: Assesses the oil's flow and consistency.
Specific Gravity Test: Determines the oil's density compared to water.

Objectives of the Study

1. Explore the natural benefits of herbal hair oil
2. Understand the role of ingredients in maintaining scalp and hair health.
3. Prevent hair fall and control frizz effectively.
4. Identify the optimal combination of herbs for maximum benefit.
5. Study the process of formulation, preparation, and evaluation.
6. Provide a relaxing and nourishing hair treatment through scalp massage.

Key Benefits of Herbal Hair Oils:
Promote natural hair growth by nourishing the roots.
Reverse dry scalp and hair conditions.
Reduce hair fall and control frizz.
Ensure a healthy, moisturized scalp.
This study aims to provide an in-depth understanding of the formulation and evaluation of herbal hair oils, emphasizing the importance of natural ingredients and their effectiveness in hair care.
Drug Profile: Coconut Oil Family- Aceraceae.
Scientific name- Cocos nucifera L.

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Parts used- kernel oil.
Geographical location: Southern India.
Active constituents- Fatty acid, capric Acid,lauricacid.

Uses
Coconut oil is widely used in hair care for its numerous benefits, including:
Vehicle for other ingredients: Often used as a base or carrier oil in formulations for hair and skin products.
Promotes Hair Growth: Coconut oil stimulates hair growth by nourishing the hair follicles and providing essential nutrients.
Coconut oil is a valuable ingredient in both traditional and modern hair care, known for its ability to strengthen, condition, and promote healthy hair growth.



Tilloil
Family- Pedaliaceae.
Scientific name- S. indicum.
Parts used- Seeds oil.
Geographical location- Middle east statesof India.
Active constituents- Sesamin, palmitic acid and Linoleic acid.
Uses- Used as vehicle, Makes hair smoother and good for dry hair and scalp.



Castoroil
Family- Euphorbiaceae.
Scientific name- Ricinus commumis L.
Parts used- Seeds oil.
Geographical location- Gujarat in western India.
Uses -
Active constituents-PhytostCastor oil is commonly used to lubricate the hair shaft, enhancing its flexibility and promoting overall hair health.erols,tocopherols, carotenoids

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Almond Oil

Family- Rosaceae.
Scientific name- Prunus dulcis.
Parts used- Dried kernels of almond tree.
Geographical location- Northern India.
ctive constituents- Palmitic acid, linolic acid, oleic acid.
Uses- Strengthen the hair, protect the hair from sunlight, use as scalp treatment.



Curry Leaves

Family- Rutaceae.
Scientific name- Murraya koenigii.
Parts used- Leaves.
Geographical location: Subtropical and tropical
Regions through the Asia.
Active constituents- Bismahanine,murrayanine,murrayazolinol.
Uses- Strengthen the hair, protect the hair from sunlight, use as scalp treatment.



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Methileaves/Fenugreek
Family- Fabaceae.
Scientific name- Trigonella foenum-graecum.
Parts used- Seeds.
Geographical location: Maharashtra.
Active constituents- Trimethylamine, Trigonelline,Quercetin.
Uses- Reduce dandruff, promotes hair growth and shows anti-fungalactivity.



Jasmineoil
Family- Oleaceae.
Scientific name- Jasminum officina Parts used- Oil of jasmine oil.



Geographical location- Tamil Nadu.
Active constituents-Benzyl acetate, Linalool Benzyl alcohol.

Uses-Flavoringagen

Moringa
Family- Moringaceae.
Scientific name- Moringa oleifera.
Parts used- Leaves.
Geographical location: Southern states of India.

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Active constituents- Flavonoids, glycosides, alkaloids.
Uses- Strengthen the hair andmoisturizesscalp.

Rawgarlic
Family- Amaryllidaceae.
Scientific name- Allium sativum.
Parts used- Bulbs of the garlic.
Geographical location-Gujrat, Madhya Pradesh, Maharashtra and Rajasthan.
Active constituents- Diallyl thiosulphate, Diallylsulfide, Diallyl

Trisulfide.
Uses- Shows antimicrobial properties and contain vitamin C helps to promote
Hair growth



Pumpkinseeds
Family- Cucurbitaceae.

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Scientific name- Cucumis sativus.
Parts used- Seeds.
Geographical location- West Bengal and Uttar Pradesh Active constituents- Palmitic acid andStearicacid.
Uses- Contains cucurbitin responsible for hair growth.



Betel Leaves
Family- Piperaceae
Scientific name- Piper betle. L.



Parts used- Leaves.
Geographical location- Assam, Andhra Pradesh,Bihar, Gujarat, Odisha, Karnataka, Rajasthan, West Bengal.
Active constituents- Alecoline, Vitamin C, Thiamine, Niacine, Riboflavin.
Uses- For quick hair growth, treats dandruff and split ends.

Cedarwood Oil
Family- Pinaceae.
Scientific name- Cedrus.
Parts used- Cedarwood oil.
Geographical location- Himachal Pradesh, Uttarkhand, Jammu and Kashmir Active constituents- Methyl Thujate and thujic acid.

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Uses- Cleanse the scalp, removing dirt and dandruff and it enhances the circulation to scalp and tightens theFollicle
Habeeba Shaikh et al., Was concluded That hair care cosmeticsadded With herbs are well recognized composed of Synthetic one. The formulation done with natural Herbs are better and not having much side effects Compared with the synthetic one.

➢ S.Gejalakshmietal.,Saysthatherbalhairoil SmaintainsnormalfunctionsofsebaceousglandAndpromotesnaturalhairgrowthbyproviding numeroUsessentialnutrientsrequiredtoit.India has a wide Variety of medicinal herbs with various cosmetic And healingproperties.

➢ Rahathunnisabegumetal. Showed that Me Thicurb hair fall and strengthens your hair from root to Tip. Almond oil is rich in vitamin E and are used for Hair loss and strengthen the hairs. Coconut oil Nourishes the scalp gives shine to the hair and the Jasmine which serves as antimicrobial agent, Conditioning agent and also gives good odour to Theoil.

- T. Usha Kiran Reddy et al., Says that Addition of Neem acts as antidandruff. Amla helps In thickening and blackening of hair and Hibiscus Helps in hair softening resulting in healthy Growth.AllthesedriedandfreshingredientsmixedwithCoconutoilwillgiveasolutionforhair Fallandproperhairgrowth.Andtheuseofhairalsousedf Orheadachesduetothecoolingeffects and also helps in relieving from stress and strainconditions.
- Ranganathan et al., Found out that the Herbal hair oil is more effective in reducing the hair Fall when compare to coconut oil by Three-month Evaluation of a herbal hair oil verses coconut oil Was conducted on human volunteers with hair fall Problem in a Y. M. T. Ayurvedic Medical College, Kharghar.CombingassaywasperformedtoevAluatetheefficacyoftheherbalhairoil.Thefinalstudyshowthatthetestoilwaseffectivei nreduCingthehairfall. Kalpesh Gaur et al., Found out that the Hibiscus is having many good activities which is Beneficial to hair and the hydro-alcoholic extract of Hibiscus rosa Sinensis Linn. Was found to possess Significant immunostimulatory action on Immunesystem.
- Shirode, D et al., Suggested the hair Growth activity of Hibiscus rosa-sinensis & Glycyrrhiza glabra were evaluated in albino rats. The extract of Hibiscus rosasinensis (petroleum Ether & benzene extract) & Glycyrrhiza glabra (alcohol Extract) respectively 0.2%w/v & 2%w/v Exhibit maximum hair growth activity as compared To standard group animals as treated with minoxidil Solution(2%w/v).
- Srivastava Varnika et al., Shared the Details and the medicinal uses of Mimosa pudica (touch me notplane)
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- Ademiluyi AO et al., Modulatory effects Of dietary inclusion of garlic (Allium sativum) on Gentamycin–induced hepatotoxicity and oxidative Stress inrats.
- Allison GL et al., Aged garlic extract Inhibits platelet activation by increasing Intracellular cAMP and reducing the interaction of GPIIb/IIIa receptor withfibrinogen.
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- Ram Kumar Roy et al., Studied the Development and evaluation of polyherbal Formulation for hair growth–promoting activity and Revealed that hair growth initiation time was Markedly reduced to one third on treatment with The prepared formulation compared with control Animals.
- Libecco JF et al., The seeds of Tectona Grandis Linn. Are traditionally acclaimed as hair Tonic in the Indian system of medicine. Hair growth Initiation time was significantly reduced to half on Treatment with the extracts compared to control Animals. The treatment was successful in bringing a Greater number of hair follicles (64% and 51%) in Anagenic phase than standard minoxidil (49%). The Results of treatment with 5% and 10% petroleum Ether extracts were comparable to the Positivecontrol Minoxidil15
- Budd D et al., A questionnaire designed Specifically to evaluate attitudes to hair loss. Men With greater hair loss were more bothered, more Concerned about looking older due to their hair Loss, and less satisfied with their hair appearance. Male pattern hair loss has significant negative Effects on hair-loss specific measures in men 18 to40 years of age in France, Italy, Germany and the UK. The degree that hair loss is perceived as Noticeable to others appears to be a significant Contributor to these negativeeffects
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- Shah CS et al., A Textbook of Pharmacognosy. 11th Ed. B.S. Shah Prakashan,Ahmedabad, 1996, 119 has studied that Ashwagandha has antioxidant and hormone Balancing properties which reduces hair fall and Promotes shinyhair18 Accurately weigh all the dried and fresh herbs such as, Fenugreek seed, Moringa leaves, Rawic, Curry leaves, Betelleaves.

FORMULATION

Ingredients	Quantity
Till Oil	15%
Cedarwood Oil	2%
Almond Oil	2%
Castor Oil	3%
Coconut Oil	60%
Moringa Leaves	4%
Raw Garlic	4%
Jasmine Oil	2%
Fenugreek	2%
Pumpkin Seeds	2%
Curry Leaves	1%
Betel Leaf	3%

- Accurately weigh all the dried and fresh herbs such as, Fenugreek seed, Moringa leaves, Raw garlic, Curry leaves, Betelleaves.
- Herbal product was mixed in Coconut oil, Till oil, Almond oil, Castor oil, The above content was boiled for 30 mins. Boiled mixture was subject for filtration through muslin cloth. After filtration coconut oil was added to the filtrate to make up the volume.
- Finally, flavoring agent was added to the oil and was placed in a bottle.

EVALUATION PARAMETERS

EVALUATION TEST FOR HAIR OILS

Prepared herbal hair oil was estimated for product Performance which includes physicochemical parameters.

1. Organoleptic Property
   - Color: Detected by naked eyes
   - Sensitivity: Applied to the skin and exposed to the sunlight for 5 minutes to check for any irritation over skin
   - Grittiness: Rubbed to the skin and observed
   - Sedimentation: Keep the whole preparation aside for overnight and check for sededimentation
2. pHDetermination

Take a pH paper and dip into the formulated hair oil and check for the color change.

3. ViscosityMeasurement

The viscosity of prepared herbal hair oil was estimated by Ostwald's Viscometer at a room temperature. The viscosity of prepared herbal hair oil was calculated by using the equation,

Ƞ1 x ƒ2 t2

Viscosity of liquid (ƞ2)= ƒ1 t1

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Ƞ1 = Viscosity of water ƒ2 = Density of sample t2 = Mean time of oil from A to B ƒ1 = Density of oil t1 = Mean time of flow of water from A to B

4. Acid Value

10 ml of oil was added with 25ml of ethanol and 25ml of ether. Phenolphthalein was added as indicator and titrated with 0.1M Potassium hydroxide solution n = Number of ml of 0.1M KOH w = Wt. of oil

5. SpecificGravity

Specific gravity of the prepared oil was determined using specific gravity bottle.

RESULT

1. Oranoleptic Property

Formulation	Color	Sensitivity	Sedimentation
F4	Dark Greenish Brown	No Irritation	No Sedimentation

2. PH Determination

Formulation	PH value
F4	6

3. Viscosity Determination

Formulation	Viscosity (Centipoise)
F4	0.92

4. Acid Value

Formulation	Acid value
F4	5.2

5. Specific Gravity

Formulation	Specific Gravity
F4	1.09

SUMMARY

Herbal hair oils are widely preferred for addressing various hair problems. They promote hair growth, prevent hair fall, and enhance the beauty of hair by providing essential moisture to the scalp. These natural oils also treat issues like hair thinning, dry scalp, and dandruff. Additionally, they improve blood circulation in the scalp, add volume to the hair, and maintain overall hair health.

IV. CONCLUSION

Theutilizationofherbalhairoilinthecosmeticsenhancedmanyfoldsinpersonalhygiene and health care system. Herbal oil is one of the most well-recognized hair treatments. The use of different herbal materials which is having different benefits with good combination will give the great effect for hair. The herbal extracts and constituents chosen for the formulation of hair oil were reported to have hair growth, relaxation, anti-dandruff, hair thickening,and hair ,which when In promoting healthy and shiny hair growth. The formulation was proven to be safe for human use. Because values of evaluation parameters of our formulation show similar resultsasstandardvalueshenceitisconcludedthattheoilisbeneficialinmaintaininggoodhairgrowthofthehairsturninggreyhairstoblackprovidingprotectionfromdandruff and results lustrous looking hairs. The formulated hair oil will help in Maintaining good growth of hair, not only that it also provides turning grey hair to black, protects from dandruff, reduces stress etc. It provides various essential nutrients required to maintain normal function of sebaceous glands and promotes natural hair growth. Formulation was done and evaluated by means of various parameters like pH, organoleptic properties (colour, odour, sensitivity, sedimentation) acid value, viscosity, specific gravity, and stability test. At last, it can be concluded that the herbal hair oil formulations have significantquality.

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A COMPLETE STUDY OF DRUG TO CONTROL HEART ATTACK

Mr. Avinash D. Hatkar[1], Mr. Chaitanya Bhaskar Nagre[2]*, Mr. Sandip Phoke[3], Dr. Sunil Jaybhaye[4], Mr. Pooja Mule[5],

[1]*Faculty of Pharmacy, Department Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere*
[2]*Student of Bachelor in Pharmacy, Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere.*
[3]*Faculty of Pharmacy, Department, Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere*
[4]*Faculty of Pharmacy Department, Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere*
[5]*Faculty of Pharmacy Department, Dr. Babasaheb Ambedkar Technological University, Raigad, Lonere*
Institute of Pharmacy, (NKSPT) Pathrikar Campus, Badnapur, Jalna 431202

ABSTRACT

Autonomic functions, such as increased sympathetic and parasympathetic activity and the brain's suprachiasmatic nucleus, higher nervous centres, depression, hostility and aggression appear to be important determinants of heart rate variability (HRV), which is, itself, an important risk factor of myocardial infarction, arrhythmias, sudden death, heart failure and atherosclerosis. The circadian rhythm of these complications with an increased occurrence in the second quarter of the day may be due to autonomic dysfunction as well as to the presence of excitatory brain and heart tissues.

Recent studies indicate that there is an interaction between biorhythms, the biological clock and triggers, which may be important in the pathogenesis of altered heart rate variability (HRV) and blood pressure variability (BPV). Circadian rhythms are under the influence of, and physiological variables are mediated by the activation of the adrenals, sympathetic/parasympathetic, hypothalamic and pituitary activity. Emotional stress, physical exertion, sleep deprivation and large fatty meals are major triggers of myocardial ischemia, angina, infarction, sudden cardiac death (SCD) and stroke.

KEYWORD ; *Heart attack , What , Type , Risk , Drug , Control , History.*

HEART ATTACK

A heart attack occurs when an artery that sends blood and oxygen to the heart is blocked. Fatty, cholesterol-containing deposits build up over time, forming plaques in the heart's arteries. If a plaque ruptures, a blood clot can form. The clot can block arteries, causing a heart attack. During a heart attack, a lack of blood flow causes the tissue in the heart muscle to die. A heart attack is also called a myocardial infarction.
Prompt treatment is needed for a heart attack to prevent death. Call 911 or emergency medical help if you think you might be having a heart attack. {1}

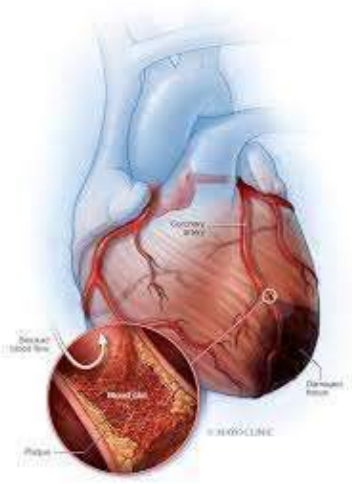


Fig No.1

- **What is a Heart Attack?**

The coronary arteries carry blood to the heart, allowing it to function. A heart attack, also known as a myocardial infarction, occurs when a blockage develops in the coronary arteries and restricts the flow of blood to the heart.

Blockages occur when fat, cholesterol, and other substances build up, forming deposits called plaques in blood vessels. These plaques can become damaged over time and may release platelets.

Platelets can cause the blood to clot. They may collect around a plaque, eventually blocking blood flow.
By restricting blood flow, these blockages can damage the heart muscle. The severity of damage will depend on the size of the blockage. When blood is not reaching a significant segment of the heart, the damage will be more extensive.

A cardiac arrest is often mislabelled as a heart attack. However, a cardiac arrest occurs when the heart abruptly stops working.

- **Types**

A heart attack results from one of the following types of coronary artery disease:

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- **STEMI**

A STEMI heart attack is severe and requires immediate attention.

These attacks occur when the coronary artery is fully blocked, preventing blood from reaching a large area of the heart. This causes progressive damage to the heart muscle, which can eventually stop it from functioning.

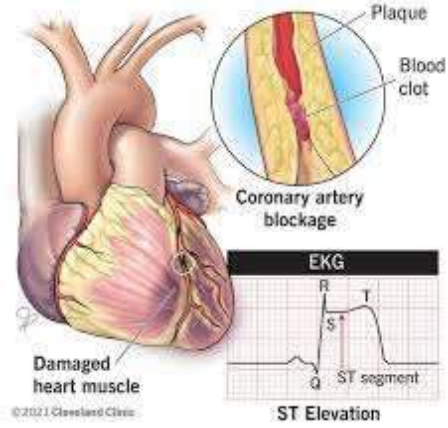


Fig No.2

- **NSTEMI**

NSTEMI heart attacks occur when the coronary artery is partially blocked and blood flow is severely restricted. While they are less dangerous than STEMI heart attacks, they can cause permanent damage.

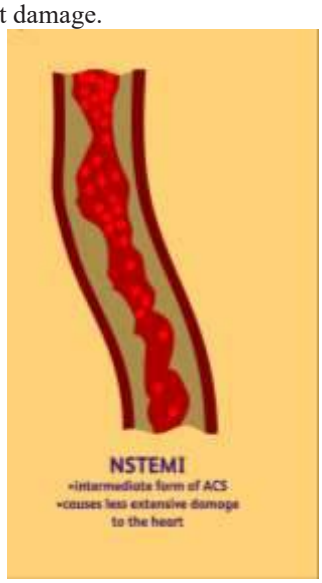


Fig No.3

- **Coronary Artery Spasm**

These spasms are also called silent heart attacks or unstable angina. They occur when the arteries connected to the heart contract, preventing or restricting blood flow to the heart.

Symptoms do not cause permanent damage, and they are less severe than those of other types of coronary artery disease.

It is possible to mistake a coronary artery spasm for a minor condition, such as indigestion. However, having a coronary artery spasm can increase the risk of having a more severe heart attack.

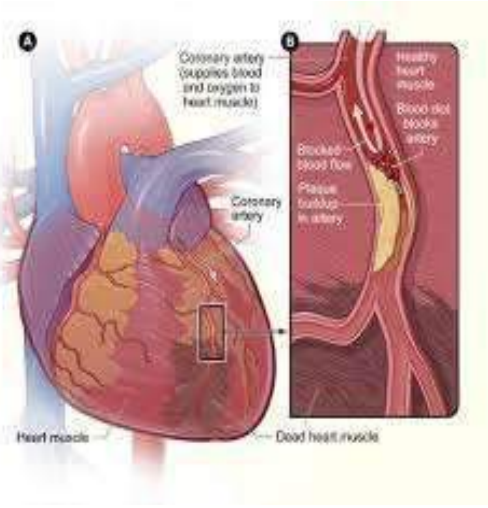


Fig No.4

Risk Factors

Heart Attack Risk Factors Include

Age. Men age 45 and older and women age 55 and older are more likely to have a heart attack than are younger men and women.

Tobacco use. This includes smoking and long-term exposure to secondhand smoke. If you smoke, quit.

High blood pressure. Over time, high blood pressure can damage arteries that lead to the heart. High blood pressure that occurs with other conditions, such as obesity, high cholesterol or diabetes, increases the risk even more.

High Cholesterol or triglycerides. A high level of low-density lipoprotein (LDL) cholesterol (the "bad" cholesterol) is most likely to narrow arteries. A high level of certain blood fats called triglycerides also increases heart attack risk. Your heart attack risk may drop if levels of high-density lipoprotein (HDL) cholesterol — the "good" cholesterol — are in the standard range.

Obesity. Obesity is linked with high blood pressure, diabetes, high levels of triglycerides and bad cholesterol, and low levels of good cholesterol.

Diabetes. Blood sugar rises when the body doesn't make a hormone called insulin or can't use it correctly. High blood sugar increases the risk of a heart attack.

Metabolic syndrome. This is a combination of at least three of the following things: enlarged waist (central obesity), high blood pressure, low good cholesterol, high triglycerides and high blood sugar. Having metabolic syndrome makes you twice as likely to develop heart disease than if you don't have it.

Family history of heart attacks. If a brother, sister, parent or grandparent had an early heart attack (by age 55 for males and by age 65 for females), you might be at increased risk.

Not Enough Exercise. A lack of physical activity (sedentary lifestyle) is linked to a higher risk of heart attacks. Regular exercise improves heart health.

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Unhealthy Diet. A diet high in sugars, animal fats, processed foods, trans fats and salt increases the risk of heart attacks. Eat plenty of fruits, vegetables, fiber and healthy oils.
Stress. Emotional stress, such as extreme anger, may increase the risk of a heart attack.

Illegal Drug Use. Cocaine and amphetamines are stimulants. They can trigger a coronary artery spasm that can cause a heart attack.
A History of Preeclampsia. This condition causes high blood pressure during pregnancy. It increases the lifetime risk of heart disease.

An Autoimmune Condition. Having a condition such as rheumatoid arthritis or lupus can increase the risk of a heart attack. {1}

- **Complications**

Heart attack complications are often due to heart muscle damage. Potential complications of a heart attack include

Irregular or atypical heart rhythms (arrhythmias): Heart attack damage can affect how electrical signals move through the heart, causing heartbeat changes. Some may be serious and can be deadly.

Cardiogenic Shock: This rare condition occurs when the heart is suddenly and abruptly unable to pump blood.

Heart Failure. A lot of damage to the heart muscle tissue can make the heart unable to pump blood. Heart failure can be temporary or long-lasting (chronic).
Cardiac arrest. Without warning, the heart stops. A sudden change in the heart's signaling causes sudden cardiac arrest. A heart attack increases the risk of this life-threatening condition. It can lead to death (sudden cardiac death) without immediate treatment. [1]

- **Types of Medications**

Heart attack treatment involves a variety of drugs. The following list provides an overview of the common types. You can also learn about cardiac medications in more detail.
Your health care team will recommend the best combination of medications for your situation.

1. **Anticoagulant:** Sometimes called blood thinners, these medicines make it harder for clots to form and also keep existing blood clots from getting larger.
2. **Antiplatelet agent:** Keeps blood clots from forming by preventing blood platelets from sticking together.
3. **Angiotensin-converting enzyme (ACE) inhibitor:** Relaxes blood vessels and allows them to expand while decreasing resistance by lowering levels of angiotensin II. Allows blood to flow more easily and makes the heart's work easier or more efficient.
4. **Angiotensin II receptor blocker:** These medicines inhibit angiotensin II from having effects on the heart and blood vessels. This keeps blood pressure from rising.
5. **Angiotensin receptor neprilysin inhibitor:** Neprilysin is an enzyme that breaks down natural substances in the body that open narrowed arteries. By inhibiting neprilysin, those natural substances can have their normal effect. That improves artery opening and blood flow, reduces sodium (salt) retention and decreases strain on the heart.
6. **Beta blocker:** Makes the heart beat slower and with less force, which lowers blood pressure.
7. **Combined alpha and beta blocker:** Combined alpha and beta blockers may be used as an IV drip for people in hypertensive crisis. They may be prescribed for outpatient high blood pressure use if the person is at risk for heart failure.
8. **Calcium channel blocker:** Interrupts the movement of calcium into the cells of the heart and blood vessels. May decrease the heart's pumping strength and relax the blood vessels.
9. **Cholesterol-loweringmedications:** Various medications can lower blood cholesterol levels, but statins are the best first course of action. When statins don't work, or if a person has serious side effects from statin therapy, other drugs may be recommended
10. **Vasodilator:** Relaxes blood vessels and increases the supply of blood and oxygen to the heart while reducing its workload. Available as pills to be swallowed, chewable tablets and as a topical application (cream).

- **Dual Antiplatelet Therapy (DAPT)**

Some people who have heart attacks, that have stents placed in their coronary arteries, or undergo coronary artery bypass graft surgery (CABG) are treated with two types of antiplatelet agents at the same time to prevent blood clotting. This is called dual antiplatelet therapy (DAPT).

One antiplatelet agent is aspirin. Many people with coronary artery disease, including those who have had a heart attack, stent or CABG are treated with aspirin for the rest of their lives. A second type of antiplatelet agent, called a $P2Y_{12}$ inhibitor, is usually prescribed for months or years in addition to the aspirin therapy.

The type of medication and the duration of your treatment will vary based on your condition and other risk factors. The risks and benefits of DAPT should be discussed with your health care professional.

If you had a heart attack and a coronary artery stent placed, or you are being treated with medical therapy (no stent, clot buster or surgery), in addition to aspirin, you should speak with your health care professional about taking a $P2Y_{12}$ inhibitor for 6-12 months. In some cases, it may be advisable to be on DAPT longer.

You may be prescribed one of the following: clopidogrel, ticlopidine, prasugrel, ticagrelor or cangrelor. You will be prescribed the drug that is best for you, based on your risk of blood clots and bleeding. The choice of what type of medication and duration of treatment will be determined in discussions with your health care professional.

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DRUG USE TO CONTROL HEART ATTACK

1.Aspirin

- **Aspirin Therapy in Heart Disease**
  Your healthcare provider may recommend low-dose aspirin therapy to reduce your risk of heart attack and stroke if you have cardiovascular disease. Aspirin therapy may be beneficial, especially if you have a history of these conditions. Talk with your healthcare provider about whether aspirin therapy for heart disease is right for you.

- **What is aspirin therapy for heart disease?**
  If you are at risk for cardiovascular disease, your healthcare provider may recommend you take a daily low dose of aspirin. Aspirin therapy can help lower your risk of heart attack and stroke, especially if you've had these conditions previously.

- **How does aspirin therapy help prevent heart disease?**
  Taking aspirin daily, known as an aspirin regimen, reduces your risk of heart attack and stroke. Aspirin thins your blood and helps prevent blood clots that can cause these conditions

- **What is low-dose aspirin therapy?**
  People on low-dose aspirin therapy typically take 81 milligrams each day, sometimes known as baby aspirin. Healthcare providers may recommend a different aspirin dose for some people. Talk to your provider about whether aspirin therapy is right for you and how much you should take.

- **Who might benefit from aspirin therapy?**
  You may benefit from taking a low-dose aspirin every day if you have:
- Diabetes.
- High blood pressure (hypertension).
- A history of smoking.
- Hyperlipidemia (high cholesterol).
- Coronary artery disease.
- Peripheral artery disease.
- History of heart attack or stroke.

If you have a history of stroke or heart attack, talk to your healthcare provider. Aspirin therapy may help prevent a second heart attack or stroke.

- **How effective is aspirin therapy for heart disease?**

Aspirin therapy can have a significant impact on lowering your risk of having a heart attack or stroke. This is especially true in people with multiple risk factors, such as high cholesterol, high blood pressure, and diabetes. Always talk to your provider before taking aspirin for heart disease.

- **Who should not take low-dose aspirin for heart disease?**

Aspirin therapy may not be right for you if you are pregnant or you have:

1. Asthma.
2. Bleeding disorders, such as hemophilia or Von Willebrand disease.
3. Stomach ulcers.
4. Kidney disease.
5. Liver disease.[4]

2.Colchicine's

Colchicine's Role in Cardiovascular Disease Management
Colchicine has long seen use as an anti-inflammatory treatment for gout and familial Mediterranean fever. Beginning in the 20th century, randomized clinical trials established low-dose colchicine as an effective treatment for pericarditis and atherosclerotic cardiovascular disease, 2 conditions driven by the NLRP3 inflammasome and interleukin-1. The mechanisms through which colchicine exerts its beneficial anti-inflammatory and cardiovascular effects remain an area of vigorous investigation. When prescribing colchicine, clinicians must consider drug-drug interactions, impaired kidney and liver function, and adverse effect monitoring.

This Review follows the journey of colchicine from a herbal medicine used to treat joint swelling and pain through its contemporary use in cardiovascular disease. We discuss the effects of colchicine on immune cells, highlight landmark clinical trials, and consider the practical aspects of colchicine use.

- **BRIEF HISTORY OF COLCHICINE**

Hartung[8] published an authoritative review of the history of colchicine based on careful examination of several dozen historical documents. The earliest medical use of colchicine possibly dates to 1500 BCE based on writings that describe the use of a plant likely containing colchicine for the treatment of pain and swelling In the 550s CE, Alexander of Tralles, a physician in the Byzantine Empire, described the use of hermodactyl, a plant resembling the Autumn crocus, for the treatment of gout as well as the botanical's adverse gastrointestinal effects. Baron Anton Stork provided an early description of the use of colchicine for pericarditis in the 18th century. Around the same time, Nicolas Husson developed the first commercial colchicine preparation: Eau Medicinale.

ase reports and clinical trials established the efficacy of colchicine in familial Mediterranean fever—an inherited autoinflammatory disorder—in the late 20th century These studies then inspired testing of colchicine for pericarditis, which demonstrated that this agent reduced the risk of recurrent pericarditis by up to 50%. Colchicine remains a mainstay treatment for acute gout attacks, although the traditional strategy of administration until limited by gastrointestinal tolerance has given way to a regimen of 1.8 mg loading dose and 0.6 mg QD or BID.

- **TREATMENT OF CARDIOVASCULAR DISEASE WITH COLCHICINE**
- **Coronary Artery Disease**

The NLRP3 inflammasome activates the inflammatory cytokines interleukin-1 and interleukin-18 in response to molecular danger signals.[16] Both interleukin-1 and interleukin-

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18 contribute to the genesis and progression of coronary atherosclerosis.[17] CANTOS (Canakinumab Anti-Inflammatory Thrombosis Outcome Study) validated the role of inflammation and interleukin-1 in atherosclerosis by demonstrating that blocking interleukin-1β with a monoclonal antibody reduced major adverse cardiovascular events without altering blood lipid levels.

Colchicine lowers hsCRP (high-sensitivity C-reactive protein) and may decrease coronary artery plaque volume. In an open-label, randomized clinical trial of colchicine versus no colchicine (LoDoCo [Low-Dose Colchicine]), colchicine lowered the risk of the composite of acute coronary syndrome (ACS), out-of-hospital cardiac arrest, or noncardioembolic ischemic stroke by 67% in people with stable coronary artery disease.

More definitive evidence of the benefits of colchicine on atherosclerotic cardiovascular disease events comes from the LoDoCo2 trial and COLCOT (Colchicine Cardiovascular Outcomes Trial; LoDoCo2 and COLCOT each compared the effects of adding either low-dose colchicine (0.5 mg QD) or placebo to background guideline-directed medical therapy, including antiplatelet and statin therapy, on major adverse cardiovascular events in ≈5000 participants per trial over 2 years of follow-up. COLCOT enrolled individuals within 30 days of a myocardial infarction while LoDoCo2 enrolled individuals with chronic coronary artery disease (at least 6 months following an ACS). In both studies, low-dose colchicine lowered the risk of major adverse cardiovascular events by >30% compared with placebo. {3}

- **MECHANISMS OF ANTI-INFLAMMATORY EFFECTS OF COLCHICINE**

Colchicine binds tubulin, which interferes with microtubule-dependent cellular processes in rapidly dividing cells. Colchicine decreases interleukin-1β secretion by blocking the colocalization of the NLRP3 inflammasome components ASC and NLRP3 (but not the NLRC4 or AIM2 inflammasomes). These experiments suggest that colchicine can inhibit the systemic inflammatory response related to molecular patterns that can trigger NLRP3 while leaving other host defense mechanisms intact.

In people with non–ST-segment–elevation ACS, colchicine pretreatment before cardiac catheterization significantly lowered the transcoronary serum concentrations of interleukin-1β, interleukin-18, and interleukin-6 compared with no colchicine Similarly, colchicine lowered the levels of interleukin-1β secretion from ex vivo stimulated monocytes derived from people with an ACS. In a substudy of participants in the LoDoCo2 trial, colchicine significantly lowered NLRP3 protein levels in extracellular vesicles.[5]

3.Nitroglycerin

- **Benefits of nitroglycerin (glyceryl trinitrate or GTN)**

Despite advances in pharmacological therapies, ischemic heart disease and acute myocardial infarction (MI) continue to be a major cause of morbidity and death worldwide. According to the World Health Organization, over 7 million people die of ischemic heart disease every year. Consequently, novel pharmacological and non-pharmacological strategies need to be explored to benefit MI patients.

Since its discovery over 150 years ago, GTN has become the most common treatment for patients with unstable angina pectoris, myocardial infarction and heart failure. The ability of GTN to promote vasodilation as well as tolerance was clearly noted during the GTN industry ascension in the 20th century. Factory workers, usually exposed to high levels of organic nitrites, often complained of headaches on Mondays that disappeared over the weekends. Indeed, factory workers suffering from angina pectoris or heart failure often experienced relief from chest pain during the work week, but which recurred on weekends. Both effects were attributed to the vasodilator action of GTN, which quickly became apparent to physicians.

- **History of the therapeutic use of nitroglycerin**

In 1847, working in Theophile-Jules Pelouze's laboratory in Turin, Ascanio Sobrero discovered GTN. Sobrero first noted the aggressive headache for several hours produced by GTN. Two years later, knowing of Sobrero's reports of headache, the German scientist Constantin Hering tested GTN in healthy volunteers and observed that headache was caused with much precision.[4] Alfred Nobel joined Pelouze in 1851 and recognized the scientific and financial potential of GTN. Years later, he began manufacturing GTN in Sweden. Nobel suffered from poor health for most of his life. In later life, he suffered from intense pain and angina pectoris. It is therefore ironic that in 1890, his physicians recommended GTN for his heart compliant.

During the second half of the 19th century, several British scientists became interested in the newly discovered amyl nitrite, recognized as a powerful vasodilator. Lauder Brunton used the compound to relieve angina in 1867, and first reported the pharmacological resistance to repeated doses.[16, 17] Following Brunton's work, scientists concentrated on recording the effects of nitrite-containing compounds on several pathological systems, which include angina pectoris, myocardial infarction, hypertension and heart failure. Finally, GTN was established as a treatment for the relief of angina at the end of the 19th century. However, the mechanism of action of GTN-induced benefit was discovered only 80 years later. {12}

In the late 1970s, the vasodilator effect of GTN was discovered to be mediated by nitric oxide, which was apparently generated from GTN in vascular smooth muscle.Years later, it was discovered that mammalian cells synthesize nitric oxide. In 1998, approximately 130 years after the invention of dynamite by Alfred Nobel and the first observed clinical benefit of GTN, the Nobel Prize in Medicine or Physiology was awarded for "Nitric Oxide as a Signaling Molecule in the Cardiovascular System" to Robert Furchgott, Louis Ignarro and Ferid Murad. GTN remains the treatment of choice for relieving angina; other organic esters and inorganic nitrates are also used, but the rapid

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action of GTN and its established efficacy make it the mainstay of angina pectoris relief.

- **Effects of GTN on Cardiac Cells**

The effects of GTN in the vasculature have been widely investigated, but relatively little is known about GTN's effect on cardiac cells. We have recently demonstrated that sustained treatment with GTN resulted in an increase in infarct size and cardiac dysfunction after myocardial infarction in rats.[52, 55] GTN tolerance-mediated deleterious effects in the heart are associated with ALDH2 inactivation As previously reported, GTN treatment drastically inhibits the dehydrogenase activity of recombinant ALDH2, *in vitro* and *in vivo*.[52] We also found that co-incubation with GTN and Alda-1 (a selective ALDH2 activator that we have identified) completely prevented GTN-induced recombinant ALDH2 inactivation. Further, sustained treatment with GTN significantly reduced mitochondrial ALDH2 activity in the rat myocardium, resulting in increased cardiac damage and ventricular dysfunction after a myocardial infarction event.[52] Of interest, co-treatment with GTN and Alda-1 restored ALDH2 activity, resulting in smaller infarct size and improved cardiac function in rats. We suggest that GTN tolerance is the main process involved in increased cardiac damage following MI, since the use of isosorbide dinitrate, an alternative NO donor often used in a sustained fashion to treat angina, did not cause ALDH2 inactivation and further cardiac damage *in vivo*.[52] Similarly, Sydow et al. observed that *in vivo* treatment with GTN leads to reduced cardiac GTN biotransformation by mitochondrial ALDH2 and resulted in accumulation of reactive oxygen species, where incubation of mitochondria from tolerant animals with reducing agents restored ALDH2 function. These findings suggest that patients under continuous GTN treatment are at risk for increased cardiac damage.

- **Cellular side effects of GTN**

The deleterious effects of organic nitrate therapy on mitochondrial were first described 55 years ago, where acute GTN exposure was described to induce mitochondrial swelling, to stimulated oxygen consumption and to caused loss of respiratory control of rat liver and heart mitochondria.[58] More recently, it was demonstrated that GTN infusion resulted in mitochondrial dysfunction-induced oxidative stress in both animal and human blood vessels.[59–61] An excessive reactive oxygen species production along with reduction of more than 50% in ALDH2 activity was observed in isolated mitochondria using the complex III inhibitor antimycin A.[62, 63] Mitochondrial-target antioxidants prevent complex I inhibition mediated by GTN treatment.[54] Therefore, accumulation of reactive aldehydes derived from oxidative stress may disrupt GTN bioactivation by negatively targeting ALDH2 function. Altogether, these findings suggest that GTN bioactivation requires functionally active mitochondria, since increased reactive oxygen species production due to mitochondrial dysfunction results in impaired ALDH2 activity and further GTN conversion.

We have recently found that sustained GTN treatment significantly decreases aldehyde dehydrogenase activity in the failing heart.[52] The fact that mammalian ALDH2 functions as a GTN reductase may explain the inhibitory effect of GTN on the aldehyde dehydrogenase activity. These findings point to a possible alcohol-GTN drug interaction through ALDH2 inactivation, which can result in a devastating phenomena induced by accumulation of reactive aldehydes inside the cell. However, this hypothesis needs to be better explored.[10]

- **Types of Heart Tests**

1. Blood Tests

Blood tests can tell a lot about your heart. They check stuff like cholesterol levels, triglycerides, and blood sugar, which can be signs of heart disease. Some common ones include:

Cardiac Troponin Test: This one helps diagnose heart attacks by detecting a protein called troponin that the heart releases into the bloodstream when it's damaged.

Lipid Profile: Measures cholesterol levels, specifically "bad" cholesterol (low-density lipoproteins), which can lead to heart disease.

Thyroid Function Tests: Checks your thyroid gland's activity. Thyroid issues can affect your heartbeat.

Complete Blood Count: Looks at different types of blood cells in your system. Abnormal counts can mimic heart issues.

B-type Natriuretic Peptide (BNP): Measures a protein called BNP, which increases when the heart has to work harder, often indicating heart failure.

2. Electrocardiogram (ECG or EKG)

This test checks your heart's electrical activity using pads on your chest. It's painless and tells the doc if your heart is beating as it should. It's handy for spotting irregular heartbeats, blocked arteries, damage, heart failure, or heart attacks.

3. Exercise Stress Test

Ever wonder how well your heart handles exercise? This test helps your doc find out. As you work out, your heart pumps more blood, and if there's an issue with the blood supply in your coronary arteries, this test will reveal it. It also guides your healthcare team on what kind of exercise is right for you.

4. Echocardiogram (Ultrasound)

Imagine it as a sonogram for your heart. It uses sound waves to create images of your heart's structure and function. Docs check your heart's walls, movement, pumping strength, valves, and even potential issues like regurgitation or stenosis.

5. Transesophageal Echocardiography (TEE)

TEE is like an upgraded echocardiogram. It uses ultrasound but via a tube that goes down your throat. This way, it gets super clear images of your heart's upper chambers and valves.

6. Nuclear Cardiac Stress Test (Myocardial Perfusion Imaging - MPI)

This test uses a smidge of radioactive stuff to show how blood flows through your heart. It's great for checking artery narrowing, damage from heart attacks, the effectiveness of stents or bypass surgery, and even if you need a coronary angiogram. You can be at rest during this test.

7. Coronary Angiogram (Cardiac Catheterization)

This one's like an X-ray for your heart. It uses a special dye to show how blood flows in your coronary arteries – those are the vessels that supply blood to your heart. It helps spot artery narrowing and diagnose coronary artery disease (CAD).

8. Magnetic Resonance Imaging (MRI)

A cardiac MRI uses magnets and radio waves to create detailed pictures of your heart and arteries. This test is for more complex

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heart conditions and gives a closer look at blood vessels and heart function.

9. Coronary Computed Tomography Angiogram (CCTA)

Think of this as a 3D heart image created from X-rays. It's useful when other tests don't give enough info about your heart's health. CCTA shows heart structure, blood flow, plaque build up, and your risk for a heart attack.

10. Coronary Artery Calcium (CAC) Test

This test, also known as a heart scan, uses CT scans to spot calcium deposits in your coronary arteries. The more calcium, the higher your risk of heart disease. It helps with decisions like starting medication or therapy.

11. Holter Monitor

This nifty device is like a portable ECG machine. It records your heart's activity for 24 to 48 hours or even longer. It's used when heart symptoms come and go, giving doctors a good look at irregular heartbeats or arrhythmias.

12. Chest X-ray

A chest X-ray provides a snapshot of your heart, lungs, and chest bones. While it doesn't show the heart's inside structures, it helps locate, size, and shape the heart and lungs.

13. Nuclear Imaging Tests

These tests use radioactive tracers to create images of the heart. There are three types:

PET Scan: It helps diagnose coronary artery disease (CAD) and heart damage after an attack.

MUGA Scan: Measures ejection fraction, which shows how well your heart pumps blood.

SPECT Scan: Shows blood flow and heart function at rest and during exercise, helpful for detecting CAD or heart attack signs.

14. Tilt-Table Test

For those who often feel faint or lightheaded, this test measures how your blood pressure and heart rate react to changes in body position. It helps identify the cause of those sensations.

CONCLUSION

The management of heart attacks involves a multi-faceted approach, combining medication, lifestyle modifications, and in some cases, invasive procedures.

Medication plays a crucial role in both preventing and treating heart attacks. Various drug classes, including statins, aspirin, blood pressure medications, antiplatelet drugs, nitroglycerin, beta-blockers, thrombolytic drugs, and ACE inhibitors, have been shown to effectively reduce the risk of heart attacks and manage their acute and long-term effects.

However, it's important to emphasize that medication alone is not sufficient. Lifestyle changes such as quitting smoking, adopting a healthy diet, engaging in regular physical activity, and managing stress are essential components of heart health.

Regular medical checkups are also vital for early detection and management of risk factors. By working closely with healthcare providers, individuals can implement a comprehensive approach to heart health, significantly reducing their risk of heart attacks and improving their overall quality of life.

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A REVIEW ON PULSATILE DRUG DELIVERY SYSTEMS

Mr. Santosh R. Dhakne[1], Mr. Sachin Dighole[2], Dr. Sunil Jaybhaye[3], Miss. Aditi Pungle[4], Mr. Bhagwat S. Gabale[5]

ABSTRACT

Pulsatile Drug Delivery Systems (PDDS) are innovative, time-controlled systems that manage drug release independently of external factors like pH, enzymes, and gastrointestinal motility.

Traditionally, drugs are released either immediately or over an extended period. However, pulsatile release systems have garnered significant interest recently, as they align with the body's circadian rhythms – where "circa" means "day" and "dian" means "night" in Latin. These systems are designed to release medication rapidly after a defined lag time, offering potential advantages for various therapies.

PDDS show promise for treating conditions such as asthma, peptic ulcers, cardiovascular diseases, arthritis, attention deficit hyperactivity disorder in children, and hypercholesterolemia. By synchronizing drug delivery with the body's internal clock, these systems ensure that medications are administered at optimal times, which can enhance therapeutic outcomes for chronic conditions like arthritis, asthma, and hypertension. The goal is to achieve complete and rapid drug release post-lag time, thus providing patients with timely and effective treatment.

1. INTRODUCTION

Oral drug delivery is the largest segment of the total drug delivery market and is the most preferred route for administering medications. Oral controlled-release systems typically maintain drug concentration within the therapeutic window over an extended period, ensuring sustained therapeutic effects. However, certain conditions require a different release pattern, specifically one that allows for drug release after a lag time. This leads to the need for pulsatile drug delivery systems (PDDS) Pulsatile systems are gaining attention because they release the drug completely after a defined lag time. Pulsatile drug delivery is characterized by time- and site-specific release, which enhances both spatial and temporal drug delivery, ultimately improving patient compliance. This type of delivery involves a rapid and transient release of a specific amount of the drug following a predetermined period without release.

Humans have endogenous circadian rhythms regulated by the body's master clock, the suprachiasmatic nucleus. Chronopharmacotherapy for diseases such as bronchial asthma, myocardial infarction, angina pectoris, rheumatic diseases, ulcers, and hypertension—conditions that exhibit circadian rhythms—requires pulsatile drug delivery systems. These systems enable rapid and complete drug release as a pulse after the lag time.

Additionally, many physiological functions, like hormone secretion (including FSH, LH, LHRH, estrogen, and progesterone), stomach acid secretion, gastric emptying, and gastrointestinal blood flow, also follow circadian rhythms and necessitate pulsatile release. Drugs that induce biological tolerance benefit from a delivery system that prevents their continuous presence in the body, as this can diminish their therapeutic effect. A lag time is crucial for drugs that may degrade in the acidic environment of the stomach (such as peptide drugs) or that may irritate the gastric mucosa and cause nausea.

Targeting drugs to distal areas of the gastrointestinal tract, like the colon, requires that release is delayed in the earlier sections of the gastrointestinal tract. Drugs that undergo first-pass metabolism, leading to reduced bioavailability and altered drug levels, also benefit from delayed release. All these factors should be considered when designing a delivery system that exhibits pulsatile release characteristics, ensuring the drug is released in a controlled manner at the appropriate site.

2. DEFINITION

The pulsatile drug delivery system is characterized by the quick and temporary release of a specific amount of drug molecules after a predetermined off-release period, known as lag time.

3. ADVANTAGES

- The pulsatile drug delivery system minimizes side effects.
- It effectively maintains the frequency of dosages.
- This technology allows for a reduction in dosage size.
- Patient adherence improves due to lower doses.
- It offers targeted action specifically for the colon.
- Drug loss is minimized due to reduced first-pass metabolism.

4. DISADVANTAGES

- Manufacturing consistency and effectiveness are low.
- There are numerous process variables.
- The formulation requires multiple steps.
- It necessitates advanced technology.

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5. DISEASES REQUIRED PDDS

Tablet No.1

Diseases	Chronological Behavior	Drug used
Arthropathy	Stress level arising during night.	Glucocorticoids, Painrelivers
Mellitus glycaemia	Blood glucose increase upon meal	Sulfonyl urea, Glucose
Hypercholesteremia	The synthesis of cholesterols generally high at night than during the day	Receptors of HMG CoA pyruvate Dehydrogenase
Physical impairment	The basic epilepsy Neurobiology of the infection and the identification for convulsive episode in behavior	MAO-Inhibitor
Ulcerative duodenal	Night times, whereas abdomen or intense cell proliferation or intense clearing are mostly slow at night.	Proton pump inhibitors
Asthma	Attack temperatures during night time or in the early morning	Antagonist of B2 Allergy medicines
Attention deficit Syndrome	Increase in DOPA level in afternoon	Methylphenidate
Ulcerative peptic	In the afternoon and night, acid secretions is strong.	H2 blocker
Back and heart disease	During the sleep cycle Bp is at its lowest and in the morning rises steeply	Sodium azide, receiver of iron channels, agonists of ACE
Cancer	During each daily phase, the blood flow to the tumors is three times greater during the phase of daily	Cannabinoid compound of Vinca, texanes

6. TIME-CONTROLLED PULSATILE RELEASE SYSTEMS

6.1 Stimuli-Induced Pulsatile Release System

Stimuli-based drug delivery systems release drugs in response to biological environmental changes. The release occurs through alterations in gels or micelles, which can swell, erode depending on the stimulus, such as temperature or chemical factors. Key mechanisms for drug release include:

1. Ejection: Drug is expelled as the fluid phase separates from the gel.
2. Diffusion: Drug moves along a concentration gradient.
3. Electrophoresis: Charged drugs migrate towards an oppositely charged electrode.
4. Erosion: Drug is liberated as the gel or micelle erodes.

There's significant interest in developing systems sensitive to specific enzymes or proteins, making them adaptable and excellent candidates for targeted drug delivery. These systems can be further classified based on their specific stimuli responses.

6.2 Thermoresponsive Pulsatile Release

Thermosensitive hydrogels are a type of polymer network that responds to temperature changes by undergoing reversible volume changes. These gels, which can be made from biological, synthetic, or semi-synthetic polymers, are being explored as drug delivery systems due to their ability to release drugs in response to temperature stimuli. The shrinking behavior of these gels occurs at a transition temperature related to the lower critical solution temperature (LCST) of the polymer used. Commonly, temperature-sensitive polymers contain hydrophobic groups such as methyl, ethyl, and propyl. One of the most widely studied thermosensitive polymers is poly(N-isopropyl acrylamide) (PNIPAm), which exhibits distinct swelling below 32°C and shrinking above this temperature.

Research by Krezanoskietal. introduced a reversed thermal gelation (RTG) system using polyol polymers like Pluronic®, which demonstrate low viscosity at room temperature and significantly increase in viscosity with rising temperatures. Additionally, Yuk et al. developed a temperature-sensitive drug delivery system combining poly(ethylene oxide)-poly(propylene oxide)-poly(ethylene oxide) triblock copolymer (F-68) with polyvinyl alcohol (PVA). This system achieved a pulsatile release of acetaminophen due to temperature fluctuations between 35°C and 40°C.

6.3 Chemical Stimuli-Induced Pulsatile Release

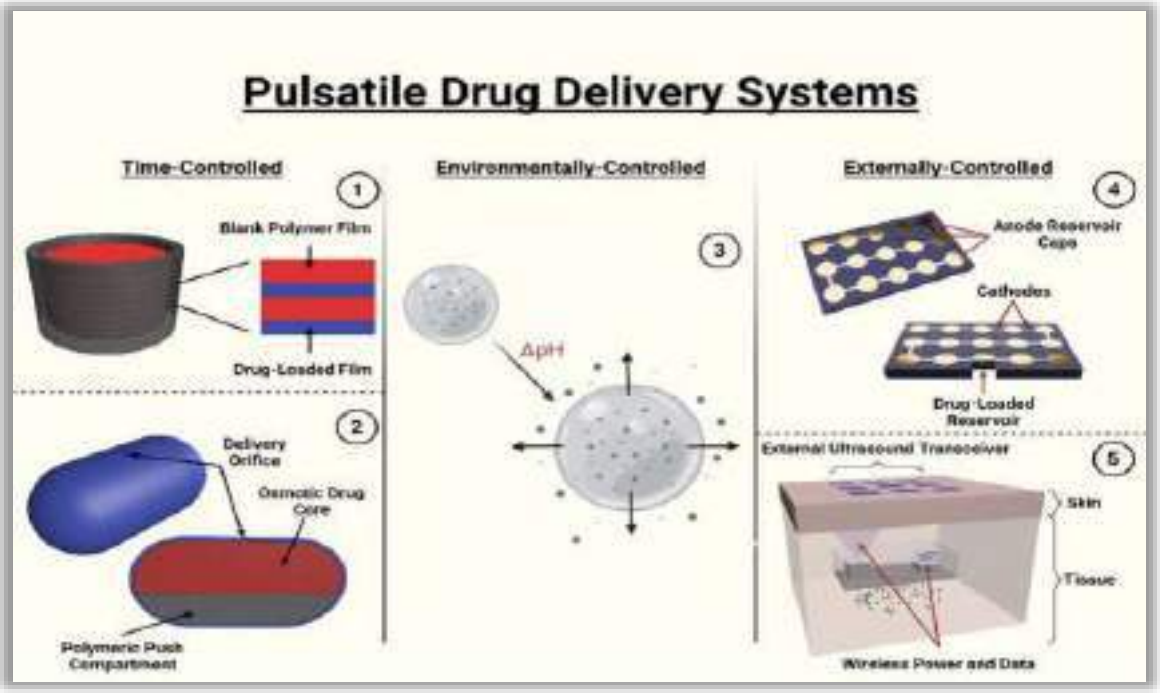
The development of stimuli-sensitive delivery systems has gained significant attention for their ability to release therapeutic agents in response to biological factors like

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enzymes, pH, or other chemical stimuli. A notable application is the creation of systems that automatically release insulin when blood glucose levels rise Kazunori et al. developed a gel made of PNIPAAm combined with phenylboronic acid moieties, which displayed significant swelling changes in the presence of glucose. This glyco-sensitive gel shows promise for self-regulated drug delivery and other applications, including actuators and separation systems.

Another approach involves pH-dependent systems that utilize the oxidation of glucose to gluconic acid, a reaction catalyzed by glucose oxidase. This reaction can lower the pH to around 5.8 in glucose-rich environments, like post-meal blood. In this context, a dual membrane system was created: the first membrane, a glucose-sensing membrane, immobilized glucose oxidase within cross-linked polyacrylamide. The second membrane acted as a barrier between the insulin reservoir and the sensing membrane, composed of N,N-diethylaminoethyl methacrylate and 2-hydroxypropyl methacrylate (DEA-HPMA).

Fig No.1



7 EXTERNALLY REGULATED PULSATILE RELEASE SYSTEM

7.1 Electro Responsive Pulsatile Release

Electric fields serve as effective external stimuli for drug delivery systems, offering precise control over parameters such as current magnitude, pulse duration, and intervals. Electrically responsive delivery systems are typically made from polyelectrolytes, allowing them to respond to both pH and electric stimuli. When subjected to an electric field, these electroresponsive hydrogels can be swell, or erode. For instance, poly (2-acrylamide-2-methylpropanesulfonic acid-co-butyl methacrylate) (P(AMPS-co-BMA)) hydrogels have been utilized for electric stimuli-induced drug delivery. Kwon et al. explored these hydrogels, highlighting several mechanisms for drug release:

1. Drug expulsion as the gel's fluid phase syneresis occurs.
2. Drug diffusion driven by concentration gradients.
3. Electrophoresis, where charged drugs migrate toward oppositely charged electrodes.
4. Drug release due to gel erosion in response to varying electric field parameters.

Overall, the dual responsiveness of t4hese systems enhances their potential for targeted and controlled drug delivery.

7.2Ultrasonically Stimulated

Ultrasound is commonly employed to enhance drug permeation across biological barriers, such as skin, lungs, intestinal walls, and blood vessels. Numerous studies have highlighted its effectiveness in controlled drug delivery. For example, Kost and colleagues investigated ultrasound-enhanced polymers, while Miyazaki et al. demonstrated that ultrasound could achieve up to a 27-fold increase in the release of 5-fluorouracil from an ethylene and vinyl acetate (EVAc) matrix. They found that increasing the ultrasound intensity directly correlated with the amount of 5-fluorouracil released, showcasing the potential of ultrasound as a tool for improving drug delivery efficiency.

7.3 Magnetically Induced Pulsatile Release

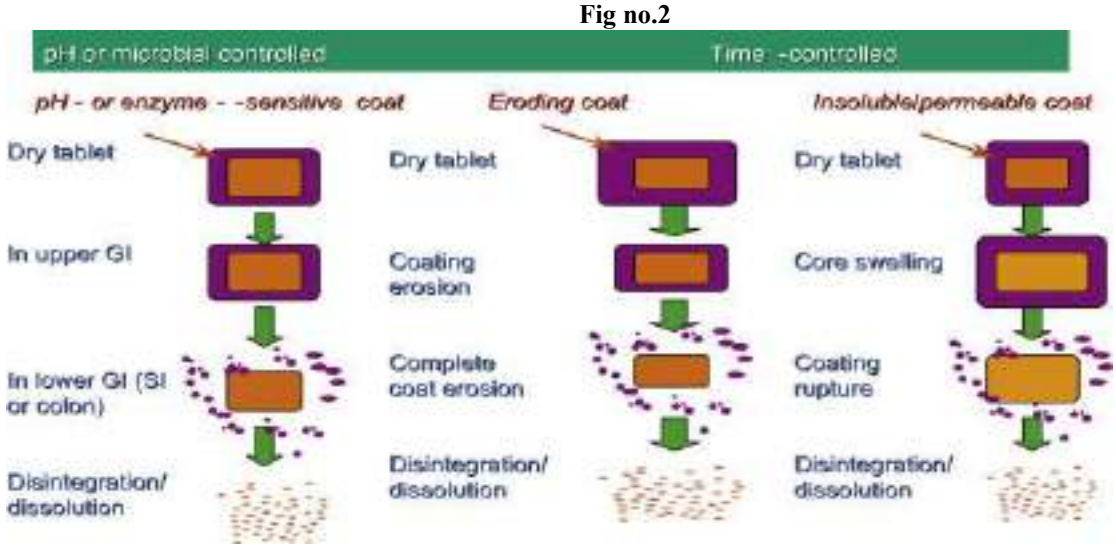
The use of oscillating magnetic fields to regulate drug delivery from polymer matrices was one of the earliest methods explored for creating externally controlled drug delivery systems. Magnetic carriers, which can incorporate materials like magnetite, iron, nickel, or cobalt, respond to external magnetic fields. For biomedical applications, it's crucial that

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these magnetic carriers are water-based, biocompatible, non-toxic, and non-immunogenic.

The underlying mechanism involves using magnetic attraction to slow down the movement of orally administered drugs in the gastrointestinal tract. This is achieved by incorporating magnetic components into capsules or tablets. By applying an external magnet, the speed of travel through the stomach and intestines can be reduced at specific locations, thereby altering the timing and extent of drug absorption in these areas. This approach offers potential for more controlled and targeted drug delivery.

Fig no.2



8. MARKETED TECHNOLOGIES OF PULSATILE DRUG DELIVERY

8.1 Pulsincap Technology

Pulsincap, developed by R.R. Scherer International Corporation, is a drug delivery system consisting of a non-dissolving capsule with a hydrogel plug sealed by a water-soluble cap. The capsule is coated with an enteric polymer to prevent variability in gastric emptying. Upon contact with dissolution fluid, the plug swells and releases the drug after a delay. Another formulation features a four-layer spherical structure, including a swelling agent, drug, and an outer membrane that ruptures as the swelling force increases. Hydrogel plugs use polymers like hydroxypropyl methylcellulose, polymethyl methacrylate, and polyvinyl acetate. An alternative approach uses enteric-coated, timed-release press-coated tablets, with a core containing drugs like diltiazem hydrochloride. Patel and Patel modified the Pulsincap device with diclofenac sodium to target the colon, offering a time-dependent release that reduces early morning symptoms and provides prolonged therapeutic effects.

8.2 CODAS (Chronotherapeutic Oral Drug Absorption System)

In some situations, immediate drug release is not desirable, and a delay in drug action is required for various reasons. One such example is chronotherapy, where drug release is deliberately programmed to occur after a certain time following administration. To achieve this delayed release, Elan Drug Technology developed the CODAS (Controlled Onset Drug Absorption System) technology. The benefits of CODAS include a delivery profile that aligns with circadian rhythms, controlled onset, extended-release properties, and a release rate that is largely unaffected by factors such as pH, posture, or food intake. Additionally, the system allows for "sprinkle" dosing by opening the capsule and sprinkling the contents on food, reduces the effective daily dose and systemic drug exposure, targets the gastrointestinal tract for local effects, and ensures a target pharmacokinetic profile.

Verelan PM, which utilizes the CODAS technology, is designed for bedtime administration, with a 4- to 5-hour delay in drug delivery. This controlled-onset system ensures that the maximum plasma concentration (Cmax) of verapamil occurs in the morning. The capsule contains pellets that facilitate the extended release of the drug in the gastrointestinal tract. The Verelan PM formulation is designed to begin the release of verapamil 4–5 hours after ingestion. This delay is achieved by using a non-enteric release-controlling polymer applied to the drug-loaded beads. The polymer coating consists of both water-soluble and water-insoluble components. As water from the gastrointestinal tract comes into contact with the beads, the water-soluble polymer dissolves gradually, creating pores through which the drug diffuses. The water-insoluble polymer continues to act as a barrier, ensuring controlled release of the drug. Importantly, the release rate is largely independent of factors like pH, posture, and food intake. Multiparticulate systems like Verelan PM are also less influenced by gastrointestinal motility.

8.3 OROS Technology

The OROS delivery systems were developd to address the challenge of poorly water-soluble drugs. The push-pull system typically consists of a bilayer or trilayer tablet core, which includes a push layer and one or more drug layers. The drug layer contains the poorly soluble drug, osmotic agents, and a suspending agent. The push layer contains osmotic agents and

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water-swellable polymers. The tablet core is surrounded by a semipermeable membrane. Various OROS systems have been developed, including Procardia XL, Ditropan XL, and Concerta, which are prominent examples. A more recent innovation, the L-OROS SOFTCAP delivery system, combines controlled-release and bioavailability-enhancing features, improving both patient compliance and therapeutic efficacy.

L-OROS technology was specifically developed by Alza to solve issues related to drug solubility. These formulations use self-emulsifying liquid carrier formulations (SEF) that improve the absorption of the drug through the gastrointestinal membrane and bloodstream. The SEF in L-OROS systems consist of drugs in non-aqueous liquid carriers, which are formulated to form either a solution or a nanosuspension. When the drug in solution is released in the GI tract, it forms very small droplets (less than 100 nm), enhancing the drug's solubility and bioavailability. In the case of a nanosuspension, the drug nanoparticles are dispersed upon release, preventing aggregation and further improving the drug's bioavailability.

8.4 IPDAS Technology

The Intestinal Protective Drug Absorption System (IPDAS) is an oral drug delivery method designed for gastrointestinal irritant drugs, such as NSAIDs. It uses controlled-release beads compressed into a tablet. Upon ingestion, the tablet disintegrates in the stomach, releasing beads that gradually release the drug as they move through the gastrointestinal tract, independent of food intake. The polymer coating on the beads controls the drug release. IPDAS technology ensures the drug is widely dispersed, reducing local irritation. It was initially developed for Elan Drug Technologies' Naprelan (naproxen) formulation, providing a once-daily controlled-release option with fast pain relief onset (within 30 minutes) and reduced gastric irritation, lasting up to 24 hours.

8.5 Geoclock

Sky pharma developed Geoclock, an oral drug delivery system using chronotherapy-focused press-coated tablets. These tablets have an active drug core inside a hydrophobic wax and brittle outer layer, allowing for controlled, pH-independent drug release after a specific delay. This technology enables both slow and immediate drug release, as well as targeted drug delivery to the colon or multiple pulses throughout the day. Lodotra, a drug formulated with Geoclock, releases prednisone four hours after ingestion, with peak plasma levels occurring six hours later, making it ideal for treating early morning stiffness in rheumatoid arthritis by delivering the drug at the optimal time when inflammatory cytokines peak.

8.6 Uniphyl

Uniphyl (theophylline, anhydrous) tablets, which utilize a controlled-release system, enable a 24-hour dosing interval for patients. When administered with food, Uniphyl is fully absorbed following oral administration.

8.7 TMDS (Time Multiple Action Delivery System)

This system regulates the release rates of various ingredients within a single tablet in a controlled manner. TMDS technology enables the release of multiple active ingredients from a single tablet formulation at different times, following distinct release profiles over a set period.

8.8 Covera-HS

Covera-HS is the first once-daily formulation of an antihypertensive and anti-anginal drug that employs an advanced tablet coating and a novel drug delivery system to mimic the body's natural 24-hour circadian rhythms in blood pressure and heart rate. This unique technology, known as COER-24 (Controlled-Onset-Extended-Release), was developed in collaboration with Alza Corp. Covera-HS is currently the only controlled-release verapamil formulation approved for the treatment of both hypertension (high blood pressure) and angina pectoris (chest pain).

Available in 180 mg and 240 mg tablet doses, Covera-HS is intended to be taken orally at bedtime. The drug reaches its peak concentration during the early morning hours, coinciding with the period when blood pressure and heart rate naturally rise most rapidly. During sleep, when blood pressure and heart rate are at their lowest physiological levels, there is minimal drug release. This timing aligns with the body's natural circadian variations, optimizing the therapeutic effects of the medication.

8.9 OSDRC Technology

The traditional dry-coated tablet (DC) method involves preparing a core tablet first, making the process more complex. This increased complexity leads to higher manufacturing costs and a greater likelihood of failure, which can result in a need for additional core tablets. To address this issue, the One-Step Dry-Coated Tablet (OSDRC) technology was developed. This system uses a double-structure punch (with a center punch and an outer punch), allowing the dry-coated tablets to be formed in a single operation. The process consists of three stages: compressing the bottom layer (the first outer layer), compressing the core, and then performing a final compression to form the whole tablet, which includes the upper and side layers (the second outer layer). Since the tablets are produced in a single step with the punches completing one rotation on the turntable, there is no longer a need for a separate stage to add the core.

8.10 Diffutab

Diffutab technology allows for tailored drug release profiles and region-specific delivery. It uses a combination of waxes and hydrophilic polymers to regulate the release of the drug through diffusion and the erosion of the matrix tablet. Diffutabs are especially beneficial for high-dose medications and those requiring sustained release or once-daily dosing. Eurand has applied this technology to both soluble and insoluble products. Key benefits of Diffutabs include high drug loading, the ability to support sustained release, and the convenience of once-daily dosing, as the matrix tablets combine water-soluble particles with the active drug.

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9. CONCLUSION

The rapid advancements and recent developments in drug delivery technologies have led to the creation of pulsatile drug delivery systems. These systems offer a unique advantage, being both easy to formulate and capable of delivering substantial therapeutic benefits. By releasing the drug at the right time, in the right place, and in the correct amount, pulsatile systems ensure more precise and effective treatment. In particular, circadian disorders often require chronopharmacotherapy, which can be efficiently achieved with pulsatile drug delivery systems. Over the past two decades, pharmaceutical technology has made significant strides, and with the advent of pulsatile drug delivery, the goal of providing safe and effective therapy is more achievable than ever.

Certain medical conditions demand that drugs or bioactive compounds be delivered in a precise manner. Conventional dosage forms often cannot meet these requirements, or they do so only partially. By modifying and designing conventional delivery systems into pulsatile formats, it becomes possible to control the time-released delivery of active compounds, which is crucial in treating such conditions. The causes of many chronic diseases can be linked to the timing and release of specific drugs, and pulsatile drug delivery systems can significantly improve therapeutic outcomes. Although considerable progress has been made in this area, there are still untapped aspects of pulsatile drug delivery that could lead to new opportunities for more effective therapies through better system engineering.

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ARTIFICIAL INTELLIGENCE IN PHARMA INDUSTRY

Mr.Avishkar S. Dabhade[1], Dr.Sunil S Jaybhaye[2], Miss.Ashwini Bahir[3], Mr.Bhagwat S. Gabale[4], Mr.Santosh R. Dhakne[5]

ABSTRACT

Artificial intelligence use in pharmaceutical technology has increased over the years, and the use of technology can save time and money while providing a better understanding of the relationships between different formulations and processes parameters, Artificial intelligence is a branch of the computer science that deals with the problem-solving by the aid of symbolized programming. It has greatly evolved in to a science of problems- solving with the hag applications in business, health care, and engineering. The article is describes the drugs discovery tools of Al, manufacturing execution system automated control processes systemsAl to predict new treatment development of novel peptides from natural foods, treatment and management of rare diseases, ding adherence und dosage challenges to adoption of Al in pharma.

KEYWORDS: *Drug Discovery, tools of AL MES, ACPS, treatment and management of rare diseases, drug adherence and dosage, challenges to adoption of Al in pharma.*

1. INTRODUCTION

Artificial intelligence (AI) is a branch of computer science that deals with the problem-solving by the aid of symbolic programming it has greatly evolved into a science of problem-solving with huge application in humanins, health care, engineering.

The main objective of this artificial intelligence to identify useful information processing problems and give un abstract account of how to solve them. Such an account is called as method and it corresponds to a theorem in mathematics. Artificial intelligence as a field that deals with the design and application f algorithms for analysis of laming from and interpreting data. Artificial intelligence encompasses many branches of statistical and machine learning pattern recognition, and clustering, similarity- bused methods.

Al is a flourishing technology which finds application in multiple aspects of life and industry. In Recent times the pharmaceutical industry discovers novel and innovative ways use this powerful technology to help solve some of the biggest problems facing pharma today. Artificial intelligence in Pharma refers to the use of automated algorithms to perform tasks which traditionally rely on human intelligence.

Over the last five years, the use of artificial intelligence in the pharma and biotech industry has redefined how scientists develop new drugs, tackle disease.

2. HISTORY

Allen Newell Herbert A Simon was developed the Logic Theorist it was borne in 1956 that dirt mouth college had organized the famous conference.

It has been forecasted that the revenue from Al market will be increasing by un much us sins-fold between the years 2017 and 2022 Natural language processing market, which has several applications including text prediction, and speech and voice recognition has been said to achieve a growth of 28.59 in the year 2017 Worldwide reverse from hug data and best analysis was USS 122 billion in the year 2015 and it is being expected that the figures will rise to more than US$ 200 billion by the year 2020 15.

Artificial intelligence has a rocky history spamming back to the 1950s. For a long time, it was seen as a field for dreamers, but that started to change in 1997 when IBM's Deep Blue computer was able to defeat chess clumpion Garry Kaspurus. By 2011. TBM's new Watson supercomputer was able to win the US$1m prize in the US game-show Jeopardy. Since then, Watson has expanded into healthcare and drug discovery, including a partnership with Pfizer in 2016 as accelerate drug discovery in immuno-oncology. In December 2016 IBM in collaboration with Pfizer introduced IBM Watson, a cloud-based such as medical lab reports and helps researchers with the ability to identify relationships between distinct data sets through dynamic visualizations.

3. ARTIFICAL INTELLIGENCEIN DRUG DISCOVERY

Drug discovery often takes a long time to test compounds against samples of diseased cells. Finding compounds that are biologically active and are worth investigating further requires even re analysis. To speed up this screening process, Novartis research teams use images from machine leaming algorithan to predict which untested compounds might be worth exploring in more details. As computers me fat quicker compared to traditional human analysis and laboratory experiments in uncovering new data sets, new and effective drugs can be made available sooner. while also rescuing the operational costs associated with the manual investigation of each compound [33. The current Al intrusive by the top biopharmaceutical

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companies include: Jal mobile platform to improve health outcomes the ability to recommend patients by means of real time data collection and thus improve patient outcomes.1h drug discovery pi companies in conjunction with wetware communes are trying to implement the most cutting-edge technologies in the costly and extensive procem of drug discovery.

4. TOOLS OF AI

Robot pharmacy: The objective of improving the safety of patients, UCSF Medical Center mess robotic technology for the preparation and tracking of medications. According to them, the technology has prepared 3, 30, 000 medication doses without any core The robot has proved to be far better than humans both in size as well as its ability to deliver accurate medications. The abilities of the robotic technology include preparation of oral as well as injectable medicines which include chemotherapy drugs that are toxic. This has given freedom to the pharmacists and nurses of UCSF so that they can utilize their expertise by focusing on direct patient care and working with the physicians



Fig. AI used in Pharmacy

4.1 MEDI ROBOT

MEDI is a short form for medicine and engineering designing intelligence. Tools of Al The pain management robot was developed as part of a project led by Tanya Beran, professor of Community Health Sciences at the University of Calgary in Alberta. She got the idea after working in hospitals where children scream during medical procedures. The robot first buildsa rapport with the children and then tells them what to expect during a medical procedure 191, although the robot cannot think, plan, or reason, it can be programmed such that it shows.



Fig. Medi Robot

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4.2 ERICA ROBOT

Erica is a new care robot that has been developed in Japan by Hiroshi Ishiguro, a professor at Osaka University. It was developed in collaboration with the Japan Science and Technology Agency, Kyoto University, and the Advanced Telecommunications Research InstituteInternational (ATR). It can speak Japanese and has a blend of European and Asian facial feature. Like any normal human being, it likes animated films, desire to visit south-east Asia, and wants a life partner who would chat with it. The robot cannot walk independently; however, it has been developed with the ability to understand and answer questions with human-like facial expressions Erica is the "most beautiful and intelligent" android as Ishiguro fixed up thefeatures of 30 beautiful women and used the average for designing the robot's nose, eyes, andso on.

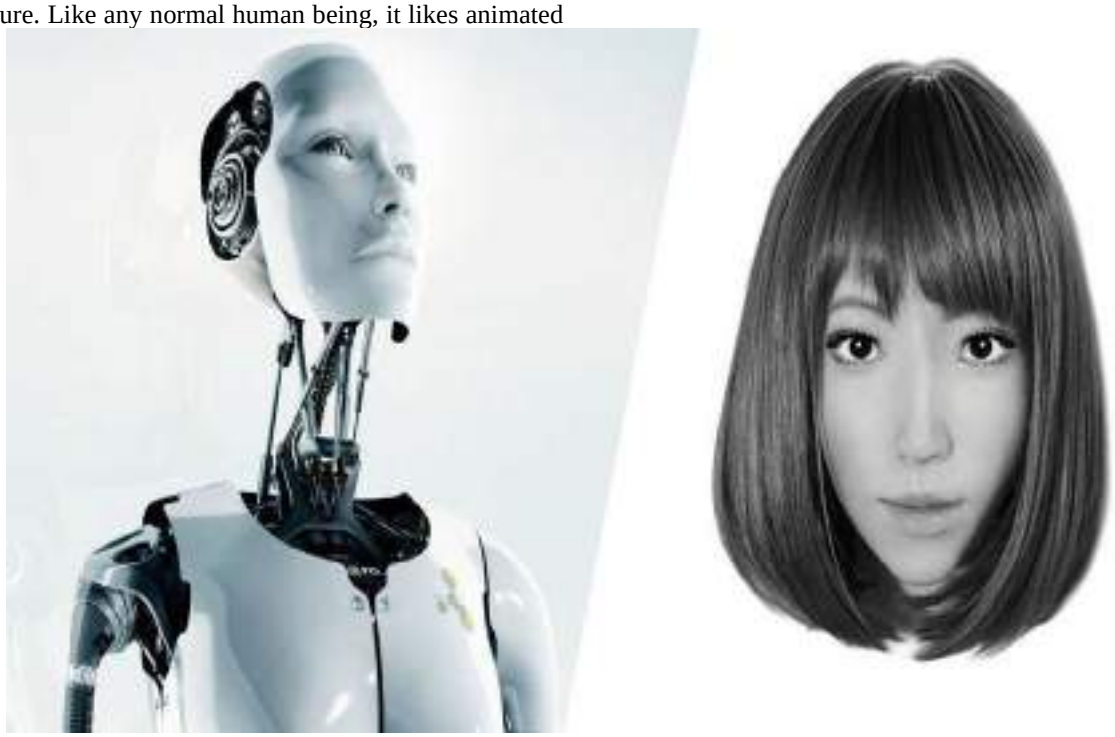


Fig. Erica Robot

4.3 TUG ROBOT

Aethon TUG robots are designed to autonomously travel through the hospital and deliver medications, meals, specimens, materials, and haul carry heavy loads such as linen and trash. It has two configurations, ... fixed and secured carts as well as exchange base platform that can be used to carry rats, hens, and carts. The fixed carts are used for delivering medications, sensitive materials, and laboratory specimens, whereas, the exchange platform is employed to Vyas, et al.: Artificial Intelligence: New era in pharmacy profession Asian Journal of Pharmaceutics Apr-Jun 2018 12 75 transport materials that can be loaded on different racks: The TUG can deliver several types of carts or racks thus making it a very flexible and utilizable resource.

Automated Control Process System (ACPS):

- The elements of [ACPS] include:
- Sensing process varmables" value
- Transmission of signal to measuring element.
- Measure process variable.
- Presenting the value of the measured variable.
- Set the value of the desired variable.
- Comparison of desired and measured values.

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Fig. Tug Robot

4.4 BERG

Berg is Boston-based biotech and is one of the key players employing Al in its various processes. It has an Al-based platform for drug discovery, which has a huge database of patientsand this is used to find as well as validate the various biomarkers responsible for causing diseases and then decides therapies according to the obtained data. The motto of the companyis to speed up the process of drug discovery and to bring about a reduction in the cost with the aid of Al as it obliterates guesswork that is involved in the process of drug development.

- **MANUFACTURING EXECUTION SYSTEM (MES)**

The benefits of using MES include compliance with guaranteed legal regulations, minimized risks, increased transparency, shortened production cycles, optimized resource utilization, controlled, and monitored production steps, and optimized up to batch release funding to use Al to develop innovative drugs for rare conditions. Thera chon, another Swiss biotech company that leverage Al to develop drugs for the treatment of rare genetic diseases, has received $60 million in funding.

5. DRUG-ADHERENCE & DOSAGE

Abbvie partnered with New York-based Acura to enhance drug trial vigilance and improvedrug adherence. In this collaboration. Abbvie used facial and image recognition algorithms of AiCure mobile SaaS platform to monitor adherence. To be more specific, the patients take a video of themselves swallowing a pill using their smartphones, and the Al-powered platform confirms that indeed the correct person swallowed the right pill. And the results were amazing, improving adherence by up to 90% Genpact's Al solution has been used severally in clinical trials to change the dosage given to specific patients to optimize the results. In this partnership, Bayer takes advantage of Genpact's Pharmacovigilance Artificial Intelligence (PVA) to not only monitor drug adherence but also detect potential side effects much earlier.

- **USING AI TO MAKE SENSE OF CLINICAL DATA & TO PRODUCE BETTERANALYTICS**

Apple's Research kit makes it easy for people to enroll in clinical trials and studies without having to go through physical enrollment. It's a clinical research ecosystem designed around its two flagship products, the iPhone and the Apple Watch Duke University, for instance, uses patient data collected by these Apple devices and Al-driven facial recognition algorithm to identify children with autism. Research kit has made it easy to make better sense of collected health data

- **FINDING MORE RELIABLE PATIENTS FASTER FOR CLINICAL TRIALS**

Although there's a lot of patient data out there, recruiting the right patients for clinical trials isa difficult process for big pharma. For instance, finding and enrolling ideal candidates can makeclinical trials last an average of 75 years, costing between $161 million and $2 billion per drug Unfortunately, 80 percent of clinical trials fail to make deadlines. With over 18.000 clinical studies currently recruiting candidates in the US, the $65 billion clinical trial market needs an overhaul. Extracting useful data from patients' records is perhaps the biggest challenge for pharmaceutical companies. Thankfully, that's where Al and machine learning comes into the picture.

6. CHALLENGES TO ADOPTION OF AI IN PHARMA

While AI has an extensive potential to help redefine the pharmaceutical industry, the adoption itself is not an easy walk in the park. Challenges that pharma companies face while trying to adopt AT: • The unfamiliarity of the technology for many pharma companies. Al still seems like a "black box" owing to its newness and esoteric nature. Lack of proper IT infrastructure - that's because most IT applications and infrastructure currently in use weren't developed or designed with artificial intelligence in mind. Even worse, pharma firms have to spend lots of money to upgrade their IT system. Much of the data is in a free text format-that means pharma companies have to go above and beyond to collate and put this data into a form that's able to be analyzed. Despite all these limitations, one thing is for

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certain: Al is already redefining biotech and pharma. And ten years from now. Pharma will simply look at artificial intelligence as a basic everyday, technology.

7. ARTIFICIAL INTELLIGENCE IN PHARMA IS A GOOD IDEA

Pharmaceutical Industry can accelerate innovation by using technological advancements. The recent technological advancement that comes to mind would be artificial intelligence, development of computer systems able to perform tasks normally requiring human intelligence, such as visual perception, speech recognition, decision-making, and translation between languages. An estimate by IBM shows that entire Healthcare domain has approx. 161 billion GB of data as of 2011. With humongous data available in this domain, artificial intelligencecan be of real help in analyzing the data and presenting results that would help out in decision making. saving Human effort time, money and thus help save Lives. Epidermic outbreak prediction, using mechine learning/artificial intelligence one can study the history of epidermic outbreak, analyse the social media activity and predict where and when epidermic can affect with cocidarable accuracy. Apart from the aforementioned use-cases there are numerous others like: Personalizing the treatment Help build new tools for the patient, physicians etc. Clinical trials research applying predictive analytics to identify candidates for the trial through social media and doctor visits.

8. LIMITATIONS

Streamlining electronic records, which are messy and unorganized across the heterogenous databases care to be cleaned first. Transparency: people need transparency in health care they receive, which is quite a task given the complexity of the processes involving artificial intelligence. Data governance medical data is private and in accessible legally consent from the public is important Hesitant to change: pharma companies are known to be traditional and resistant to change. we have to break the stigma to give the best care we can.

9. BENEFITS AND ISSUES

- Effective use of incomplete data sets,
- rapid analysis of data,
- ability to accommodate constraints and preferences and ability to generate understandable rules enhancement of product quality and performance at low cost. shorter time to market, development of new products.
- improved customer response.
- improved confidence.
- AI would have a low error rate compared to humans, if coded properly. They would have incredible precision, accuracy, and speed.
- They won't be affected by hostile environments, thus able to complete dangerous tasks,explore in space, and endure problems that would injure or kill us.
- This can even mean mining and digging feels that would otherwise be hostile for humans.
- Replace humans in repetitive, tedious tasks and in many laborious places of work.
- Predict what a user will type, ask, search, and do. They can easily act as assistants and canrecommend or direct various actions.
- An example of this can be found in the smartphone.
- Can detect fraud in card-based systems, and possibly other systems in the future. Organized and manages records. Interact with humans for entertainment or a task as avatarsor robots.
- An example of this is Al for playing many videogames.
- Robotic pets can interact with humans. Can help w/ depression and inactivity. Can fulfillsexual pleasure.
- They can think logically without emotions, making national decisions with less or nomistakes. Can assess people.
- This can be for medical purposes, such as health risks and emotional state. Can simulatemedical procedures and give info on side effects. Robotic radiosurgery, and other types of surgery in the future, can achieve precision that humans can't.
- They don't need to sleep, rest, take breaks, or get entertained, as they don't get bored.
- Can cost a lot of money and time to build, rebuild, and repair. Robotic repair can occur toreduce time and humans needing to fix it, but that'll cost more money and resources.
- Storage is expansive, but access and retrieval may not lead to connections in memory as well as humans could They could never, or, at least, seemingly never with our technological perceptions, receive creativity that humans have.
- This can prevent sympathizing with emotions for human contact, such as in being mirses. This can also reduce wisdom can understanding.

10. APPLICATION

(1) In Formulation

Controlled release tablets: The first work in the use of neural networks for modeling pharmaceutical formulations was performed by Hussain and coworkers at the University of Cincinnati (OH, USA). In various studies they modelled the in vitro release characteristics ofa range of drugs dispersed in matrices prepared from various hydrophilic polymers. In all cases,neural networks with a single hidden layer were found to offer reasonable performance in the prediction of drug release In a more recent study involving the formulation of diclofenac sodium from a matrix tablet prepared from cetyl alcohol, personnel from the pharmaceutical company KRKA dd (Smerjeska, Slovenia) and the University of Ljubljana (Slovenia) have used neural networks to predict the rate of drug release and to undertake optimization usingtwo- and three- dimensional response surface analysis. Immediate release tablets: Workin this area began only some three years ago with two studies. One by Turkoglu and coworkers from the University of Marmara (Turkey) and the University of Cincinnatill used both neural networks and statistics to model

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tablet formulations of hydrochlorothiazide The networks produced were used to prepare three-dimensional plots of massing time. compression pressure and crushing strength, or drug release, massing time and compression pressure in an attempt to maximize tablet strength or to select the best lubricant. Although trends were observed no optimal formulations were given. The trends were October Issue comparable to those generated by statistical procedures. Comparable neural network models Department of Pharmaceutic were generated and then optimized using genetic algorithms. It was found that the optimum formulation depended on the constraints applied to ingredient levels used in the formulation and the relative importance placed on the output parameters. A high tablet strength and low friability could only be obtained at the expense of disintegration time. In all cases lactose was the preferred diluents and fluidized bed the preferred granulating technique.

(2) In Product Development

The pharmaceutical product development process is a multivariate optimization problem. I involve the optimization of formulation and process variables. One of the most useful properties of artificial neural networks is their ability to generalize. These features make them suitable for solving problems in the area of optimization of formulations in pharmaceutical product development. ANN models showed better fitting and predicting abilities in the development of solid dosage forms in investigations of the effects of several factors (such as formulation, compression parameters) on tablet properties (such as dissolution) ANNS provided a useful tool for the development of micro emulsion-based drug-delivery systems in which experimental effort was minimized.

11. CONCLUSION

Human being is the most sophisticated machine that can ever he created. The human brain, which is working hard to create something that is much more efficient than a human being indoing any given task and it has great success to extent in doing so. The AI tools like Watson for oncology. tug robot and robotic pharmacy has change the profession considerably. The bigger the health- care sector gets more sophisticated and more technologically advanced infrastructure it will need. Artificial intelligence is the design and application of algorithms for analysis of learning and interpretation of data.

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A STUDY OF SERVICE QUALITY AND ITS IMPACT ON CUSTOMER SATISFACTION TOWARDS SELECTED TELECOMMUNICATION SERVICE PROVIDER IN UTTAR PRADESH CIRCLE

Anand Soni[1], Dr. Satendra S. Thakur[2]
[1]Research Scholar Faculty of Management RKDF University Bhopal
[2]Professor & Dean Faculty of Management RKDF University Bhopal

ABSTRACT
The present study deals with impact of service quality of telecommunication companies on customer satisfaction with respect to various factors such as Customer care service, Value added services and network connectivity. The study is based on primary data which has been collected by using questionnaire method. The final questionnaires were distributed among the 200 subscribers and 171 subscribers positively replied and filled the questionnaire. The data has been analyzed by using ANOVA test at 5% level of significance. The findings of the study indicates that all the factors of service such as Customer care service, Value added services and network connectivity having positive impact on customer satisfaction.

INTRODUCTION
In the present scenario Telecommunication companies playing most significant role towards connecting of peoples with each other's, however, it has become one of the most important need for each one around the world. In India there is few numbers of telecommunication companies offering mobile phone operating service to the customer such as Jio, Airlel, Voda-Idea and BSNL. Among all these companies service quality is one of the major issues which is directly influence the satisfaction level of the customer. The present study related with service quality and its impact on customer satisfaction among the mobile phone subscribers of selected companies. In order to examine the impact of mobile phone service provider companies on customer satisfaction various factors of service quality such as Customer care service, Value added services and network connectivity has been discussed from the subscriber's point of view. the relationship between service quality and customer satisfaction is based on the subscribers response which has been taken by using questionnaire methods.

REVIEW OF LITERATURE
Alridge, S., & Rowley, J. (2001), used this model in Croatian higher education sector to identify the gap between expectations and perceptions of educational services from the point of view of students using the SERVQUAL instrument. Based on this research it was concluded that the negative gap in service dimensions can be used as a guideline for planning and allocating resources in order to improve educational service quality. Higher education in developing countries has serious quality

Atheeyaman, A. (1997) examined the relationship between customer participation and satisfaction. The study presented a typology of service customer's quality assurance behaviour and a conceptual model of the service customer's value chain. The study strongly embraced the usefulness of the value perspective for exploring the phenomenon of customer participation in service delivery. The tendency in the literature had been to treat customer participation as an input to the service firm's mix of production resources. The study encouraged treating customer participation as a variable in the customer's own value equation. Doing so created a rich set of implications in marketing, human resources and operations, for both researchers and managers.

Bigne, E., Moliner, M. A., & Sanchez, J. (2003), study new developments in customer service training explained that the ongoing customers were better educated than ever before and wanted value for their money. Customers also wanted good service and were willing to pay for it. The level of courtesy and assistance required from a customer service representative had increased dramatically over the past decade as a result of the customer's upgraded "acceptable" service standards; more kills were required. As a result, companies in various industries were induced to provide distinguished customer service in order to remain competitive. Learning was taking on strategic importance. Demand for customer service training was higher than ever before. The study summed up with suggestion that in today's volatile economy, providing excellent customer service could be the critical difference between a company's success and failure.

Cronin, J. J. Jr., & Taylor, S. A. (1992), study demonstrated that some determinants of quality predominated over others. The study found that for the personal customers of the bank, the main sources of satisfaction were attentiveness, responsiveness, care and friendliness. The study also found that the intangible aspects of the staff-customer interface had significant effects, both

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negative and positive, on service quality. Responsiveness was a crucial determinant of quality, as it was a key component in providing satisfaction and the lack of it was a major source of dissatisfaction. The main sources of dissatisfaction were integrity, reliability, responsiveness, availability and functionality. Reliability was predominantly a source of dissatisfaction not satisfaction

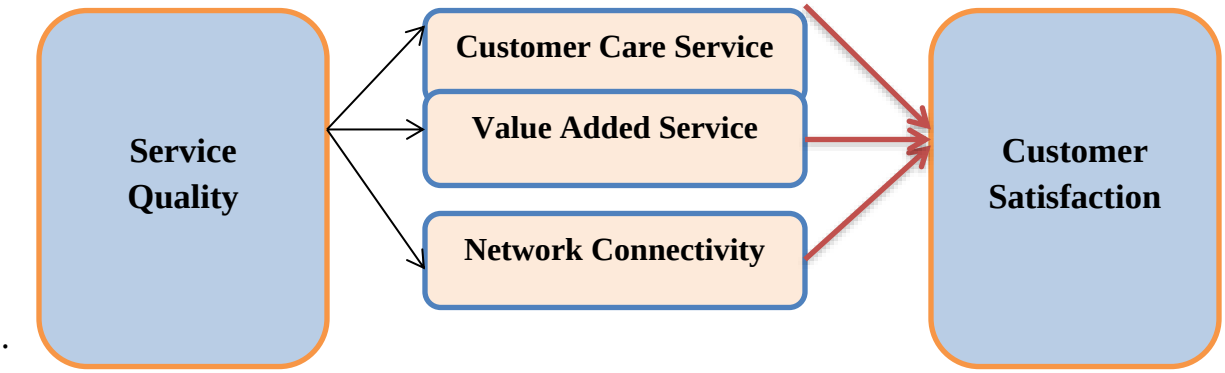
Parasuraman, Berry, and Zeithaml (1985), have introduced five specific dimensions of service quality which apply regardless of the service industry viz. assurance, responsiveness, tangibles, empathy and reliability. They have devised a scale called SERVQUAL since there were several models (scales) for the measurement of service quality and the satisfaction of customers, they are often too generalized or ad hoc, and as such hard to apply in the hospitality industry. On other hand TQM, which began before all in companies that dealt with products, due to the specificities of services due to factors such as impalpability, inseparability from provider and receiver of service, and perishability, a specific concept called SERVQUAL (Services Quality Model) was created.

OBJECTIVES OF THE STUDY

The various objectives of the study are as under

1. To study the impact of service quality of mobile phone service providers and customer satisfaction towards customer care service
2. To study the impact of service quality of mobile phone service providers and customer satisfaction towards Value Added Service
3. To study the impact of service quality of mobile phone service providers and customer satisfaction towards Mobile network Connectivity

Research Framework



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HYPOTHESIS OF THE STUDY

The hypothesis of the study is as under

H_{a1}: Service quality has a significant impact on customer satisfaction with respect to customer care service

H_{a2}: Service quality has a significant impact on customer satisfaction with respect to customer care service

H_{a2}: Service quality has a significant impact on customer satisfaction with respect to Network Connectivity

RESEARCH DESIGN

Research design for present study deals with relationship between service quality of telecommunication companies and its impact on customer satisfaction, however, the design of present study prepare on the basis of various factors of service quality. The research design is exploratory in nature and relationship between various variables has been examined by using primary and secondary data. The primary data has been collected by using questionnaire method and secondary data collected from various sources such as research paper and other sources.

SAMPLE SIZE AND DESIGN

Samples size and design for present study deals with the relationship between service quality and customer satisfaction among the subscribers of various companies. The sample has been taken from selected cities of Uttar Pradesh circle and Random stratified method of sampling has been used. In order to maintain the accuracy the sample were taken from various geographical locations of subscribers. The samples were collected with the help of questionnaire method which has prepared on the basis of various factors of service quality and its impact on customer satisfaction. The entire process has been completed in following steps

Sample Size: The final questionnaires were distributed among **200** subscribers and **171** subscribers positively replied and filled the questionnaire. However, final sample size of the study is **171**

Sample Method: Random stratified method were adopted to collect the sample among the entire population

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Sample Area: Sample Area for present study is limited up-to selected Areas of Bareilly city

Tools for Data Analysis

ANOVA Test has been used as data analysis for present study at 5% level of significance and 95% level of confidence

Hypothesis Testing

Hypothesis	Predictors	df	F	P Value	Result
H_{a1}	Customer Care Service	3	6.217	0.019	Significant
H_{a2}	Value Added Service	3	9.024	0.032	Significant
H_{a3}	Network Connectivity	3	8.812	0.001	Significant
Dependent Variable: Customer Satisfaction					

FINDINGS

The findings of the study are as under

1. The above table explores the impact of service quality of selected telecommunication companies and customer satisfaction with respect to customer care service. Table clearly explore in the first hypothesis value of **F** is **6.217** and **p** value is **0.019** which is less than critical value. Hence, study strongly recommended rejecting the null hypothesis and accepting the alternative hypothesis. On the basis of result it can be said that value added service of telecommunication companies is positively and significantly related with customer satisfaction
2. The above table explores the impact of service quality of selected telecommunication companies and customer satisfaction with respect to value added service. Table clearly explore in the second hypothesis value of **F** is **9.024** and **p** value is **0.032** which is less than critical value. Hence, study strongly recommended rejecting the null hypothesis and accepting the alternative hypothesis. On the basis of result it can be said that Value Added Service of telecommunication companies is positively and significantly related with customer satisfaction
3. The above table explores the impact of service quality of selected telecommunication companies and customer satisfaction with respect to network Connectivity. Table clearly explore in the first hypothesis value of F is **8.812** and **p** value is **0.001** which is less than critical value. Hence, study strongly recommended rejecting the null hypothesis and accepting the alternative hypothesis. On the basis of result it can be said that network connectivity of telecommunication companies is positively and significantly related with customer satisfaction

CONCLUSIONS

Service quality of telecommunication companies playing most important role towards customer satisfaction with respect to various factors of service. However, it is important for both companies as well as subscribers. The present study explore the impact of service quality on customer satisfaction with respect to various factors of service such as Customer care service, value added service and network connectivity. Data for present study has been analyzed by using ANOVA test. Result of hypothesis testing clearly indicates that all the factors of service such as Customer care service, value added service and network connectivity has significant impact on customer satisfaction. Hence, study concludes that telecommunication companies in Uttar Pradesh circle are offering excellent service from the subscriber's point of view and it is positively related with level of customer satisfaction.

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EXTRACTION OF NEEM OIL FROM SEEDS: ANTIMICROBIAL ACTIVITY

Mr.Avinash.B. Rathod[1], Mr.Awinash.S. Chavan[2], Nikita Sahebrao Wankhede[3]
[1]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur, Jalna
[2]Asst.Prof. (Faculty of P'chemistry) Roasaheb Patil Danve College of Pharmacy, Badnapur
[3]Student of Bachelor of Pharmacy, Raosaheb patil Danve College of Pharmacy Badnapur, Jalna
Raosaheb Patil Danve College of Pharmacy Badnapur Jalna 431202

ABSTRACT

The extraction of neem oil from neem seeds (Azadirachta indica) has garnered significant interest due to its wide range of applications in medicine, agriculture, and cosmetics. This study aims to explore the extraction methods of neem oil and evaluate its antimicrobial properties. Neem seeds were collected, dried, and subjected to solvent extraction using n-hexane to obtain the neem oil. The extracted oil was then analyzed for its antimicrobial activity against common pathogenic microorganisms, including Escherichia coli, Staphylococcus aureus, and Candida albicans, using the disc diffusion method.

The results indicated that neem oil exhibited significant antimicrobial activity against all tested microorganisms, with varying levels of inhibition. The oil showed the strongest antimicrobial effect against Staphylococcus aureus, suggesting its potential as a natural antibacterial agent. The antimicrobial efficacy was dose-dependent, with higher concentrations of neem oil leading to stronger inhibition zones. This study underscores the potential of neem oil as an effective, eco-friendly alternative to synthetic antimicrobial agents. Further research into its active components and applications in pharmaceutical and agricultural industries is recommended.

KEYWORDS: *Neem oil, Azadirachta indica, extraction, antimicrobial activity, Staphylococcus aureus, Escherichia coli, Candida albicans.*

INTRODUCTION

The people of India have long revered the neem tree; for centuries, millions have cleaned their teeth with neem twigs, smeared skin disorders with neem-leaf juice, taken neem tea as a tonic, and placed neem leaves in their beds, books, grain bins, cupboards, and closets to keep away troublesome bugs. The neem oil is used for hair for growth of hair Given the use of various neem-derived products as pesticides and the realistic chances of residues derived from the treatments still being present at the time of consumption, there may be a risk for consumers. Therefore, in this study we present a review of the toxicological data from human and animal studies with oral administration of different neem- based preparations. These preparations can consist of crude plant parts, the seed oil, aqueous extracts of parts of the tree, extracts obtained with non-aqueous solvents, the pure bioactive insecticide ingredients and commercially available neem-based pesticides.

The word NEEM is derived from Sanskrit Nimba which means "bestower of good health. It has also been known as Ravisambha sun ray like effects in providing health. The Neem tree has been venerated through the ages in the Indian countryside as it provided hope in any situation and the faith in the miraculous healing powers of this amazing tree led patients with incurable diseases to adopt neem as way life. They lived in the shade of the tree, drank infusion of various part (Leaf, bark, etc) as advised by Ayurvedic tradition. They used young twigs for oral hygiene first thing in the morning, ate tender leaves as salad or cooked leaves with vegetable as food. Neem gums was used as lozenges for dryness of throat and allay thirst. In summer, sweet, ripe fruit were sucked for their sweetish pulp. All this together, probably strengthened their immune system to meet any challenge!!!

Neem oil is generally recommended for skin diseases while neem leaves are used for beauty purposes. Neem oil is a vegetable oil obtained from the fruits and seeds of the Neem tree *(Azadirachta indica*). It has been used for centuries in traditional Indian medicine and is now used in a wide range of applications due to its many beneficial properties. In recent years, extraction of Neem oil has become increasingly common, and the methods used to extract the oil vary. Neem oil has been used for centuries in traditional Indian medicine for its medicinal properties. It is known to have anti- inflammatory, antimicrobial, and antifungal properties, which makes it beneficial in treating a variety of skin and hair conditions. It is also known to be an an effective insect repellent, which is why it is often used in organic farming. In addition, its taste and smell can be used to naturally flavor food, which has become increasingly popular in recent years. This research paper aims to investigate the extraction of neem oil with different methods, as well as the potential applications of the extracted oil in different fields. Neem oil is a vegetable oil obtained from the leaves, bark and seed kernels of the neem tree. The review will evaluate the different extraction methods and discuss their efficacy, cost effectiveness, and safety. Furthermore, the paper will assess the potential uses of neem oil in various fields and discuss the benefits and risks associated with them. The extraction of Neem oil is a complex process and there are

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several methods used to extract the oil from the seeds. These include mechanical pressing, which is the most common method, solvent extraction, and steam pressure extraction. Each method has its own advantages and disadvantages, and it is important to choose the right. Neem leaf extracts have a powerful antiseptic, anti-fungal, antiviral and anti-bacterial effect. Unlike synthetic chemicals that often produce side effects such as allergic reactions, rashes etc. Neem is gentle and does not create any the complications. Unlike Neem seed oil, Neem leaves have a pleasant odor. An extract from neem leaves can be prepared as an alcoholic tincture or as tea. The alcohol extract has a dark green colour and is effective for several weeks. It can be used in anti-ageing nourishing formulas, mouthwashes, face washes, shower gels, soothing gels, face masks, skin toners, etc.

PLANT PROFILE



Fig. No. 01 Neem Plant Profile.

BIOLOGICAL IMPORTANCES OF NEEM

More than 150 compounds have been isolated from different parts of neem. The compounds have been divided into two major classes: isoprenoid (***Chatterjee and Pakrashi, 1991***) like diterpenoids and triterpenoids containing protomeliacins, limonoids, azadirone and its derivatives, gedunin and its derivatives, vilasinin type of compounds and C secomeliacins such as nimbin, salanin and azadirachtin) and non-isoprenoids, which are proteins, carbohydrates, sulphurous compounds, polyphenolics such as flavonoids and their glycosides, dihydrochalcone, coumarin and tannins, aliphatic compounds, etc. Nimbidin, is responsible for crude bitter principle extracted Azadirachata, chemistry, medicinal properties, neem, A. indica which possess several biological activities, from this crude principle some tetranortriterpenes, including nimbin, nimbinin, nimbidinin, nimbolide and nimbidic acid have been isolated (***Siddiqui, 1942; Schumacher et al., 2011; Naik et al., 2014***). Further, Biswas et al. (2002) have reviewed the biological activities some of the neem compounds, pharmacological actions of the neem extracts, clinical study and plausible medicinal applications of neem along with their safety evaluation. Further, neem also possess compounds acts as Anti-inflammatory, Antiarthritic, Antipyretic, Hypoglycaemic, Antigastric ulcer. Spermicidal, Antifungal, Antibacterial, Diuretic, Antimalarial, Antitumour, Immunomodulatory
Medicinal Uses:

They are said to be antifungal, antidiabetic, antibacterial, antiviral, contraceptive and sedative. Neem products are also used in selectively controlling pests in plants. Neem is considered a part of Ayurvedic medicine. Neem is also known as the village pharmacy'. All parts of neem are used for preparing many different medicines, especially for skin disease. A compound from the Neem tree can be used as aspermicide Neem oil is used for preparing cosmetics (soap and shampoo, ozone as well as lotions and others), and is useful for skin care such as acne treatment. Neem oil has been used effectively as a mosquito repellent.

1.Leaves

Neem preparations are reportedly efficacious against a variety of skin diseases, septic sores, and infected burns. The leaves, applied in the form of poultices or decoctions, are also recommended for boils, ulcers, and eczema. The oil is used for skin diseases such as scrofula, indolent ulcers, and ringworm.

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2.Neem Flowers



Dried neem flowers are powdered and mixed with the leaves to prepare beauty packs for treating excess oil secretion, reducing acne and pimple and also to cure itching problems. Dried neem flowers help in treating blackheads. You need to mix neem oil with dried neem leaves and apply these directly on the blackheads.

3.Neam Bark



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Powder promotes skin health by encouraging natural skin rejuvenation, healthy turnover, and maintaining optimal moisture levels. It supports digestive health and healthy metabolism with its naturally soothing properties that rekindle the digestive fire while maintaining Pitta levels.

4.Gum



- Moisturizes the skin.
- Soothes inflamed and irritated skin.
- Fight multiple signs of premature aging.....
- Tackles blackheads and whiteheads.
- Treats uneven skin tone.
- Fights acne and pimples...
- Protects against environmental damage.

5.Seed

.



Treats acne. The antibacterial properties of neem fight acne-causing bacteria, which helps in the treatment and prevention of acne...
Pacify irritated skin.
Fight signs of ageing.....
Benefit of neem
High in fat content, neem oil improves the quality of your hair. Use neem oil if your scalp is dry because it nourishes the scalp, and its antifungal agents help treat dandruff.
Adding a few drops of neem oil to your hair can help with an itchy scalp.
Using neem oil can help you have a healthier scalp and in turn more robust locks.

MEDICINAL USE OF NEEM

Antimicrobial Activity

An antimicrobial kills or inhibits the growth of microbes, They used for cures of microbial infections. Various types of

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antimicrobials are used such as antibiotics, synthetic and natural compounds. However, prolonged use of mostly antibiotics can decrease the number of gut flora and causes. resistance, which can have a negative impact on health. Prolonged courses of antibiotic also cause serious side effects. Antifungal agents work by exploiting differences between mammalian and fungal cells to kill off the fungal organism without dangerous effects on the host. Unlike bacteria, both fungi and humans are eukaryotes cells. These cells are similar at the molecular level. Consequently, there are often side-effects to some of these drugs
Antibacterial and Anti-Fungal Activities:

The antibacterial activity of Neem leaves oilagainst various bacterial and fungal strains. The Neem oil showed considerably activity against bacterial [Gram-positive bacteria: example. Staphylococcus species and the Gram-negative bacteria; example Escherichia colil and fungal strains. The antibacterial activity against microbial cultures namely: Bacterial Strain; Escherichia coli, Bacillus cerus, Proteus vulgaris, Salmonella typhi, Klebsiella pneumoniae. Shigella dysenterae and Fungal strain; Fusarium oxysporum, Aspergillus flavus, Aspergillus fumigates, Aspergillus niger, Candida albicans, Cladosporium sp., Microsporum canis, Microsporum gypseum. Trichophyton rubrum, Trichophyton mentagrophytes, Penicillum notatum etc. The oil was not able to inhibit Proteus vulgaris. It was observed that the oil exhibited inhibitor effects against most of the microorganisms tested. The antifungal activity of neem oil against above fungal strains showed considerably activity. Moreover, the aqueous extract of plant has been previously reported to show antifungal activity, In this study the antibacterial and antifungal activities of the extracts from leaves oil. The crude oil is generally active against bacteria and fungi. In the light of these results we can conclude that level of antimicrobial activities of the Neem oil was compared with the chemical composition: activity relationship of extract.

Anticancer Activity
Neem leaf aqueous extract effectively suppresses oral squamous cell carcinoma induced by 7, 12-dimethylbenz[a] anthracene (DMBA), as revealed by reduced incidence of neoplasm (Gogati and Marathe, 1989). Pramanik et al. (2016) has conducted a study in chemoprotective neem compounds viz., azadirachtin, nimbolide and limonoid enrich extractson models of buccal carcinogenesis in hamsters. Overall studies were tested positive to reduce the expression and cell proliferation antigens. Further, researchers have shownprominent anti-cancerous activities from limonoid-derived compounds from neem. Amongst these, both 1-0-deacetylohchinolide B and 15-0-deacetylnimbolindin-B are proved to be beneficial to hinder cell growth in human cervical adenocarcinoma (Zhu et al., 2017; Chen et al., 2018). A very recent study discovered that alkaloid-derived limonoid, azadiramide-A, is primarily found in Neem leaf ethanolic extracts, showed to stop cell growth and induce apoptosis in both the estrogen independent MDAMB-231 and estrogen dependent MCF-7 cell lines of breast cancer in human beings (Elumalai et al., 2012; Zhu et al.,2017).

Antioxidant Activity
The antioxidant activity of neem seed extract has been demonstrated in vivo during horse- grain germination which is associated with low levels of lipooxygenase activity and lipid peroxides (Balasenthil et al., 1999). An antioxidant principle has also been isolated, which is a potent inhibitor of plant lipooxygenases. Anti-oxidants derived from neem is simple and cost effective way to supplement with natural extracts like those derived from Neem, in forms such as teas and oils, seem to be a simple and cost-effective way to introduce antioxidants (Alzohairy, 2016). 061 International Journal of Economic Plants2022

MATERIAL AND METHOD

MATERIAL

1. Neem Seeds: Fresh or dried seeds of Azadirachta indica.
2. Solvents: Methanol, ethanol, acetone, or water for extracting bioactive compounds.
3. Microorganisms: Bacteria (*E. coli, S. aureus, P. aeruginosa*), fungi (C. albicans, A. niger), and viruses (HIV, HSV).
4. Culture Media: Nutrient agar, Mueller-Hinton agar, or Sabouraud dextrose agar.
5. Tulsi leaf and coconut oil

- **Extraction of neem oil**

  Material
  1. Neem seeds
  2. Solvent (methanol, ethanol, or water)
  3. Grinder or mortar and pestle
  4. Filter paper
  5. Rotary evaporator or lyophilizer (optional)

  Protocol:
  1. Dry Neem seeds at 50°C for 2 hours
  2. Grind seeds into a fine powder.
  3. Weigh 10g of powder and transfer to a flask.
  4. Add 100mL solvent and stir for 2 hours.
  5. Filter mixture using filter paper.
  6. Concentrate extract using rotary evaporator or lyophilizer (if desired).

METHOD

- **Agar dilution method**

1. Prepare agar medium according to manufacturer's instructions.
2. Autoclave the agar medium at 121°C for 15-20 minutes.
3. Cool the agar medium to 45-50°C.
4. Add Neem seed extract to the agar medium at various concentrations (e.g., 100, 500, 1000 µg/mL).
5. Mix well and pour the agar medium into sterile petri dishes.
6. Allow the agar to solidify.
7. Inoculate microorganisms onto the agar surface using a sterile inoculum.
8. Incubate the plates at 37°C (bacteria) or 25°C (fungi) for 24-48 hours.

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CONCLUSION

Neem oil extracted from Azadirachta indica seeds exhibits potent antimicrobial activity against a wide range of microorganisms, including bacteria, fungi, and viruses. The oil's bioactive compounds, particularly azadirachtin, nimbin, and nimbidin, contribute to its antimicrobial properties.

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GENDER SENSITIVITY WITHIN THE PUBLIC SAFETY SECTOR IN SAN PABLO CITY, LAGUNA

Jennifer A. Valdez
Graduate School, University of Baguio

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ABSTRACT

Gender equality and empowerment of both sexes in the workplace allow more opportunity and enhance the personnel's capability and job performance. In the context of public safety where sex is highly observed due to the nature of the job, gender sensitivity is oftentimes affected and, in some areas, discrimination exists. However, in the selected locale of the study, gender sensitivity is highly observed and given importance, and both sexes are given equal opportunity and treatment at all times. This study aimed to determine the perception of the group of respondents on gender sensitivity within the public safety sector in San Pablo City, Laguna, in terms of capability and job performance. The researcher employed a descriptive-quantitative research design through a survey questionnaire to gather accurate assessments by the group of respondents from the public safety sector, such as the Philippine National Police, Bureau of Jail Management and Penology, and the Bureau of Fire Protection. The findings revealed that gender sensitivity in the workplace within the public safety sector is largely upheld, highly observed, and promoted in the context of public safety concerning personnel capability and job performance. There is respect, autonomy, and equal treatment among the personnel. However, there is a potential benefit of enhancing employee capability through targeted interventions such as training and skills development to improve job performance outcomes in gender-sensitive environments. It was concluded that gender sensitivity in the workplace within the public safety sector is highly perceived. However, there is still a need to ensure consistent gender equality and awareness through capability training and interventions such as training development and close evaluation and motoring of gender-sensitive work environments. The researcher recommends a yearly evaluation and monitoring of enhancing capability and development programs to promote gender sensitivity.

KEYWORDS: *Gender sensitivity, Public Safety, Capability, Job performance, Workplace*

INTRODUCTION

The gender and sexism discourse in relation to workplaces is finally taking shape in some organizations. Most workplaces have more men than women, and any majority enable privilege. The problem is that men are not trained to recognize the signs of sexism, which leads to discrimination in the workplace that can cause an unhealthy work environment. There is a great deal an employer can do to ensure that both men and women have a good work environment.

Increased gender equality and gender-sensitive systematic work environment management can contribute to a better work environment for everyone.

LITERATURE REVIEW

The concept of gender sensitivity has been developed to reduce barriers to personal and economic development created by sexism. Gender sensitivity helps to generate respect for the individual regardless of sex. Gender sensitivity is not about pitting women against men. On the contrary, education that is gender-sensitive benefits members of both sexes. It helps them determine which assumptions in matters of gender are valid and which are stereotyped generalizations. Gender awareness requires not only intellectual effort but also sensitivity and open-mindedness. It opens up the widest possible range of life options for both women and men (UNESCO, 2004 as cited by Fernandes, 2018).

Gender sensitivity means respect for an individual irrespective of his or her gender. It involves greater awareness of the needs, aspirations, abilities, and professional values of employees as men and women, without any prejudice about their gender. A neutral workplace creates the right conditions for the fullest utilization of human potential in the organizational setting. Thus, it is imperative for people within an organization to be aware of the widest possible range of life options for everyone (Career Institute, 2015).

The ability to recognize gender issues and to recognize women's different perceptions and interests arising from their different social positions and gender roles. Gender sensitivity encompasses the ability to acknowledge and highlight existing gender differences, issues, and inequalities and incorporate these into strategies and actions. It is about changing behavior and instilling empathy into the views that we hold about our own and other genders. It helps examine their attitudes and beliefs and question the realities they thought they knew (Sharma, 2016).

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Yamaguchi's study (2019) concluded that in Japan, women are discriminated against in male-type jobs. Male-type jobs provide higher wages, require longer training, and have different masculine characteristics. The same scenario occurs in Pakistan, where women's employment in higher-paying jobs is very limited, and their advancement is slow compared to men's. Most women occupy low positions, and they suffer from gender discrimination.

Meanwhile, the United Nations ensures gender-sensitive policing throughout the work of the United Nations Police (UNP) as an operational necessity to address the differentiated security needs of women, men, girls, and boys. The UNP integrates the different concerns and vulnerabilities into the design, implementation, monitoring, and evaluation of all police activities ("Gender Initiatives" , n.d.).

Workplace experience can be from the perspective of the organization and the employees. Addressing the first point, research on women within organizations attempts to link the presence of women with the bottom line of the company. A study by Catalyst (2007), as cited by Kaul (2009), states that companies with more Women Board Directors have higher Return on Equity (53%), Return on Sales (42%), and Return on Invested Capital (66%) than those with the minimal representation of women on board. Arguably, then it makes business sense to discuss the role of women within organizations.

According to the Global Aid Network (2019), in many developing countries, women are viewed as second-class citizens. In countries like Benin and Tanzania, the inequality between men and women is an accepted part of society, and often men are not aware that women are experiencing hardships because of their sex.

Moreover, according to the European Institute for Gender Equality (2015), gender awareness raising plays an important role in informing women and men about gender equality, the benefits of a more gender-equal society, and the consequences of gender inequality. It also intends to change attitudes, behaviors, and beliefs that reinforce inequalities between women and men.

According to Singh (2019), his study states that an intervention program to diminish gender insensitivity and sexual harassment can significantly improve the environment in the institute. It is important to understand that giving respect to the opposite sex not only creates a gender-sensitive environment but also encourages individuals to rise above their current level, seek new opportunities, and move beyond outdated traditional mindsets. The ability of an organization to identify and address gender inequality and discrimination is essential for creating a gender-sensitive and inclusive work culture. Ultimately, the goal is to achieve gender equality (Prabhakar, 2019). According to Anethol, Barcuss, and Cobb-Clark (2009), discrimination against women in the workplace also exists in other parts of the world. Women are often viewed as unfit for senior management positions due to the high proportion of male managers who see women as lacking suitability for these roles. Additionally, Wood and Eagly (2010) stated that stereotypes influence attitudes toward women's performance and their promotion to higher management ranks. Both male and female employees believe that women require more time to attain senior management positions due to gender stereotyping attitudes.

Meanwhile in the context of public safety, historically, women were excluded from policing because they were thought to be physically as well as temperamentally unsuited for the rigors of police work. Even though most evaluations of behavior on the street reveal few differences in the way men and women perform most tasks, many police officers, a academicians, and observers, believe that women bring a different set of attitudes and values to policing. However, there has been little research that either confirms or casts doubt upon these attitudinal differences. Although men and women may not be equally integrated into their jobs as police officers, there are few differences in the ways men and women see their role, their clientele, or their departments (Worden, 2005).

According to Vasko (2024), women in policing emerged in specialized role positions based on gender but replaced this ideal with demands for equality and participation in uniform patrol. The roots of women in policing can be traced by their earlier approaches to addressing society's troubles. Their introduction into the occupation was one of the earliest significant modifications to policing. They filled a special role in many agencies early in the 20th century and were eventually hired for their distributive skills in mediating problems associated with women and children. In addition, despite the limitations placed on most women in policing during the early 20th century, the roles of women in policing continue to face hostility and harassment. They are underrepresented, and only a few have advanced to command and supervisory positions. Although women have served as police officers in Canada for approximately four decades, they still comprise only a small proportion of this profession (Perrott, 2021). As such, national and provincial police organizations are currently employing recruitment strategies with the aim of addressing this gender disparity. Despite these initiatives, the role of females within law enforcement remains complex, controversial, and limited. The issues surrounding female police officers and their contributions to Canadian law enforcement, to identify officers' perceptions about females' appropriateness and capabilities as police officers, and to provide a current assessment of female officers' occupational experiences (Lappage, 2015).

Men are disproportionately represented in many institutions, including law, politics, academy, and the economy. Women have made great strides in increasing representation in many of these professions except for policing, where police departments have had difficulty hiring, retaining, and promoting female officers. On women in policing, it is largely theoretical and does not thoroughly address advancement barriers, the retention of women, and women's experiences, as well as coping and adaptation

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strategies in the gendered institution of policing (Shelley, Morabito & Tobin-Gurley, 2011).

Female officers in Dubai and Taipei were more likely than their male colleagues to view women as capable and effective in performing police duties. Compared to their colleagues in Taiwan, the Emirati male and female officers were more likely to be supportive of women's restricted role in policing. Dubai male officers were less likely to be receptive to working in a unit with a female as their supervisor in comparison to their female colleagues in both countries (Chu, 2018).

Women firefighters' response to the gendered work environment was either to downplay gender differences and accept unfavorable customs or to actively challenge the existing masculinized culture. Many fire departments were ill-prepared for the mixed-gender workforce, women were more often forced to adapt to the masculine culture, and morale issues would allow gender-based challenges to the existing culture. The fire services are described as a vocation where men must prove they can be firefighters; women must prove they can, in some sense, be men (Hollerback et al., 2019). In Australia, despite the increasing percentage of women entering masculinized workplaces, certain organizations consistently see little change in the gender makeup of staff. Women in rigidly gendered organizations are victimized due to their gender. Women firefighters were less interested in dismantling general stereotypes about women's abilities as firefighters as they were about proving themselves as exceptional compared to other women and, therefore, deserving of the role of firefighters (Stamarski & Son Hing, 2016).

Meanwhile, the gender situation in the Philippines is characterized by sharp contradictions. It graphically showcases samples of women's advancement in politics, academic and professional excellence, and even legislation. But this is contrasted by images of prostituted women, battered wives, economically disadvantaged women, and exploited migrant workers. The conception of women as full-time homemakers, as subordinate to men, violence against them is private, as a reserve labor force, and as sexual objects are now being eroded by modern women asserting themselves in many aspects of life. On the other hand, some are marginalized, discriminated against, or exploited by the harsh realities of the global economy and consumerism (Anonuevo, 2000). More and more Filipino women in uniform are proving they can do whatever their male counterparts can. Females from all over have long broken the mold, but in the patriarchal Philippines, women are at the forefront of national security - whether as police officers, firefighters, or soldiers. Now, Pinays in uniform prove that what men can do, they can do too (Robillos, 2015). In Dumaguete City, Philippines, women perform well in the field of firefighting and can still do their duties like men. In fact, a woman's tender and loving care is very beneficial to the victims to calm them down. Further, the Chief of the Regional Operations Division of the Bureau of Fire Protection Region 7 (BFP 7) stated that for the second year, they held the Female Olympics to show that women are as effective as men in firefighting and they want to eradicate the notion of gender bias in the BFP, women can also do what men can in terms of rescue and putting out flames. He noted an increase in the number of female applicants to the BFP, that females comprise 20% of BFP 7, and that number continues to rise as they attempt to create a fire station where all the firefighters and marshals are women. He also urged women to join the region's firefighting force, emphasizing that not only men can do this work. The risk of work should not cause any apprehension to women because they can also do it (Sunnexdesk, 2017).

There is no gender gap in the BFP. The Fire Officer 1 training to be a firefighter entails tons of hard work. Even though it is difficult in terms of training, it can be learned. It's tough but manageable. It's all in the mind. Women go through the same training as men undergo; they all go through the exact same thing in assignments as well as in academic requirements are the same for the enhancement of their job performance (Robillos, 2015).

The high commanders of BFP recognized that in the past, women were not recruited and hired because of the occupational culture that was exclusionary. There seemed to be unequal employment opportunities in recruiting, hiring, assigning, and promoting women generally in the tri-bureau but more particularly in the fire service. With the selfless support through training and education facilitated by the instructors mentioned above, notwithstanding the encouragement of the superiors and colleagues, these lady firefighters are heroes already, standing up bravely to fight fires and related eventualities. They are the personification of gender equality in all aspects, as they show that women are very much capable of becoming firefighters (Hollerbach et al., 2019).

Even though it is given that women are usually in a disadvantaged position in workplaces compared to men, the promotion of gender equality requires explicit attention to women's needs and idiosyncrasies. Recognizes that there are significant negative effects of unequal power relations and expectations of men and boys due to stereotyping about what it means to be a male. The lectures emphasize that everyone should be free to develop his or her abilities and make choices without limitations set by rigid gender roles and prejudices (Magalit, 2018).

Women in leadership positions face an impossible situation. They will either receive feedback highlighting their lack of feminine, communal attributes, criticizing them for taking too much power, or for lacking some key leadership qualification. No matter their leadership style, they are deemed unfit. Women received more negative leadership attributes in greater overall quantity and variety than men. Specifically, women were more likely to be described as inept, frivolous, gossipy, excitable, scattered, temperamental, panicky, and indecisive; in other words, a host of negative feminine stereotypes, and women were evaluated as incompetent and not qualified to be leaders (Smith et al., 2018).

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THEORETICAL/CONCEPTUAL FRAMEWORK

The researcher was guided by the following theories and concepts relevant to her research work, which were derived from her findings of related literature and studies.

Theory of Gendered Practices in Organizations.

A vast amount of literature attempting to explain the mechanism of women's marginalization in the workplace through various theoretical approaches has identified several organization processes apparently responsible for the continued incidence of gender discrimination in the workplace. The discriminator organizational practices not only limit the desired movement of talent between organizational ranks but also reportedly impact the quality of employees' organizational experiences rendering less positive attitudes of female employees toward their jobs and less engagement in the work (Welle & Heilman, 2005 cited by Ansari, Jabeen, Baig & Salman, 2016).

In relation to the study, this theory explains the work role of women in an organization and how women are treated and discriminated against. Thus, research on gender sensitivity in the government agencies' workplace is important as it is commonly exhibited in some government organizational workplaces. However, there is a need to determine the causes and the level of assessment to come up with a possible solution to the problem.

Gender Sensitization

Gender sensitization involves teaching gender sensitivity and encouraging behavior modification by raising awareness of gender equality concerns. This can be achieved by conducting various sensitization campaigns, training centers, workshops, programs, etc. (Sharma, 2016). The goal of gender sensitization is to address issues in gender equality and encourage participants to pursue solutions (Vasundhara, 2020).

In relation to the study, this theory supports the notion that awareness of gender sensitivity must be increased by determining its causes. This will enhance knowledge and address issues relevant to the problem being studied.

Social Role Theory

This theory argues that individuals assimilate a gender role depending on their sex and behave according to this role in society. Some scholars believe gender roles are the result of a socialization process starting in early childhood and developing during adolescence. This is consistent with the liberal feminist thought that through family, school, and media, society supports and encourages the development of specific skills and qualities that facilitate the assimilation of social roles. Once rooted in individuals, gender roles are applied to domestic and working life and reproduce from one generation to another. Sex division of labor goes back historically, when male strength was required for outdoor activities such as hunting, and women were seen as more fragile and assumed domestic responsibilities. However, such characteristics lose their relevance in today's post-industrial societies. Based on differences in social behavior, expectations for men and women have varied. By perpetuating these expectations from generation to generation, social behavior has profoundly influenced both genders, leading to sexual stereotypes. Hence, the stereotypes of social roles govern male and female behavior. In this respect, men develop "agentic" characteristics such as assertiveness, independence, and competence that align with male social role expectations. In contrast, women develop "communal" characteristics such as friendliness, generosity, kindness, and compassion that are consistent with female social role expectations. Consequently, based on such traits, men are considered breadwinners and women as homemakers (Diekman & Goodfriend, 2008).

Schematic Illustration of the Study

To have a clearer picture of how the interaction of these concepts is used in this study, a schematic illustration of the study is constructed and presented in Figure 1.

The Independent Variables will affect the dependent variable through the moderator variables. The independent variable contains the (1) perception of gender sensitivity in the workplace within the public safety sector in San Pablo City, Laguna, in terms of capability and job Performance, (2) the correlation between capability and job performance on gender sensitivity in the workplace of government agencies within the public safety sector, and (3) predictive influence of capability on job performance through regression analysis. The moderator variable that is assumed to affect the process contains the group of respondents, specifically the personnel in the Philippine National Police (PNP), Bureau of Jail Management and Penology (BJMP), and the Bureau of Fire Protection (BFP) in San Pablo City, Laguna.

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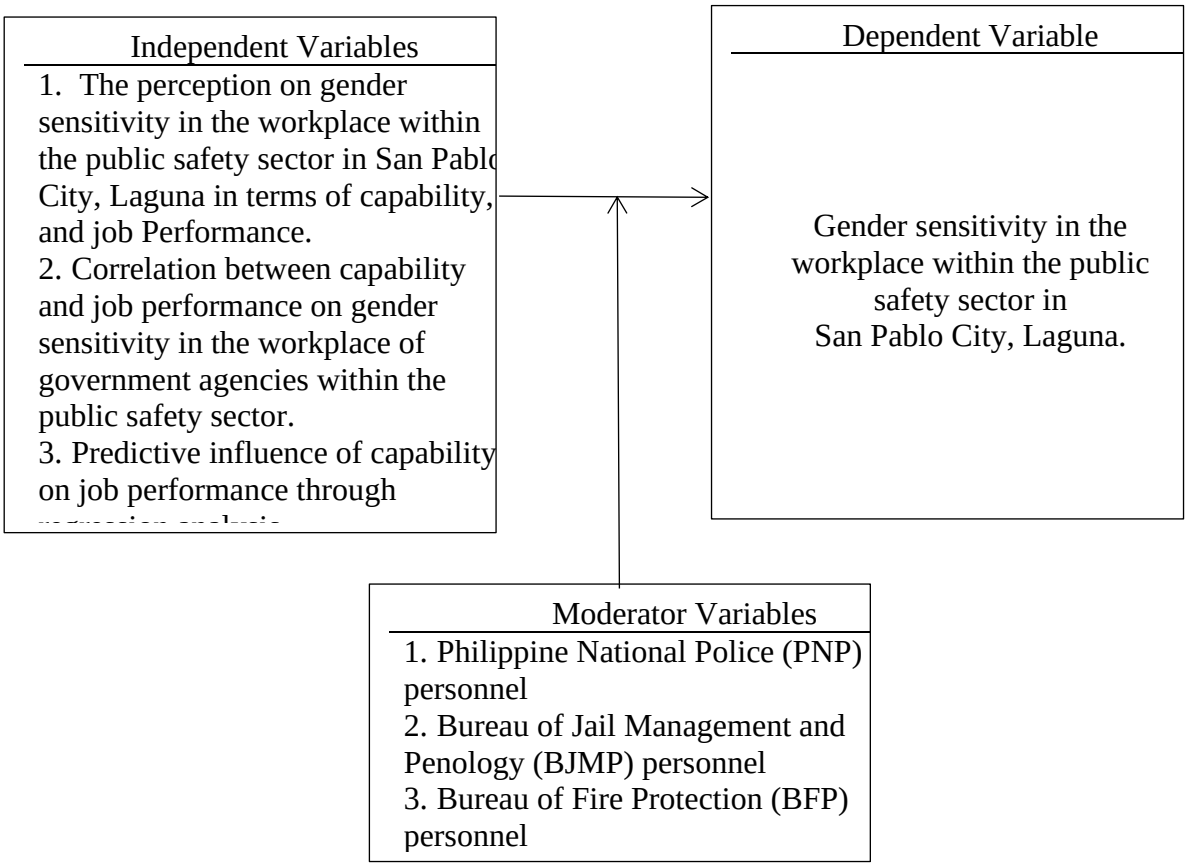


Figure 1. **Schematic Illustration of the Study**

SIGNIFICANCE OF THE STUDY

This study will be beneficial to the following.

The personnel of the Public Safety sector in this study will benefit them since they are constantly involved in the administration of the agencies and have direct experience relevant to the problem.

This study will benefit public safety sectors and government administrators, as they are the main anchors of the agency. It will also help them understand personnel perceptions of gender sensitivity in the workplace and determine possible remedies based on the results and discussion.

This study will benefit the Gender and Development Unit of Government Agencies by shedding light on the issue and providing them with an idea of what other remedies can be implemented to lessen the problem.

OBJECTIVES OF THE STUDY

To assess gender sensitivity in government agencies within the public safety
sector, focusing on the relationship between capability and job performance. Specifically, this study aims to (1) determine perceptions of gender sensitivity regarding capability and job performance, (2) examine the correlation between capability and job performance, and (3) analyze the predictive influence of capability on job performance through regression analysis.

STATEMENT OF THE PROBLEM

Specifically, this study sought to answer the following questions.

1. What is the perception of gender sensitivity in the workplace within the public safety sector in San Pablo City, Laguna, in terms of capability and job performance?
2. Is there a significant correlation between capability and job performance concerning gender sensitivity in the workplace within the public safety sector in San Pablo City, Laguna?
3. What is the predictive influence of capability on job performance through regression analysis on gender sensitivity within the public safety sector in San Pablo City, Laguna?

MATERIALS AND METHODOLOGY

Study Design

The researcher employed a descriptive-quantitative research design, using a survey questionnaire to gather accurate assessments from the respondents and conducting informal interviews to support and enhance the interpretation and analysis of the study findings.

Descriptive design deals with a situation that demands various techniques of
data gathering through survey questionnaires and informal interviews, which were eventually under the option of the researcher at the time the process of investigation was made.

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Population of the Study

The respondents were from the selected government agencies within the public safety sector in San Pablo City, Laguna, specifically the PNP, BJMP, and the BFP. Due to the nature of the job, gender or sex is highly observed in these agencies. Twenty-five personnel were chosen from each agency, for a total of 75 respondents. All respondents were full-time personnel who could accurately assess the problem being studied.

The respondents were selected through convenience sampling, where they were given equal chances to participate in the study based on their availability and convenient timing.

Data Gathering Tools

The researcher used a survey questionnaire as a data gathering tool composed of self-constructed indicators aligned to the specific and main problem of the study. The researcher also sought an authorized person to validate the self-constructed questionnaire to determine its validity and possible changes to enhance it. Afterward, since the tool was self-constructed, a reliability test was conducted using

Cronbach Alpha.

The survey questionnaire had two parts: the first part contained indicators on the perception of gender sensitivity in the workplace within the public safety sector in terms of Capability, and the second part was in terms of Job Performance. Each part was used to draw interpretations, findings, and conclusions.

Data Gathering Procedures

Before gathering data, the researcher sought the approval of the Chief or Head of Office of the selected government agencies within the public safety sector, specifically the PNP, BJMP, and BFP. Upon approval of the Chief or Heads, the researcher individually floated and explained the mechanics and contents of the survey questionnaire to better understand the group of respondents and avoid misunderstanding the purpose of the study.

After the respondents completed the survey questionnaire, the researcher personally collected and counted the data, then submitted it to the statistician for computing weighted means and conducting statistical treatments.

Treatment of Data

The study employed basic statistical tools such as frequency, mean, and standard deviation to determine the perception of gender sensitivity in the workplace within the public safety sector in terms of capability and job performance. Based on the 4-point Likert scale, it is followed by ranking for the interpretation and analysis of each indicator.

Furthermore, Pearson r correlation was used to test the significant relationship between capability and job performance. A regression analysis was also used to analyze the predictive influence of capability on job performance.

Ethical Considerations

The researcher considered the principles of voluntary participation, confidentiality of respondents' information and responses through consent forms, and to avoid potential harm among them. All gathered data was treated with utmost confidentiality and were used for education and research purposes only.

RESULTS AND DISCUSSION

The table below shows the results on the perception of gender sensitivity in the workplace within the public safety sector in terms of capability.

Table 1

Gender sensitivity in the workplace within the public safety sector in terms of capability.

	Indicators	Mean	SD	DI	Rank
1.	Women are primarily encouraged to apply for support roles (staff positions, administrative services and etc.) rather than for operational, technical, and general management.	3.00	.753	Agree	3
2.	There are equal career development opportunities for men and women.	3.32	.701	Strongly Agree	1
3.	Gender does influence your profession.	2.75	.807	Agree	5
4.	There is fair treatment in deployment.	3.24	.541	Agree	2
5.	Women must perform better than their male counterparts to be promoted to the same positions.	2.40	.658	Disagree	7
6.	Men get promoted more than women at workplace.	2.12	.614	Disagree	10
7.	The number of women penetrating the hierarchy and achieving senior positions is steadily rising.	2.51	.665	Agree	6
8.	Peers treat you differently because of your gender.	2.13	.577	Disagree	9
9.	Gender have influence on your decision-making in your workplace.	2.24	.694	Disagree	8
10.	Gender sensitivity exist in your workplace.	2.89	.815	Agree	4
	Overall Mean & Standard Deviation	**2.66**	**.392**	**Agree**	--

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Table 1 presents perceptions of gender sensitivity in the workplace within the public safety sector in terms of capability. The survey findings revealed that indicator 2, ranked first, "*there are equal career development opportunities for men and women,*" has obtained a mean of 3.32 with a descriptive interpretation of "Strongly Agree" and a standard deviation of .701. It suggests that respondents generally agree that career advancement opportunities are available equally across genders. Likewise, a standard deviation of 0.701 indicates that this perception is consistent among respondents, reflecting a positive view of gender equity in professional growth. Similaar findings was found by Robillos (2015) that more and more uniformed Filipino women prove they can do whatever their male counterparts do, whether as police officers, firefighters, jail officers, or soldiers and go through the same training and opportunities for the advancement of and enhancement of capabilities.

Indicator 3, ranked second, "*There is fair treatment in deployment,*" has obtained a mean of 3.24 descriptively interpreted as "Agree" and a standard deviation of .541. It implies a general agreement that deployment practices are fair regardless of gender, with a narrower spread of standard deviation of 0.541, pointing to even more consistency in perceptions on this indicator. Thus, there is equal opportunity among women and men in job opportunities and deployment within the public safety sector. These findings negate result of the study of Yamaguchi (2019) that male job deployment provides higher wages and requires longer training and different masculine characteristics. They found that employment of women in higher-paying jobs is very limited, and their advancement is slow compared to men. Most of the women occupy low positions and are suffering from gender discrimination.

Meanwhile, indicator 1 ranked third, *"women are primarily encouraged to apply for support roles (staff positions, administrative services etc.) rather than for operational, technical and general management"* has obtained a mean of 3.00 with a descriptive interpretation of "Agree" and a standard deviation of .753. It implies that, while overall seen as fair, there may still be traditional expectations or implicit biases about gender roles. This is similar to the claim of Sharma (2016) that the ability to recognize gender issues and to recognize women's different perceptions and interests arising from their different social positions and gender roles. Gender sensitivity encompasses the ability to acknowledge and highlight existing gender differences, issues, and inequalities and incorporate them into strategies and actions. However, the result of negates to the claim of Wood and Eagly (2010) that gender stereotyping influenced the attitude of women's performance toward promotion to higher management ranks. Both male and female employees believed that women need a longer time to be in senior management due to their gender stereotyping attitudes.

However, it was observed that indicators 6, 8, and 9 *"men get promoted more than women at the workplace", "peers treat you differently because of your gender"*, and *"gender have an influence on your decision-making in your workplace"* have obtained a mean of 2.40 (SD=.658), 2.13 (SD=.577), and 2.24 (SD=.694), with a descriptive interpretation of "Disagree." This means that respondents generally feel that promotions, peer treatment, and decision-making are not significantly impacted by gender, reinforcing a sense of fairness and neutrality on these fronts. It also implies that equal treatment and job opportunities are fairly observed and enjoyed by both genders/sexes within the public safety sector. If the negative impact of gender inequality is avoided, it obviously might greatly affect the self-confidence, job satisfaction, and career commitment of women in uniformed services. This result negates to what was found by Vasko (2024) and Lappage (2015) that despite limitations placed on most women in policing during the early 20th century, the roles of women continue to face hostility and harassment, and only a few have advanced to supervisory positions which also affects the appropriateness and capabilities as police officers.

In general, the perception of gender sensitivity in the workplace within the public safety sector in terms of capability has obtained an overall mean of 2.66 with a descriptive interpretation of "Agree" and a standard deviation of .392. It implies that there was general agreement on gender sensitivity in the workplace within the Philippine National Police, Bureau of Fire Protection, and Bureau of Jail Management Penology. Thus, gender equality and awareness are highly observed and promoted in the context of public safety. This finding is similar to the claim in the article by the European Institute of Gender Equality (2015) that gender awareness plays an important role in informing women and men about gender equality, the benefits of a more gender-equal society, and the consequences of gender inequality. In addition, similar findings were found by Prabhakar (2019) that the ability of an organization to identify and handle gender inequality underpins its success in the creation of gender-sensitive and inclusive work culture, which is also crucial in the public safety sector.

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Table 2

Gender sensitivity in the workplace within the public safety sector in terms of job performance.

	Indicators	Mean	SD	DI	Rank
1.	There is the same treatment with colleagues.	3.36	.607	Strongly Agree	3
2.	Job allows you to use personal initiative in carrying out the work regardless of gender.	3.39	.655	Strongly Agree	2
3.	Supervisors consider gender in delegating job assignments.	3.05	.715	Agree	5.5
4.	Receive equal respect you deserve from your colleagues.	3.43	.574	Strongly Agree	1
5.	Satisfied with your involvement in decisions that affect your work.	3.05	.695	Agree	5.5
6.	Working harder at your job because of your gender.	2.43	.738	Disagree	9
7.	Enough and equal opportunities for advancement in your job.	2.89	.669	Agree	7
8.	Women at your workplace receive opportunities than men.	2.15	.512	Disagree	10
9.	Enough and equal opportunities for career advancement in my department/unit.	2.87	.723	Agree	8
10.	Job gives equal opportunity for freedom in how you do your work.	3.15	.651	Agree	4
	Overall Mean & Standard Deviation	**2.98**	**.426**	Agree	--

Table 2 presents the perception of gender sensitivity in the workplace within the public safety sector in terms of job performance. The survey findings revealed that indicator 4, ranked first, "*receive equal respect you deserve from your colleagues,*" has obtained a mean of 3.43 with a descriptive interpretation of "Strongly Agree" and a standard deviation of .574. It indicates that respondents strongly agree they receive respect from colleagues, regardless of gender. This suggests a positive and respectful work environment where respect is distributed equally, enhancing workplace morale and job satisfaction. This also indicates the significance of gender awareness within the work environment. This finding is similar to the article published by Career Institute (2015) that greater awareness of the needs, aspirations, abilities, and professional value of employees as men and women, without any prejudice about their gender. A gender-neutral workplace creates the right conditions for utilizing human potential in the organizational setting. Moreover, the same result were found by Fernandes (2018) that gender sensitivity helps to generate respect for the individual regardless of sex, which helps promote enhancing workplace morale and job satisfaction.

Indicator 2, ranked second, "*job allows you to use personal initiative in carrying out the work regardless of gender,*" has obtained a mean score of 3.39 with a descriptive interpretation of "Strongly Agree" and a standard deviation of .655. It implies that employees feel empowered to use their initiative and skills without gender-based limitations. The relatively low standard deviation indicates consistent experiences among respondents, reinforcing a sense of autonomy in job performance. Similar findings were found by Magalit (2018) that there are significant negative effects of unequal power relations and expectations of men and boys due to stereotyping about what it means to be a male. Everyone should be free to develop his or her abilities and make choices without limitations set by rigid gender roles and prejudices.

Meanwhile, indicator 1, ranked third, *"There is the same treatment with colleagues,"* has obtained a mean of 3.36 with a descriptive interpretation of "Strongly Agree" and a standard deviation of .607. This reflects a workplace that strives for fairness and equality in treating employees, which can enhance job satisfaction and performance across gender lines. In the context of public safety, gender equality promotes the enhancement of job performance, which also contributes to an optimistic work environment, especially in this modern era. Sex discrimination can also likewise be avoided through positive and fair treatment of both sexes. This is similar to the claim of Antecol, Barcuss, and Clark (2009) that discrimination against women in the workplace also exists in other parts of the world and that sex discrimination is one of the main factors which influence worker's job satisfaction and worker's intention to quit affecting job performance and work environment.

However, it was observed that indicators 8 and 6, *"women at your workplace receive opportunities than men"* and *"working harder at your job because of your gender,"* obtained a mean of 2.15 (SD=.512) and 2.43 (SD=.738), respectively, with a descriptive interpretation of disagree. This disagreement indicates that respondents do not feel women receive preferential opportunities, nor do they feel that they need to work harder solely because of their gender. These scores suggest that, in general, gender does not impose additional effort requirements or favoritism in terms of job performance. This result is the same to the findings in the

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study of Hollerbach et al. (2015) that in the past, women were not recruited and hired because of occupational culture that was exclusionary within the public safety sector and there seemed to be unequal employment opportunities but with selfless support through training, gender equality in all aspects show that women are very much capable of. Women can also do what men can in terms of public safety.

In general, the perception of gender sensitivity in the workplace within the public safety sector in terms of job performance has obtained an overall mean of 2.98 with a descriptive interpretation of "Agree" and a standard deviation of .426. It suggests a positive perception of gender sensitivity regarding job performance in government agencies within the public safety sector. Similarly, gender sensitivity in government agencies' workplaces is largely upheld in terms of job performance, with employees perceiving respect, autonomy, and equal treatment. Minor reservations may exist, hinting at the potential need for further gender sensitivity training to ensure consistent agency experiences.

Table 3

Correlation between capability and job performance on gender sensitivity in the workplace within the public safety sector

		Capability	Job Performance
Capability	Pearson Correlation	1	.292*
	Sig. (2-tailed)		.011
	N	75	75
Job Performance	Pearson Correlation	.292*	1
	Sig. (2-tailed)	.011	
	N	75	75

**Significant at 0.05*

Table 3 presents that Pearson r correlation was performed to test the significant relationship in the perception on gender sensitivity in the workplace within the public safety sector in terms of capability and job performance. The results show a positive significant relationship between the capability and job performance of the employees in the Philippine National Police, Bureau of Fire Protection, and Bureau of Jail Management and Penology, *r*(.292*), p=.011. It reflects a positive relationship between capability and job performance in these government agencies. Although this correlation is moderate, it suggests that as gender sensitivity in terms of capability increases, so does job performance among employees. In other words, when employees perceive a workplace to be more supportive of their capability, they are likely to perform better. It implies that fostering gender-sensitive practices that support the capabilities of both male and female employees can enhance job performance in the PNP, BFP, and BJMP. For instance, providing equal opportunities for skill development, career growth, and unbiased treatment may lead to better outcomes in terms of productivity and job effectiveness.

Table 4

Predictive influence of capability on job performance using regression analysis on gender sensitivity within the public safety sector

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
Capability	(Constant)	1.860	.310		6.001	.000
	Job Performance	.269	.103	.292	2.608	.011
F=6.804, Sig.= .011, r square = .085						

Table 4 presents the results of a regression analysis assessing the perception of gender sensitivity in the workplace within the public safety sector. The analysis focused on the influence of capability on job performance in public safety contexts. The R-squared value of 0.085 indicates that capability explains approximately 8.5% of the variance in job performance. While this is a relatively low percentage, it demonstrates that capability has some predictive power for job performance, suggesting that other factors may also play significant roles in determining performance outcomes.

The model's F-statistic (F = 6.804, p = .011) is statistically significant, indicating that capability significantly predicts job performance. This significance level implies that the observed relationship between capability and job performance is unlikely to be due to random chance. In terms of effect size, the unstandardized coefficient (B = 0.269) suggests a positive association, where each unit increase in capability corresponds to an increase of 0.269 in job performance, holding other variables constant.

Additionally, the standardized coefficient (Beta = 0.292, p = .011) suggests that capability is a statistically significant predictor of job performance in gender-sensitive workplaces within the public safety sector. This finding underscores the potential benefits of enhancing employee capability through targeted interventions, such as training or skills development programs, to improve job performance outcomes in gender-sensitive

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environments.

CONCLUSION AND RECOMMENDATIONS

Conclusion

Gender sensitivity in the workplace within the public safety sector is highly perceived and need the consistent gender equality and awareness within the workplace of public safety sector is observed through capability training and interventions, such as training development, close evaluation, and monitoring of a gender-sensitive work environment.

Recommendations

1. A gender sensitivity training at least once a year to ensure consistent experiences across the public safety sector to be led by the Gender and Development Unit in collaboration with the Department Heads.
2. A gender sensitivity awareness program will be launched every year in conjunction with the celebration of Gender Awareness, which is celebrated every third month of the year.
3. A yearly evaluation and monitoring of enhancing employee capability and development programs to promoting gender sensitive environments that helped in enhancing job performance among personnel..

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ADVERSE DRUG REACTION

Mr.Abhijeet Maroti Giri[1]*. Dr.Swati Rawat[2], Dr.Sunil S. Jaybhaye[3], Mr.Avinash Hatkar[4] Ms. Pooja Mule[5]

[1]Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Jalna.
[2]Departmet of Principal, Institute of Pharmacy, Badnapur, Jalna.
[3]Department of Pharmacology, Institute of Pharmacy, Badnapur, Jalna.
[4]Department of Pharmacognosy, Institute of Pharmacy, badnapur, Jalna.
[5]Department of Faculty, Institute of Pharmacy, Badnapur, Jalna.

ABSTRACT

Treatment decisions should be based on high-quality data, ideally obtained from randomized controlled trials. However, randomized trials are not immune from bias and other important limitations. Critical appraisal of such studies must consider both the methodological rigour of the study and the applicability of the results to routine clinical practice.Readers should work systematically through trial reports to establish the aims of the study and consider whether the methods used are able to provide an unbiased answer. Particular attention should be directed towards randomized patient allocation, ensuring that the treatment and control groups are equally balanced at the start. There should be adequate follow-up and sufficient blinding of the investigator and participants so that important outcomes are reliably recorded without any interference from preconceived notions. The trial's Results section should be reviewed to confirm that the researchers have transparently reported all data (positive or negative) relevant to the study question. Critical appraisers should also consider how closely the conduct of the trial (e.g. selection of patients, follow-up arrangements) reflects real-world medicine, and the applicability of the trial results to everyday clinical practice.

KEYWORD : *Clinical trials; critical appraisal; evidence-based medicine; intention-to-treat; MRCP; publication bias; randomization; reporting bias*

1 .INTRODUCTION

Adverse Drug Reactions (ADRs) are unintended, harmful effects that occur when a medication is administered at its normal dosage for the prevention, diagnosis, or treatment of a disease. These reactions represent a significant concern in healthcare due to their impact on patient safety, treatment outcomes, and the overall cost of medical care. ADRs can range from mild, self-limiting symptoms to severe, life-threatening conditions, making their identification and management a critical component of clinical practice.

The World Health Organization (WHO) defines an ADR as "a response to a drug which is noxious and unintended, and which occurs at doses normally used in humans for the prophylaxis, diagnosis, or therapy of disease, or for the modification of physiological function." Unlike side effects, which can be both beneficial and harmful, ADRs are exclusively harmful and require attention to ensure patient well-being.

ADRs are influenced by various factors, including patient characteristics, drug properties, and environmental or genetic factors. Their unpredictable nature often complicates treatment regimens and necessitates a careful approach to prescribing and monitoring medications. With the increasing prevalence of polypharmacy and complex treatment protocols, ADRs have become a leading cause of morbidity, hospitalizations, and even mortality worldwide. Understanding ADRs is, therefore, essential for healthcare professionals to improve drug safety and optimize therapeutic outcomes.

2. DEFINITION OF ADRS

According to the World Health Organization (WHO), an ADR is defined as:
"A response to a drug which is noxious and unintended, and which occurs at doses normally used in humans for the prophylaxis, diagnosis, or therapy of disease, or for the modification of physiological function."

ADRs are distinct from drug side effects, as side effects can include both beneficial and harmful effects, whereas ADRs exclusively refer to harmful responses.

3. TYPES OF ADVERSE DRUG REACTIONS

1. Type A (Augmented) Reactions

These are dose-dependent and predictable based on the pharmacological properties of the drug. They are often related to the drug's therapeutic effects but occur to an exaggerated degree.

- Examples:
  - Sedation from antihistamines (e.g., diphenhydramine).
  - Hypotension from antihypertensive drugs (e.g., beta-blockers).

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- Gastrointestinal upset from nonsteroidal anti-inflammatory drugs (NSAIDs).
- Characteristics:
  - Usually related to the drug's primary or secondary pharmacological effects.
  - More common and easier to anticipate.
  - Can often be managed by adjusting the dose or discontinuing the drug.

2. Type B (Bizarre) Reactions

These are dose-independent and unpredictable. They are often immune-mediated or related to genetic factors, making them less foreseeable.

- **Examples:**
  - Anaphylaxis (severe allergic reaction) to penicillin.
  - Stevens-Johnson syndrome (skin and mucosal eruption) due to anticonvulsants or sulfonamides.
  - Hemolytic anemia caused by certain antibiotics (e.g., penicillin).
- **Characteristics:**
  - Often related to individual susceptibility, such as genetic variations or immune system responses.
  - Rare, but can be severe or fatal.
  - Requires immediate medical intervention and discontinuation of the offending drug.

3. **Type C (Chronic) Reactions**

These are related to prolonged use of a drug and occur after long-term administration. They are often related to drug accumulation or chronic toxicity.

- **Examples:**
  - **Osteoporosis** or **fractures** with long-term use of corticosteroids.
  - **Kidney damage** from long-term use of nonsteroidal anti-inflammatory drugs (NSAIDs).
  - **Liver damage** from chronic use of alcohol or certain hepatotoxic drugs.
- **Characteristics:**
  - Develop after extended exposure to the drug.
  - Can be minimized by monitoring for side effects and adjusting dosages.

4. **Type D (Delayed) Reactions**

These reactions manifest after a long latency period, sometimes months or years after exposure to the drug. They may be related to carcinogenesis or teratogenicity.

- **Examples:**
  - Cancer due to chemotherapy agents like alkylating agents.
  - Birth defects from drugs like thalidomide or isotretinoin.
- **Characteristics:**
  - May not become apparent until after prolonged exposure or years after the drug has been discontinued.
  - Can have severe, long-lasting consequences.

5. Type E (End-of-Treatment) Reactions

These reactions occur after discontinuation of a drug, particularly if the drug was stopped abruptly.

- **Examples:**
  - Withdrawal symptoms **(**e.g., from benzodiazepines or opioids**).**
  - Rebound hypertension after stopping an antihypertensive like clonidine**.**
  - Adrenal insufficiency after abrupt cessation of corticosteroids.
- **Characteristics:**
  - Occur when the drug is withdrawn too quickly or not tapered properly.
  - Can be prevented by proper discontinuation protocols.
  -

6. Type F (Failure) Reactions

These occur when the drug **fails to produce the desired therapeutic effect**, often due to issues like drug interactions, incorrect dosing, or patient noncompliance.

- **Examples:**
  - **Inadequate blood pressure control** with an antihypertensive due to drug resistance or noncompliance.
  - **Antibiotic treatment failure** due to bacterial resistance.
- **Characteristics**
  - Can result from incorrect drug selection, inadequate dosage, or resistance.
  - Requires a reassessment of the treatment plan.

Other Important Classifications:

- Allergic Reactions**:** Immune-mediated responses, ranging from mild rashes to severe anaphylaxis**.**
- Idiosyncratic Reactions: These are unusual responses that do not follow typical patterns of ADRs and are often unpredictable, potentially related to genetic or immune factors.
- Toxic Reactions: Result from high doses or prolonged exposure, leading to toxicity to organs like the liver or kidneys.

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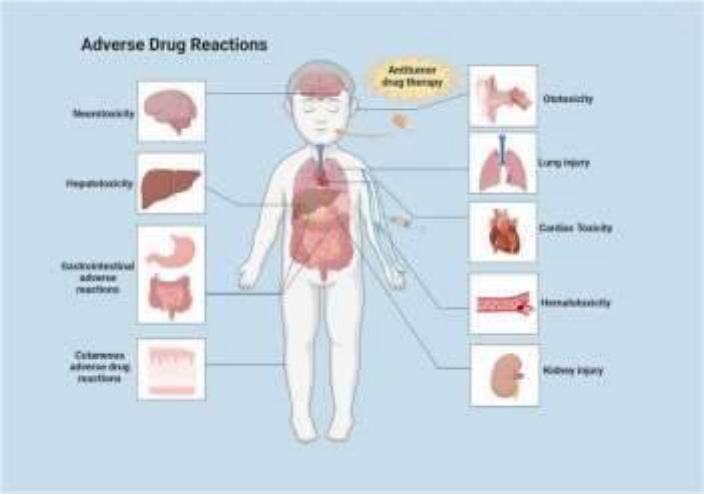


(Fig : Types of ADR)

4. CAUSES OF ADRS

Several factors contribute to the development of ADRs, including:

1. Polypharmacy: The use of multiple medications increases the risk of drug interactions and ADRs.
2. Patient Factors: Age (elderly and children are more vulnerable), genetic predispositions, comorbidities (e.g., liver or kidney disease).
3. Dosage Errors: Incorrect dosing can lead to toxicity or therapeutic failure.
4. Drug Interactions: Concurrent use of drugs that potentiate or inhibit each other's effects.
5. Allergic Reactions: Hypersensitivity to certain drugs, often unpredictable.



(Fig : Causas of ADR)

5. IMPACT OF ADRS

ADRs can have widespread implications for patients and healthcare systems:

1. On Patients

Increased morbidity and mortality.
Reduced quality of life.
Non-compliance with treatment due to fear of side effects.

2. On Healthcare Systems

Prolonged hospital stays and additional treatments.
Increased financial burden on healthcare providers and patients.

3.Effective Strategies Can Minimize The Occurrence And Impact Of Adrs:

1. Patient Education: Informing patients about potential side effects and signs of ADRs.

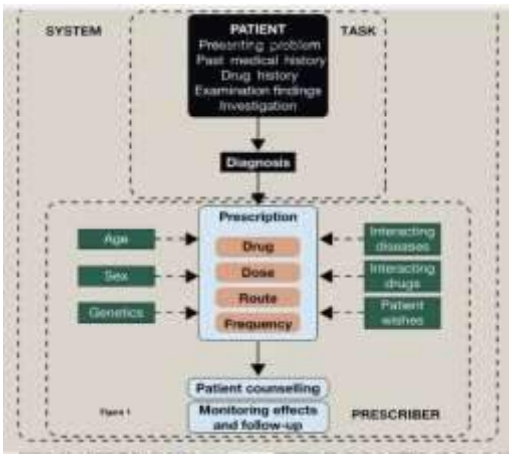
2. Monitoring and Reporting: Regular monitoring of drug levels and patient symptoms. Adverse events should be reported to pharmacovigilance centers.

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3. Personalized Medicine: Tailoring drug therapy based on genetic profiles, especially in cases of hypersensitivity or idiosyncratic reactions.
4. Dose Adjustments: Modifying doses in vulnerable populations like the elderly, children, or patients with organ impairments.
5. Avoiding Polypharmacy: Simplifying drug regimens to reduce interactions and errors.
6. Global Statistics: ADRs are among the leading causes of hospital admissions in many countries.
They account for 5-10% of hospitalizations globally and are a significant cause of mortality.

6. METHODS OF DATA ANALYSIS AND FOLLOW-UP

There are numerous reasons why patients drop out of trials, with the consequences of incomplete or missing outcome data. Some decide to withdraw after experiencing adverse effects, while others give up because they feel no better on the trial treatment.
This potentially leads to a situation where the only people who persevere with trial follow-up are the ones who are doing well, without any adverse reactions. If drop-outs are not accounted for in the statistical analysis, the trial results can be misleading because these remaining patients are not representative of those who were originally randomized to the specific interventions (Figure 1).
To get round this type of bias, 'intention-to-treat' analysis is carried out. All randomized patients are included in the analysis according to the assigned treatment group, irrespective of whether or not the treatment and follow-up were completed in the specified manner. If such analysis is not possible, the trial should report on the number who dropped out, and the reasons Why.



7. PRESCRIBING IN HEALTHCARE

Prescribing of medicines is central to the work of trainee doctors in most developed countries. They write a large proportion of the
prescriptions (medication orders) in most hospitals, and the task is high-stakes for all concerned. For patients, medicines are a major influence on present and future health outcomes. For doctors and hospitals, prescribing represents an important source of clinical risk and cost. Prescribing is also arguably one of the most complex intellectual challenges trainee doctors face. Prescribers have to select the correct medicine, dosage, route and frequency of administration, sometimes in the face of diagnostic uncertainty, taking into account predicted individual variability in drug-handling and response as a consequence of co-morbidity, genetics and
interacting drugs (Figure 1).l Given that individual patients hav

8. PRESCRIBING ERRORS

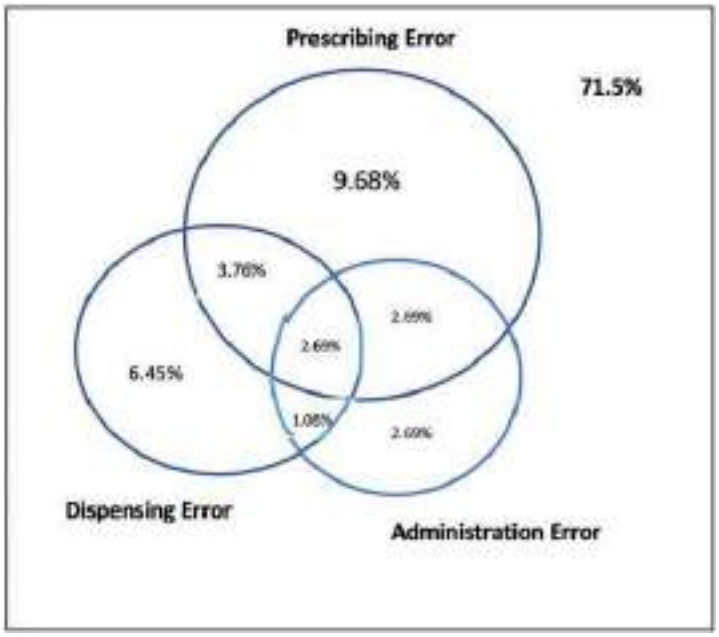
Given the complexity of the prescribing process, it is unsurprising that studies consistently find evidence of poor prescribing in all areas of healthcare. A prescription can be considered to contain an error if it results in either: (1) a significant reduction in the probability of treatment being timely and effective, or (2) a significant increase in the risk of harm, when compared with generally accepted practice. Additional failures of the prescribing process considered in some studies are underprescribing (failure to prescribe a medicine that is indicated), overprescribing (prescribing a medicine that is not indicated or with which the patient is not concordant) and failing to put in place adequate monitoring arrangements.

9. COMMON PRESCRIBING ERRORS

Type of error Frequency (%)
Medication omitted 29
Incomplete prescription 16
Incorrect dose:
C Sub-therapeutic 8
C Supra-therapeutic 5
Incorrect frequency:
C Correct total daily dose 1
C Incorrect total daily dose 7
Medication prescribed without indication 5
Duplication of therapy 5
Inappropriate abbreviation 4
Incorrect timing 3
Omission of prescriber's signature 3
Incorrect formulation 2
Illegible 2
Missing instructions for use 3
Incorrect drug 1
Significant drugedrug interaction 1

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Incorrect route 1	<1
Incorrect duration 1	Patient allergic to medication prescribed
Contraindication to medication 1	<1
Wrong patient	



(Fig : Common Prescribing Errors)

10. OTHER WAYS OF IMPROVING PRESCRIBING

Prescribers themselves play a major role in delivering safe, effective and error-free drug therapy. However, there are other important means of achieving optimal prescribing and reducing errors, based on ameliorating the factors listed in Table 2.

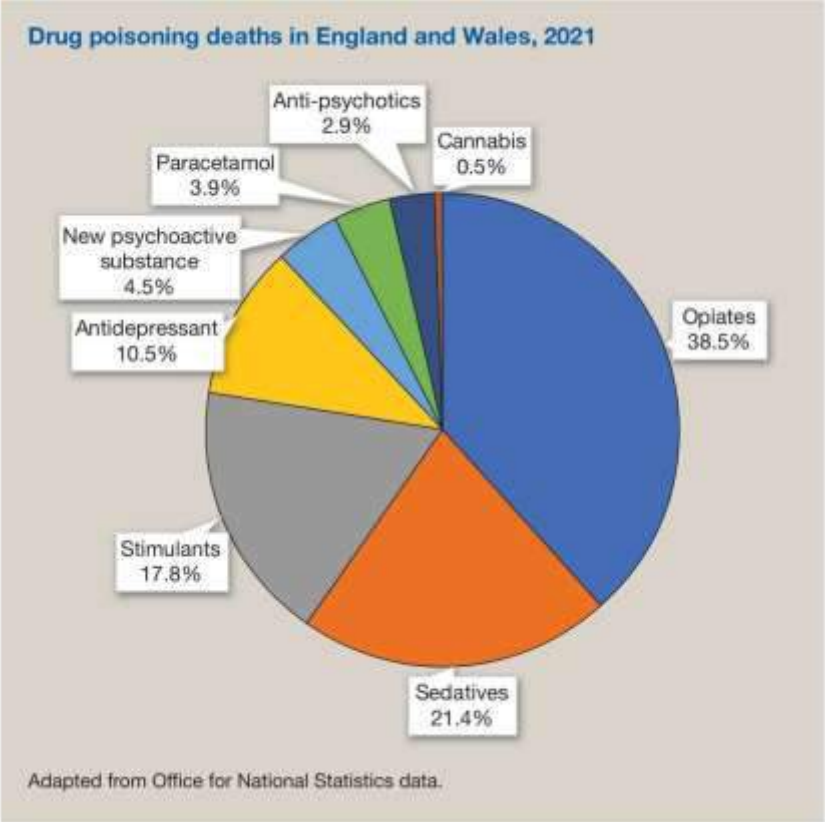
Task factors Errors are more likely when inexperienced prescribers are required to treat complex patients using medicines with which they are unfamiliar or which are associated with significant risk of adverse effects. These situations can be minimized if prescribers work in supportive environments where they care for appropriate patients, under supervision, and feel able to ask for help at any time, without prejudice.

System factors The systems in which prescribers work are often suboptimal,emphasizing the importance of adequate training and preparation as an important defence and source of resilience. The working environment could be improved in several ways:

Clinical pharmacy service e pharmacists improve medicines safety by advising prescribers at the point of care (e.g. on ward rounds), scrutinizing prescriptions beforeadministration and supporting medicines reconciliation on admission and discharge from hospital. They also have an important role in educating and reinforcing good prescribing habits.

Electronic prescribing e this requires prescribers to enter the details of prescriptions into a computerized system that can also offer some clinical decision support by drawing on;individual patient details from the electronic health record. Prescribers can be provided with relevant information and Priorities in the emergency treatment of poisoning When caring for the patients who are undifferentiated or have potentially time-critical pathologies, clinicians should consider the order in which management priorities are addressed. Immediately life-threatening issues should be identified and managed using standard Airway, Breathing, Circulation and Disability protocols; consideration may need to be given to using personal protective equipment. Decontamination should be considered once the patient is stabilized (or separately, while stabilization is continuing). Advice on these approaches in the UK is provided by national advisory groups, such as NHS England, the UK Health Security Agency and the Joint Emergency Services Interoperability Programme. Subsequently, additional relevant assessments can include:
electrocardiogram analysis (i.e. rhythm, QRS duration, QT interval)blood gas analysis (i.e. pH, lactate, anion gap, calculated osmolarity)blood glucose and temperature (often forgotten in disability assessment) toxidrome (toxic syndrome) identification (Table 2) specific investigations (e.g. paracetamol concentration,

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(Fig : Drug Poisoning Death in England And Wales)

The broad Categories of poisoning requiring emergency care :

The broad categories of poisoning requiring emergency care

Cause	Example
Use of illicit drugs	Heroin, benzodiazepine, cocaine or amphetamine toxicity
Self-harm ingestions	Paracetamol overdose, antidepressant overdose
Unintentional (accidental) poisoning	Cognitive impairment leading to excess anticoagulant ingestion
Body packing or stuffing	Drug smuggling. Short-notice concealment of poorly packed drugs by ingesting them or inserting them into cavities
Exploratory poisoning	Paediatric ingestion of detergent capsules
Environmental exposure	Carbon monoxide poisoning
Industrial exposure	Hydrocarbon exposure in oil and gas workers
Ocular or dermal exposure	Caustic agents
Envenomation	*Vipera berus* (adder) envenomation
Major incident or mass casualty events	Salisbury poisonings (Novichok)

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Classical toxidromes

Toxidrome	Example agent	Mechanism	Symptoms	Antidote
Anticholinergic	Tricyclic antidepressants	Block binding of acetylcholine to receptors	Confusion, agitation, flushed dry skin, dilated pupils, hypertension, tachycardia, hyperthermia, urinary retention, decreased bowel motility	Supportive care (physostigmine is not routinely recommended in the UK because of concerns of asystole; use is more common in Australia and the USA)
Cholinergic	Organophosphorus compounds	Inhibition of cholinesterases	Variable, depending on level of nicotinic/muscarinic activation. Sweating, lacrimation, bronchorrhoea/spasm, pupillary constriction, decreased consciousness, vomiting, defecation, urination, respiratory failure	Atropine (and pralidoxime for organophosphorus insecticides or nerve agents)
Opioid	Heroin	μ-Opioid receptor activation	Reduced respiratory rate, decreased consciousness, pupillary constriction	Naloxone
Sedative-hypnotic	Benzodiazepine	Enhanced GABA receptor binding (sedative-hypnotic is a broad category with many alternative mechanisms)	Decreased level of consciousness, ataxia, dysarthria	Supportive care (flumazenil is not routinely recommended because of concern of refractory seizures, but it may have a role in selected patients)
Sympathomimetic	Cocaine	Adrenoreceptor activation	Hypertension, tachycardia, agitation, tremor, seizures, dilated pupils, hyperthermia, sweating	Sedative, typically benzodiazepines

GABA, γ-aminobutyric acid.

(Fig : Classical Toxidromes)

11. DEALING WITH UNCERTAINTY IN EMERGENCY CARE

Emergency care of undifferentiated patients is a careful balance of being guided by pre-test probability while avoiding anchoring bias.

Clinicians can obtain information about emerging drug trends (thusimproving their pre-test probability) from a variety of sources. Multi-agency drug alerts are often circulated to emergency department staff, and the Royal College of Emergency Medicine (RCEM) issues 'safety FLASH' alerts nationally that aim to identify emerging trends for recreational drugs and unintentional poisoning. When better informed, clinicians must avoid anchoring bias,and recognize when new information means a prior diagnosis becomes unlikely. For example, clinicians are often witnessed to give naloxone to patients with a decreased level of consciousness, even in the absence of bradypnoea or pupillary constriction to support a diagnosis of opioid toxicity. When unsure, the good clinician seeks guidance.

When managing patients with an unclear diagnosis, it is important to anticipate the potential risks and benefits of treatment. Used injudiciously, naloxone can precipitate opiate withdrawal, activated charcoal can cause aspiration (rare), and sodium bicarbonate can cause hypernatraemia. Supportive care is often the mainstay of care even in severe toxicity, because innate detoxification mechanisms often succeed given sufficient time Planning in emergency care It is easier to ensure satisfactory outcomes if issues have been anticipated and addressed. The NPIS and RCEM produce guidelines on antidote stocking for emergency departments. The antidotes shown in Table 3 are those it is felt should be immediately available in any emergency department. Unfortunately, compliance with these guidelines is frequently poor. Some presentations require extremely high doses of antidote tocking. For example, glucagon antidote therapy (often trialled in severe b-adrenoceptor blocker and calcium channel blocker toxicities) can require 10 mg of glucagon every hour, which can easily exhaust hospital stocks. Similarly, organophosphorus poisoning can easily deplete a hospital's entire stock of atropine. Large stocks of some antidotes are held by ambulance services (e.g. atropine) and in regional centres (e.g. pralidoxime). Major incident plans should address how these stocks can be accessed when needed, and all hospitals should ensure that their antidote quantities are stocked in line with recommendations. The future of the emergency treatment of poisoning Clinical knowledge in toxicology is always increasing, and the speed of knowledge translation to direct clinical care is being reduced by online medical education resources and podcasts.

While this undoubtedly makes a difference to patients on a caseby-case basis, clinicians caring for individuals with poisoning would benefit from an increased understanding of the specific reasons for poisoning attendances. Current primary prevention in toxicology is limited, and these insights would allow for both continued lobbying for regulatory change when clear issues are identified, and local solutions to emerging problems

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Toxicology care is now largely protocolized. While this has significant benefits (supporting clinicians caring for rare presentations, reducing variability in quality of care), the future islikely to see an increased focus on identifying patients who would benefit from variations in standard care, including, for example, antidote administration earlier than normal or in different doses. Finally, toxicology is currently largely focused on the prevention of injury through supportive care and antidote therapy. When antidotes do not work, and significant injury occurs (e.g.hepatotoxicity after paracetamol overdose), there are limited options. Future research in toxicology may identify routes by which to reverse injury when patients with established injury present to emergency departments; awareness of these therapies and how to use them will be critical.

12. ADVERSE EFFECTS AND LIMITATIONS

Adverse Drug Reactions (ADRs)

ADRs are unintended, harmful reactions to a drug administered at normal doses for prevention, diagnosis, or treatment. They are a significant concern in clinical practice and can range from mild symptoms like nausea to severe effects such as organ failure or death.

Adverse Drug Effects (ADEs)

ADEs encompass any injury resulting from drug use, including ADRs, medication errors, or improper usage. While ADRs occur despite appropriate use, ADEs can result from both proper and improper drug administration.

Common Adverse Drug Reactions

1. Gastrointestinal effects: Nausea, vomiting, diarrhea.
2.Allergic reactions: Rash, itching, anaphylaxis.
3. Central nervous system effects: Drowsiness, dizziness, confusion.
4. Cardiovascular effects: Hypotension, arrhythmias.
5. Hepatotoxicity: Liver damage.
6. Nephrotoxicity: Kidney damage.Nephrotoxicity: Kidney damage.
7. Blood dyscrasias: Anemia, leukopenia, thrombocytopenia.

Limitations of ADR Reporting

1. Underreporting: Many ADRs go unreported, especially mild ones.
2. Subjectivity: Variability in perception and reporting by healthcare professionals and patients.
3. Delayed effects: Some ADRs manifest long after drug exposure, complicating detection.
4. Complexity: ADRs may be mistaken for symptoms of underlying conditions.
5. Bias: Reporting may focus on severe or well-known ADRs, ignoring subtle or less common effects.
6. Limited population diversity: Clinical trials often exclude certain demographics (e.g., pregnant women, elderly), making ADR data less generalizable.
7. Insufficient monitoring systems: Inadequate post-marketing surveillance limits ADR detection.

13.MANAGING ADRS

Prevention: Use patient history, avoid polypharmacy, and adjust dosages for specific populations (e.g., elderly, renal impairment).
Monitoring: Regular follow-ups and blood tests for at-risk drugs (e.g., hepatotoxic or nephrotoxic drugs).
Education: Inform patients about possible ADRs and the importance of reporting symptoms.
Pharmacovigilance: Strong reporting systems (e.g., WHO's VigiBase) are crucial for early detection of ADRs.
Would you like a deeper discussion on ADR management or pharmacovigilav Managing ADRs:
Prevention: Use patient history, avoid polypharmacy, and adjust dosages for specific populations (e.g., elderly, renal impairment).
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Would you like a deeper discussion on ADR management or pharmacovigila system

14 . THERE ARE TWO GROUPS OF INTRABODY

Endoplasmic reticulum intrabodies produced as singlechain fragment variables. These small single polypeptides contain the variable light chain and variable heavy chain of an antibody connected by a flexible linker peptide.

Single-domain antibodies are small molecules (about 15 kDa) composed of a variable domain of the heavy chain but completely devoid of the light chain; they retain the ability to bind antigens with high specificity and affinity.Intrabodies have several potential applications in canc

15. HOW CAN DRUG THERAPY BE MONITORED?

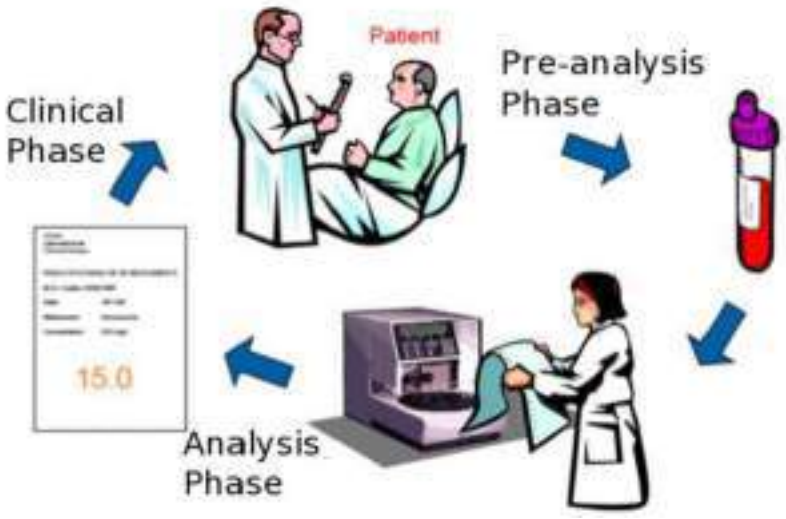
Monitoring using clinical and surrogate endpoints

In general, monitoring parameters are most informative if theyare closely related to the clinical outcome that the treatment is intended to produce (Figure 1). Indeed, wherever possible, it is best to monitor the clinical endpoint itself. A clinical endpoint is a ‘characteristic or variable that reflects how a patient feels,functions, or survives’.1 For example, when a benzodiazepine is administered to allow an interventional procedure to be performed, the clinical endpoint e sedation e is usually readily apparent. The drug dosage can be titrated to achieve the required level of sedation.

Often, however, measuring the effect of the drug on the clinical endpoint is impractical or cannot readily be used to guide therapy. This could be because the clinical endpoint is an event that cannot be detected until it is inevitable or irreversible, as in preventive therapy (e.g. anticoagulation to reduce the risk of stroke in atrial fibrillation). Alternatively, it could be because theclinical endpoint is a delayed event, which cannot be measured until after treatment has finished. For example, the clinical endpoint in the treatment of pneumonia e cure of the

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infection,most reliably confirmed by the complete resolution of symptomse may not be measurable until weeks after the treatment course has ended. In these situations, a surrogate endpoint may be required.



(Fig : . How Can Drug Therapy Be Monitored)

16 THE PRACTICALITIES OF DRUG CONCENTRATION MEASUREMENT

When is measurement of Drug Concentration Indicated?

Sampling can be indicated if:3there is (or, in the case of a preventive therapy, could be) an inadequate clinical response, which might be attributable to sub-therapeutic concentrations or incomplete adherence it is difficult to determine clinically whether an adverse event is the result of drug toxicity or a feature of the underlying condition (e.g. renal impairment in a person with sepsis can be a manifestation either of the disease or of aminoglycoside toxicity) there is a change in circumstances that can alter theplasma drug concentration. For example, if a patient taking lithium requires antihypertensive therapy with a thiazide diuretic or angiotensin-converting enzyme inhibitor, one should be alert to the risk of a drugedrug interaction leading to lithium accumulation. Monitoring lithium concentrations is essential in this context. Similarly, clearance of gentamicin depends on renal function; if this is fluctuating, more frequent monitoring can be required.

When should samples be taken?

Timing in relation to doses: the concentration of a drug rises and then falls during the dosage interval. The interpretation of measurements made during the initial absorption and distribution phases is complex and usually uninformative. It is therefore generally best to take samples during the elimination phase, such as at the end of the dosage interval (a 'trough' or 'pre-dose'concentration). Whatever time is selected, it is essential that it is accurately recorded with the measurement request, otherwise interpretation is impossible.

Timing in relation to the start of the treatment regimen: after the introduction of a medicine, the drug accumulates in the body. At some point, provided the situation remains stable, a state of equilibrium is reached at which the amount of drug administered in a given period is equal to the amount of drug eliminated during that period. This is termed steady state. The time taken to reach steady state depends on the half-life (t½) of the drug. A good rule of thumb is that steady state is achieved five half-lives after the introducing the drug or changing the dosage regimen. For example, the antibiotic vancomycin has a half-life of approximately 6 hours. After starting treatment, it takes approximately 30 hours (5 6 hours) for steady state to be achieved (Figure 3a). Only at this point can the plasma concentration associated with that dosage regimen be reliably assessed.

Likewise, if the dosage is changed, it takes another 30 hours before a new steady state is reached. There are, however, circumstances in which it can be useful to measure concentrations before steady state is reache

17. HOW DO THE RESULTS GUIDE TREATMENT?

Interpreting the target range: the target range is derived from population studies. Natural interindividual variation dictates that

some people do not derive therapeutic benefit within the population target range, and others experience toxicity below the population toxicity range.

Other variables can also influence the target range. For example, phenytoin is heavily protein bound, but only the unbound drug exerts an effect. If the measured concentration includes both the unbound and protein-bound fractions (i.e. it is a'total' concentration), a low total concentration could be associated with a therapeutic or toxic concentration of unbound drug in the presence of hypoalbuminaemia.4 It is therefore more informative to measure only the unbound (free) fraction. If this facility is unavailable, a mathematical correction can be

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applied to allow the total concentration to be assessed against the standard target range (Table 1).
The concept of diminishing returns: as discussed in 'Pharmacodynamics and pharmacokinetics for the prescriber' (pp. 1e10 of this issue).

18. THE IDEALIZED TIME-CONCENTRATION RELATION FOR ADSORPTION (ADR)

typically describes how the concentration of a solute or adsorbate decreases in solution over time due to adsorption onto a solid adsorbent. This relationship is commonly modeled using different adsorption kinetics, depending on the system's physical and chemical conditions.

Here are the most common models

1. Lagergren's Pseudo-First-Order Model

This model assumes that the rate of adsorption is proportional to the difference between the equilibrium adsorption capacity and the amount adsorbed at time .

\frac{dq_t}{dt} = k_1 (q_e - q_t)

The integrated form is:

\ln(q_e - q_t) = \ln(q_e) - k_1 t

Where:

: Adsorption capacity at time (mg/g or mol/g)

: Adsorption capacity at equilibrium

: Pseudo-first-order rate constant

2. Pseudo-Second-Order Model

This model assumes the adsorption rate is proportional to the square of the difference between and .

\frac{dq_t}{dt} = k_2 (q_e - q_t)^2

The integrated form is:

\frac{t}{q_t} = \frac{1}{k_2 q_e^2} + \frac{t}{q_e}

Where:

: Pseudo-second-order rate constant

3. Intraparticle Diffusion Model

This model considers diffusion within the pores of the adsorbent as the rate-limiting step:

q_t = k_i t^{0.5} + C

Where:
: Intraparticle diffusion rate constant
: Constant related to the boundary layer effect

4. Elovich Model

Often used for chemisorption, this model assumes a logarithmic decrease in the adsorption rate over time:

\frac{dq_t}{dt} = \alpha e^{-\beta q_t}

The integrated form is:

q_t = \frac{1}{\beta} \ln(\alpha \beta) + \frac{1}{\beta} \ln(t)

Where:

: Initial adsorption rate

: Desorption constant

5. Langmuir Adsorption Dynamics

For systems where adsorption follows Langmuir isotherm behavior:

C_t = C_0 e^{-k_a t}

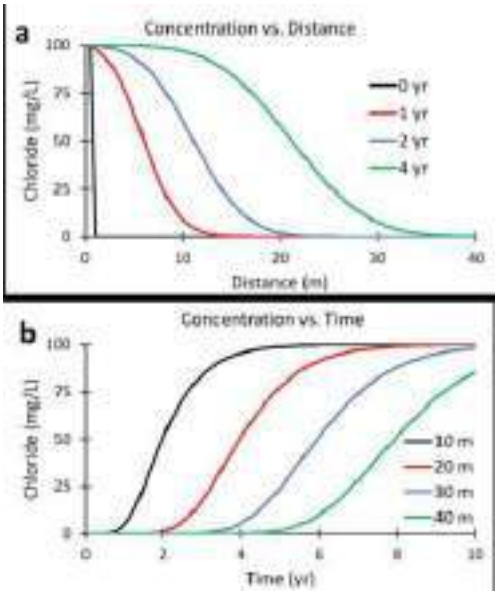
Where:
: Solute concentration in the solution at time

: Initial solute concentration

: Adsorption rate constant

The choice of the model depends on experimental conditions, the type of adsorption process, and the nature of the adsorbent and adsorbate.

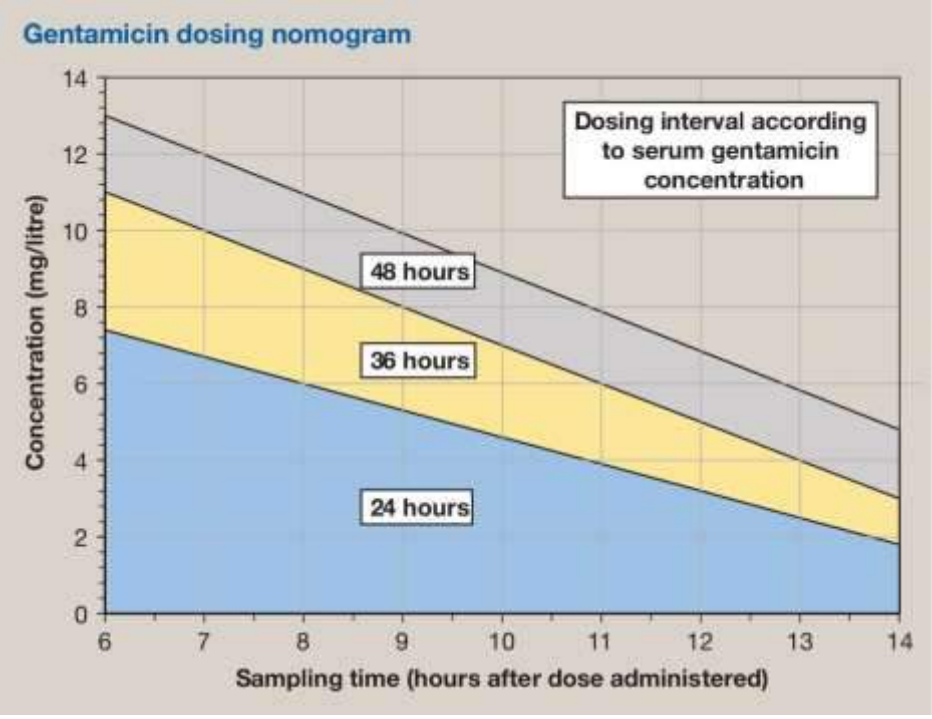
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(Fig : The idealized time-concentration relation for adsorption (ADR))

19.GENTAMICIN DOSING NOMOGRAM

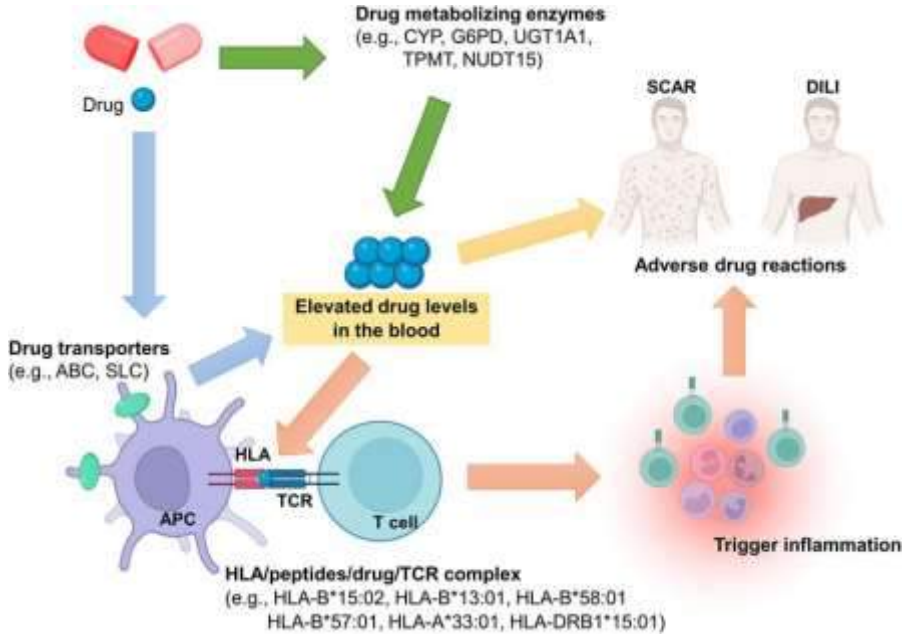
Gentamicin is monitored using the Hartford nomogram which relates observed concentration to the time post dose within a given concentration range. The dose is calculated as detailed below and repeated at 24 hour intervals or longer. interpretation of measured level The Gentamicin level is evaluated via the Hartford nomogram. interval will be recommended as 24, 36 or 48 hours respectively. If the level falls on the line, the longer dosing interval will be recommended.



20. ABNORMAL DRUG METABOLISM

Changes that alter the rate of metabolism of a drug also alter the amount present at the site of action, and thereby the extent and duration of the beneficial and adverse effects. The most important enzymes responsible for drug metabolism are the hepatic microsomal oxidases (cytochrome P450 system), of which CYP2D6 and CYP3A4 are especially relevant

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(Fig Abnormal Drug Metabolism)

21 .DETECTION AND DIAGNOSIS

When harm occurs during or after drug treatment, it may have been caused the drug but could also be a manifestation of the disease for which the drug was being taken, or it may haven another cause. In the simplest case, the reaction is identified by its close relationship in time to drug, exposure, its resolution when the drug is stopped (de-challenge) and sometimes, its emergence when the drug is restarted (re-challenge).

However,this clear relationship seldom occurs in practice. Some reactions (e.g. teratogenesis and neurodevelopmental disorders in offspring from in utero drug exposure) only become evident long after exposure. Some (including fatal reactions) are irreversible,and some occur only when several factors coincide and do not recur at re-challenge.

22.PREVENTING ADVERSE DRUG REACTIONS

While some ADRs are unpredictable e such as anaphylaxis in a patient after their first exposure to a penicillin-containing antibiotic e many are preventable with adequate foresight and monitoring. Interventions that reduce the probability of an ADR occurring are important to reduce the risk of patient harm.

There are two basic steps that can be followed to reduce risk: identify the subgroup of patients who are likely to be susceptible to the adverse effect and modify the treatment choice accordingly ensure that the treatment plan mitigates any possible adverse effects.

23. CONCLUSION

As medication experts, pharmacists are a vital part of the treatment team, especially when an ADR occurs. Treating an ADR consists mainly of supportive therapy with symptom management. Furthermore, additional steps should be taken to determine the cause of the patient's symptoms and whether they can be attributed to the use of a drug.

Begin by evaluating the nature of the event. Thoroughly review the medical history available in the patient's chart. Identify and document the clinical reaction, including the patient's subjective report of symptoms. Review the patient's medication list, and then use references such as product inserts, MedWatch reports, and published literature to evaluate whether the reaction is known to occur with any of the drugs the patient has taken. Classify the severity of the reaction. A severe reaction is fatal or life threatening; the drug should be discontinued and not rechallenged. A moderate reaction requires an antidote, a medical procedure, or hospitalization. In many cases, this may mean discontinuing the drug. Mild reactions have symptoms that often require thereapy discontinuation. It is possible that the therapy can be reinitiated with an adjustment in dosage if management of the disease state warrants continuation. Incidental reactions have mild symptoms; patients can choose whether to discontinue treatment, depending on their tolerability of the ADR. After the reaction is evaluated, the cause of the reaction should be established, if possible. Tools such as the Naranjo algorithm or the Liverpool ADR causality assessment tool can be used to assist in determining causality. Check to make sure the ADR is not caused by a medication error; this could influence whether a treatment is continued or discontinued. If the reaction can be attributed to a drug, a suggestion is to update the patient's allergy profile with the name of the drug and a brief description of the reaction.

Finally, take corrective action and follow up. Prescribers should be educated on the ADR. If necessary, a formulary review should be done to determine whether an alternative

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EXPLORING UNIVERSITY ENGLISH TEACHING IN THE CONTEXT OF ARTIFICIAL INTELLIGENCE

Su Chengchieh
Associate Professor, School of Foreign Languages and Culture, Zhaoqing University

ABSTRACT
This study examines the integration of Artificial Intelligence (AI) in university English teaching, focusing on its impact on educational technology and personalized learning. It highlights the challenges students face in mastering English, including limited exposure, lack of practice, and inconsistent feedback, and explores how AI can address these issues by providing personalized feedback and fostering independent learning. The article further discusses the challenges and opportunities of incorporating AI into existing teaching methods, emphasizing the need for ongoing research into AI's long-term effects on language development. It advocates for a balanced approach that combines AI tools with traditional teaching methods to enhance English education in the AI era. The article concludes by proposing strategies to improve university English instruction, such as strengthening institutional support, enhancing teachers' digital skills, and promoting students' digital literacy. Ultimately, it suggests that the future of English teaching lies in the synergy between AI and traditional methods, aiming to improve language education while preserving the essential human aspects of teaching.

KEYWORDS: *Artificial Intelligence (AI), University English Teaching, Educational Technology, Personalized Learning*

1. INTRODUCTION

English serves as a vital global bridge that unites people from diverse backgrounds, especially in areas like intercultural communication, international trade and diplomacy. While English's prevalence is undeniable, many learners continue to struggle with mastering the language, particularly when it comes to acquiring the skills necessary for effective instruction. Students often face challenges such as limited exposure to English, inadequate real-world practice opportunities, and inconsistent feedback from instructors. These issues can significantly impede students' ability to develop essential language skills, such as grammatical precision, fluency, and the capacity for nuanced self-expression. Unfortunately, traditional teaching approaches often fall short of addressing these obstacles.

In recent years, as a multidisciplinary field, artificial intelligence (henceforth AI) blends elements from computer science, cybernetics, psychology, neurophysiology, linguistics, and other domains (Bin & Mandal, 2019; Crompton & Burke, 2023; Pokrivčáková, 2019). Within the realm of education, and particularly in English language teaching, AI has emerged as a promising tool to help address longstanding challenges. This paper investigates how AI might be leveraged to tackle these difficulties, especially in the context of university-level English instruction. Specifically, it explores how AI can deliver personalized feedback and foster independent learning, both of which are crucial for improving English proficiency (Chun, 2017; Wei, 2023; Wang & Li, 2018). Additionally, the paper examines the challenges and opportunities that arise when integrating AI into existing teaching methodologies. With the rising global demand for English proficiency, particularly in non-English-speaking regions, AI-based language learning solutions are becoming more crucial than ever.

The aim of this paper is to explore how AI can improve teaching and learning outcomes in university-level English instruction. The focus will be on how AI can support both educators and students in advancing language skills while also examining the difficulties of incorporating AI into traditional educational frameworks. Moreover, this study highlights the need for ongoing research into the long-term impacts of AI on students' English language development, advocating for a balanced teaching approach that combines AI-driven tools with conventional methods to further enrich English education in the era of AI.

2. LITERATURE REVIEW

The application of AI in English teaching can be explored through various language acquisition theories. For example, Communicative Language Teaching (CLT) emphasizes the communicative function of language, and AI in language learning often plays a role in providing personalized feedback and interactive experiences. AI technologies, such as ChatGPT and other deep learning-based models, can offer context-specific practice that aligns with learners' current language levels, gradually increasing in difficulty, in line with Input Hypothesis (Krashen, 1982). This hypothesis posits that learners acquire language most effectively when exposed to input that is just beyond their current proficiency level. AI, by providing personalized, progressively challenging language input, supports language acquisition (Shatri, 2020; Rahimi & Fathi, 2022). However, AI tools have limitations in facilitating social interaction in language learning. Although AI can simulate dialogue, it lacks the rich, authentic human interaction that is central to sociocultural learning theories (Thorne, 2016). Hence, AI should complement, rather than replace, traditional teaching methods.

AI significantly impacts English learning by providing supportive tools for both teaching and learning. One of the most

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prominent AI applications is Automated Essay Scoring (AES) systems, which offer automated feedback on writing, helping learners improve grammar, syntax, and style, especially for non-native speakers (Loraksa & Peachavanish, 2007). However, these tools also have limitations, particularly in assessing higher-order cognitive skills such as critical thinking and creativity in writing (Balfour, 2013). Thus, AI should be used as a supplementary tool, rather than the sole evaluator.

Another important development is the use of intelligent tutoring systems, such as Duolingo, which uses AI to personalize language lessons and engage students through interactive activities. Research shows that these tools positively impact vocabulary acquisition and basic grammar skills (Vesselinov & Grego, 2012). In addition, speech recognition technologies, like Amazon Alexa and Google Assistant, offer learners an interactive platform to practice speaking skills (Sindermann et al., 2021). While AI tools are versatile, they may overlook the social and collaborative aspects of language learning, which are central to many traditional teaching approaches. Accordingly, AI should be incorporated into the classroom in ways that enhance communicative, task-oriented, and collaborative learning, rather than replacing or diminishing the role of human interaction.

Understanding how learners perceive and interact with AI tools is crucial for assessing their effectiveness. Many students report positive experiences with AI-powered applications, especially in terms of personalization and immediate feedback. AI platforms enhance engagement and offer personalized learning experiences, ultimately boosting motivation and fostering self-regulated learning (Wei, 2023). AI tools like chatbots and speech recognition software provide a non-judgmental environment where students can practice without fear of embarrassment or failure. This has been shown to increase learner confidence and motivation, particularly for shy or introverted students who may hesitate to participate in traditional classroom settings (Li, 2020). However, while AI can simulate conversational interactions, it cannot replicate the emotional and social nuances of human communication (Annamalai et al., 2023). As such, over-reliance on AI could lead to disengagement, as learners may feel disconnected from the learning process due to the lack of human interaction.

AI holds immense potential to revolutionize English language teaching and learning, yet challenges remain, particularly in integrating it with traditional teaching methods. For AI to be a constructive adjunct to teaching by humans, it is crucial that its integration is deliberate and mindful, particularly with respect to factors like student involvement. Further research is needed to explore how AI can be integrated with existing language teaching methodologies and its impact on learners' cognitive, social, and emotional development. As AI technologies continue to evolve, it is essential to strike a balance between technological innovation and human-centered pedagogical practices, ensuring that AI enhances language learning without replacing the essential role of human teachers.

3. UNIVERSITY ENGLISH TEACHING IN THE AGE OF AI

In today's educational landscape, university English instruction predominantly follows a model that consists of lecture, practice and assessment. In this conventional model, the teacher is the central figure in the teaching process. However, this traditional approach struggles to ignite students' interest in learning, and in the era of the internet, education cannot progress efficiently without the support of AI. Although there have been attempts to implement student-centered flipped classrooms in university English teaching, the overall results have been less than satisfactory.

The arrival of AI in education has given rise to AI-powered tools and their application in teaching. Unlike traditional classroom instruction, AI offers a platform for information sharing and stores vast amounts of teaching resources in the cloud, allowing both teachers and students to access rich educational content anytime and anywhere. The role and value of AI in education have been widely adopted and promoted in university English teaching across higher education institutions. Platforms such as Google Cloud, Microsoft's Azure, and Hugging Face, based on AI, offer a one-stop service for teaching, learning, assessment, and research. These platforms feature rich learning resources, engaging content and effective tools that support both personal computers and mobile devices.

University English teachers, as collaborators, facilitators, and transmitters of data and information, can leverage AI to improve teaching methods, making them more targeted and individualized to meet students' needs. On the other hand, AI should serve to support both teachers and students, adapting to their needs and demonstrating its application value and advantages. It follows that the relationship between artificial intelligence and educators is one of synergy and reciprocal advantage. AI education, as a product of the internet age, is crucial for teachers, enriching teaching methods and content, boosting student engagement, and ultimately improving teaching quality. Hence, it is essential to view the development of AI alongside teachers, rather than seeing AI as a replacement for educators.

With the introduction of AI technology, the roles and positions of both teachers and students in the university English teaching system will undergo fundamental changes. The activities, tasks, and assessments involved in teaching will also transform, leading to the emergence of new models of English teaching.

3.1 The Roles of Teachers and Students

In the AI-driven education era, AI can assist English teachers in course design and the personalized adjustment of teaching content. For example, AI can generate customized learning materials based on students' English proficiency and learning progress, and even help teachers grade assignments, check grammar, and correct spelling errors, thus alleviating the workload of educators. Traditional face-to-face teaching may integrate with online learning tools, as AI supports blended learning models, making classroom time more flexible. For instance, students can engage in self-directed learning through

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AI-powered platforms, while teachers can enhance learning outcomes through online feedback and personalized tutoring. Additionally, AI can analyze students' learning progress and provide individualized learning recommendations. This allows university English teachers to offer more targeted guidance based on the students' learning needs. For example, areas where students may struggle in listening, speaking, or writing can be strengthened through AI tools for practice and feedback, enabling teachers to adjust the content more effectively. AI can analyze students' learning data to help teachers understand which teaching methods are effective and which areas need adjustment, thereby optimizing course design.

For learners, AI can tailor learning content according to students' English proficiency and interests, allowing them to learn at their own pace. For instance, AI can automatically adjust learning plans based on the analysis of students' error records, progress, and participation, enabling students to master knowledge more efficiently. Through AI-driven learning platforms, students can engage in English study anytime and anywhere, receiving real-time feedback. Particularly in areas such as writing, speaking, and listening, AI can provide automatic scoring and improvement suggestions, helping students to continuously improve. Moreover, AI technology offers more opportunities for students to engage in self-directed learning. They can use intelligent assistants for language practice, participate in virtual conversations, simulate different learning scenarios, and engage in repeated practice, thus filling learning gaps outside the classroom. Crucially, AI can facilitate students in engaging in English conversations with people from around the world through virtual exchange platforms, fostering cross-cultural communication skills. This global interaction opportunity may be more diverse and enriching than traditional classroom interactions. Students can also enhance the practicality of their language learning through AI applications such as speech recognition, translation tools, and grammar checkers. These tools help students overcome language barriers and improve their language expression and comprehension skills.

3.2 Teaching Activities

AI has the potential to revolutionize English teaching by generating personalized content and activities tailored to each student's learning progress, interests, and needs. Rather than relying on a one-size-fits-all curriculum, English teachers can leverage AI tools to customize lessons for students of different levels and abilities. For instance, AI can suggest reading materials, listening exercises, or writing prompts that match the students' proficiency levels, ensuring that the learning experience is both relevant and effective.

Furthermore, AI enhances the efficiency of grading and feedback. It can automatically grade assignments, particularly in areas such as grammar, spelling, and sentence structure. Once students submit their work, AI provides quick and detailed feedback, highlighting errors and offering targeted practice to help reinforce learning. This process not only saves teachers significant time on grading but also allows them to concentrate on more meaningful classroom interactions and individualized support for students.

In addition to grading, AI facilitates the design of interactive learning activities through intelligent platforms. These platforms enable teachers to create virtual conversations, speech recognition exercises, and listening comprehension drills that actively engage students. Such activities help improve students' practical language skills, particularly in speaking and listening. Moreover, AI allows teachers to monitor real-time student participation, ensuring that they can offer immediate, personalized guidance where needed.

Lastly, AI plays a key role in optimizing teaching strategies by collecting and analyzing student learning data. By examining factors such as online participation, test performance, and assignment completion, AI provides valuable insights into classroom progress. This enables teachers to identify areas where students may be struggling and adjust their teaching methods accordingly. With continuous feedback from AI, teachers can refine their lesson plans and course content, ensuring that their teaching always meets students' evolving needs. Additionally, AI supports blended learning models, where students complete independent tasks online while classroom time is dedicated to interactive discussions, maximizing the effectiveness of both in-person and digital learning experiences.

3.3 Teaching Evaluation

AI can provide personalized assessment plans tailored to students' learning progress and needs. Unlike traditional standardized tests, AI is capable of continuously monitoring students' performance, analyzing their strengths and weaknesses, and automatically generating assessment content that is aligned with their proficiency levels. This approach allows teachers to gain a more accurate understanding of each student's learning status, which in turn enables them to implement more targeted and effective teaching strategies.

In addition, AI technology enables instant feedback, especially in areas like speech recognition and essay grading. For instance, when students practice speaking, AI can evaluate their pronunciation, grammar, and vocabulary usage, providing specific suggestions for improvement. This immediate feedback is crucial, as it helps students promptly correct their mistakes and enhance their learning efficiency. As a result, students benefit from continuous guidance, which helps them make faster progress in their language skills.

Moreover, AI can process vast amounts of data, including students' learning behaviors, test results, and study time. By analyzing this data, AI can identify patterns in students' learning and detect potential issues, providing teachers with insights into which teaching methods are most effective and which students may require additional support. Furthermore, this data-driven approach can be used to evaluate the effectiveness of teaching content and methods, helping educators make data-informed decisions to improve the overall learning experience. Additionally, AI helps minimize human bias, ensuring fairness in the evaluation process by adhering to consistent and transparent grading standards.

Finally, AI plays a significant role in reducing the workload of teachers by automating certain aspects of assessment. For example, AI can replace manual grading, particularly in essays

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and multiple-choice questions, using natural language processing technology to assess the quality of students' writing, detect grammar and spelling errors, and offer suggestions for improvement. This not only ensures a more objective and consistent evaluation process but also allows teachers to dedicate more time to interactive classroom teaching and individualized support for students.

4. STRATEGIES FOR ENHANCING UNIVERSITY ENGLISH TEACHING IN THE AGE OF AI

4.1 Strengthening Institutional Support

The government and educational institutions should introduce relevant policies to guide the integration of AI into English language teaching. For instance, they should establish clear standards for the use of AI tools, ensuring that these technologies adhere to educational ethics and quality requirements. Policies should prioritize critical issues such as data privacy and security to prevent the misuse of students' personal information, while also ensuring transparency and fairness in AI applications. Additionally, the government could offer financial support and incentives to encourage schools and teachers to explore and apply AI technology, ultimately enhancing the quality of education.

While AI technology holds significant potential, its successful application still depends heavily on teachers' understanding and mastery of the tools. Consequently, educational institutions must provide comprehensive training for teachers, helping them learn how to effectively apply AI in the classroom, utilize AI tools to enhance teaching outcomes, and interpret the data analyses provided by AI systems. This training should cover essential areas such as using AI for personalized instruction, automating grading processes, and adjusting teaching strategies based on AI feedback. Furthermore, schools should offer ongoing technical support to ensure that teachers can effectively use AI platforms and tools with confidence.

Moreover, educational institutions should actively encourage and fund research into AI's role in English language teaching, exploring how AI can further improve teaching effectiveness. Through research, institutions can evaluate the practical impact of various AI tools, analyzing their strengths and weaknesses to continuously refine teaching methods. These findings will help institutions make informed decisions, while also providing more efficient and effective AI-assisted teaching solutions for both teachers and students. It is also crucial that AI applications consider the diverse needs of all students, ensuring equal access to AI tools to avoid exacerbating educational inequality. By ensuring that AI services are personalized and cater to students' individual learning needs, whether they are struggling or excelling, educational institutions can provide targeted support for all learners. Additionally, AI's ability to support blended learning models, combining online and face-to-face instruction, should be promoted, allowing students to engage in self-directed learning outside of class while benefiting from personalized teacher guidance during in-class time.

4.2 Improving Teachers' Information Technology Skills

To enhance their information technology (IT) skills, teachers can take advantage of numerous online platforms that offer courses specifically designed for educators. Websites like Coursera, edX, Udemy, and LinkedIn Learning provide access to courses on a variety of topics, including AI in education, digital tools for teaching, coding, and data analysis. By enrolling in these courses, teachers can learn at their own pace and gain valuable insights into integrating AI and other technologies into their classrooms. Many of these platforms also offer certificates, which can enhance a teacher's professional profile and demonstrate their commitment to technological advancement in education. Vitally, to effectively address the lack of student interest in traditional teaching models, teachers can leverage AI to design personalized, interest-based learning materials and incorporate gamified activities, while simultaneously utilizing teacher-led interactive strategies to create a more engaging and emotionally supportive learning environment.

In addition to online courses, teachers can participate in free or low-cost webinars and virtual conferences organized by universities, tech companies, and educational associations. These events help teachers stay updated on the latest trends in AI and digital tools, while also offering practical advice, case studies, and demonstrations on how to apply these technologies in the classroom. Furthermore, webinars provide opportunities for networking and collaboration, allowing educators to connect with peers and experts in the field, which can enrich their learning and professional growth.

Another effective way for teachers to improve their IT skills is through hands-on experience with AI tools and educational software. Many platforms offer free trials or versions for educators, which enables teachers to explore these tools on their own. By experimenting with AI in areas such as lesson planning, grading, and student assessments, teachers can familiarize themselves with how AI can assist in personalized learning. Additionally, teachers can join online communities and forums where they can share experiences and insights, ask questions, and learn from colleagues who have successfully integrated AI into their classrooms.

4.3 Enhancing Students' Digital Literacy

In the age of AI, students can enhance their digital literacy by engaging with a variety of online resources. Platforms like Coursera, edX, and Khan Academy offer structured courses on topics such as coding, data analysis, and digital media, which help students build a solid foundation in technology. These courses not only provide valuable skills for both academic and personal use but also offer certifications that can boost students' resumes and digital competence.

In addition to formal courses, students can further develop their digital literacy by exploring free resources such as tutorials, blogs, and videos on platforms like YouTube or Medium. These resources cover a wide range of topics, from basic technical skills to advanced concepts, allowing students to learn at their own pace. By participating in online communities or forums, students can stay informed about the latest technology trends, ask questions, and collaborate with peers, strengthening their problem-solving abilities in the process.

Students can also gain practical experience by using digital

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tools in real-life projects. For instance, they can create websites or blogs using platforms like WordPress or Wix, or use software to develop presentations and digital portfolios. These hands-on projects help students apply their skills creatively while gaining valuable experience. Additionally, experimenting with AI-driven applications, such as personal assistants or educational apps, allows students to explore how AI works and how it can enhance learning, further building their digital literacy for the future.

5. CHALLENGES OF AI IN UNIVERSITY ENGLISH TEACHING

The integration of AI in university English instruction brings significant promise but also presents a series of challenges. While AI has the potential to transform the learning experience, its adoption is often met with resistance, primarily due to unfamiliarity and apprehension. Teachers play a critical role in addressing these concerns, as they are essential for fostering a deep understanding of language and nurturing independent thought. Without proper human guidance, AI feedback might become overly simplistic and fail to address the complexities of student learning. Moreover, relying too heavily on AI for tasks like grammar correction and content generation could undermine students' development of crucial language skills and dampen their creativity and intrinsic motivation.

Additionally, the use of AI tools often requires students to submit their work online, raising significant concerns about privacy and data security. Universities must ensure that AI platforms comply with stringent privacy standards to protect sensitive student information. Furthermore, the integration of AI with traditional teaching methods poses another challenge, as educators struggle to balance the efficiency of AI with the richness of conventional pedagogical approaches, particularly in large or resource-limited educational settings. This balance is crucial to ensuring that AI supports, rather than replaces, valuable human interaction in the classroom.

To overcome these challenges, universities need to adopt a comprehensive strategy. Professional development workshops for teachers and orientation sessions for students can help ease the transition and address resistance to AI integration. Implementing pilot programs that allow students and educators to gain hands-on experience with AI in language instruction can provide valuable insights. A blended approach that combines AI feedback with human evaluation will offer a more holistic assessment of student progress. Moreover, ensuring that AI tools are transparent, ethical, and adhere to privacy regulations is essential to maintaining academic integrity. Universities must also develop clear policies on ethical AI use and provide equal access to AI resources for all students. Finally, to combat potential issues like plagiarism, educational institutions should implement academic integrity programs and use plagiarism detection tools to ensure AI is used responsibly. By addressing these concerns, universities can ensure that AI is integrated effectively and responsibly into English education.

6. CONCLUSION

This paper has demonstrated that AI's integration into university English instruction offers significant benefits, such as personalized feedback and enhanced learning experiences. However, it is essential to maintain a balanced approach, using AI as a supplement to traditional teaching rather than a replacement. While AI tools have improved language acquisition and learner engagement, they cannot fully replicate the nuances of human interaction and higher-order thinking skills. The shift towards AI requires redefining teacher and student roles, with a focus on personalized learning and reduced teacher workloads. Despite the challenges, including privacy concerns and ethical issues, a multifaceted strategy can ensure AI's effective and responsible use in education. This includes professional development, pilot programs, and a blend of AI and human feedback to maintain academic integrity and support skill development. In addition, future research should explore the long-term sustainability of AI-driven learning and assess whether these tools can support learners in acquiring deeper cognitive and metacognitive skills, which are essential for advanced language proficiency. In summary, the future of English teaching in universities lies in the synergistic combination of AI and traditional methods, aiming to enhance language education while preserving the irreplaceable aspects of human instruction.

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THE REFLECTION OF REALITY IN UZBEK FOLK TALES

Ollaberganova Sanobar Khamidovna
Candidate of Philological Sciences, Docent of the Department of Primary Education Methodology, Urgench State University, Urgench, Uzbekistan

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ABSTRACT

In this article, it is given the criteria for reflecting the reality of the genres in Uzbek folklore and the issue of time and space in Uzbek folk tales. The problems of epic space in fairy tales have been sufficiently studied in a number scientific works of Uzbek folklorists and have been drawn certain conclusions.

KEY WORDS: *Time and space, genres of Uzbek folklore, homeland, country, home, place, town, village, place, concepts such as area, epic space.*

The methodology of teaching folk oral literature in primary education is recognized as one of the sources and tools that ensure the effectiveness of the process of students' moral and ethical upbringing. This approach has retained its importance even in the context of the globalization of education. Additionally, the methodology for teaching folk oral literature in primary grades is seen as an essential resource for developing students' oral and written communication skills, creative thinking abilities, reading habits, and speech culture. Studying folk oral literature and the genres of Uzbek folklore, as well as examining the criteria by which they reflect reality, allows for an exploration of the spiritual world, cultural, moral-ethical, and artistic-aesthetic views of the people [1].

In particular, it plays a significant role in identifying and enriching the foundations of independence ideology and national spirituality, in fostering and strengthening the sense of homeland in young hearts, in cultivating a sense of justice and bravery, and in promoting peace and goodness. Space, as one of the objective and real forms of existence, can be defined as the place where events and phenomena occur, and where subjects act. In speech, it is represented by concepts such as land, homeland, country, house, palace, city, village, place, and square. The space depicted in magical fairy tales is characterized by both reality and extraordinariness. It represents the place where events and phenomena unfold, and where characters act. In Uzbek magical fairy tales, the events of the plot develop within an epic space, with all characters operating within this realm. The events of the tale begin, develop, and conclude within this spatial framework.

The issues of epic space in fairy tales have been thoroughly studied in a number of scientific works by Uzbek folklorists, and certain conclusions have been drawn. Space in fairy tales is manifested not as a philosophical category, but rather in the form of an epic phenomenon. Nevertheless, both are reflected in a unified whole. Epic space, as an inseparable part of philosophical space, has its own unique characteristics [2].

These characteristics are related to the national life of our ancestors, their worldview, and their perception and understanding of the world. Various events occur in the epic space used in magical fairy tales. During the course of the fairy tale, each plot event has its own space, more precisely, its own microspace. Epic space initially appears in the initial formula (opening) section of the fairy tale plot. The epic space in the opening of the fairy tale is depicted in its unique artistic forms. In other words, the spaces that appear in the plot events are distinct from each other. Firstly, they are expressed in accordance with the nature of the magical fairy tale. For example, the spaces in the opening of this type of tale are rarely used in other genres of folklore, particularly, the epic space used in the opening of a magical fairy tale does not appear in epics. The beginning of plot events in magical fairy tales after the introductory formulas is a typological phenomenon. As a result, the interpretations of epic spaces are also depicted in similar, general forms. Nonetheless, they also stand out with their unique aspects. The elements of the initial (opening) epic space are initially presented in an indefinite form that does not convey reality, such as in expressions like "Once upon a time..." ("The Ring of the Snake King"), which convey uncertainty. This ambiguity of the epic space serves as one of the distinctive characteristics that define the magical fairy tale as a genre and draws the listener into the world of the magical fairy tale. The expression of the initial space in vague forms gradually changes and becomes clearer in subsequent sentences. That is, the epic space is no longer associated with elements that convey uncertainty but rather with elements that bring reality into focus. "Once upon a time, in an ancient city" ("The Ring of the Snake King"), "In an ancient country" ("The Forty Snakes"), "At the foot of the Alatau lived an old man and an old woman".

"It is evident that the subsequent elements of epic space convey not ambiguity but rather clarity (for instance, "a boy lived in a certain city") and vitality. Therefore, in the openings of Uzbek magical fairy tales, spaces are depicted in both clear and ambiguous forms (realistic and indefinite). They establish traditional micro and macro spaces in the structure of the tale [2].

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In Uzbek magical fairy tales, some spaces are named with specific geographical terms. In her research dedicated to the poetics of folk epics, scholar S. Mirzaeva writes: in folk tales, especially in romantic epics, the epic space does not correspond geographically to real places...

Consequently, attempting to replace these spaces with actual cities or places misinterprets the nature of the artistic conventions in folk epics. Often, these epic spaces are famous cities or countries that have left a mark on the history of human culture, with the events of the tale occurring in these spaces. For example, in the beginning of the Uzbek magical fairy tale titled "The Dark-Haired Fairy," the plot events take place "in ancient times, in the land of Sham". The plot events within the epic space occur in the countries of Iran and Sham, which were legendary locations well-known between the East and West and played significant roles in ancient cultural, social, and economic development. The use of these historical countries and cities as epic spaces in folk tales is intertwined with the conventions of storytelling. The naming of epic space with geographical or legendary terms aims to clarify the setting of the tale's events. In "The Ring of the Snake King", a wealthy merchant tells his son, 'Tomorrow, I will send you to the city of Rum for trading," and gives him a thousand coins. Here, the term "Rum" does not indicate a specific city but rather refers to the land of Byzantium. Rum is a legendary city and is commonly mentioned in tales. In The Dark-Haired Fairy, the epic heroes Prince Nadir and Qadir take the Dark-Haired Fairy to the city of Rum. At the beginning of the tale, events unfold in the land of Sham, and by the end, they conclude again in the city of Sham.

Thus, the plot events unfold within the framework of epic spaces related to the cities of Sham and Rum. In Uzbek magical fairy tales, locations are often named after cities where Uzbeks have traditionally lived, and the main events also take place in these epic spaces. For example, in the tale "Muqbil the Stone-Thrower," it is said, "There was a beautiful daughter of the Amir of Bukhara". In "Bektemir the Hero," the story mentions, "Long ago, in the direction of Ferghana, there was a ruler named Odil Khan". Similarly, in "Prince Salmon," the opening states, "Long ago, in the land of Khorezm, there was a king".

The use of geographical toponyms in fairy tales indicates their significant role in the spiritual and social life of the people. Additionally, ancient foreign locations are also used in tales. The presence of places like Rum and Egypt in Uzbek fairy tales indicates that there were cultural and economic ties between nations. Thus, it is worth noting the presence of foreign-related epic micro-locations in Uzbek folk tales. These epic micro-locations include culturally and educationally significant regions such as Rum, Egypt, Iran, Turan, India, and China. Nearly every tales events take place in these named epic spaces and conclude there.

In "Bektemir the Hero," the epic hero lives in the area of Ferghana and falls in love with Aqbilak at first sight, then sets off to Egypt to find her. The events start and end in the same place, meaning that Bektemir and Aqbilaks wedding takes place in Ferghana. In the tale "Tagrimtash," events unfold across various locations, and in the end, the epic characters return from the land of the demons to their own homeland, the city of Mashhad. In the story "Momir and Somir," the king lives "in the land of Turkmenistan," and by fate, "the fiery Somir of the Turkmen king marries the daughter of the king of India". After the celebration, "the king, with his two sons, daughter-in-law, and the entire army, returns to his own people". In "The Dark-Haired Fairy," after a forty-day celebration, Nodir and the prince depart from the foreign land and return to their homeland.

This recurring theme of returning home from foreign lands is common in many tales and has become a tradition, symbolizing the sense of homeland among the tales heroes. It shows that a sense of loyalty to ones land and a feeling of homeland have long existed among our ancestors and are expressed in Uzbek folk tales. Thus, the sense of homeland is exceedingly strong in folk tales. Loving and protecting ones country, as well as being loyal to it, emerges as one of the main themes of Uzbek folk tales. No matter where the hero goes, what he does, or what dreams he fulfills, he eventually longs for his homeland and returns to it. In the tales, events begin in the epic space of the homeland and conclude there. In Uzbek magical fairy tales, epic space appears in unique forms, and plot events take place in these spaces. The epic spaces can be categorized as follows.

Epic place	Sky	City, fortress, motherland
	On the road	Mountain, hill
	Under the	Desert, glance
	Road	Sea, cave and others

Epic space consists of macro-spaces like the sky, surface, and underground. These spaces, in turn, encompass micro-spaces

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where plot events unfold. We consider locations such as cities, fortresses, mountains, caves, deserts, steppes, rivers, riverbanks, and orchards as micro-spaces where the plot events occur.

The characters in fairy tales live in specific locations according to their status and responsibilities. Kings, merchants, and wealthy craftsmen live in cities and fortresses, as in "After a few days, the hero approached the rich mans fortress" ("The Ring of the Serpent King"). Poor people generally live on riverbanks or in the steppe: "The old mans hut was in a deserted, remote place" ("The Fiery Hero"). Mythological characters (such as demons and witches) reside in mountains, caves, and wells. We can say that the sky, surface, underground, underwater, and dream-world locations are the realms of fairy-tale characters. Epic spaces differ in their meaning, structural form, main function, and role within the plot. In ancient Turkic myths, the heavens were the domain of sky gods and cruel people, while the underground was the realm of evil spirits, such as demons, dragons, and old witches. In magical fairy tales, the surface of the earth is considered a vast space.

However, an analysis of Khorezm fairy tales shows that this concept is not always accurate. The use of topographical beginnings as a separate artistic formula is one of the traditional poetic phenomena of fairy-tale construction. According to our findings, a purely traditional topographical beginning exists in only two of the Khorezm fairy tales. For example, in "To the south of the Amu Darya, four demons lived, scaring everyone, stealing livestock, and fleeing to their hiding place. When the jackal howled a little to the east, there lived a man named Shamrot who would run home in fear ("Shamrot the Coward")". This traditional beginning is based on a model of topographical markers and biographical information, where the place where the fairy tale events occur is localized through a specific geographical term. This way, the listener is encouraged to believe in the reality of the events narrated in the fairy tale.

In the second instance mentioned, the topographical marker is given in a general manner, with the vague concept of an epic space interpreted through the phrase "in one land": "Once upon a time, in one land, there was a lone bald hero without parents or family ("The Bald Hero")". Most Khorezm fairy tales feature a mixed type of traditional beginning, known as a universal opening that simultaneously includes biographical, chronological, and topographical information. The compositional structure of this type of beginning is generally based on the poetic expression of artistic formulas in a consistent order: "affirmation-negation and again affirmation-negation formula" ("There was, there wasnt; there was hunger, there was plenty"), the expression of the time when the events took place ("a long time ago, etc."), and biographical information about the fairy-tale characters ("there was an old man and an old woman")".

"In Khorezm fairy tales, the mixed type of traditional opening with topographical markers generally consists of oasis toponyms. Place names like Khorezm, Urgench, Amu Darya, Khazorasp, and Suleiman Fortress are used in these tales: "Once upon a time, long ago in Khorezm, there lived an old man ("Loyalty")", "Once upon a time, long ago, there lived a poor but skillful young patchworker named Alouddin in the fortress of Solomon ("The Wise Mother and the Foolish King")". Sometimes, the setting of the tale is generalized and expressed vaguely: "Once upon a time, in ancient times, in the very center of their home, there lived two people ("The Crafty Monkey")".

In some forms of the mixed type of traditional opening, a confirmation-negation poetic model appears, starting with a direct chronological marker: "Long ago, far, far away, in this world, there lived two brothers ("The Brothers")"; "In ancient times, near Old Urgench, there was a king named Odilshah, blessed with power, a strong army, and content with his land ("Torabekhonim and Sultan Sanjar")". This traditional opening, based on rhyme, provides complete information about the time and place of the events, the epic qualities of the hero, and his social status. This epic information prepares the listener for the tale and captures their attention toward the events that occurred in Odilshahs country.

In the mixed type of traditional opening, the epic time of the events is expressed based on imaginative fiction. We previously reviewed the forms of chronological markers like "a long time ago". Such language units serve to express the time of the tales events in a generalized manner. The above reflections can be summarized as follows: The texts of Khorezm folk tales predominantly consist of traditional openings, with no full poetic form of the initial formula, characteristic of the broader Uzbek folk narrative, that is unrelated to the tales plot. This is one of the poetic features that indicate the unique compositional structure of Khorezm fairy tales. In Khorezm fairy tales, traditional openings of biographical, chronological, topographical, descriptive, and mixed types are used. Each of these opening types has its own poetic expression and aesthetic functions. The traditional opening provides information about the epic time and space in which the events occur, introduces characters into the sequence of events, and artistically describes the tales heroes.

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THE ISSUE OF PERIOD AND HERO IN SHUKRULLA'S DRAMA "HASRAT BOGI" ("THE GARDEN OF SORROW")

Kurbanova Saida Bekchanovna
UrSU, Candidate of Philological Sciences, Docent,

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ABSTRACT

This article analyzes Shukrulla's verse drama "Hasrat Bogi" ("The Garden of Sorrow"). The tragedy of time and hero reflected in the drama is explored, that is, the consequences of the "cult of personality", the problem of the negative and tragic impact of traumas inflicted by the socio-political system on the destinies of people.

KEY WORDS: *Shukrulla, verse drama, social and spiritual-moral problem, conflict, tragedy of time and hero.*

In Shukrulla's drama "Hasrat Bogi" ("The Garden of Sorrow"), the dreadful tragedies of the Soviet era, including the cult of personality, and the socio-economic, spiritual, and moral issues faced by individuals oppressed by the despotic regime, are highlighted [1]. Several reviews were published in the press about this drama in its time, and H.Ikromov expressed the following thoughts about this play: "In this play, not the entire era but a slice of life on the brink of Independence is depicted. From the early 1980s, the Soviet regime was gasping for breath, and even in its death throes, it devised various tricks to further oppress the people and close the opening eyes of awareness. Among these tricks were the Afghan war and the Chernobyl disaster [1]. The playwright begins his narrative about the regime with these deceptions".

It is apparent that the drama reflects the tragic impact of the 70-year despotic regime on the fate of the nation in connection with the tragedies of its characters. The drama showcases the tragedies of the era and individuals, the scars of repression, the Afghan war, the Chernobyl disaster, the command-and-control and bureaucratism of the Soviet period, and the negative impact of the cult of personality on people's destinies in dramatic situations. Indeed, "the difference between drama and tragedy is that drama depicts life events not in a tragic but in a dramatic manner [2]". In short, the drama not only portrays the tragedies of individual characters but also artistically embodies the issue of a whole nation's spiritual crisis. This crisis, which arose from external interventions and pressures, encapsulates the social tragedy resulting from the disregard for human life.

If we focus on the composition of the drama "Hasrat bogi" ("The Garden of Sorrow") it consists of 3 acts and 6 scenes. The characters in the drama include Ulmas (the killed soldier), mother (Ulmas' mother), Murad (Ulmas' uncle, nicknamed "Murad coward"), Mels, Ashrafiy, Azim (Ulmas' friends), Jamila (Mels' lover), Kholikulov (one of the party leaders), Nozanin (Kholikulov's secretary), Mirsoat (a lunatic), Ziyad (a drunkard), and Kasim (the teahouse owner).

The title of the drama "Hasrat Bogi" ("The Garden of Sorrow") itself carries a symbolic meaning, combining the sorrows and sufferings of the characters with the laments of the era. In nearly all of Shukrulla's dramas, the sufferings and tragedies of the era and its characters are artistically interpreted through dramatic action. The playwright delves deeper into the tragedy of the era and its characters through their inner feelings and experiences. The main characters of the poetic drama "Hasrat Bogi" ("The Garden of Sorrow") are two young individuals, Mels and Jamila. They deeply love each other, but the tragic past separates them. Due to the bitter truth that "Mels' father had Jamila's father executed during the years of repression", their lives are turned upside down.

In fact, the primary aim of the playwright in "Hasrat Bogi" ("The Garden of Sorrow") is not just to depict the love and its rupture between the two youths, but more importantly, to highlight the socio-political issues.

It is well-known that the foundation of drama consists of dramatic action and conflict, the clash of characters and situations. Scholars who study drama theory indicate that conflict, collision, and confrontations are the basis for creating dramatic action. Specifically, H.Abdusamatov notes the role of conflict in dramatic works, stating: "Conflict is the force that forms the basis of coherent dramatic action. The essence, direction, and development of the conflict are interconnected with the manner and ideological direction of the dramatic action. In a play, conflict and dramatic action appear like twins, complementing and enriching each other [2]". In this sense, the dramatic action in the plot of "Hasrat Bogi" ("The Garden of Sorrow") is generated by social, interpersonal, and psychological conflicts. These conflicts are not only expressed in the confrontations between characters, their interactions with Soviet government regulations, or their psychological experiences but also in the dramatic situations and circumstances that cause these conflicts to emerge.

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In particular, in the second scene of the drama, social (the conflict between the hero and the environment) and psychological conflict are revealed very effectively through the laments of the mother:

Mother

May the Soviet's house burn to the ground, for it has scorched my very soul.

Murad

(Startled by these words...)

Hey, hey, slow down, we mustn't utter a word about the government.

Mother

Fate dealt me a bad hand.

Murad

Don't you dare say that?

Mother was about to say something, but Murad, startled, scratched his ear and quickly backed away.

Mother

"Instead of so much love,
Couldn't mothers give their
children their lifespan [3]?".

From these words of the mother, we sense a profound inner psychological conflict dominating her psyche, a fundamental element of the drama. Her heart becomes a battlefield of emotional turmoil. The playwright skillfully depicts the mother's inner struggles and reflections primarily through psychological collisions. The mother character in the drama is a composite figure, embodying the brutal realities of both the Afghan War and the Chernobyl disaster in her tragic fate.

The vivid representation of inter-character conflict in the drama is clearly manifested through the confrontations between Ashrafiy and Mels. Ashrafiy feels the anguish and grief of the mother whose son was martyred in the Afghan war. However, he knows very well that he cannot complain about this to anyone or anywhere, as lamenting the times could lead to serious consequences. Therefore, he finds solace in expressing such sorrow and suffering of the people through the verses of his poetry. His friend Mels, on the other hand, strongly opposes Ashrafiy's writing of such poems and openly speaking the truth. These situations lead to the emergence of conflicts between the two friends.

It is essential to emphasize that tragedy is merely a manifestation of human fate in specific difficult and extraordinary circumstances. Tragic situations and conflicts have both subjective and objective causes. In this poetic drama, Shukrulla highlights the inappropriate psychological factors in the relationship between the era and the individual, presenting the consequences of the Afghan War and the Chernobyl disaster as objective causes. Meanwhile, he identifies the subjective reasons as the flaws in the characters' consciousness and psyche, such as sycophancy, idolization, and cowardice.

The tragedies and fateful destinies mentioned in the drama, the life conflicts and contradictions, are not simple or random; they have socio-historical characteristics. Because life conflicts, confrontations, and tragedies are social phenomena, they inherently reflect the problems of society. Tragedies and conflicts are manifested in the characters' actions and moral-ethical world, leading them to suffering and sometimes even death. As the researcher of dramaturgy V.Volkenshtein noted, "An experienced playwright does not hesitate to put their characters in difficult situations. On the contrary, they seek such situations [4]." In this sense, Shukrulla also does not shy away from placing his main characters in perilous situations and severe psychological states. The psychological turmoil of the main character Mels in "Hasrat Bogi" ("The Garden of Sorrow") reaches its peak when he meets his beloved Jamila in the park and is rejected by her. Consequently, Mels sees death as the only cure for his pain and takes his own life, creating the climax of the psychological state. The playwright reflects such anguished psychological situations and conditions through the elements of drama (in monologues and dialogues, stage directions):

Mels

God relieves the mad of sorrow's weight,
For some, in wine, their solace they find.
But for those like me, torn from their fate,
Is death the only cure for hearts confined?

With a heavy heart, he drew a gun from his side and, in a moment of despair, ended his life [3].

In the drama, a young man, whose heart is brimming with love, takes his own life in the park. Shukrulla repeatedly portrays such tragic confrontations in his dramatic works, intensifying the painful and heavy experiences in his characters' lives. Through this, he opens a path for them to understand the tragic contradictions of their time.

It is well known that the author-dramatist's position is reflected in the development of dramatic conflicts, characters' actions and speech, as well as in monologues and dialogues. An experienced playwright reveals the individual character of drama characters through their speech. As V.Volkenshtein, a researcher of dramaturgy aesthetics, stated: "The unique speech of characters simultaneously embodies individuality and sociality, reflecting the peculiarities of the social environment to which the character belongs [4]". In particular, in "Hasrat Bogi" ("The Garden of Sorrow") the characters' speeches are given with such high skill that they perfectly match the time in which the characters are acting. In almost all scenes of the drama, the phrase "There is a man under the hat" is repeatedly mentioned by Mirsoat.

Mirsoat

The walls have ears, and beneath the hat There is a man!
Speak softly, what time is it, now (page 10).

Through this phrase used by Mirsoat, the playwright alludes to the informers (delator) of that era, who would report to KGB officers. During the Soviet era, no one could speak the truth or express their true thoughts openly because there were "ears" everywhere, in every organization, passing information to the relevant authorities.

As H.Abdusamatov said, "The unity of action and word is an essential feature of the play. The harmony of the phrase's tone with the inner action is one of the creative achievements [2]." Specifically, if we focus on the practical

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actions, psychological state, and speech of another character in the drama – Murad:

Azim

(to Murad)

The time for the funeral has come,
A crowd of thousands gathers,
Shoulders lift the coffin high,
Through sorrow, their hearts tethered.

Murad

To hold a funeral without government permission...
Communists, don't put our heads in the noose.

Azim

Even if he is a communist, he is still a Muslim!

Hearing this, Murad, startled, scratched his ear and pretended not to hear, then began to walk away [3].

The words and actions of Murad in the above excerpt (pretending to be naive, scratching and covering his ear) may initially seem insignificant. However, a keen viewer or reader will notice that this scene reveals the "psychology of fear" of the government deeply rooted in the characters of many people from that era. By giving Murad the nickname "the coward", Shukrulla symbolically points to the "fear" in his psyche through this conditional artistic depiction.

In summary, Shukrulla's poetic drama "Hasrat Bogi" ("The Garden of Sorrow") vividly interprets the lives of dozens of characters such as Mels, Jamila, Kholikulov, mother, and Ziyad, illustrating the tragic chain between generations. The drama masterfully highlights the tragedies of the time and the heroes through conflicts and bright characters. "Hasrat Bogi" ("The Garden of Sorrow") is valuable as a work that exposes not just personal tragedies but the broader tragedies of life and the era itself.

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AN AUTONOMOUS ROBOT FOR CLEANING WATERSURFACES

Aditya Singh, Vivek Dohare, Sumit Rajput, Vaibhav Sharma,Sumit Rajan, Dr. Abhishek Sharma
Dept. of Electronics and Communication, Oriental Institute of Science and Technology, Bhopal, MP

ABSTRACT

Water is essential to our daily lives, serving as a vital source of life for people, animals, and ecosystems alike. For many towns andcommunities, rivers and other bodies of water remain a primary source of drinking water. However, the increasing amount of waste in these water bodies poses a serious threat – not only to the environment but also to human health. Even a single piece of litter, carelessly discarded, can contribute to the pollution of our rivers, lakes, and creeks. While water is typically treated before itreaches our homes, heavily polluted water bodies cannot be fully purified, making it unfit for consumption.

To ensure clean water continues to flow from our taps, it is crucial to protect and maintain our river systems. This need for preservation is the driving force behind our project: an autonomous water surface cleaning robot designed to collect floating debris from rivers, lakes, and other bodies of water. The robot will operate without human supervision, navigating designated areas and collecting waste along its path. Equipped with a camera, the robot will provide real-time video footage, allowing it to identify and target waste effectively.

The waste will be collected via a conveyor belt system, which will transport the debris to a storage area on the robot. Once full, therobot will dock for waste removal, ready to continue its mission. Our goal is to keep our water bodies clean, ensuring a healthier environment and safer water supply for all.

KEY WORDS: *Water Pollution, Environmental Conservation, Autonomous robot.*

1. INTRODUCTION

Waste has been identified as an environmental problem that arises persistently year after year and remains unresolved. Garbage is often found dumped into rivers, waterways, or reservoirs, leading to blocked water flow, dirty and foul- smelling water, and frequent overflows causing disasters such as flooding. Cleaning waste from water areas typically requires extensive resources, such as cleaning staff and the useof excavators. This study is aimed at providing an alternative solution to the waste problem in water areas through the development of robotics technology capable of operating in such environments. The proposed applied research is expectedto serve as an alternative means to prevent disasters, particularly flooding. Robotics technology in the form of an eco-robot is developed, with the primary task of collecting waste. The robot is designed to be manually controlled using remote control. The development method referred to in this research is ADDIE, which includes the analysis of the robotic cleaning system, the design of the robot, the development of the robot, its implementation for cleaning waste in limited water areas, and the evaluation of its effectiveness in cleaning trash from more extensive areas. The focus of this article is on the design and development of the robot.Previously, robots for cleaning water surfaces have been developed, with limited results available in open references discussing the development of such purpose-built robots. This work is aimed at the developmentof a more versatile and efficient system using an aqua robot. The robot is seen as having significant potential to expand its functionality in the future, including activities such as the removal of algae, leaves, and twigs; spraying chemicals in targeted locations; checking water quality; and deploying payloads autonomously.

2. LITERATURE SURVEY

During the months of August, September, October, and November of 2022, a literature review for this project was completed. The focus was given predominantly to literature addressing advancements in automated water robots. Relevant literature sources have been included in the References section. The following journals were reviewed to gather information.

2.1 Detection of Waste Materials Using Deep Learning and Image Processing[1]

A framework was planned and developed with a deep learning approach for effective waste segregation. Images were recognized using a convolutional neural network along with an image processing method to identify waste based on shape, color, dimension, and size. This technique enabled the system to

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automatically learn relevant features from sample images of trash and recognize those features in new images.

2.2 Automatic Collaborative Water Surface Coverage and Cleaning Strategy of UAV and USVs[9]
An autonomous water cleaning approach was designed, and a system architecture for cooperation between UAVs and USVswas ingeniously established. Autonomous obstacle avoidance path planning methods were developed for enabling autonomous navigation and cooperative cleaning by robots.

2.3 Detection With Deep Learning: A Review[2]
The development of deep learning and convolutional neural networks was reviewed, focusing on typical generic object detection designs and various adjustments. Practical tips for enhancing detection performance were provided. This study contributed to the training of models using custom training datasets.

2.3.1 Pond Cleaning Robot[10]
A robot was designed to remove waste materials from water surfaces and safely dispose of them in the water body. A Bluetooth-enabled pond cleaning robot was deployed to extract trash, plastics, and waste from the Godavari River in Nashik. The basic design and configuration required for such a robot were outlined.

2.3.2 Arduino-Based Tracking System Using GPS andGSM[12]
A location tracking system was created by integrating GPS and GSM with a microcontroller. Vehicles or items connected to a tracking device were located using GPS. A smartphone and Arduino UNO were effectively utilized in the proposed system. Updates were sent and received regarding object locations through a database using the GSM module.

2.3.3 SMURF
A fully autonomous water surface cleaning robot called SMURF was developed using cutting-edge sensors and a novel coverage path planning method. Garbage and contaminants were collected and stored while environmental variables were monitored. Remote control and monitoring of SMURF were enabled, making it a potential solution for maintaining clean and healthy water bodies.

2.3.4 A Modified YOLOv3 Detection Method for Vision-Based Water Surface Robots[11]
A modified YOLOv3 object detection method was introduced for a vision-based water surface garbage capture robot. Deep learning and computer vision techniques were incorporated to enhance the accuracy and speed of object detection. This modified method provided precise information, aiding in the preservation of water quality and ecosystem health.

2.3.5 A Smart Autonomous Floor Cleaner with an Android- Based Controller[8]
An intelligent cleaning robot was developed, capable of autonomously navigating and cleaning floors while being controlled and monitored through an Android device. Mapping, path planning, and obstacle avoidance algorithms were utilized to ensure efficient navigation and cleaning.Additional features such as scheduling options, cleaning mode selection, and virtual boundaries were incorporated.

3. PROPOSED METHODOLOGY

The primary objective of this research is focused on the development of an autonomous robotic system designed to efficiently clean water surfaces by collecting and removing pollutants such as plastic waste, algae, and debris. The system is intended to be navigated through various aquatic environments with minimal human intervention. Advanced sensing and path- planning algorithms are to be utilized to optimize cleaning performance while ensuring the safety and sustainability of the water ecosystem.

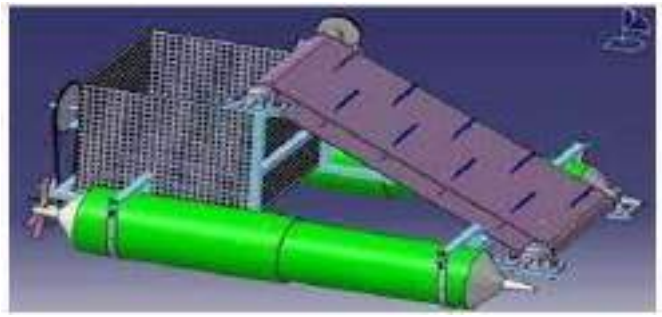


Fig. 1: Robot Model using a Conveyor belt

3.1 NEO-6M Module[3]
The GPS NEO-6M module is recognized as a compact, low- power, and cost-effective GPS (Global Positioning System) solution that is widely utilized in applications such as navigation systems, asset tracking, UAVs (unmanned aerial vehicles), robotics, and more.



Fig. 2: NEO-6M

It is built on u-blox's industry-leading GPS chipset technology, ensuring high sensitivity and excellent performance in acquiring and tracking GPS signals even in challenging environments with weak signal strength orinterference. Several features are provided by the module, including a compact size, low power consumption, serial communication, and NMEA protocol support. Low power operation is enabled, making it suitable for battery-powered applications where power efficiency is prioritized. Accurate time information, a built-in ceramic patch antenna, and reliable positioning performance are provided. Configuration and control are achieved through AT commands, which allow

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customization of settings. Integration with host systems is carried out through serial communication, with NMEAsentences being parsed to extract GPS information. For applications requiring higher accuracy or additional features, more advanced GPS modules are offered by u- blox in their product lineup.

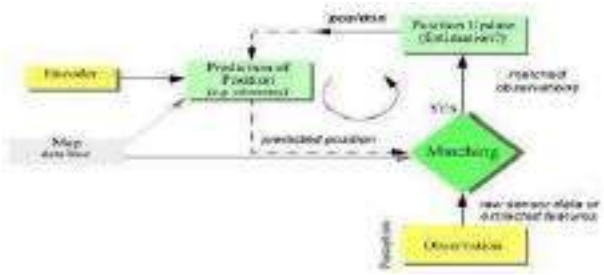


Fig. 3: Block Diagram

3.2 HC-05 Module[4]

The HC-05 Bluetooth module is widely acknowledged as a popular and reliable solution for wireless communication between electronic devices. It is based on the Bluetooth 2.0+EDR specification, with a communication range of up to 10 meters. Communication with the host system is conducted using a serial interface, commonly referred to as UART, which supports standard serial communication protocols such as 8-N-1. The module is designed to operatein either master or slave mode and is configured and controlled using AT commands. The range is influenced bythe surrounding environment and potential obstructions. Customization of settings, such as the Bluetooth device name, pairing code, communication baud rate, and operating mode, is made possible using AT commands. Operation is supported on a voltage supply of 3.3V, and secure and encrypted communication is enabled through the Secure Simple Pairing (SSP) protocol. Extensive use is made of the module in domains such as home automation, robotics, wireless sensor networks, and Internet of Things (IoT) projects. Compatibility is ensured by adhering to manufacturer documentation, with integration simplified through the use of online tutorials and libraries.



Fig. 4: HC-05 module

3.3 HMC5883LModule[5]

The HMC5883L module is described as a three-axis digital compass used for measuring magnetic fields. A three-axis magnetometer is featured, which measures the strength and direction of magnetic fields along the X, Y, and Z axes.



Fig. 5: HMC5883L

Digital output for the measured magnetic field data is provided, ensuring compatibility with various microcontrollersand development boards. High accuracy and resolution are offered, with a typical accuracy of 2–3 degrees and a resolution of up to 0.2 milligauss. Built-in calibration functionality is included to compensate for external magnetic interference or offsets. Optimization of power consumption and measurement speed is achieved through different operating modes. Features such as adjustable measurement range, data output rate configuration, and automatic gain control are integrated. Extensive support is provided through various libraries and code examples for integration into different platforms, making the module a popular choice for magnetic field sensing and orientation determination.

3.3 A2212/6t 2200kv BLDC Motors[6]

The A2212/6T 2200KV motor is identified as a brushless motor used in RC aircraft and multirotor drones. Brushless technology is utilized, offering advantages such as higher efficiency, longer lifespan, and reduced maintenancerequirements. Substantial power is delivered for its size, with compatibility ensured with a range of electronic speed controllers (ESCs). Three wire leads are featured: one connected to the ground or negative terminal, one for the positive supply voltage, and one for signal control. Cooling and maintenance are required to prevent overheating during extended operation, with regular inspection recommended for ensuring optimal performance and longevity. Safety precautions are advised, with handling conducted carefully and manufacturer guidelines followed to ensure proper operation.



Fig. 6: A2212/6t 2200kv BLDC Motors

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Electronic Speed Controllers[7]

The ESC (Electronic Speed Controller) 30A is described asa device commonly utilized for controlling Brushless DC (BLDC) motors. It is designed to act as an intermediary between the power source and the BLDC motor, with control signals received from a compatible controller to adjust the motor's speed and direction. A continuous current of up to 30 Amps is handled, with speed regulation achieved through Pulse Width Modulation (PWM). Safety features, such as low voltage protection, over-temperature protection, and current limiting, are included to prevent damage to the motor and ESC. Initial configuration and calibration are required, with proper installation and wiring emphasized for achieving optimal performance and safety.



Fig. 7: Speed controller

4. EXPECTED RESULT

A fully functional prototype of the autonomous water- cleaning robot is expected to be yielded by the research, with effective debris detection, navigation, and waste collection capabilities being demonstrated. The robot is designed to operate autonomously in both still and flowing water bodies, with adaptability to environmental changes being showcased. Significant efficiency in cleaning, compared to traditional manual methods, is anticipated to be demonstrated. Furthermore, performance metrics, including the area cleaned per hour and waste collection efficiency, will be analyzed and documented, providing a benchmark for future improvements and scalability.

5. CONCLUSION

In conclusion, autonomous river cleaning robots are advanced robotic boats that are designed to autonomously clean rivers and water bodies. Various features and technologies, such as navigation systems, cleaning mechanisms, filtration systems, energy sources, communication systems, and safety features, are incorporated into these robots. They operate without human intervention, using their capabilities to navigatewaterways, collect debris and pollutants, filter water, and transmit data for monitoring and analysis. Significant benefits for environmental conservation are contributed bythe development of autonomous river cleaning robots. Pollution reduction and water ecosystem preservation are promoted by these robots, as they efficiently remove debrisand pollutants from rivers. The contamination of water sources is prevented, marine life is protected, and the overall cleanliness of water bodies is improved by these robots. By leveraging advanced technologies and autonomous capabilities, continuous operation is enabled, large areas are covered, and adaptability to different river conditions is ensured. A sustainable and cost-effective solution for river cleaning is offered by these robots, reducing the reliance on manual labor and increasing the efficiency of cleaning operations. While challenges, such as handling complex debrisor addressing specific local conditions, remain to be overcome, great promise is held by the advancement of autonomous river cleaning robots for the future. By combining technological innovation, environmental stewardship, and collaborative efforts, cleaner and healthier rivers can be worked towards, contributing to a more sustainable planet.

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A REVIEW ON THE ROLE OF ARTIFICIAL INTELLIGENCE (AI) IN THE FUTURE OF PHARMACY EDUCATION

Aniket V. Bunge[1], Ms. Ashwini Bahir[2], Dr. Sunil S. Jaybhaye[3], Dr. Swati Rawat[4]

[1]*Student of Institute of Pharmacy, Jalna*
[2]*Department of Pharmaceutical Analysis, Institute of Pharmacy, Jalna*
[3]*Department of Quality Assurance Institute of Pharmacy, Jalna*
[4]*Department of Pharmaceutics, Institute of Pharmacy, Jalna*

ABSTRACT

Artificial Intelligence (AI) focuses in producing intelligent modelling, which helps in imagining knowledge, cracking problems and decision making. Recently, AI plays an important role in various fields of pharmacy like drug discovery, drug delivery formulation development, polypharmacology, hospital pharmacy, etc. In drug discovery and drug delivery formulation development, various Artificial Neural Networks (ANNs) like Deep Neural Networks (DNNs) or Recurrent Neural Networks (RNNs) are being employed. Several implementations of drug discovery have currently been analysed and supported the power of the technology in quantitative structure-property relationship (QSPR) or quantitative structure-activity relationship (QSAR). In addition, de novo design promotes the invention of significantly newer drug molecules with regard to desired/optimal qualities. In the current review article, the uses of AI in pharmacy, especially in drug discovery, drug delivery formulation development, polypharmacology and hospital pharmacy are discussed. Key words: Artificial intelligence, Artificial neural network, Drug discovery, Drug delivery research, Hospital pharmacy.

KEYWORDS: *Artificial Intelligence, AI Technology, ANNs, Roles of AI.*

1. INTRODUCTION

Artificial Intelligence (AI) is a stream of science related to intelligent machine learning, mainly intelligent computer programs, which provides results in the similar way to human attention process.1 This process generally comprises obtaining data, developing efficient systems for the uses of obtained data, illustrating definite or approximate conclusions and selfcorrections adjustments.

In general, AI is used for analyzing the machine learning to imitate the cognitive tasks of individuals.2,3 AI technology is exercised to perform more accurate analyses as well as to attain useful interpretation.3 In this perspective, various useful statistical models as well as computational intelligence are combined in the AI technology.4 The progress and innovation of AI applications are often associated to the fear of unemployment threat. However, almost all advancements in the applications of AI technology are being celebrated on account of the confidence, which enormously contributes its efficacy to the industry.

Recently, AI technology becomes a very fundamental part of industry for the useful applications in many technical and research fields.3,4 The emergent initiative of accepting the applications of AI technology in pharmacy including drug discovery, drug delivery formulation development and other healthcare applications have already been shifted from hype to hope.5,6 The uses of AI models also make possible to predict the in vivo responses, pharmacokinetic parameters of the therapeutics, suitable dosing, etc.

According to the importance of pharmacokinetic prediction of drugs, the uses of in silico models facilitate their effectiveness and inexpensiveness in the drug research.8 There are two key classes of AI technology developments.9 The first one comprises the conventional computing methodologies including expert systems, which are capable of simulating the human experiences. Many sectors use clinical trial data analysis approaches to improve their success in meeting client requests and expectations. There is no more critical sector when saving lives than the pharmaceutical business. Reacting to medical crises like the current pandemic and other worldwide healthcare issues relies on constant innovation and the use of new technology.

Extensive research and development across several areas, including production technology, packaging concerns, and customer-oriented marketing techniques, is usually the foundation of innovation in the pharmaceutical sector . New pharmaceutical developments span the gamut from small molecule drugs to biologics, emphasizing improved stability and high potency to address unfulfilled demands for disease treatment. An area of great worry that will need future study and inquiry is the evaluation of the substantial toxicity levels linked

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to new medications. Finding the most beneficial and appropriate pharmacological molecules for use in healthcare is one of the main goals. Nevertheless, to meet the medical and healthcare needs of people throughout the globe, the pharmacy business must continue to innovate by using technology- driven approaches.

Training healthcare workers to enhance their participation in everyday responsibilities is an ongoing need due to the industry's continued demand for competent workers.The pharmaceutical sector places a premium on identifying workplace skill shortages. Recognizing that providing sufficient training may be a substantial problem, it is critical to address the identified gaps successfully via suitable corrective actions. Some authorities have reported that June 2022 was the month in which 41% of supply chain disruptions occurred. The research goes on to say that the second most challenging obstacle to overcome is disruptions in the supply chain. Several pharmaceutical sectors are looking forward to more supply chain innovations and new models to tackle these problems, which may make their businesses more resilient. Clinical trials are among the several activities severely impacted by the 2019 coronavirus illness (COVID-19) pandemic.

The pandemics, natural disasters, price fluctuations, cyberattacks, logistical problems, and faulty products. The epidemic's transportation effects have devastated the world's supply chain and sectors. Disputes about whether to use the current or new pricing for commodities or resources cause decision-induced delays in receiving price updates from suppliers, which in turn cause price fluctuations.

Problems like rising crime rates and unpredictability in the supply of vital operating and manufacturing resources are new developments stemming from nations' tactics of crossborder economic cooperation. To meet the demands of patients and ensure their compliance, it is necessary to manufacture footprint changes. According to the pharmaceutical industry, the difficulty with maintaining the cold supply chain rendered many COVID-19 vaccinations useless during the pandemic. Inadequate innovation and inaccurate forecasting in business and industrial operations are the main reasons for the interruption in the supply chain due to the delayed reaction. Customer happiness, business image, and potential revenues are all severely affected when there are interruptions in the pharmaceutical industry's supply chain.

Figure 1 shows that the pharmaceutical industry's supply chain activities will undergo a radical upheaval due to the introduction of AI. Furthermore, it synthesizes a great deal of artificial intelligence research for a few decades to address many supply chain problems. Furthermore, the paper proposes future research directions to improve supply chain management decision-making tools.

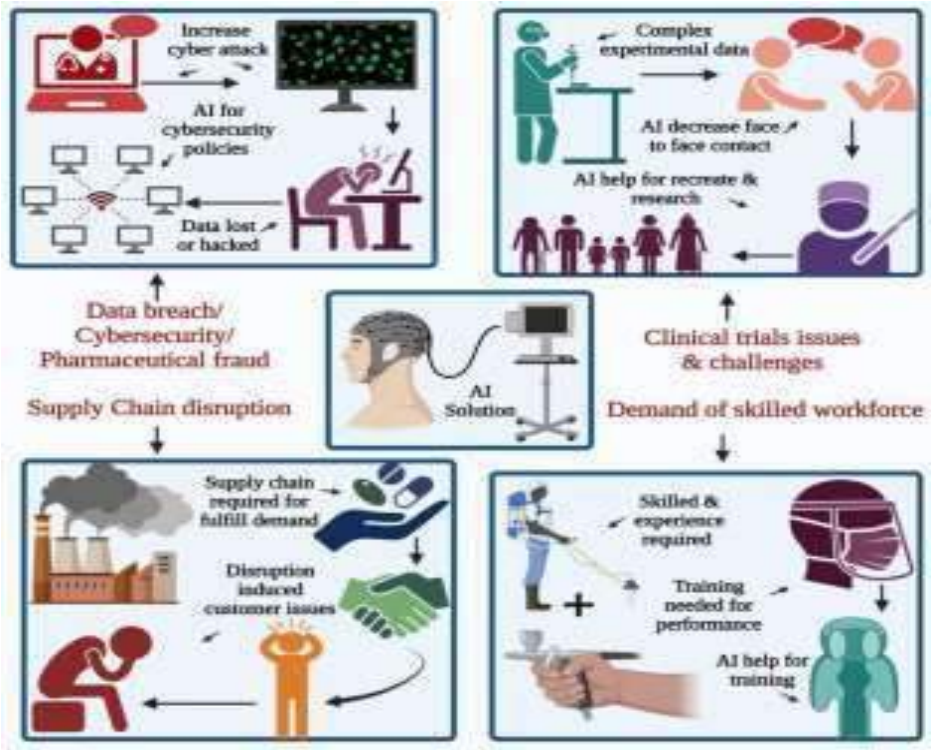


Fig: Potential AI solution to the problems faced by the pharmaceutical business

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2. CLASSIFICATION OF AI

AI can be classified into two different ways: according to calibre and their presence According to their ability, AI can be categorized as: i) Artificial Narrow Intelligence (ANI) or Weak AI: It performs a narrow range task, i.e., facial identification, steering a car, practicing chess, traffic signalling, etc.

Artificial General Intelligence (AGI) or Strong AI: It performs all the things as humans and also known as human level AI. It can simplify human intellectual abilities and able to do unfamiliar task. iii) Artificial Super Intelligence (ASI): It is smarter than humans and has much more activity than humans drawing, mathematics, space, etc.

According to their presence and not yet present, AI can be classified as follows

i) **Type 1:** It is used for narrow purpose applications, which cannot use past experiences as it has no memory system. It is known as reactive machine. There are some examples of this memory, such as a IBM chess program, which can recognize the checkers on the chess playing board and capable of making predictions.

ii) **Type 2:** It has limited memory system, which can apply the previous experiences for solving different problems. In automatic vehicles, this system is capable of making decisions there are some recorded observations, which are used to record further actions, but these records are not stored permanently.

iii) **Type 3:** It is based upon "Theory of Mind". It means that the decisions that human beings make are impinged by their individual thinking, intentions and desires. This system is non-existing AI.

iv) **Type 4:** It has self-awareness, i.e., the sense of self and consciousness. This system is also non-existing AI.

3. NEURAL NETWORKS AND ANNS

The learning algorithm of neural networks (from input data) takes two different forms mainly. The classes of neural networks are as follows (Figure 2):9,17 i) Unsupervised learning: Here the neural network is submitted with input data having recognised pattern. It is used for organizational purpose

The unsupervised learning algorithm uses „Self Organizing Map" or „Kohonen".9 This is known as very useful modeling for the searching of relationships amongst the complex data sets. ii) Supervised learning: This kind of neural network is illustrated with the sequences of harmonizing inputs and outputs. It is used for learning relationshipconnection between the inputs and the outputs. It shows its usefulness in formulation to measure the cause and effects linking between input-output. It is the most frequently employed ANNs and is entirely linked with the back propagation learning rule. This learning algorithm is known as the outstanding methodology.

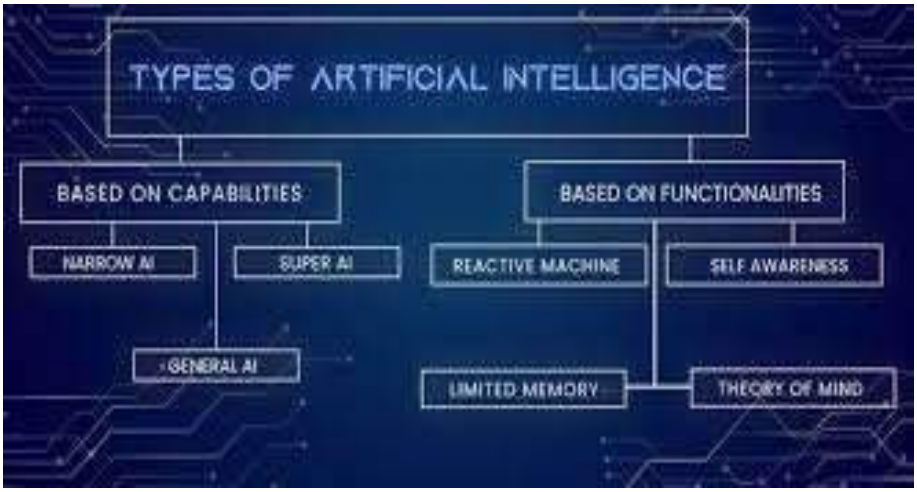


Fig: Types Of Artificial Intelligence (AI)

4. THE FUTURE ROLE OF (AI).

In Addressing Current Pharmaceutical Challenges Research on nano molecules is underway in the pharmaceutical sector to improve goods and ensure consumer satisfaction. These molecules have various Alanazi: Role of Artificial Intelligence in Pharmacy Practice: A Systematic Review Archives of Pharmacy Practice ¦ Volume 15 ¦ Issue 2 ¦ April – June 2024 37 benefits. Preparing synthetic derivatives is cheap and requires little effort in the chemical synthesis process.

Therefore, a wide variety of stable and effective formulations including tiny molecules, are available in the pharmaceutical industry. Innovative small molecules confront competition from generic molecules, complicated data is necessary for their introduction, and clinical studies are also necessary, except for uncommon illness therapy.

As a result of these procedures, businesses are under increasing financial pressure to innovate. Amidst the dilemma caused by molecules being too tiny and advances not being widely disseminated, the biomolecular drug business continues to expand quickly. The shape and reactivity of small molecules constitute the foundation of their effects.

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The building blocks of proteins, known as amino acids, and the building blocks of nucleic acids, known as nucleotides or ribonucleotides, make up biomolecules. The spatial conformation and supramolecular sequence also impact their stability and function.
Products from biomolecules, like insulin and adalimumab, have succeeded wildly. Because infusion is the most practical and preferred method of administering these biomolecules, their pharmacokinetics are intricate. Research based on nucleic acids places a premium on pharmacokinetic regulation and molecular stability .

Applying AI to Advancements in Drug Delivery and Discovery
Essential objectives include improving the pharmacokinetic exposure of these molecular forms. New technology advancements might be helpful in tackli these obstacles and similar ones. While artificial intelligence (AI) has great promise for the future of medication administration and discovery, it is not without significant limits that human intervention or intellectuals will be needed to decipher the complicated outcomes.

Artificial intelligence (AI) relies heavily on datasets for its predictions. However, human intervention is necessary to interpret the findings correctly due to the gray area. When it comes to making predictions and evaluating hypotheses, AI might run into problems with algorithm bias. In addition, the identification of inactive molecules is a typical outcome of docking simulationsHuman intervention is still necessary for a rigorous review of these parameters to make successful decisions and conduct cross-verifications to eliminate system bias. Still, AI has a lot of room to grow in practical applications; with enough effort, we should be able to address its shortcomings and make it more trustworthy and effective .

5. APPLICATIONS OF ARTIFICIAL INTELLIGENCE

When it comes to artificial intelligence, the approach uses machine learning or portions of it, including deep learning and NLP. Supervised and unsupervised learning are possible, with the algorithm used playing an essential role in both cases. Machine learning approaches may be either supervised or unsupervised.

6. ADVANTAGES OF AI TECHNOLOGY

The potential advantages of AI technology are as follows:6,15,41 Das, et al.: Artificial Intelligence in Pharmacy 308 Indian Journal of Pharmaceutical Education and Research.

i) Error minimization: AI assists to decrease the errors and increase the accuracy with more precision.Intelligent robots are made of resistant metal bodies and capable of tolerating the aggressive atmospheric space, therefore, they are sent to explore space.

ii) Difficult exploration: AI exhibits its usefulness in the mining sector. It is also used in the fuel exploration sector. AI systems are capable of investigating the ocean by defeating the errors caused by humans.

iii) Daily application: AI is very useful for our daily acts and deeds. For examples, GPS system is broadly used in long drives. Installation of AI in Androids helps to predict what an individual is going to type. It also helps in correction of spelling mistakes.

iv) Digital assistants: Now-a-days, the advanced organizations are using AI systems like „avatar" (models of digital assistants) for the reduction of human needs. The „avatar" can follow the right logical decisions as these are totally emotionless. Human emotions and moods disturb the efficiency of judgement and this problem can be overcome by the uses of machine intelligence.

v) Repetitive tasks: In general, human beings can perform single task at a time. In contrast to the human beings, machines are capable of performing multi-tasking jobs and can analyze more rapidly in comparison to the human beings. Various machine parameters, i.e., speed and time can be adjusted according to their requirements.

vi) Medical uses: In general, the physicians can assess the condition of patients and analyze the adverse effects and other health risks associated with the medication with the help of AI program. Trainee surgeons can gather knowledge by the applications of AI programs like various artificial surgery simulators (for examples, gastrointestinal simulation, heart simulation, brain simulation, etc.

vii) No breaks: Unlike human beings who have the capacity of working for 8 h/day with breaks, the machines are programmed in such a way that these are capable of performing the work in a continuous manner for long hours devoid of any kinds of confusions and boredom.

viii) Increase technological growth rate: AI technology is widely used in most of the advanced technological innovations worldwide. It is capable of producing different computational modelling programs and aims for the invention of the newer molecules. AI technology is also being used in the development of drug delivery formulations.

ix) No risk: In case of working at the risky zone like fire stations, there are huge chances of causing harm to the personnel engaged. For the machine learning programs, if some mishap happens then broken parts can be repairable.

x) Acts as aids: AI technology has played a different function by serving children as well as elders on a 24x7 basis. It can perform as teaching and learning sources for all.

xi) Limitless functions: Machines are not restricted to any boundaries. The emotionless machines can do everything more efficiently and, also produce more accurately than the human beings.

7. DISADVANTAGES OF AI TECHNOLOGY

The important disadvantages of AI technology are as follows:

i) **Expensive:** The launch of AI causes huge money consumption. Complex designing of machine, maintenance and repairing are highly cost effective. For the designing of one AI machine, a long period of time is required by the R&D division. AI machine

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needs updating the software programmes, regularly. The reinstallations as well as recovery of the machine consume longer time and huge money.

ii) **No replicating humans**: Robots with the AI technology are associated with the power of thinking like human and being emotionless as these add some advantages to perform the given task more accurately without any judgement. If unfamiliar problems arise, robots cannot take the decision and provide false report.

No improvement with experience: Human resource can be improved with experiences. In contrast, machines with AI technology cannot be enhanced with experience. They are unable to identify which individual is hard working and which one is nonworking.

iii) **No original creativity:** Machines with AI technology have neither sensitivity nor the emotional intelligence. Humans have the ability to hear, see, feel and think. They can use their creativity as well as thoughts. These features are not achievable by the uses of machines.

iv) **Unemployment:** The widespread uses of AI technology in all the sectors may cause large scale unemployment. As because of the undesirable unemployment, human workers may lose their working habits.

8. CONCLUSION

During past few years, a considerable amount of increasing interest towards the uses of AI technology has been identified for analyzing as well as interpreting some important fields of pharmacy like drug discovery, dosage form designing, polypharmacology, hospital pharmacy, etc., as the AI technological approaches believe like human beings imagining knowledge, cracking problems and decision making. The uses of automated workflows and databases for the effective analyses employing AI approaches have been proved useful. As a result of the uses of AI approaches, the designing of the new hypotheses, strategies, prediction and analyses of various associated factors can easily be done with the facility of less time consumption and in expensiveness.This systematic review explores the pivotal role of artificial intelligence (AI) in addressing challenges within the pharmaceutical industry. The integration of AI is depicted as a transformative force in supply chain management, workforce optimization, and clinical trial disruptions, particularly in the aftermath of the COVID-19 pandemic.

The review emphasizes the potential of AI to streamline drug development processes, from target identification to drug discovery, design, and optimization. Furthermore, the application of supervised and unsupervised learning models in various pharmaceutical contexts, such as drug discovery, predictive maintenance, and clinical trial outcomes prediction, is highlighted. The evolving landscape of AI in the pharmaceutical sector promises to revolutionize research and development, offering solutions to longstanding issues and presenting new opportunities for innovation.

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TREATMENT COMBINATION FOR ALZHEIMER DISEASE: CURRENT AND FUTURE PHARMACOTHERAPY OPTIONS

Miss. Suchita S. Lathi[1], Prajakta Badrinarayan Shinde[2*]
Sudarshana R. Shelke[3], Shruti P. Shinde[4], Tushar Sanjay Sawant [5]
[1]Asst. Prof. (Faculty of P'ceutics) Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
[2]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
[3]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
[4]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
[5]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur,Jalna
Raosaheb Patil Danve College Of Pharmacy Badnapur,Jalna 431202

ABSTRACT

There are several stages of Alzheimer's disease, ranging from early memory loss to functional reliance and death. We go over the assessment and diagnosis of mild cognitive impairment using a case study, as well as the diagnosis and treatment of Alzheimer's disease at every stage, including the treatment of the disease's cognitive and behavioral/psychiatric components as well as end-stage and end-of-life care.One Seventy percent of dementia cases are caused by Alzheimer's disease (AD), which is the sixth most common cause of death. By 2050, there will likely be 106.8 million instances of AD worldwide, up from 26.6 million in 2006. In 2010, the estimated global expenses of dementia were US$604 billion, or 1% of global GDP from windows in the economy. The overview of AD pathophysiology and treatment is the main emphasis of this paper.

The literature search was conducted using PubMed, ScienceDirect, Scopus, and Google Scholar as sources.

AD is typically thought of as a disorder that involves a more severe loss of neurons and synapses that occurs in different anatomic al locations and produces a variety of symptoms.

Numerous mechanisms, including cholinergic dysfunction, amyloid/tau toxicity, and oxidative stress/mitochondrial dysfunction, are attributed to the etiology of Alzheimer's disease.Herbal medications, secondary metabolites, and, to a lesser degree, non-pharmacological therapies are emerging and promising options for the treatment of AD in addition to the numerous therapeutic ta rgets, biomarkers, and pharmacotherapies currently available.

The precise mechanism of herbal medications, secondary metabolites, and non-pharmacological therapy for the treatent of AD needs to be further investigated.

KEYWORDS: *Dementia, Differential Diagnosis, End Of Life, Mil, Alzheimer's Disease, Mitochondrial Dysfunction, Biomarkers Herbal Drugs*

INTRODUCTION

Alzheimer's disease is a brain ailment that gradually impairs thinking and memory, and ultimately the capacity to do anything at all. a degenerative illness that impairs memory and other critical mental processes. Memory and other mental processes are eventually destroyed as brain cell connections and the cells themselves deteriorate and die. Wide swaths of the cerebral cortex and hippocampus are impacted by Alzheimer's disease, a neurodegenerative condition that progresses and never stops. The brain tissue including the frontal and temporal lobes is typically where abnormalities are initially identified. They then gradually spread to other parts of the neocortex at rates that differ greatly from person to person. The primary cause of dementia is Alzheimer's disease (AD), one of the biggest health care issues of our century. According to estimates, 40 million individuals worldwide suffer from dementia, and this figure is expected to double every 20 years until around 2050.The majority of dementia patients are over 60, and as lifespans continue to increase, the number of dementia patients—primarily AD patients—is rapidly rising. As a result, research on dementia treatment is rapidly expanding. Nevertheless, there are currently no effective therapy options for the disease, despite all of the diligent research efforts.

Although the illness lasts for 8 to 10 years on average, preclinical and prodromal stages usually last for more than 20 years before the clinical symptomatic phases. The most prevalent kind of Alzheimer's disease, sporadic, often manifests about age 80. The inability to remove Aβ peptide from brain tissue is the primary reason. However, at this age, co-morbid conditions including hippocampus sclerosis and cerebrovascular disease are common, making diagnosis and treatment more difficult. While sporadic disease frequently has a family history of afflicted near relatives, autosomal dominant inherited Alzheimer's disease affects only a small percentage of people (<1%). The primary cause of dementia and one of the biggest medical care challenges of our century is Alzheimer's disease (AD). According to estimates, 40 million individuals worldwide suffer from dementia, and this figure is expected to double every 20 years until around 2050.The majority of dementia patients are over 60, and as lifespans continue to

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increase, the number of dementia patients—primarily AD patients—is rapidly rising. As a result, research on dementia treatment is rapidly expanding. Aggregation of the microtubule protein tau in neurofibrillary cells and the buildup of insoluble forms of amyloid-β (Aβ) in plaques in extracellular spaces and blood vessel walls are linked to Alzheimer's disease. A complex family of enzymes cleaves the amyloid precursor protein (APP) proteolytically to produce Aβ.6.

Although the sickness lasts for 8–10 years on average, preclinical and prodromal stages usually last for more than 20 years before the clinical symptomatic phases. The most prevalent kind of Alzheimer's disease, sporadic, often manifests about age 80. The inability to remove Aβ peptide from brain tissue is the primary reason.

However, at this age, co-morbid conditions including hippocampus sclerosis and cerebrovascular disease are common, making diagnosis and treatment more difficult. While sporadic disease frequently has a family history of afflicted near relatives, autosomal dominant inherited Alzheimer's disease affects only a small percentage of people (<1%). The clinical syndrome known as dementia is defined by a progressive loss of ability to execute instrumental and/or basic activities of daily life in two or more cognitive domains, such as memory, language, executive and visuospatial function, personality, and behavior. Approximately 80% of dementia diagnoses are due to Alzheimer's disease (AD), which is by far the most prevalent cause of dementia.

Numerous microorganisms, including bacteria, fungi, and viruses, live in the gastrointestinal (GI) tract. These organisms are generally referred to as the gut microbiota (sometimes used interchangeably with "microbiome," which refers to the collection of genomes from all microorganisms). Through a variety of pathways controlling peripheral neurotransmitters, metabolites, and immunological signals, dysbiosis—an unbalanced community of gut microbiota—has been connected to a number of brain disorders, according to recently mounting data.

Molecules. Significant study in the subject was sparked less than ten years ago by studies that revealed changed gut microbiota composition in animal models and AD patients. Numerous investigations have since been carried out to determine the relationship between the gut microbiota and AD, and a number of mechanistic theories have been put forth to explain the role of microbiota in AD. These theories include the production of neuroactive compounds, immune system and metabolism modulation, blood-brain barrier regulation, and involvement in the formation and removal of Aβ plaques. Although this development raises the possibility that addressing the gut microbiota could be a therapeutic approach for AD, the topic of the "microbiota-gut-AD brain axis" is still in its infancy, and there are still a number of unanswered questions that must be resolved before Understand the intricate relationship between AD and the gut flora before implementing clinical treatments that aim to address it.

THE MICROBIOTA-GUT-AD BRAIN AXIS IN OVERVIEW

The notion that the gut and the brain are connected has been acknowledged for centuries in medical history, but in recent decades, the precise function of the microbiota in this gut-brain axis has come to light and is now a hot topic in both scientific research and public interest. The development of bioinformatics and high-throughput sequencing technology has allowed researchers to fully characterize the composition and function of the gut microbiota5, which has led to the field's exponential growth. Additionally, this technological development has created new opportunities to investigate the connection between neurological disorders like AD and the gut microbiome.

French neurologists Pinel and Esquirol were instrumental in the 19th-century medical adoption of the word dementia. The last third of that century saw the development of novel brain fixation and histological staining techniques, inhibitor therapy, and the identification of brain changes in a number of mental diseases (including syphilitic general paresis). Age-related sleep and wakefulness issues could be caused by a lowering of circadian rhythm amplitudes. Sleep and cognitive functioning in older adults and Alzheimer's patients seem to be improved by non-pharmacologically modifying circadian rhythms through a variety.

The disorder can be treated with a variety of medications, inc luding as N-methyl D

aspartate receptor antagonists (memantine) and acetylcholine sterase inhibitors (rivastigmine, galantamine, donepezil).

Alzheimer's disease has historically been regarded as an illne ss in which a progressive loss of neurons and synapses occur s in specific anatomical locations, leading to a variety of sym ptoms.

The location, distribution, and number of distinctive brain les ions are assessed in order to diagnose AD.

Cortical atrophy is a key trait of the AD brain that is typically diffuse and reasonably comparable throughout the cerebral he mispheres rather than being conspicuous in certain lobes or on one side of the brainIn certain fronto-temporal lobar degenerations, for example. Although it is not always the case, fresh brain weight is typically below the adult normal range of 1,200–1,400g. In exceptional cases, it may even be above the upper range of normal. Cortical atrophy, which manifests as thinning of the cortical ribbon, is typically accompanied by ventricular system enlargement, also known as hydrocephalus ex-vacuo, and occasionally by subcortical white matter shrinkage, atrophy, and/or pallor. Two distinct patients' coronal slices of (fixed) brains, one with and one without dementia, are at similar coronal levels (close to the caudate nucleus' head there is less cortical thinning. A progressive decline in cognitive function is the hallmark of Alzheimer's disease, which accounts for 70% of all dementia cases and is the sixth most common cause of death. Alzheimer's disease also manifests as confusion, poor judgment, annoyance, withdrawal, and hallucinations. Seizures, Parkinsonian symptoms, myoclonus, increased muscular tone, incontinence, and mutism might occasionally happen.3. Patients should receive primary care in order to identify and monitor their illness, even if they may face

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different diagnostic and treatment obstacles. This aids in the early detection and identification of Alzheimer's disease, which eventually results in the provision of psychosocial support and symptomatic medication therapy

AD's World Wide Economy

1.By 2050, there will likely be 106.8 million instances of AD worldwide, up from 26.6 million in 2006.9. In 2010, the estimated global expenses of dementia amounted to US$604 billion, or 1% of global GDP. Less than 1% of global expenses were incurred by low-income nations (although they accounted for 14% of dementia prevalence), 10% by middle-income nations (though they accounted for 40% of dementia prevalence), and 89% by high-income nations (though they accounted for 46% of dementia prevalence). Just two regions accounted for around 70% of the global costs.

North and Western Europe. The significantly lower cost per North person in lower-income countries—US$ 868 in low-income countries, US$ 3,109 in lower-middle-income countries, US$ 6,827 in upper-middle-income countries, and US$ 32,865 in high-income countries—explains these disparities.6. While the percentage share of direct medical costs (15%) is far smaller, the majority of costs in high-income nations are attributed to informal care (45%) and formal social care (40%). Informal care expenditures—that is, unpaid care given by family members—dominate in low- and lower-middle-income nations, while direct social care costs are negligible. According to the 2012 WHO report "Dementia: a health priority.10," shifting population demographics in various LMIC may result in a decrease in the readily available extended family members in the ensuing decades.

Clinical Standards

Based on the criteria of the Alzheimer's Disease and Related Disorders Association (ADRDA) and the National Institute of Neurological and Communicative Disorders and Stroke (NINCDS), the diagnosis of Alzheimer's disease is classified as probable (typical clinical syndrome without histological confirmation), definite (clinical diagnosis with histological confirmation), or possible (atypical clinical features but no alternative diagnosis apparent; no histological confirmation).A decline in other areas of cognition, like anomia and reduced executive functioning, may be the major symptoms to be detected, according to the new guiding principle, which expands the definition of Alzheimer's dementia beyond memory loss as its principal symptom. It is possible to use biomarkers to improve diagnosis specificity.

The process of making a clinical diagnosis of Alzheimer's disease is explained as follows: the patient's history and the most crucial details regarding any prior illnesses are obtained from an informant in the first phase. The assessment of mental health and a confirmatory cognitive function test are part of the second phase. The physical examination, which is the third and most crucial step, should concentrate on neurological and vascular symptoms and be supported by investigations. The method of diagnosing dementia involves two steps. 13.First and foremost, it's critical to distinguish dementia syndromes from other illnesses that downplay them, such as mild cognitive impairment, delirium, and depression. Second, diagnosing the dementia subtype is crucial when dementia syndrome has been identified since it aids in selecting the best course of treatment.

Pharmacotherapeutics of AD

For the treatment of AD-associated dementia, there are currently just four approved and marketed medications, and their effectiveness is restricted. Three of these medications—donepezil, galantamine, and rivastigmine—act on cholinergic pathways in the central nervous system (CNS). All three medications exhibit anticholinesterase properties, while the natural alkaloid galantamine functions as an allosteric modulator at nicotinic acetylcholine receptors.

These medications are licensed for mild to severe dementia and are now accessible in generic forms. However, based on the findings of cognitive testing, they are frequently prescribed to patients in early stages of predementia who have considerable progressive memory deterioration. The most recent medication approved for AD in the US is memantine, which is noteworthy for being the first to target the glutaminergic pathway and the N-methyl-d-aspartate (NMDA) receptor.

A pathophysiological mechanism in AD has recently been linked to excess glutamate at excitatory synapses with accompanying cytotoxicity, which may be caused by reduced glutamate absorption from microglia. In a mouse model of the illness, glutaminergic regulation influences dendritic spine clustering.

Along with their approved indications, memantine and donepezil are both licensed medications used in monotherapy to treat AD symptoms.43 Memantine and donepezil both exhibit different and complementary modes of action, and when taken together, they provide the patient with extra advantages. Data from clinical studies conducted on healthy participants offered preliminary evidence that memantine and donepezil might be administered together without risk. In patients with AD, memantine exhibits a good safety profile when used in conjunction with steady ChEI treatment.

Non-pharmacological therapy of AD

Alzheimer's patients' quality of life (QOL) can be enhanced by non-pharmacological therapy (NPTs).

A small number of well-conducted randomized controlled trials have demonstrated that different forms of stimulation therapy can help people with AD with their **caues.** cognitive symptoms. These trials also suggest that cholinesterase inhibitor therapy may have additional benefits. Age-related sleep and wakefulness issues could be caused by a lowering of circadian rhythm amplitudes. Sleep and cognitive functioning in older adults and Alzheimer's patients seem to be improved by non-pharmacologically modifying circadian rhythms through a variety of environmental

Sleep

disturbance appears to be a contributing factor to the pathogenesis of Alzheimer's disease. Inappropriate sleep causes amyloid-β (A β) to build up, which may cause memory loss in the early stages and eventually lead to AD. Numerous studies have revealed that sleep patterns either directly or indirectly

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impact Alzheimer's disease. Aβ, AD, and non-rapid-eye-movement (NREM) sleep disturbance are associated with a probable mechanism. A new mechanism that links cortical Aβ to poor hippocampus-dependent memory consolidation is disruption of NREM sleep. Appropriate sleep appears to be a novel treatment focus in older age, offering therapeutic and anticipatory compensation.

As a non-invasive biomarker of Aβ pathology, AD risk, and AD pathophysiological development, the disturbance of NREM sleep physiology may have diagnostic value. There is evidence linking sleep disturbance to the development of AD; this disturbance is controllable and may be prevented or treated therapeutically.
Both direct and indirect biological factors influencing brain health have been connected to physical and cognitive activity. Details on the kind, level of intensity, duration, and mix of interventions must be investigated in future studies.

Music Therapy
While some research have shown that music therapy can help with the behavioral and psychological symptoms of dementia, the majority of these investigations are small and uncontrolled. For moderately severe and severe AD, music therapy is a safe and efficient way to reduce agitation and anxiety. Potential problems with diagnosis, selecting therapeutic targets, developing drug candidates, and designing clinical trials result from both successes and failings in our understanding of the pathophysiology of Alzheimer's disease. Numerous in vitro and in vivo investigations are still being conducted, but we must prioritize finding a suitable treatment for Alzheimer's disease, therefore this advancement in the creation of medications for the condition needs to be re examined. Clinical trial research often gives us

In addition to providing new insights into Alzheimer's disease treatment, music aids in the research of pharmacological interaction patterns rather than focusing on a particular potential medication target. We are getting closer to creating the best possible pharmaceutical strategy for treating Alzheimer's disease thanks to a number of ongoing randomized controlled trials that show encouraging results and provide a means of fostering greater cooperation between pharmaceutical companies, basic researchers, and clinical researchers.

Potential Herbal Drugs For AD
There are common traditional Indian botanicals that may help treat neurological conditions including dementia and Alzheimer's. Ayurvedic rasayana medications are abundant in immunomodulatory and antioxidant compounds. Some of these medications have already been shown to have considerable antioxidant activity. Since the delicate balance between oxidants and antioxidants is disrupted in most illnesses,

You could consider their primary mode of action to be their capacity to scavenge free radicals or to activate oxidant defenses of cells. Ashwagandha, Brahmi, Mandukaparni, Shankapushpi, Vacha, Jatamansi, and Jyotshmati are just a few of the numerous plants that fall within the Rasayana plant category. These herbs are categorized as brain tonics or rejuvenators since they are unique to brain tissues. In addition to the aforementioned, our labs have reported that a number of Rasayana medications have a positive impact on memory impairments and are recommended for a possible function in dementia and other neurological disorders. They may also be useful in AD.

As a shrub, ashwagandha (Withania somnifera) belongs to the solanaceae family. It is regarded as an adaptogen, a non-toxic drug that engages the immunological and endocrine systems to restore physiological processes against long-term stress. By increasing neurite outgrowth, ashwagandha may aid in the restoration of damaged neural circuits

Brahmi
Since ancient times, Brahmi (Bacopa monniera; family: Scrophulariaceae) has been utilized as a valuable brain tonic to improve cognitive function, reduce stress in anxiety, and rejuvenate the intellect. According to numerous research, this medicinal herb can be used to treat mental and neurological diseases since it functions as a nervine and mental tonic16.
4. Chandan Chandan, a member of the Santalaceae family (Santalum album). According to Siddha, this plant has the ability to improve cognitive function and memory. Licorice has a strong memory-boosting effect and helps people with scopolamine-induced dementia learn and remember things better.

Haldi
The majority of chronic disorders, including as autoimmune, metabolic, pulmonary, cardiovascular, neurological, and neoplastic conditions, are treated with haldi (Curcuma longa).16 One herbal medication with therapeutic potential for AD is curcumin. When given to a mouse model of AD17, curcumin, the principal chemical component of haldi or turmeric, reduced the blood Aβ level and lessened the load of Aβ in the brain. This effect was mostly observed in the neocortex and hippocampus of the AD animal model. Curcumin penetrates the blood-brain barrier, prevents Aβ plaques from forming, destroys preexisting Aβ fibrils, and stops them from extending. Curcumin therapy has a greater therapeutic impact and can restore the distorted neuritic morphology found close to plaques

Symptoms
- ❖ Memory loss is the key symptoms of Alzheimer disease
- ❖ Depression
- ❖ Loss of interest in activities
- ❖ Anger or aggression
- ❖ Anxiety
- ❖ Mood swings.

Causes /Risk Factors
- ✓ Age
- ✓ Family history
- ✓ Genetics
- ✓ Down syndrome
- ✓ Excessive alcohol consumption

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✓ Lifestyle and her health

Prevention

1.Exercise Regularly
2.Eat Healthy
3.Manage Chronic Condition
4. Reduce Stress
5. Blood Pressure Management
6. Mental Stimulation

Types

1.Earlyonset
The kind is less prevalent than let on set, and symptoms start to show before the age of 60. and frequently connected to chromosome 1 defects
2. Arriving late to the set
This is the most prevalent disease that affects persons 65 and older.

SYMPTOMATIC TREATMENT OF AD

➢ **Cholinesterase Inhibitors**

The cholinergic hypothesis states that AD results from a decrease in the manufacture of acetylcholine (ACh). One of the treatment approaches that improves cognitive and neural cell function is to raise cholinergic levels by blocking acetylcholinesterase (AChE). Acetylcholine breakdown in synapses is inhibited by AChEIs, causing ACh to continuously accumulate and cholinergic receptors to become activated. The first FDA (Food and Drug Administration)-approved cholinesterase inhibitor medication for the treatment of AD was tacrine (tetrahydroaminoacridine), which works by raising ACh in muscarinic neurons. However, it was taken off the market right away because of a high rate of adverse effects, such as hepatotoxicity, and a lack of benefits, which were noted in multiple trials. Later on, a number of AChEIs were released, including donepezil, and areThe cholinergic hypothesis states that AD results from a decrease in the manufacture of acetylcholine (ACh). Increasing cholinergic levels is currently being used to treat AD symptoms. Increasing choline reuptake and, consequently, acetylcholine production at the presynaptic terminals is another tactic that could aid in the treatment of AD.

The choline transporter (CHT1), which provides choline for the manufacture of ACh, can be targeted to do this. The future of AD treatment may involve creating medications that can raise CHT1 at the plasma membrane. It includes the following medications:

Donepezil

The most used medication for treating AD is donepezil, a second-generation AChEI and derivative of indanonebenzylpiperidine. Acetylcholine hydrolysis is inhibited by donepezil's reversible binding to acetylcholinesterase, increasing the amount of ACh at synapses. The medication has minor and temporary cholinergic side effects that are associated with the neurological and gastrointestinal systems, although they are well tolerated. It should be mentioned that donepezil is used to treat AD symptoms, such as enhancing behavior and cognitive, without changing the course of the disease.

Rivastigmine

The mechanism of action of rivastigmine, a pseudo irreversible inhibitor of AChE and butyrylcholinesterase (BuChE), is to bind to the anionic and estearic sites of AChE, hence blocking ACh metabolism. Although BuChE is mostly present in glial cells and has only 10% of AChE activity in the normal brain, its activity can range from 40% to 90% in the AD brain while ACh activity is also decreased. This shows that BuChE action could be a sign of moderate to severe dementia.Rivastigmine is referred to as a pseudo-irreversible because it dissociates more slowly than AChE. AChE and BuChE metabolize it at the synapse. When AD is mild to severe, the medication is administered. The majority of AD patients experience swallowing issues and memory loss, which impact their

Memantine

AchE inhibitors are not what this is.It functions by preventing the effects of glutamate, a neurotransmitter that is present in the brain in excess. It used to serve AD or moderate it. NMDA, or N-methyl d-aspartate. Ach-producing cells are destroyed by a number of physiological events in AD, which lessens cholinergic transmission in the brain. Reversible, irreversible, and pseudo-reversible acetylcholineses22terase inhibitors (AChEIs) work by preventing the breakdown of ACh by cholinesterase enzymes (AChE and butyrylcholinesterase (BChE)).

PATHOPHYSIOLOGY

An accumulation of aberrant neuritic plaques and neurofibrillary tangles in the brain is a pathological hallmark of Alzheimer's disease. Neurons, especially cholinergic neurons in the neocortex and basal forebrain, are lost in conjunction with these pathogenic alterations.

In addition to subcortical nuclei like the serotonergic dorsal raphe, noradrenergic locus coeruleus, and cholinergic basal nucleus, neuronal loss and/or pathology can be observed in the entorhinal cortex, hippocampus, amygdala, and cortical association areas of the frontal, temporal, and parietal cortices. There is a pattern to the way tangles get deposited.

CONCLUSION

With an emphasis on both symptom management and possible disease modification, pharmacological approaches for Alzheimer's disease have undergone significant change.The prevalence and course of Alzheimer's disease (AD) in Arabian populations are influenced by distinct genetic, environmental, and cultural factors, as is now understood.

AD is a condition that has been shown to be challenging and demanding.It is caused by lifestyle issues and environmental factors.Alzheimer's disease is a terrible illness that needs immediate care. Even while there has been progress, there are still many obstacles to overcome. Improving diagnosis, care, and treatment requires ongoing research, creativity, and cooperation.We must give research, early detection, and compassionate care top priority as our knowledge of its causes, symptoms, and development grows. By doing this, we can help

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people impacted, provide support to their families, and work toward developing efficient treatments and, eventually, a cure.

SUMMARY

Which is the sixth most common cause of death. By 2050, there will likely be 106.8 million instances of
AD world wide, upfrom26.6millionin2006.

AD is Seventy percent of dementia cases are caused by Alzheimer's disease (AD), a condition that has been shown to be challenging and demanding.It results from changes in lifestyle and environmental factors. In addition to current pharmacotherapies, biomarkers, and therapeutic targets, the quest for comprehensive AD therapy is ongoing. Nonetheless, it is commendable to combine medicine with non-pharmacological therapeutic methods.

THE FUTURES SCOPE

Numerous areas of attention are emerging in the promising field of research. One important field is biomarker development, which seeks to create trustworthy and efficient biomarkers for Alzheimer's disease monitoring, diagnosis, and early detection. This includes analytical and clinical validation of biomarkers, such as those measured with digital technology

1) Research is being done on personalized medicine techniques, which center on customized therapies based on personal traits including genetic profiles and lifestyle choices.
2) The effects of lifestyle interventions on the prevention and treatment of Alzheimer's disease are being investigated. Examining how nutrition, exercise, and social interaction affect cognitive health is part of this.
3) Strategies for neuroprotection and regeneration seek to prevent harm to neuronal cells and encourage their regeneration. This covers studies on immunotherapy, gene editing technology, and stem cell therapies.

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TOTAL QUALITY MANAGEMENT AND ITS IMPACT IN HIGHER EDUCATION

Reshmi Sasi
Assistant Professor, Jyotirmoy School of Education, West Bengal

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ABSTRACT

The purpose of the paper is to clarify how instructors' perceptions are affected by whole quality management. One of the most crucial issues in education is quality. Everyone is familiar with the term "quality," which can signify many different things. As a successful management philosophy for organisational excellence and continuous development, TQM is attracting the genuine interest of educators, policymakers, academics, and researchers. The message of Total Quality Management (TQM) in education is that every kid is valuable and deserves the finest opportunity in life. TQM, then, is the art of managing everything to attain perfection. As a methodology, Total Quality Management (TQM) signifies a long-term change in an organization's emphasis from immediate efficiency to long-term quality enhancement. TQM has been used in the education sector for the past few years, primarily in the administrative aspects of the institutions. However, some schools are now incorporating TQM into their curriculum development. Through planning, observing, guaranteeing, and enhancing quality, quality management in education is essential to reaching quality objectives. An effective TQM system can help an organisation achieve its goals and fulfil its role in the education of the next generation while also facilitating global market progress. Additionally, it is improving the overall quality of labour and management in educational institutions.

KEYWORDS: *TQM, Continuous Improvement, Quality Improvement, Higher Education, Organizational Excellence*

INTRODUCTION AND BACKGROUND OF QUALITY MOVEMENT

Most agendas prioritise quality, and enhancing quality is arguably the most crucial activity any institution can undertake. But despite its importance, quality is a term that many people find confusing. It is challenging to define and frequently hard to quantify. As we are all too aware, no two experts ever reach a consensus on what constitutes an exceptional school, college, or university, and different people frequently have different ideas about what quality is. We can all sense quality when we see it, but it can be more difficult to define and explain. We frequently take quality for granted in our daily lives, especially when it is consistently offered. However, we are all too keenly aware of its absence. Therefore, identifying the source of quality is a crucial endeavour. Education also acknowledges the necessity of pursuing and imparting it to students. The nation's cultural and economic advancement is greatly influenced by higher education. Numerous creative concepts have been implemented in recent decades to improve intellectual and educational standards. Institutions must concentrate on the idea of total quality management if they truly wish to improve the calibre of the higher education system. Quality educational programs in higher education are correlated with modernisation, globalisation, the number of students increasing, mass enrolment rates, shifting socioeconomic conditions, and job descriptions. Total Quality Management is a methodology as well as a philosophy. We must comprehend the quality movement's industrial roots in order to look at how it got its start. The terminology, concepts, and methods of Total Quality Management are drawn from industry. There has always been a need to make sure that items meet specifications, satisfy customers, and offer good value. Consistent quality enables customers to trust the manufacturer and the product.

OBJECTIVES OF THE STUDY

i. To access the compatibility of TQM with education
ii. To identify the impact of TQM in education.
iii. To find out the potential benefit of adopting TQM that can be visualized in all sphere of education.

METHODOLOGY OF THE STUDY

The qualitative methodology has been chosen for this study. This exploratory approach would give an opportunity to understand and clarify the main issue of this study. Data and information for this study are collected through extensive literature including books, journals and articles.

Operational Definition of Terms Used

- **Total Quality Management (TQM):** Total Quality Management is a management technique based on the idea that all employees continuously improve their ability to provide on demand products and services that customers will find of particular value and satisfaction.
- **Continuous Improvement:** Continuous Improvement is the ongoing improvement of products, services or processes through incremental and breakthrough improvements.
- **Quality Improvement:** Quality Improvement is the

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systematic and coordinated process of continuously striving to improve services, products or processes.

- **Higher Education:** The level of education that follows secondary education and provides advanced academic and professional knowledge and skills.
- **Organizational Excellence:** Organizational Excellence means that an organization makes continuous improvement to increase its efficiency, effectiveness, quality and customer satisfaction.

SIGNIFICANCE OF THE PROBLEM

Organisations that seek to thrive in highly competitive, globally interconnected settings must effectively accomplish their goals and outcomes, which is why Total Quality Management is so important. TQM plays a crucial role in this process as they build and execute management systems that enable them to assign resources, define and develop essential activities, and establish policies and responsibilities. The goal of TQM, a strategic strategy, is to promote an ongoing stream of incremental quality improvements. It promotes the development of a collaborative culture among the organization's many departments. It is mostly a management style and cultural effort aimed at improving quality. TQM is an organised method for managing an organisation as a whole. By continuously improving internal procedures, the process aims to raise the calibre of an organization's outputs, including goods and services. Both internal priorities and any existing institutional standards can be reflected in the standards established as part of the TQM process.

LITERATURE REVIEW

N. Ravindran & R. Karpaga Kamaravel (2016) The potential, problems, and difficulties related to Total Quality Management in education are the main topics of this study. Both individuals who directly or indirectly participate in education and those who utilise its services place a growing emphasis on its quality. It is important to recognise that access to education and high-quality education are inseparable needs and rights. This is mainly accomplished by cultivating civic, democratic, and creative ideals in addition to the knowledge, skills, and abilities required for daily and professional life.

M.S Farooq et all (2007) The paper's goal is to examine the ideas behind the contemporary management paradigm known as "Total Quality Management" (TQM) and how it is used in the educational sector. TQM's central tenet is the use of a participatory approach to address quality issues in both business and education. Due to the cooperation of the organization's members and the emphasis on long-term profitability through customer satisfaction and societal advantages, organisational management is paying attention to quality.

Abu Saleh Md. Sohel-Uz-Zaman & Umana Anjalin (2016) This paper's primary goal is to examine if TQM and education are compatible. This study aims to pinpoint the main obstacles to TQM implementation in the classroom. It is anticipated that this article will be able to make a significant conclusion on the suitability of TQM in education and raise awareness of the issues that could make its implementation in that field more difficult. In many societies around the world, high-quality education is a major concern. The quality of education is crucial to academic institutions' performance in the fiercely competitive education sector. Since Total Quality Management (TQM) is acknowledged as a successful management concept for continuous improvement, customer satisfaction, and organisational excellence, educators, policymakers, scholars, and researchers are demonstrating their genuine interest in it.

A.K.M Fazlul Hoque & Md. Siddique Hossain (2017) The idea of Total Quality Management (TQM) has been covered in this paper, with an emphasis on how it might be used in the educational sector. Definition, concept, TQM principles, and philosophy are addressed side by side. Additionally, covered in this work are relationships, synergy, self-evaluation, continuous improvement, and a system of continuous process leadership, among other topics. Mission and passion, administrators as role models, environment considerations, accountability, human interactions, and feedback are all common components of the TQM process in educational institutions. After determining the obstacles to implementing overall quality in education, the concept's implementation principles and procedures have been described. TQM will assist in achieving excellence, which is the only way to ensure an institution's existence in the current highly competitive world with diminishing educational subsidies.

Ankit Chauhan & Poonam Sharma (2015) We can understand from this article that the notion of quality has become a fundamental element of the educational process for its success as a result of the shifting patterns of education delivery from in-person to online, course content, learner characteristics, and organisational structures. Numerous organisations have been founded worldwide to create standards for high-quality goods and services as well as how to maintain them. Education professionals and administrators have good reason to be concerned about the globalisation of education and the movement of pupils from one community to another. In education, Total Quality Management (TQM) is a timely instrument that needs to be fully comprehended, embraced, and put into practice as soon as feasible.

Eylem Mentesoglari (2023) This essay addresses the need for a strategic strategy to attain success and continual development while highlighting the significance of quality management in the education sector. We can comprehend that the current environment in which the education industry functions is complex and changing quickly. To preserve their competitive edge and provide the greatest education possible to their students, schools must thus embrace a quality-oriented strategy. The idea of Total Quality Management (TQM) is relevant in this situation. Additionally, this paper outlines tactical measures for implementing TQM in educational settings. These include establishing data and information management procedures, assessing student happiness, assessing and refining processes, guaranteeing employee involvement, and deciding on the company's mission.

Sangeeta Sahney et al (2008) This research aims to understand the role that Total Quality Management (TQM) had in the transformation process of education. Next, we will identify the

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clients of the higher education system. Preschool and higher education institutions have upheld TQM, which has led to high-quality input in the form of students, faculty, student activities, placement infrastructure, etc., and high-quality output in the form of enlightened students who have left the system. We chose the best approach to address the problem first because it is not always the case that the demands and interests of the different student groups will yield the desired outcomes.

Higher Education

In order to push students to new knowledge frontiers in various areas of life, higher education teaches in-depth knowledge and insight. It expands the individual's capacity for thought. Following secondary school, higher education—also known as post-secondary education, third level, or tertiary education—occurs as an optional last phase of formal education. Universities and colleges that provide formal degrees above high school or secondary school education make up this group.

Quality Education

When attempting to comprehend quality in any circumstance, two fundamental enquiries must always be asked. "What is product?" is the first query. "Who are the customers?" is the second query. These enquiries are equally relevant to the conversation about educational quality. Lifelong learning is at the heart of education. TQM must target the quality of the learner's (customer's) experience (product) if it is to be relevant in the field of education. It won't significantly improve educational quality unless it accomplishes that.

Working Mechanism of Total Quality Management (TQM)

A customer-focused organisation can utilise Total Quality Management as a management method that engages all staff members in ongoing enhancements to every facet of the business. Total employee participation, continuous improvement, continuous training, teamwork, empowerment, top management commitment and support, democratic management style, customer or person satisfaction, and culture transformation are among the TQM concepts found in quality management literature. Teaching, learning, and administration are some of these procedures. TQM is a general management concept and toolkit that enables an organisation to identify what quality is and how to achieve it. Quality is defined as a continual improvement that is determined by how satisfied customers are with the services they receive.

Principles of Total Quality Management (TQM)

Leadership, respect, integrity, trust, honesty, commitment, customer satisfaction, openness, high ethics, problem solving, continuous improvement, complete involvement, training and education, problem ownership, reward and recognition, error prevention, teamwork, instinct motivation, consistency, and effective communication are just a few of the soft concepts that TQM depends on. Examining the literature reveals that there are numerous notions or principles, sometimes expressed with various terminology. The cornerstone of TQM is a set of guiding principles:

- **Customer Focus:** Recognise and surpass client expectations by providing goods and services that satisfy their requirements.
- **Employee Involvement:** Encourage and enable staff members at all levels to participate in initiatives for quality improvement.
- **Integrated System:** Establish a unified system in which all departments and functions collaborate to meet quality standards.
- **Process-Centric Approach:** Stress the value of effective and thoroughly recorded procedures.
- **Systematic Flow:** Make decisions and solve problems using data and methodical techniques.
- **Constant Efforts:** Make an ongoing effort to enhance every facet of the company.
- **Factual Decision-Making:** To reduce risks and uncertainties, base decisions on information and facts.
- **Relationship Management:** To improve cooperation and success for both parties, cultivate solid connections with suppliers and consumers.

Earlier Efforts of Implementation TQM in Education

At Mt. Edgcombe High School in Sitka, Alaska, TQM first appeared in the field of education in 1988. In his seminars, IT coordinator and instructor David Langford used the principles of comprehensive quality. In the field of education, TQM has grown in popularity. Additionally, TQM has permeated conventional educational institutions. For instance, the quality movement in education was the focus of the entire November 1992 issue of the Association of Supervision and Curriculum Development's journal, "Educational Leadership."

Quality Management Implementation & Practices: Indian Perspective

Higher education institutions around the world have embraced many quality management strategies created for the industry. There isn't much use of TQM in the field of education. However, a number of colleges and institutions have begun implementing the TQM idea in recent years. All India Council for Technical Education (AICTE), a national apex advisory organisation, was established to oversee, guarantee, and manage the nation's educational standards. When it comes to the application of TQM in the higher education system, India has not yet achieved impressive achievements. There is a lot of demand for this and room for development in order to raise the standard of education going forward. This essay demonstrates the different steps that higher education institutions have taken or should take to properly adopt Total Quality Management.

Importance of TQM in India's Educational System

Since India is a democratic nation, everyone has an equal opportunity to receive a quality education. Numerous educational institutions exist, however, they only offer theoretical instruction with little focus on practical instruction. The curriculum that is taught in schools and universities has been in place for many decades; it has not been modified to meet the demands of students, the times, or society. Schools don't offer any instruction that could foster professionalism, a scientific mindset, or practical hands. The current system produces students with degrees but no knowledge, kids with certificates but no employability, and students with grades but no

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originality. It also takes time, money, and effort for industries to reverse, alter, and rewrite what is taught in schools. Therefore, Total Quality Management must be used in schools, colleges, and universities in order to address these kinds of issues at all levels. The core of the educational system should be quality in order to empower, advance, and provide all forms of support to other sectors. Thus, the development of practical education in the nation's educational institutions will benefit from a dedication to quality but comprehensive quality management. Quality improvement is an ongoing effort. A bright future is the result of high- quality education in India.

Therefore, the category in the wide range of educational strata should receive the necessary attention, and understanding on quality indices and virtual implementation should be given high priority. All facets of the system, including classroom instruction, professional development, scientific temper development, and infrastructure, should be made better. Educational institutions should support high-quality education if they want to compete in the global arena.

Advantages TQM in Higher Education

In the twenty-first century, total quality management, or TQM, has gained international attention. Although TQM has developed and expanded in numerous organisations, it is now playing a crucial role in the sector of education. Many organisations worldwide have recognised the benefits of Total Quality Management. The majority of TQM's tenets may be applied to training and education. The purpose of this article is to demonstrate the impact of TQM on higher education.

- TQM addresses the issues of growing expenses and the demand for high-quality instruction in postsecondary educational establishments.
- By removing organisational inefficiencies, TQM will assist higher education institutions in remaining competitive.
- TQM aids in meeting the demands of all stakeholders, concentrating on the needs of the market, and achieving excellent performance across the board.
- •The following are impacted by the application of TQM in higher education, which spans all subject areas and educational levels:
  - Buildings, sports complexes, open fields, and other physical facilities
  - Academic infrastructure includes things like labs, libraries,documentation,communication,and information systems.
  - Assessment and development of curriculum
  - Development & improvement of exam and evaluation system
  - Supportingadministrative and academic staff members and their processes for improvement
  - Research and publications
  - Plans for institutional development
  - Good governance, efficient use of resources etc.

CONCLUSION

In the assessment process of teaching and learning, the collection of high-quality and trustworthy feedback is essential to the effectiveness of any ongoing growth endeavour. One of the most effective instruments for the teaching and learning process in education is TQM. According to Bloom's Taxonomy, the primary goal of a higher education institution is to produce extremely useful knowledge for its students. This study finds that TQM will have a greater influence on the goals of the organisation and yield benefits in terms of increasing economic value as well. Higher student morale, improved departmental or classroom collaboration, bridging faculty staff roles, improved quality from the perspective of the customer, and ongoing growth for all those involved in the educational institution are some of the results of TQM in education.

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MEDICINAL PLANT AS SOURCE FOR NOVEL ANTI-MICROBIAL AGENTS [LANTANA CAMARA]

Mr.Awinash.S. Chavan [1], NikitaSahebraoWankhede[2*], Avinash. B. Rathod[3] Renuka.V.Wagh[4]

[1]Asst.Prof. (Faculty of P'chemistry) Roasaheb Patil Danve College of Pharmacy, Badnapur
[2]Student of Bachelor of Pharmacy , Raosaheb Patil Danve College of Pharmacy Badnapur ,Jalna
[3]Student of Bachelor of Pharmacy , Raosaheb Patil Danve College of Pharmacy Badnapur ,Jalna
[4]Student of Bachelor of Pharmacy , Raosaheb Patil Danve College of Pharmacy Badnapur ,Jalna
Raosaheb Patil Danve College of Pharmacy Badnapur , Jalna 431202

ABSTRACT

Introduction Earthworm (Pheretima posthuma) and plant (Lantana camara) extracts have been used for centuries to treat a variety of ailments; they have been shown to inhibit the growth of numerous harmful bacteria and are particularly useful for wound healing. To determine which is more effective for creating antiseptic ointment, we evaluated the antibacterial activity of the various organic extracts derived from these species against harmful bacterial strains. The disk diffusion and shaking flask tests were utilized to determine the antibacterial activity of the ethanol and acetone solvents employed for the extraction. Next, we determined the extracts' lowest inhibitory concentrations against both gram-positive and gram-negative microorganisms. When it came to Pseudomonas aeruginosa, Lantana camara exhibited the biggest growth inhibitory zone, followed by Serratia marcescens and StaphylococcusAureus is the abstract. While earthworm extract inhibited growth at a minimum level of 200µg/ml, plant extract had a minimum inhibitory concentration (MIC) of 150µg/ml. In contrast to the worm extract, we discovered that the ethanol extract of the plant (L. camara) demonstrated strong antibacterial activity. The use of Lantana camara extract to create an ointment to treat wound infections is supported by current research.

KEYWORDS: *antibacterial, harmful bacteria, Pheretima posthuman, and Lantana camara.*

HISTORY

Originally from Central and South America, Lantana camara is a perennial blooming shrub that is now extensively found throughout tropical and subtropical regions of the world. It is often referred to as Spanish flag or wild sage. It is a member of the Verbenaceae family and is distinguished by its thick clusters of tiny, colorful flowers that might be pink, red, or yellow and orange. The plant can reach a height of two meters and has a sturdy, woody stem.

Because of its capacity to spread quickly and establish itself in a variety of settings, such as disturbed woods, pastures, and degraded land, Lantana camara is frequently considered an invasive species.

OVERVIEW

The flowering plant Lantana camara, also referred to as lantana, is indigenous to the tropical Americas but has become well-known throughout the world for its aesthetic appeal and possible therapeutic uses. The plant's bioactive chemicals, which have a variety of biological functions, especially antibacterial effects, have been the subject of more recent research.

• Lantana camara extracts have been shown in numerous studies to have strong antiviral, antifungal, and antibacterial properties. As an example, research shows.

show the growth of several harmful bacteria, including Escherichia coli, Staphylococcus aureus, and Pseudomonas aeruginosa, as well as fungi like Candida albicans, can be inhibited by its leaf and flower extracts. Given the rise in antibiotic resistance, these results imply that Lantana camara may be a good source of natural antimicrobial agents that could replace manufactured antibiotics.

• Lantana camara has medicinal potential that goes beyond antibacterial uses; its extracts have demonstrated promise in the treatment of skin disorders, inflammatory illnesses, and even as a cancer treatment adjuvant. In light of the growing interest in using natural products for therapeutic purposes, the purpose of this review is to gather and examine the most recent research on Lantana camara as a source of antimicrobial agents, emphasizing its phytochemical components, processes, andailments, skin disorders, and even as a supplement to cancer treatment. Considering the growing demand for natural products for therapeutic uses, this The purpose of this study is to gather and evaluate the most recent research on Lantana camara. as an antibacterial agent source, emphasizing its phytochemical components, modes of action, and possible therapeutic uses.

Botanical Description

- Kingdom: Plantae
- Family: Verbenaceae
- Genus: Lantana
- Species: L. camara

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Traditional Uses
- Fever reduction
- Wound healing
- Skin infections
- Respiratory tract infections

Phytochemical Profile
- Flavonoids (e.g., lantanoside, camarine)
- Phenolic acids (e.g., caffeic acid, ferulic acid)
- Terpenoids (e.g., lantanol, camarol)
- Alkaloids (e.g., lantanine)

Antimicrobial Activity
- Bacteria: Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa
- Fungi: Candida albicans, Aspergillus niger, Fusarium oxysporum
- Viruses: Herpes simplex virus, Influenza virus

Advantages
- Natural and sustainable source
- Broad-spectrum antimicrobial activity
- Low toxicity
- Potential for combination therapy

Methodology
- Plant collection and extraction
- Phytochemical analysis
- Antimicrobial activity evaluation
- Minimum inhibitory concentration (MIC) and minimum bactericidal/fungicidal concentration (MBC/MFC) determination

Objectives
- To evaluate the antimicrobial activity of Lantana camara extracts
- To identify the bioactive compounds responsible for antimicrobial activity
- To assess the potential of Lantana camara as a source of antimicrobial agent

Classification
- Kingdom: Plantae
- Family: Verbenaceae
- Genus: Lantana
- Species: L. camara

Common Names
- Lantana
- Wild Sage
- Shrub Verbena
- Yellow Sage
- Camara

Description
- Evergreen shrub
- Height: 2-4 meters (6-12 feet)
- Spread: 1-2 meters (3-6 feet)
- Leaves: Oval, pointed, 2-5 cm long, opposite
- Flowers: Small, fragrant, yellow, pink, or purple, in clusters
- Fruits: Small, round, purple berries

Habitat
- Native to tropical Americas (Mexico, Central America, South America)
- Naturalized in Africa, Asia, Australia, and Pacific Islands
- Grows in warm, humid climates
- Tolerates drought, salt, and poor soil

Cultivation
- Propagation: Seeds, cuttings, layering
- Soil: Well-draining, fertile
- Water: Regular, but drought-tolerant
- Sun: Full sun to partial shade
- Temperature: 20-30°C (68-86°F)

Uses
- Ornamental plant
- Medicinal plant (antimicrobial, anti-inflammatory, antioxidant)
- Insect repellent
- Food source for butterflies and birds

Chemical Constituents
- Flavonoids (lantanoside, camarine)
- Phenolic acids (caffeic acid, ferulic acid)
- Terpenoids (lantanol, camarol)
- Alkaloids (lantanine)

Medicinal Properties
- Antimicrobial (bacteria, fungi, viruses)
- Anti-inflammatory
- Antioxidant
- Anticancer
- Antidiabetic

Toxicity
- Toxic to humans and animals if ingested in large quantities
- Causes skin irritation and allergic reactions in some individuals

Interesting Facts
- Lantana camara is considered an invasive species in many regions.
- The plant's berries are toxic to humans and animals.
- Lantana camara has been used in traditional medicine for centuries.

1.Antimicrobial Action

Extracts from lantana camara have demonstrated strong efficacy against common infections as well as Gram-positive and Gram-negative bacteria.
such as Salmonella species, Pseudomonas aeruginosa, Escherichia coli, and Staphylococcus aureus.

Mechanism: It is thought that substances like flavonoids and tannins, which break down bacterial cell walls, prevent protein synthesis, and obstruct enzyme function, are what cause the antibacterial effect.

2. Activity Against Fungi

Strong antifungal qualities have also been shown by the plant, especially against fungi including Candida albicans, Aspergillus niger, and Fusarium oxysporum.

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Mechanism: By rupturing fungal cell membranes and impeding spore germination, essential oils and certain phenolic chemicals found in Lantana camara may suppress fungal growth.

3. Antiviral Action

Although less thorough, research on Lantana camara's antiviral properties is nonetheless encouraging. The extracts havesuppress demonstrated efficacy against specific viruses, such as influenza and the herpes simplex virus (HSV).

PLANT PROFILE



 Lantana camara
 Botanical Name : –Lantana camara Linn.
 common Name :- Lantana.
 Marathi Name :- Tantani, Ghaneri
 Family : Verbenaceae.
 Chemical constituents : Alkaloids, Flavonoids, tannins.
 Medicinal use : Exhibits antibacterial, Fungicides, Insecticidal
qualities, Leprosy treat, Skin rashes treat.

Technique and Content

Conventional Extraction Techniques

1. Solvent Extraction: The process of removing bioactive substances from Lantana camara plant components (leaves, stems, and roots) using solvents such as ethanol, methanol, or hexane.

2. Maceration: The process of extracting chemicals by soaking plant material in a solvent.

3**. Infusion**: To extract chemicals, plant material is steeped in hot water.

4. Decoction: Extracting chemicals by boiling plant material in water.

Techniques for Phytochemical Extraction

1. Alkaloid Extraction: The process of extracting alkaloids using solvents such as ethyl acetate or chloroform.

2**. Flavonoid Extraction**: Flavonoids are extracted using solvents such as methanol or ethanol.

3. Terpene Extraction: Terpenes are extracted using solvents such as dichloromethane or hexane.

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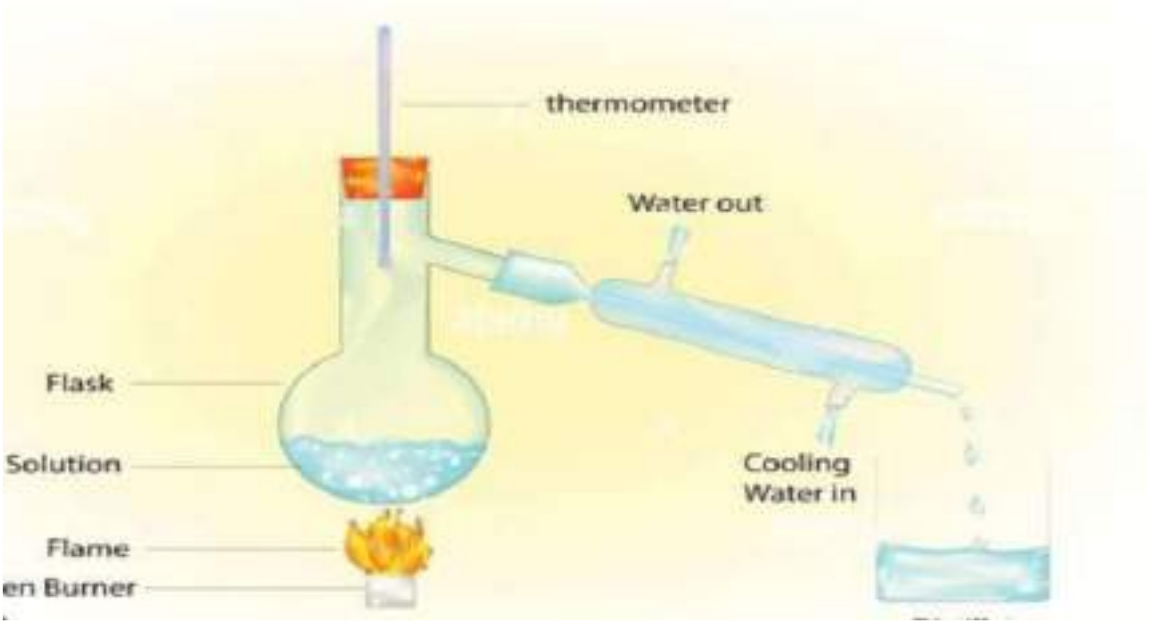


Fig. Soxhlet Apparatus



Fig. Decoction

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CONCLUSION

The variety of bioactive chemicals that can be used as a therapeutic source in the creation of pharmaceuticals.

The ethanolic extract of L.camara leaf contains anti-oxidant, anti-metastatic, anti-cancer, anti-inflammatory, antibacterial, and anti-tumor effects, per an initial screening. The current research focuses on the antimicrobial qualities of additional pathogens and helpful microorganisms as well as their anti-insectidal activity against insects that harm plants.

Reports found in previous and ongoing research may lead to the development of a medication to protect plants against insects and microorganisms. In our research, a novel herbal insecticide (Lantocide) was created based on the properties of the ethanolic extract of L.camara. We are here with a natural insecticide solution because the globe is currently dealing with the terrible impacts of chemical pesticides. As a result, this extract might be studied further for usage as a better herbal pesticide in the marketplace.

Summary

The flowering plant Lantana camara, also referred to as lantana, is indigenous to the tropical Americas and has become well-known in

different regions of the world because of its possible medical benefits and aesthetic value. The plant's bioactive chemicals, which have a variety of biological functions, especially antibacterial effects, have been the subject of more recent research.

Future Scope

1. Pharmaceutical industry: Creating and promoting Lantana camara ointment in collaboration with pharmaceutical firms.
2. Cosmetics industry: Using lantana camara ointment in skincare products in partnership with cosmetics firms.
3. Herbal and Ayurvedic markets: Capitalizing on the rising demand for herbal and Ayurvedic goods.
4. Export prospects: Examining export prospects to nations where there is a significant need for herbal and natural products.

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EVALUATION OF THE BASE ISOLATION SYSTEM FOR CONTROLLING SEISMIC RESPONSE

[1]Limesh Kumar Randive, [2]Dr. Jyoti Yadav
[1]M.Tech Scholar, [2]Assistant Professor,Department of Civil Engineering, Sarvepalli Radhakrishnan University, Bhopal, M.P, India

ABSTRACT— *Base isolation is one of the most powerful tools of earthquake engineering pertaining to the passive structural vibration control technologies. It limits the effects of the earthquake attack through a flexible base which decouples the structure from the ground motion, and the structural response accelerations are usually less than that of the ground acceleration. . For this Three dimensional nonlinear time history analysis is performed on r/c building by the use of computer program SAP 2000 v12.0.0. The dynamic analysis of the structure has been carried out and the performance of the building with and without isolator is studied. The main objective here is to make seismic response control by providing Isolators and comparing between the fixed based and isolated base building. Rubber bearing and Friction pendulum bearing are used.*

I. INTRODUCTION

Base isolation (BI) is a mechanism that provides earthquake resistance to the new structure. Earthquakes are one of nature greatest hazards; throughout historic time they have caused significant loss of life and severe damage to property, especially to man-made structures. On the other hand, earthquakes provide architects and engineers with a number of important design criteria foreign to the normal design process. From well established procedures reviewed by many researchers, seismic isolation may be used to provide an effective solution for a wide range of seismic design problems. It controls structural response in which the building or structure is decoupled from the horizontal component of the earthquake ground motion by interposing a layer with low horizontal stiffness between the structure and its foundation. A base-isolation system reduces ductility demands on a building, and minimizes its deformations. These changes improve building performance.

According to the revised provisions of IS 1893 (Part 1): 2002 Code [3], the seismic zones of India become more vulnerable and reduced to four zones. So it is important to design the structures with seismic resistance. In seismic isolation, the fundamental aim is to reduce substantially the transmission of the earthquake forces and energy into the structure. This is achieved by mounting the structure on an isolation system with considerable horizontal flexibility so that during an earthquake, when the ground vibrates strongly under the structue, only moderate motions are induced within the structure itself. The primary function of an isolation device is to support the superstructure while providing a high degree of horizontal flexibility. This gives the overall structure a long effective period and hence lower earthquake generated accelerations and inertia forces.

Many kinds of isolation systems have been developed to achieve this function, such as laminated elastomeric rubber bearings, lead-rubber bearings, yielding steel devices, friction devices (PTFE sliding bearings) and lead extrusion devices, etc .The main types of earthquake protective systems include passive, active and semi-active systems. In passive control systems the devices do not require additional energy source to operate and are activated by the earthquake input. Active control systems require additional power source, which has to remain operational during an earthquake and a controller to determine the actuator output. Hybrid control systems combine features of both passive and active control systems. Dynamic Analysis shall be performed to obtain the design seismic force, and its distribution to different levels along the height of the building and to various lateral loads resisting elements. Dynamic Analysis may be performed either by the Time History Method or by the Response Spectrum Method. Time History Method shall be used on as approximate ground motion and shall be performed by using accepted principles of Dynamics. Response Spectrum Method of analysis shall be performed by using design spectrum specified in 6.4.2 as per I.S. 1893(Part1):2002

The basic concept of base isolation is to protect the structure from the damaging effects of an earthquake by improving dynamic response of structure. When base isolation is used, special bearings are installed between the bottom of the building and its foundation. The bearings are flexible in the horizontal direction and reduce the natural frequency of a building. The first dynamic mode of the isolated structure involves deformation only in the isolation system, and the structure above remains almost rigid. An isolated system does not absorb the vibrating energy, but rather deflects it through the dynamics of the system. It lengthens the natural period of vibration of the structure so that the responses are greatly reduced. In some cases a passive damper may also use to control excessive displacement. Figure 1 represents the shifting of period by the isolator and the resulting reduction in the acceleration response.

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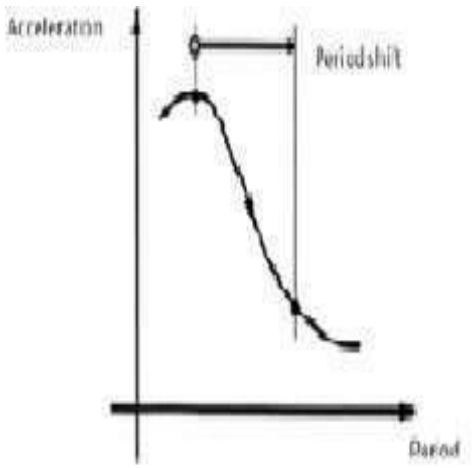


Fig. 1 Period shift induced by an isolator

The objective of this work is

- To illustrate the basic concept and behavior of the base isolated structures.
- To Analyze a building by providing rubber bearing and friction pendulum bearing.
- To study and compare total base shear forse, maximum absolute acceleration, velocity ,displacement with respect to the fixed base and isolated base structure.

II. METHODOLOGY

For comparing a fixed base and isolated base building a Seven-storied building is modeled in the SAP 2000 software . An open frame building model with3 and 4 bays in each X and Y directions, the height of each storey as 3.2 m are modeled. Height .of building is 22.4m, Width of building in X direction is 11m and Width of building in Y direction is 14 m. The material properties of the frame elements and the area element are defined and M25 concrete grade and Fe-415 is used. The rebar material properties are also given. The beams and columns of dimensions b1 300x300,b2 300x350,c1 230x350,c2 230x400,c3 230x450 mm are given as frame elements. The slab in the building is assigned as a shell element with a thickness of 120mm. Live load is taken as 3kn/m2 .Interior and Exterior wall thickness is taken as 150mm and 230mm.Soil type is taken as 1,Zone factor is V, Response reduction factor is taken as 5.And Importance factor is 1.. The support condition at the bottom is made as fixed and the fixed-base analysis is performed considering the combination of 1.5(DL+LL).All other data is referred from I.S.1893-2002. The period for the fixed base is identified. The SAP model of the building is shown in Figure 2.

Then the calculated rubber properties are given as link/ support properties in the software and the base-isolation model analysis is performed. The response of the structure with the rubber isolator and friction pendulum isolators are determined.The parameters selected to define the utilized Isolators in the SAP2000 program are as follows:

For Rubber Bearing

Nonlinear Link Type: Rubber, U1 Linear Effective Stiffness: 1500000 kN/m, U2 and U3 Linear Effective Stiffness: 800 kN/m, U2 and U3 Nonlinear Stiffness : 2500 kN/m, U2 and U3 Yield Strength : 80 kN, U2 and U3 Post Yield Stiffness Ratio: 0,1.

For Friction Pendulum Bearing

Nonlinear Link Type: Friction Isolator, U1 Linear Effective Stiffness: 15000000 kN/m, U1 Nonlinear Effective Stiffness: 15000000 kN/m, U2 and U3 Linear Effective Stiffness: 750 kN/m, U2 and U3 Nonlinear Stiffness:15000 kN/m, U2 and U3 Friction Coefficient, Slow: 0,03,U2 and U3Friction coefficient, Fast : 0,05, U2 and U3 Rate Parameter: 40, U2 and U3 Radius of Sliding Surface: 2,23.(Referred from. Torunbalci1 and G. Ozpalanlar2 octo.12-17(2008)) After providing all the details the program is to be run to see the results.

III. RESULTS AND DISCUSSION

Analysis is done for both X and Y direction for fixed base and isolated base and is also carried for different storey heights of the building for the same building plan i.e. each floor. The isolator in each case varies in its total height and its single layer thickness depends on the vertical loads on the columns. The corresponding increase in time verses displacement by using time history analysis is represented by graph for fixed, rubber and friction beraring base fig.2a,2b,2c in X and 3a,3b,3c Y direction.

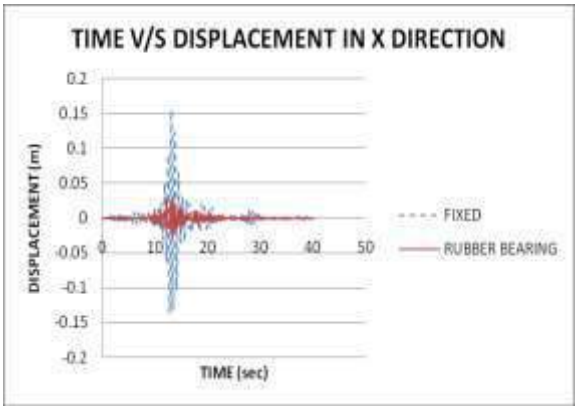


Fig 2a. For Fixed and Rubber bearing

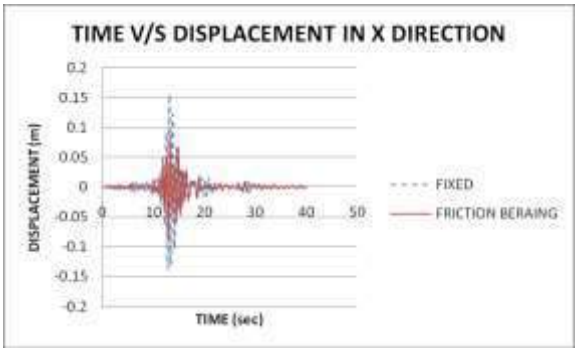


Fig 2b. For Fixed and Friction bearing

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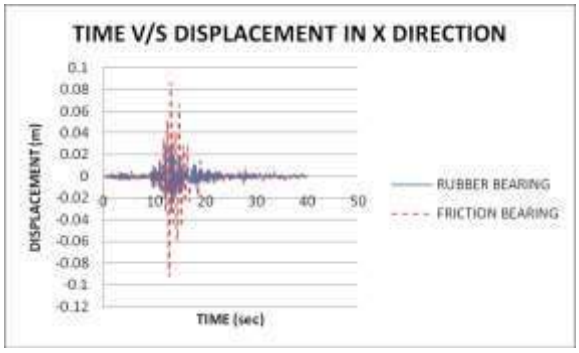


Fig 2c. For Friction and Rubber bearing

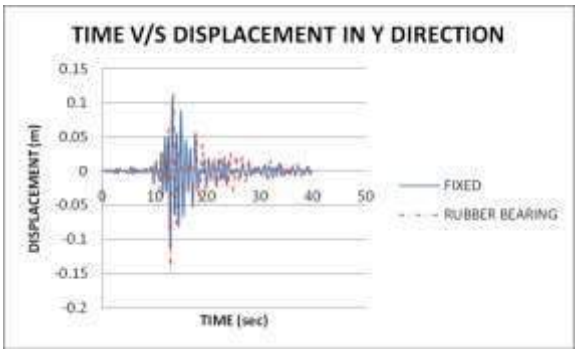


Fig 3a. For Fixed and Rubber bearing

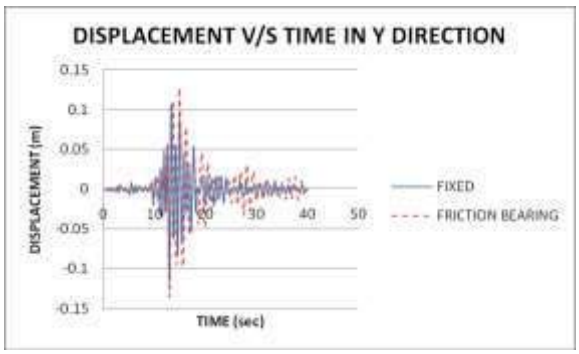


Fig 3 b. For Fixed and Friction bearing

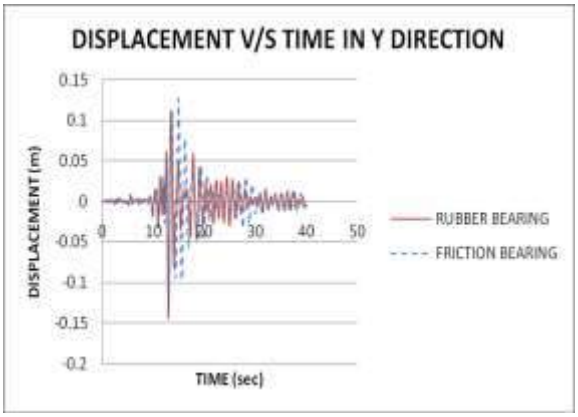


Fig 3c. For Friction and Rubber bearing

Base reaction in X and Y direction for Fixed base ,Rubber bearing and friction bearing isolators are represented byfig.4 and values are shown in table 1



Fig 4. Base reaction v/s Story in X and Y direction

	FIXED	RB	FRB
X Direction	2200.176	268.558	33.616
Y Direction	1099.898	214.554	5.837

Table 1. BASE REACTION

Displacement with respect to story for fixed base ,rubber beraring, friction bearing are represented by fig 5 a for X direction and 5b for Y direction and values are shown in table 2



Fig 5a Displacement v/s Story in X direction



Fig 5b. Displacement v/s Story in Y direction

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		JOINT DISPLACEMENT				
	Fixed U1	*Fixed U2*	*Rb U1*	*Rb U2*	*Frb U1*	*Frb U2*
Story	X	Y	X	Y	X	Y
	m	m	m	m	m	m
1st	0.019688	0.01943	0.00856	0.024781	0.065731	0.041051
2nd	0.049809	0.04222	0.01262	0.052928	0.078322	0.059677
3rd	0.080064	0.06249	0.01733	0.072985	0.085791	0.080492
4th	0.107544	0.07919	0.02223	0.089292	0.088718	0.09792
5th	0.130203	0.09239	0.02672	0.100713	0.088631	0.112487
6th	0.146413	0.10173	0.03019	0.108396	0.087336	0.122499
7th	0.155581	0.10667	0.03221	0.112042	0.086319	0.127335

Table 2 : Joint Displacement

		JOINT ACCELERATION				
	Fixed U1	*Fixed U2*	*Rb U1*	*Rb U2*	*Frb U1*	*Frb U2*
Story	X	Y	X	Y	X	Y
	m/sec^2	m/sec^2	m/sec^2	m/sec^2	m/sec^2	m/sec^2
1st	3.26868	2.47461	2.64427	2.58859	5.12463	2.01345
2nd	4.98295	2.64748	3.5071	2.55756	5.94795	1.98926
3rd	6.52387	3.87731	4.45245	2.57741	6.33089	2.3469
4th	8.07398	4.78505	5.39808	3.74789	6.34118	2.98273
5th	9.73806	5.13	6.24319	4.77362	6.25064	3.73975
6th	11.36987	5.13837	6.88498	5.40081	6.36227	4.40527
7th	12.37692	5.4219	7.2579	6.2219	6.43315	4.8021

Table 3 : Joint Acceleration

Acceleration with respect to story for fixed base ,rubber bearing, friction bearing are represented by fig 6 a for X direction and 6b for Y direction and values are shown in table 3

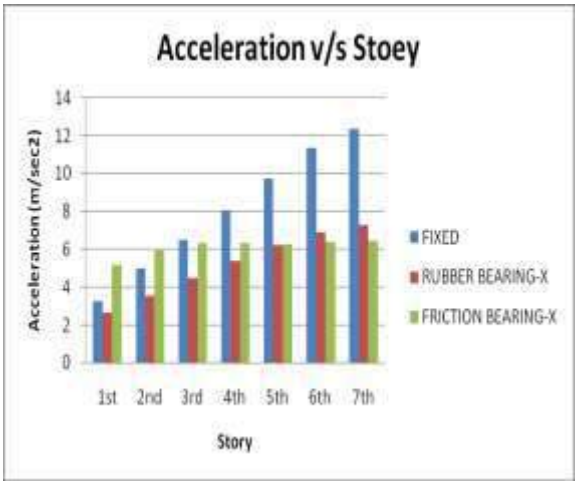


Fig 6a. Acceleration v/s Story in X direction

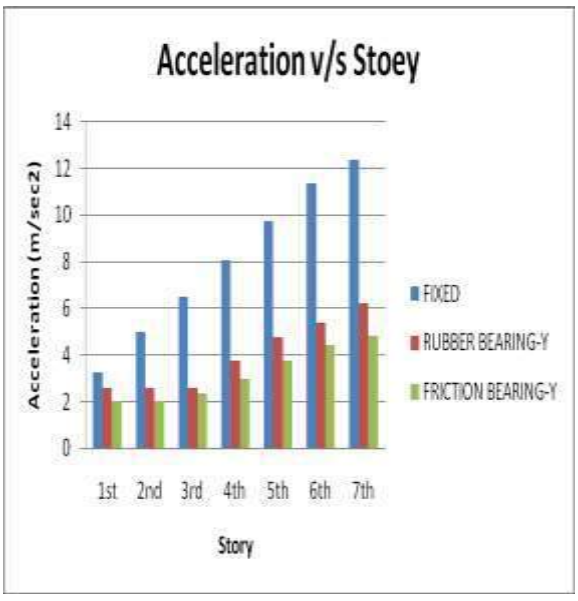


Fig 6b. Acceleration v/s Story in Y direction

IV. CONCLUSIONS

- Base isolation system and basic concept of base isolation are studied .
- Base Isolators controls structural response in which the building or structure is decoupled from the horizontal component of the earthquake ground motion. A base-isolation system reduces ductility demands on a building, and minimizes its deformations.
- From the result, By conducting the nonlinear time history analysis it was shown that base isolation increases the flexibility at the base of the structure which helps in energy dissipation due to the horizontal component of the earthquake and hence superstructure's seismic demand drastically reduced as compared to the conventional fixed base structure.

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USING THE BASE ISOLATION TECHNIQUE WITH FRICTION DAMPERS TO CONTROL SEISMIC VIBRATION IN BUILDINGS

[1]Limesh Kumar Randive, [2]Dr. Jyoti Yadav
[1]M.Tech Scholar, [2]Assistant Professor,Department of Civil Engineering,
Sarvepalli Radhakrishnan University, Bhopal, M.P, India

ABSTRACT - *Since base isolation techniques and energy dissipation seismic devices were developed during the past forty years, research on ways to lessen the impact of earthquakes on buildings has accelerated. Using ETABS software, an attempt has been made to investigate the effects of Friction Dampers as energy-dissipating devices and Lead Rubber Bearings (LRB) as base isolators when put alone and in combination in the eight-story "C" shaped structure. The building is thought to be in earthquake zone 4, and linear response spectrum analysis is the seismic analysis technique used. Time period, base shear, storey displacement, and storey drifts are the response parameters examined in this paper. The findings demonstrate that by reducing the structure's reactions when used alone and in conjunction with other control strategies, these devices have increased the building's seismic resilience. The enhanced outcomes are contrasted with the traditional paradigm.*

KEY WORDS: *Base Isolation, Friction Damper, Seismic Analysis, Response Spectrum Analysis, ETABS V17*

1. INTRODUCTION

For controlling earthquake vibrations, Base isolation technique and Friction dampers are being used in this study. Base isolation system decouples the superstructure from substructure and hence reduces the effect of earthquake on the structure whereas friction dampers increase the stiffness of the structure and hence makes the structure earthquake resistant. Till now there have been studies conducted on the behavior of the Concrete framed structure upon the incorporation of either base isolation systems or the friction dampers as the passive earthquake energy dissipating devices in order to mitigate the earthquake effects on the structures. An attempt has been made in this work to check the effectiveness of these devices as a combined control strategy for the structure.

1.1 Base Isolation

Base isolation, also known as seismic base isolation or base isolation system is one of the most popular means of protecting a structure against earthquake forces. It is a collection of structural elements which should substantially decouple a superstructure from its substructure resting on a shaking ground thus protecting a building or non- building structure's integrity. Base isolation system is the frequently adopted earthquake resistance system. It reduces the effect of ground motion and thus leads to nullify the effect of earthquake to on the structure. Base isolation has become popular in last couple of decades in its implementations in buildings and bridges. Base isolation has become a traditional concept for structural design of buildings and bridges in high risk areas. The isolation system decouples the structure from the horizontal components of the ground motion and reduces the possibility of resonance as shown in Figure 1.This decoupling is achieved by increasing the flexibility of the system, together with appropriate damping by providing isolator at the basement level of the structure.

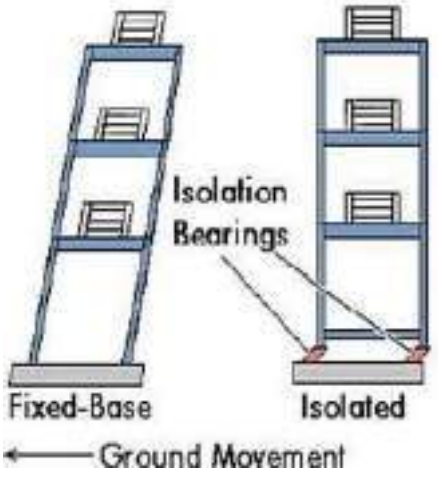


Figure 1: Typical explanation of base isolation system

1.2 Lead-Plug Rubber Bearing

Lead-plug rubber bearings were invented in New Zealand in 1975. The mechanism of lead-plug rubber bearings is very similar to that of low-damping natural rubber bearings. As show in Figure 2, there are three main pieces of equipment, layers of steel plates, rubber layers and lead core, respectively. Same as the steel shims in natural rubber bearings, the layers of steel provide vertical stiffness and the layers of rubber supply the device with high lateral flexibility. Lead core is the device that will supply extra stiffness to the isolators and appropriate damping to the system. Owing to current well-developed technologies, it is possible to manufacture lead-plug rubber bearings with high stiffness and enormous shear deformation. Innovations in materials and design related technologies such as analysis software and construction methods have enabled the concept of isolation become a reality.

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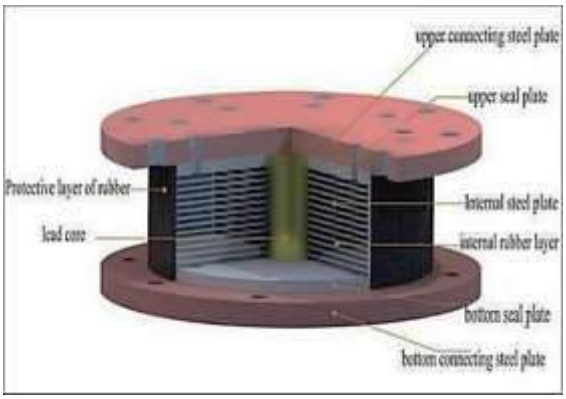


Figure 2: Typical Lead Rubber Bearing

1.3 Friction Dampers

Earthquake cause ground vibration due to the sudden release of energy. This energy can be absorbed by using the vibration control device called friction damper. The friction dampers are designed to have moving parts that will slide over each other during a strong earthquake. When the parts slide over each other, they create a friction which uses some of the energy from earthquake that goes into the building. This Friction damper increases the stiffness of the building as a result vibration of the building is reduced. The structural response to the seismic excitation has reduced by applying friction dampers based on different construction techniques. Friction dampers come under passive seismic control system does not require any external energy source to operate and is activated by the earthquake input motion only. The friction surfaces of these systems are clamped with pre-stressing bolts. Since the amount of energy dissipated is proportional to displacement these systems are referred as displacement dependent systems. Contact surfaces of these systems used are lead–bronze against stainless steel or Teflon against stainless steel. Below Figure 3 depicts various types of Friction damper images.



Figure 3: Friction Damper

1.4 Objectives

1. To perform Response Spectrum Analysis on an irregular "C" shaped concrete framed structure using ETABS software.
2. To design the Lead Rubber Bearing as a base isolation system for the considered multi-storey building and to study the seismic behaviour of the structure upon incorporation of LRB to it.
3. To study the seismic response parameters of the considered structure with the incorporation of just Friction Dampers to it.
4. To carry out seismic analysis by introducing both LRB and Friction Dampers as a dual system in the considered structure and study the response parameters.
5. To conduct comparative study on all the four cases, reinforced concrete framed structure, framed structure with LRB, framed structure with Friction dampers, framed structure with LRB and Friction dampers, by considering time period, base shear, storey displacement and storey drifts as the response parameters.

2. LITERATURE REVIEW

Mohammued Irfan Faraaz et.al (2016) the study is performed to compare the effectiveness of base isolation over the fixed based building and fixed based building with shear wall. For this study, 10 storied R.C frame building is considered and Time History analysis is carried out for Bhuj earthquake using ETABS 2015 software. The Lead Rubber Bearing is designed as per UBC 97 code and the same was used for analysis of base isolation system. The results obtained from the analysis were time period, deflection and base shear. The models selected for analysis were fixed based building, fixed based building with shear wall and base isolated building. The installation of isolator in building at base level significantly increases the time period of the structure, which means it reduces the possibility of resonance of the structure giving rise to better seismic performance of the building.

Aparna Bhoyar et.al (2019) the paper mainly emphasized use of one such device friction damper for response control of structures. In this paper the comparison of reinforced concrete building connected with and without damper for G+5, G+10, G+15 storied building for seismic zone IV is considered. Analysis is done using equivalent static method, response spectrum method and time history method in finite element software package, ETABS version 16.2. For seismic load combination IS 1893:2016 is used. The model analysis is carried out by all four methods of analysis and results are discussed in terms of storey displacement, storey drift, base shear, bending moment and axial forces. From result obtained it is concluded that storey drift and displacement in friction damper building is reduced whereas base shear is less in building without damper.

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3. METHODOOGY

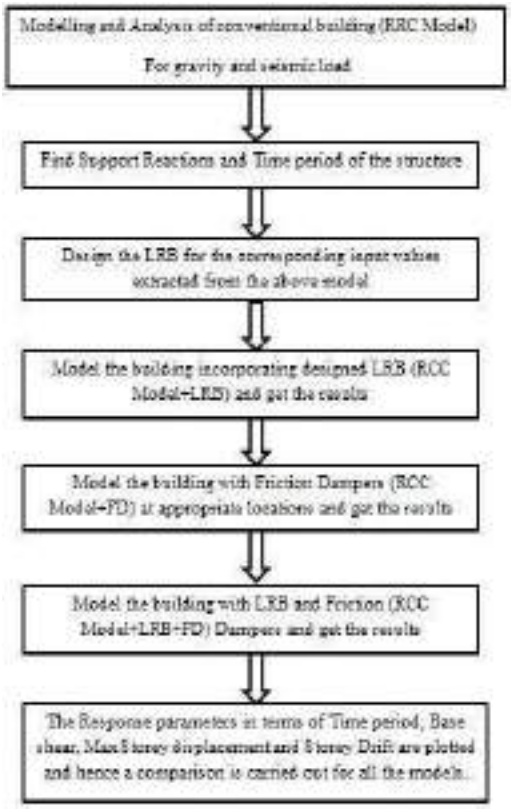


Figure 4: Flow chart of methodology

4. MODELING

Table 1: Design data for all models

No	Design data for all the buildings	
1	**Details of Building**	
i)	Number of stories	G+7
ii)	Type of building	Institutional
iii)	Story height	3.2 m
2	**Material Properties**	
i)	Grade of concrete	M30
ii)	Grade of steel	Fe500
3	**Member Properties**	
a	**Slab**	
i)	Grade	M30
ii)	Thickness	150 mm
b	**Beam**	
i)	Grade	M30
ii)	Size	300X450 mm
c	**Column**	
i)	Grade	M30
ii)	Size	350X450 mm
4	**Loads and Intensities**	
i)	Live Load on all the floors	4 kN/m^2
ii)	Live Load on terrace	1.5 kN/m^2
iii)	Floor Finish	1 kN/m^2
iv)	Terrace Finish	1.75 kN/m^2
v)	Wall load	14 kN/m^2
vi)	Parapet Wall load	4 kN/m^2
5	**Seismic Data from IS : 1893(Part1)-2016**	
i)	Zone factor	0.24
ii)	Importance factor	1.5
iii)	Response reduction Factor	5.0
iv)	Soil Type	Medium
6	**LRB link properties**	
	For U1	
i)	Vertical stiffness of bearing, K_v	2237015 kN/m
ii)	Effective damping of bearing, ξ_{eff}	20%
	For U2 & U3 Linear Property	
iii)	Effective horizontal stiffness, K_{eff}	2161.68 kN/m
iv)	Effective damping of bearing ξ_{eff}	20%
	For U2 & U3 Non-Linear Property	
v)	Initial Stiffness of Bearing, K_e	11660 kN/m
vi)	Yeild Force of Bearing, F_y	213.912 kN
vii)	Post yield stiffness ratio	0.1
7	**Link (Friction damper) Properties**	
i)	Mass	80 kg
ii)	Weight	0.78 kN
iii)	Effective Stiffness	108855 kN/m
iv)	Yield strength or Slip load	250 kN

For the purpose of modelling Friction Dampers, have referred Quaketek company's guidelines, which is a Canada based company known for its manufacturing of Friction dampers. The damper has been modelled as according to their guidelines.

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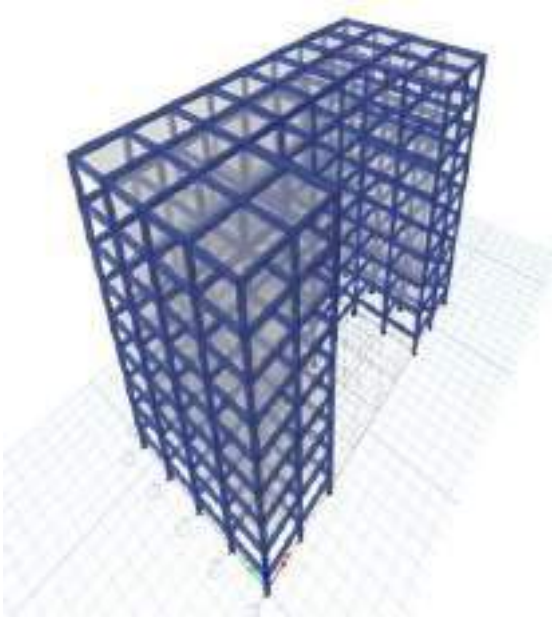


Figure 5: 3D Model of the conventional building

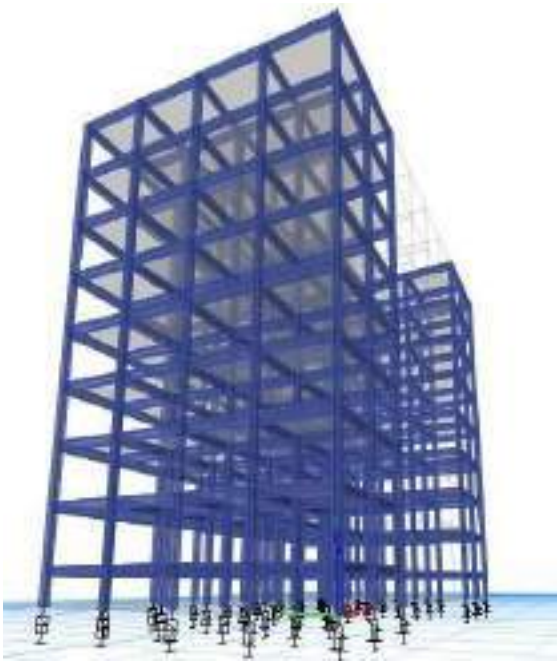


Figure 6: Building after the incorporation of LRB at the base of it



Figure 7: Building after the incorporation of Friction Dampers

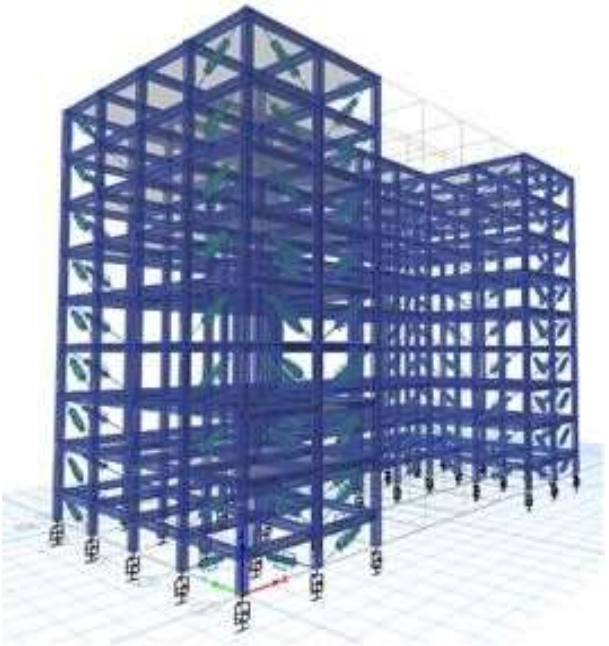


Figure 8: Building with the inclusion of LRB and Friction Damper

4.1 Load Combination

- 1.5(DL+RSx)
- 1.5(DL+RSy)

Response Spectrum Analysis Analysis results are taken for above load combination for the parameters like Time Period , Base Shear, Storey displacement, Storey drift.

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5. RESULTS AND DISCUSSION

5.1 Time Period

The time taken by the wave to complete one cycle is called its time period. The fundamental time period for all models obtained from the modal analysis in ETABS.

M1: RCC Model M2: RCC Model +FD
M3: RCC Model+LRB M4: RCC Model+LRB+FD

Table 2: Time Period for different Models

Mode	M1 (sec)	M2 (sec)	M3 (sec)	M4 (sec)
1	1.93	1.252	2.798	2.398
2	1.777	1.201	2.622	2.33
3	1.695	1.029	2.608	2.168

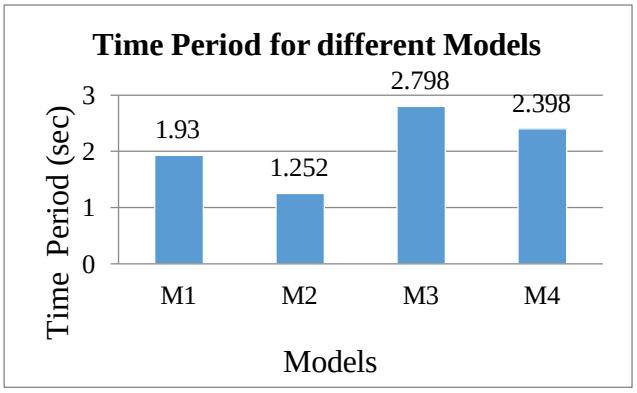


Figure 9: Time periods of all the models considering only the first mode

Table 3: Percentage variation in Time Periods calculated with respect to the Time period of conventional model considering 1st Mode results only.

Model type	Percentage variation
RCC + FD	35.12% ↓
RCC + LRB	44.50% ↑
RCC +LRB+ FD	24.24% ↑

The Figure 9 shows the comparison of time period of different models in seconds. With the incorporation of LRB at base of the building, has increased time period to an extent of 44% that is from 1.93 seconds to 2.798 seconds, with only FDs reduced time period to 35% that is from 1.93 seconds to
1.252 seconds and upon the inclusion of both LRB and FDs, have resulted in increase of time period to 24% that is from
1.93 seconds to 2.398 seconds, on comparing with time period of first mode of conventional model which is fixed base and without dampers.

5.2 Base Shear

Base shear is an estimate of the maximum expected lateral force that will occur due to seismic ground motion at the base of the structure. Base shear is the total estimate of the lateral force that would act at the base of the building.The base shear values have been taken for the load combinations 1.5DL+1.5 RSX and 1.5DL +1.5RSY and the results are plotted for the same.

Table 4: Base Shear results of all the models

Models	Base Shear in X direction, (kN)	Base Shear in Y direction, (kN)
M1	3234.417	2839.98
M2	4571.989	4386.222
M3	2088.447	1956.878
M4	2352.887	2285.644

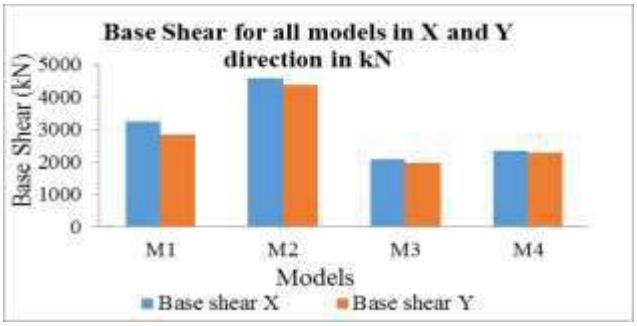


Figure 10: Base Shear of all the models in both X and Y direction

Table 5: Percentage variation in Base Shear calculated with respect to the Base Shear of conventional model

Model type	Percentage variation in X	Percentage variation in Y
RCC + FD	41.35% ↑	54.44% ↑
RCC + LRB	35.43% ↓	31.09% ↓
RCC +LRB+ FD	27.25% ↓	19.51% ↓

When LRBs are introduced at the base of building, it has reduced the base shear values to 35% in X and 31% in Y directions. With the inclusion of only FDs in the model, base shear values have increased to an extent of 41% in X and 54% in Y direction. But in the combined control strategy, that is LRB with FD, the base shear values decrease to 27.25% in X and 19.51% in Y direction as compared with conventional model which is clearly depicted in the Figure 10.

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5.3 Storey Displacement

Displacement is the distance of element (beam, column, frame, etc.) moved from its original location.

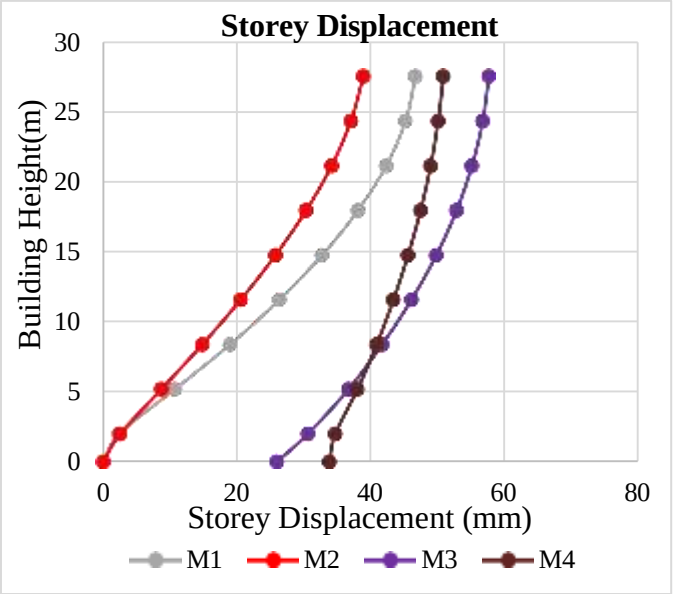


Figure 11: Storey Displacement of all the models in X direction

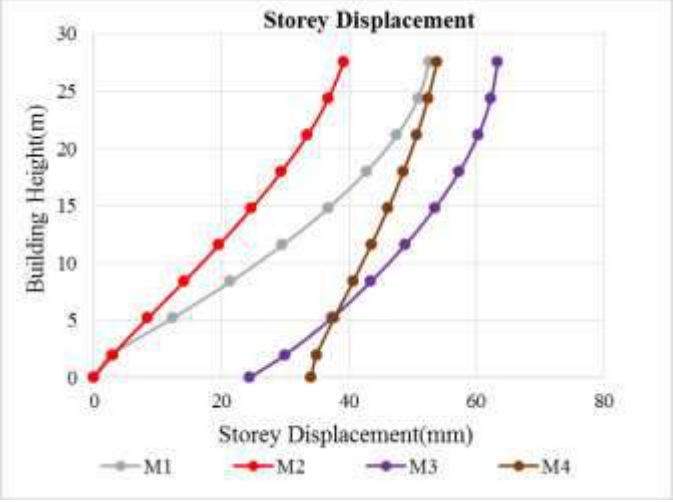


Figure 12: Storey Displacement of all the models in Y Direction

Table 6: Percentage variation in Storey Displacement calculated with respect to the Top Storey Displacement of conventional model

Model type	Percentage variation in X	Percentage variation in Y
RCC + FD	16.68% ↓	25.56% ↓
RCC + LRB	23.47% ↑	20.42% ↑
RCC +LRB+ FD	8.95% ↑	2.27% ↑

Figure from 11 and 12 shows the variation of lateral displacement of the building at each story in both X and Y direction. For all models the lateral displacement is maximum at top and minimum at the bottom.

The maximum storey displacement values decrease to an extent of 16.68% in X and 25.56% in Y direction that is from 46.679mm to 38.891mm in X and 52.58mm to 39.139mm in Y for the model with FDs. For the model with LRB, the maximum storey displacements increase to an extent of 23.47% in X and 20.42% in Y directions that is from 46.679mm to 57.638mm in X and 52.58mm to 63.321mm in Y. For the model with both LRB and FDs there is increase of 8.95% in X and 2.27% in Y directions that is from 46.679mm to 50.857mm in X and 52.58mm to 53.777mm in Y as compared with conventional case.

5.4 Storey Drift

Storey drift is the difference of displacements between two consecutive stories w. r. t. height of that storey.

As per IS 1893 (Part 1): 2016, the storey drift in any storey due to specified lateral force, shall not exceed 0.004 times the storey height.

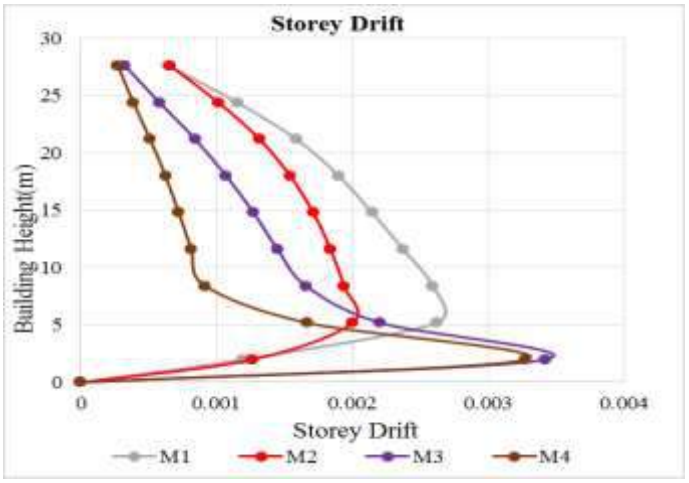


Figure 13: Storey Drift of all the models in X direction

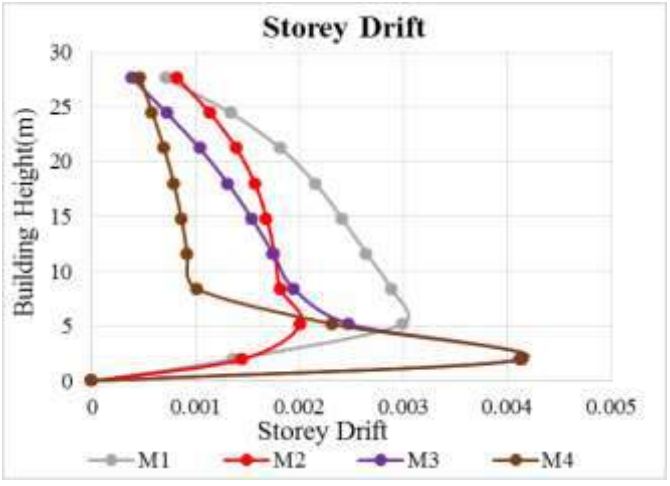


Figure 14: Storey Drift of all the models in Y direction

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Table 7: Percentage variation in Storey Drifts calculated with respect to the Maximum Storey Drift of conventional model

Model type	Percentage variation in X	Percentage variation in Y
RCC + FD	25.21% ↓	37.00% ↓
RCC + LRB	35.94% ↓	32.48% ↓
RCC+LRB+ FD	64.63% ↓	64.73% ↓

It is very clear from the results and Figures 13 and 14 that for both the individual models equipped with LRB singally, with Friction Dampers alone and with both of them as a dual system has reduced the storey drift values which is a major parameter to look for in seismic analysis. The following points depict the actual decrease in storey drift values in percentages,

The storey drift values gets reduced almost to a range of 25.21% in X direction and to 37% reduction in Y direction after the incorporation of friction dampers. When LRB is introduced in the place of fixed base condition, has effectively reduced storey drift values to 35.94% at the storey2 level in X direction and to 32.48% reduction in Y direction. To an extent, the dual effect of LRB and Friction dampers has worked on the same way as above in reducing the drift values effectively, reduced almost to a range of 64% in both X and Y direction.

6. CONCLUSIONS

- The seismic control methods that are used, base isolation (LRB) and Friction Dampers (FD) have effectively reduced the response parameters caused due to earthquake.
- With the incorporation of LRB at base of the building, has increased time period to an extent of 44.50%, with only FDs reduced time period to 35.12% and upon the inclusion of both LRB and FDs, have resulted in increase of time period to 24.24% on comparing with time period of first mode of conventional model which is fixed base and without dampers.
- When LRBs are introduced at the base of building, it has reduced the base shear values of 35.43% in X and 31.09% in Y directions. With the inclusion of only FDs in the model, base shear values have increased to an extent of 41.35% in X and 54.44% in Y direction. But in the combined control strategy, that is LRB with FD, the base shear values decrease to 27.25% in X and 19.51% in Y direction as compared with conventional model.
- The maximum storey displacement values decrease to an extent of 16.68% in X and 25.56% in Y direction for the model with FDs. For the model with LRB, the maximum storey displacements increase to an extent of 23.47% in X and 20.42% in Y directions. For the model with both LRB and FDs there is increase of 8.95% in X and 2.27% in Y directions as compared with conventional case.
- In the model with LRB and in the model with both LRB and FDs, shows some little displacement at base level to an extent of 25mm in X and 34mm in Y, which is zero in case of fixed base building.
- The storey drift values significantly decrease in all the models with LRB, with FDs and even in the dual system that is with both LRB and FDs as compared with conventional building.
- The storey drift values have reduced to an extent of 25% in X and 37% in Y directions for model with FDs. Those drift values have decreased to 35% and 32% in both X and Y directions for model with LRB and to 64% in the case of model with both LRB and FDs in both X and Y directions as compared with conventional case.
- The decrease in storey drifts in the case of combined strategy, that is with LRB and FDs, is because of the seismic energy dissipation and increased stiffness of the structure due to both LRB and FDs. Hence this combined control strategy can be adopted to mitigate the effects of earthquake.

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ASTHMA AND TREATMENT

Mr.Aniket Chandrkant Mhaske[1*]. Dr. Swati Rawat[2], Dr.Sunil S Jaybhaye[3], Mr. Sachin Dighole[4], Ms. Aditi Pungle[5]

[1]Student of Bachelor of Pharmacy, Institute of Pharmacy, Badnapur, Dist. Jalna.
[2]Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.
[3]Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.
[4]Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.
[5]Faculty of Pharmaceutical Science, Institute of Pharmacy, Badnapur, Dist. Jalna.

ABSTRACT

Asthma is a condition marked by chronic inflammation of the airways, increased sensitivity to various triggers, and airway obstruction. It is at least partially reversible, either spontaneously or with appropriate treatment. Asthma affects approximately 3-5% of the U.S. population and is more prevalent in children than in adults. Airway obstruction can result from smooth muscle spasms in the walls of the smaller bronchi and bronchioles, swelling (edema) of the airway lining, excessive mucus production, and/or damage to the airway's epithelial layer.

Currently, numerous medications are available for asthma treatment. A key strategy for managing this disease includes preventing exposure to triggering antigens, reducing airway inflammation and hypersensitivity, and using medications to dilate narrowed airways. This review explores the pathophysiological approaches to asthma management.

Asthma is also the most common respiratory disorder in Canada. Despite advancements in its

Diagnosis and management, many Canadians with asthma remain poorly controlled. However, for most patients, effective control can be achieved through avoidance measures and appropriate pharmacological treatments.

Inhaled corticosteroids (ICS) are the standard treatment for most patients. For adults who do not achieve adequate control with ICS alone, combination inhalers containing ICS and long-acting beta2-agonists (LABA) are preferred. Allergen-specific immunotherapy offers a potentially disease-modifying option for certain asthma patients but should only be administered by physicians trained in allergy management.

Regular monitoring of asthma control, adherence to prescribed therapies, and proper inhaler techniques are essential aspects of effective asthma management. This article reviews current literature and guidelines for the accurate diagnosis and optimal treatment of asthma.

KEYWORD : *Pathophysiological approaches, symptoms, causes and treatment of asthma*

INTRODUCTION

Individuals with asthma often react to concentrations of triggers that are too low to cause symptoms in those without the condition. Common triggers include allergens such as pollen, dust mites, mold, or specific foods.

Other frequent triggers of asthma attacks include emotional stress, aspirin, sulfiting agents (found in wine, beer, and salad bar greens), physical activity, exposure to cold air, or inhaling cigarette smoke.

In the early (acute) phase of an asthma response, smooth muscle spasms occur, accompanied by excessive mucus production that can clog the bronchi and bronchioles, worsening the attack.

The late (chronic) phase is marked by inflammation, fibrosis, swelling (edema), and the death (necrosis) of bronchial epithelial cells. Various mediator chemicals, such as leukotrienes, prostaglandins, thromboxane, platelet-activating factor, and histamine, play a role in this phase.

Symptoms of asthma include difficulty breathing, coughing, wheezing, chest tightness, rapid heart rate (tachycardia), fatigue, moist skin, and feelings of anxiety. Acute attacks are typically managed with inhaled beta2-adrenergic agonists, such as albuterol, which help relax the smooth muscles in the bronchioles and reopen the airways.

Long-term asthma treatment focuses on suppressing the underlying inflammation. The most commonly used anti-inflammatory drugs include inhaled corticosteroids (glucocorticoids), cromolyn sodium, and leukotriene blockers.

Asthma is a chronic (long-term) lung condition characterized by inflammation and narrowing of the airways. It causes recurrent episodes of wheezing

Asthma affects individuals of all ages but most commonly begins during childhood. In the United States, over 25 million people are diagnosed with asthma, including approximately 7 million children.

To understand asthma, it is helpful to know how the airways function. The airways are tubes that transport air into and out of the lungs. In individuals with asthma, the airways are inflamed, making them swollen and highly sensitive. This sensitivity causes them to react strongly to certain inhaled substances.

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When the airways react, the surrounding muscles tighten, narrowing the airways and reducing airflow to the lungs. The swelling may worsen, further restricting airflow. Additionally, cells in the airways may produce excessive mucus, a thick, sticky substance that can exacerbate the narrowing of the airways.

This series of reactions leads to asthma symptoms, which occur whenever the airways are inflamed.
Asthma is the most common chronic respiratory condition in Canada, affecting approximately 10% of the population. While it is often considered a lung-specific disord.

DEFINITION

Asthma is a chronic inflammatory condition of the airways. This inflammation is linked to airway hyperresponsiveness, which is an exaggerated narrowing of the airways in response to triggers like allergens or physical activity. It results in recurring symptoms, including wheezing, shortness of breath (dyspnea), chest tightness, and coughing.

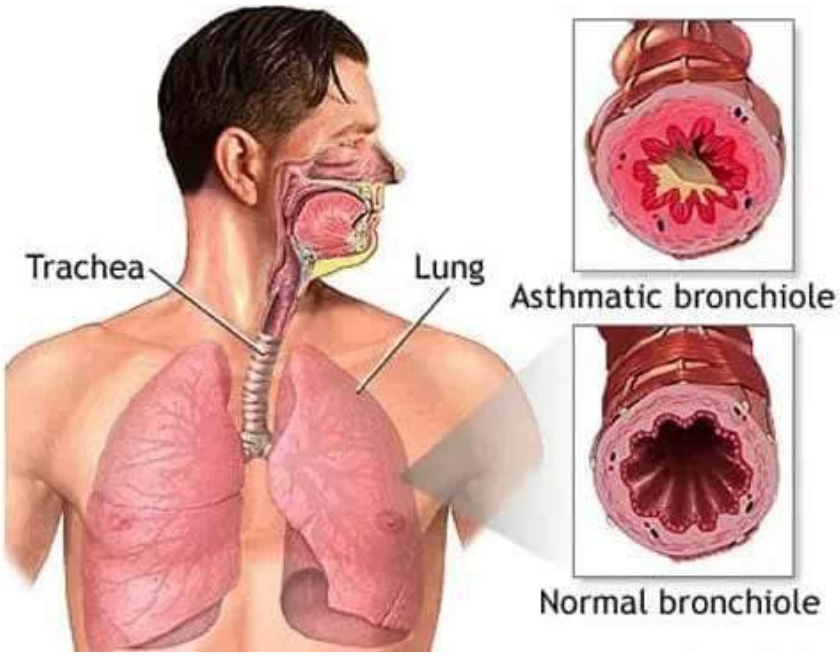
Symptom episodes are typically associated with widespread but variable airflow obstruction in the lungs. This obstruction is usually reversible, either spontaneously or with appropriate treatment.

Asthma symptoms can sometimes be mild, resolving on their own or with minimal medication. However, in other cases, symptoms may worsen over time. When symptoms become more severe or additional symptoms develop, it is referred to as an asthma attack, also known as a flare-up or exacerbation.

It is crucial to treat symptoms as soon as they appear to prevent them from escalating into a severe asthma attack. Severe attacks may require emergency medical care and can be life-threatening.

Asthma currently has no cure. Even when symptoms are absent, the condition persists and can flare up unexpectedly. However, with modern treatments and a better understanding of the disease, most individuals with asthma can effectively manage their condition. Many experience few, if any, symptoms and can lead normal, active lives, including uninterrupted sleep at night.

To manage asthma successfully, individuals should take an active role in their treatment. Building strong partnerships with healthcare providers is essential for effective, continuous, and personalized management of the disease.



SIGNS AND SYMPTOMS

Asthma is marked by recurring episodes of wheezing, difficulty breathing, chest tightness, and coughing. Coughing may produce sputum from the lungs, though it is often difficult to expel. During recovery from an asthma exacerbation (attack), the sputum may appear pus-like due to the presence of a high concentration of white blood cells called eosinophils.

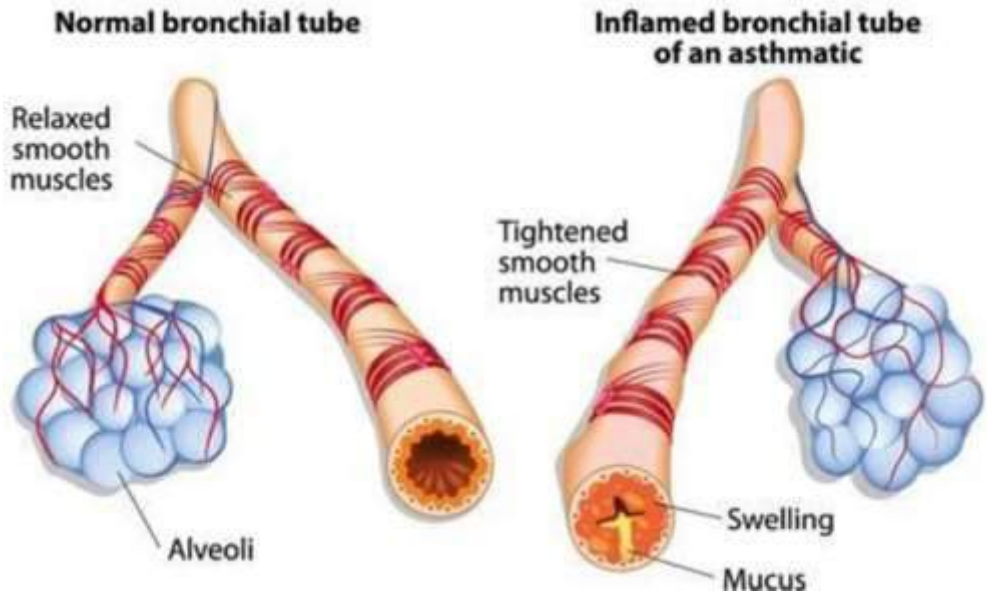
Symptoms tend to be more severe at night, early in the morning, or in response to triggers such as exercise or exposure to cold air. While some individuals with asthma experience symptoms only occasionally, typically in response to specific triggers, others may have frequent reactions and persistent symptoms.

Associated Conditions

Several health conditions are more common in individuals with asthma, including gastroesophageal reflux disease (GERD), rhinosinusitis, and obstructive sleep apnea. Psychological conditions are also frequently observed, with anxiety disorders affecting 16-52% of individuals and mood disorders impacting 14-41%. It remains unclear whether asthma contributes to psychological issues or vice versa.

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Current asthma (as opposed to former asthma) is linked to higher rates of all-cause mortality, heart disease mortality, and chronic lower respiratory tract disease mortality. Severe asthma, in particular, is strongly associated with the development of chronic obstructive pulmonary disease (COPD). Additionally, those with asthma, especially if poorly controlled, have an increased risk of adverse reactions to radiocontrast agents.



PATHOPHYSIOLOGY

Asthma is linked to immune responses driven by T helper cell type-2 (Th2) activity, a hallmark of other allergic (atopic) conditions.

Various triggers, both allergic (e.g., dust mites, cockroach droppings, pet dander, mold, and pollen) and non-allergic (e.g., respiratory infections, tobacco smoke, cold air, and physical exertion), initiate a series of immune reactions that result in chronic airway inflammation.

Increased levels of Th2 cells in the airways release specific cytokines, such as interleukin (IL)-4, IL-5, IL-9, and IL-13. These cytokines promote eosinophilic inflammation and stimulate mast cells to produce immunoglobulin E (IgE).

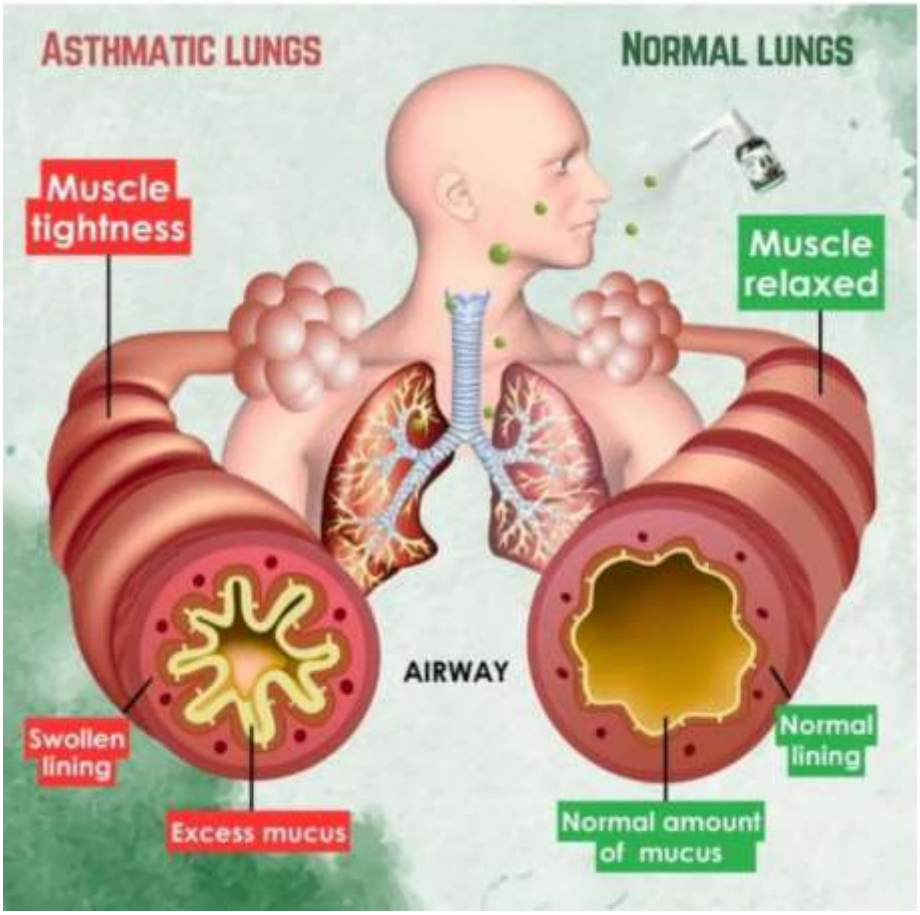
IgE, in turn, activates the release of inflammatory substances like histamine and cysteinyl leukotrienes. These mediators cause bronchospasm (airway smooth muscle contraction), swelling (edema), and excessive mucus production (mucus hypersecretion), leading to the classic symptoms of asthma.

The inflammatory mediators and cytokines released during the initial immune response to a triggering allergen further amplify inflammation in a late-phase response. This exacerbates airway inflammation and increases bronchial sensitivity (hyperreactivity).

Research suggests a genetic predisposition to asthma. Certain chromosomal regions have been associated with asthma-related traits, such as IgE antibody production, airway hyperresponsiveness, and inflammatory mediator activity.

However, more research is needed to pinpoint specific genes involved and to understand how genetic and environmental factors interact to contribute to the development of asthma.

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Asthma is a prevalent respiratory condition characterized by persistent inflammation of the airways, constriction of the smooth muscles in the respiratory tract, and recurrent episodes of bronchoconstriction.

According to the Centers for Disease Control and Prevention (CDC), asthma affects approximately 1 in 11 children and 1 in 12 adults in the United States.

Globally, the World Health Organization (WHO) estimates that 235 million people live with asthma. The condition can be broadly categorized into two types: allergic asthma and non-allergic asthma. This discussion will focus on allergic asthma. Regardless of the type, bronchoconstriction remains a key feature of the disease.

BRONCHIAL INFLAMMATION

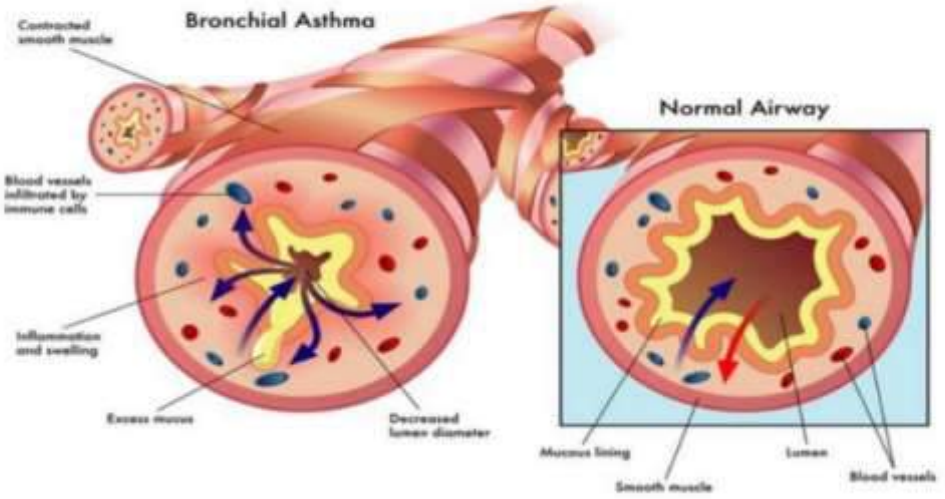
The mechanisms underlying allergic asthma-caused by an immune response to inhaled allergens are among the most thoroughly studied factors contributing to the condition.

In both individuals with asthma and those without, inhaled allergens that reach the inner airways are processed by antigen-presenting cells (APCs). These cells capture and present fragments of the allergens to other immune cells.

In most individuals, these immune cells, known as naïve T helper (Tho) cells, "inspect" and typically ignore the allergen fragments. However, in people with asthma, these Tho cells differentiate into Th2 cells, a process not yet fully understood. One possible explanation is that mast cells release interleukin-4 (IL-4), which promotes the transformation of Tho cells into Th2 cells.

The newly formed Th2 cells activate the humoral branch of the immune system, leading to the production of antibodies against the allergen. When the individual is exposed to the same allergen again, these antibodies recognize it and trigger a humoral immune response.

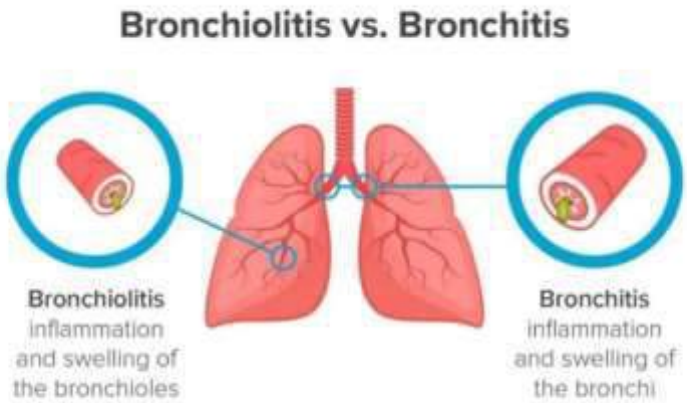
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INFLAMMATION RESULTS

chemicals are produced that cause the wall of the airway to thicken, cells which produce scarring to proliferate and contribute to further 'airway remodeling', causes mucus producing cells to grow larger and produce more and thicker mucus, and the cell-mediated arm of the immune system is activated. Inflamed airways are more hyper-reactive, and will be more prone to bronchospasm.

The "hygiene hypothesis" postulates that an imbalance in the regulation of these Ta cell types in early life leads to a long-term domination of the cells involved in allergic responses over those involved in fighting infection. The suggestion is that for a child being exposed to microbes carly in life, taking fewer antibiotics, living in a large family, and growing up in the country stimulate the TH1 response and reduce the odds of developing asthma. Asthma is associated with a procoagulant state in the bronchoalveolar space



Exposure to indoor volatile organic compounds (VOCs) can act as a trigger for asthma. For instance, formaldehyde exposure has been positively linked to the condition.

While phthalates found in some types of PVC are associated with asthma in both children and adults, most evidence does not establish a causal relationship between asthma and acetaminophen (paracetamol) or antibiotic use. A 2014 systematic review revealed that the observed link between acetaminophen use and asthma disappeared when respiratory infections were considered. However, maternal use of acetaminophen during pregnancy is associated with an increased risk of asthma in children. Similarly, maternal psychological stress during pregnancy is a recognized risk factor for childhood asthma.

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Asthma is also linked to exposure to common indoor allergens, including dust mites, cockroach droppings, animal dander (skin, fur, or feathers), and mold. Efforts to reduce dust mites have not shown significant improvements in symptoms among sensitized individuals. On the other hand, weak evidence suggests that repairing buildings to reduce mold exposure may alleviate asthma symptoms in adults.

Certain viral respiratory infections, such as respiratory syncytial virus (RSV) and rhinovirus, acquired during early childhood, may increase the likelihood of developing asthma. However, some infections might reduce the risk of asthma, highlighting the complex relationship between infection and immune system development.

HYGIENE HYPOTHESIS

The hygiene hypothesis suggests that the rising prevalence of asthma worldwide may be an unintended consequence of reduced exposure to non-pathogenic bacteria and viruses during early childhood.

This reduced exposure is thought to result, in part, from increased hygiene practices and smaller family sizes commonly seen in modern societies. These factors may limit the development of a balanced immune system, potentially increasing the risk of asthma and other allergic conditions.

Exposure to bacterial endotoxin in early childhood may prevent the development of asthma, but exposure at an older age may provoke bronchoconstriction. [67] Evidence supporting the hygiene hypothesis includes lower rates of asthma on farms and in households with pets.

Use of antibiotics in early life has been linked to the development of asthma.

Also, delivery via caesarean section is associated with an increased risk (estimated at 20-80%) of asthma this increased risk is attributed to the lack of healthy bacterial colonization that the newborn would have acquired from passage through the birth canal.

There is a link between asthma and the degree of affluence which may be related to the hygiene hypothesis as less affluent individuals often have more exposure to bacteria and viruses

There is also a correlation between asthma and socioeconomic status. Individuals from less affluent backgrounds often experience greater exposure to bacteria and viruses, which may support the hygiene hypothesis and explain the lower asthma prevalence in these populations.

GENETIC

A family history of asthma is a significant risk factor, with numerous genes implicated in the condition. If one identical twin has asthma, the likelihood of the other being affected is approximately 25%.

By the end of 2005, at least 25 genes had been associated with asthma across six or more populations, including SPINK5, LTC4S, IL4R, ADAM33, and others like GSTM1, IL10, and CTLA-4. Many of these genes are involved in immune system regulation or inflammation. However, even for well-replicated genes, findings have not been consistent across all populations studied.

In 2006, a single genetic association study identified over 100 genes linked to asthma, and new associations continue to emerge.

Some genetic variants may increase the risk of asthma only when combined with specific environmental factors. For instance, a single nucleotide polymorphism (SNP) in the CD14 region has been linked to asthma in individuals exposed to endotoxins, which are bacterial products commonly found in the environment.

MEDICAL CONDITIONS

The combination of atopic eczema, allergic rhinitis, and asthma is referred to as atopy. A history of atopic diseases is the strongest risk factor for developing asthma, with significantly higher rates observed in individuals with eczema or hay fever.

Asthma has also been linked to eosinophilic granulomatosis with polyangiitis (formerly Churg-Strauss syndrome), an autoimmune disorder characterized by vasculitis. Additionally, some individuals with specific forms of urticaria may experience asthma symptoms.

There is a noted correlation between obesity and an increased risk of asthma, with the prevalence of both conditions rising in recent years. Contributing factors may include reduced lung function due to excess fat and the pro-inflammatory state caused by adipose tissue.

EXACERBATION

Some individuals will have stable asthma for weeks or months and then suddenly develop an episode of acute asthma. Different individuals react to various factors in different ways, 571 Most individuals can develop severe exacerbation from a number of triggering agents.

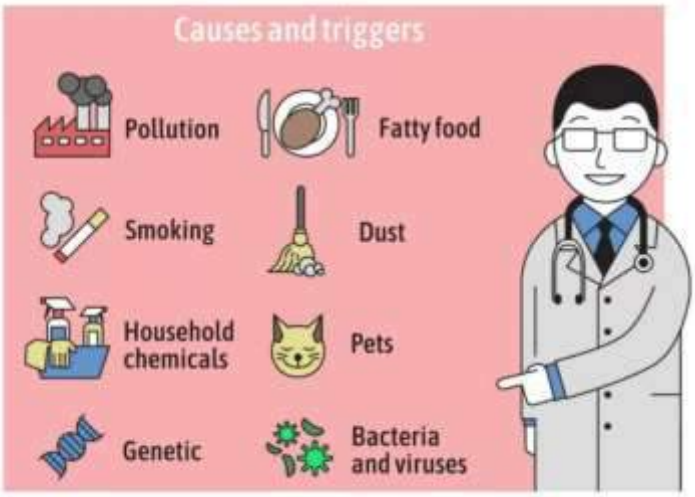
Several home factors can trigger asthma exacerbations, including dust, animal dander (particularly from cats and dogs), cockroach allergens, and mold. Perfumes are also a common cause of acute attacks, especially in women and children.

Both viral and bacterial infections of the upper respiratory tract can aggravate asthma symptoms. Additionally, psychological stress may worsen asthma, as it is believed to alter the immune system and increase the airway inflammatory response to allergens and irritants.

Asthma flare-ups in school-aged children tend to peak in the autumn, shortly after they return to school. This may be due to a combination of factors, including poor adherence to treatment, increased exposure to allergens and viruses, and changes in immune tolerance. While there is limited evidence

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on how to prevent autumn exacerbations, seasonal treatment with omalizumab (starting four to six weeks before school resumes) may help reduce asthma flare-ups, although it is a costly option.



DIAGNOSIS

The diagnosis of asthma requires a comprehensive approach, including a detailed medical history, physical examination, and objective lung function assessments, with spirometry being the preferred method for confirmation. Additional tests, such as bronchoprovocation challenge testing and evaluation of airway inflammation markers, can aid in diagnosis, especially when lung function appears normal despite asthma symptoms.

Medical History

Asthma should be considered in individuals who experience recurrent symptoms such as cough, wheezing, chest tightness, and shortness of breath. Symptoms that are variable, triggered by allergens or irritants, worsen at night, or improve with appropriate asthma treatment strongly indicate the condition.

It is essential to rule out alternative causes for these symptoms, such as chronic obstructive pulmonary disease (COPD), bronchitis, chronic sinusitis, gastroesophageal reflux disease (GERD), recurrent respiratory infections, and heart disease.

A family history of asthma or atopic conditions, along with a personal history of allergic disorders like allergic rhinitis, can support the diagnosis. Identifying triggers such as dust mites, cockroaches, pet dander, mold, pollen, physical activity, exposure to tobacco smoke, or cold air-is crucial.

Work-Related Asthma

If occupational asthma is suspected, a detailed review of workplace exposures and symptom changes during holidays or time away from work should be conducted.

Comorbidities

Evaluating for comorbid conditions, including allergic rhinitis, sinusitis, obstructive sleep apnea, and GERD, is critical, as these can exacerbate asthma symptoms.

Diagnosing asthma in young children can be challenging because episodic wheezing and coughing are common in this age group, and spirometry is unreliable for children under six years of age.

Diagnosis in Young Children

A practical approach to confirm asthma in young children is a trial of treatment with short-acting bronchodilators and inhaled corticosteroids (ICSs). Significant clinical improvement during therapy, followed by symptom recurrence when treatment is stopped, strongly suggests asthma.

Physical Examination

Asthma symptoms are often variable, so the physical examination of suspected cases is frequently normal, especially if the patient is asymptomatic during the evaluation. The absence of abnormal findings does not exclude asthma. When present, wheezing heard during auscultation is the most common abnormal finding and indicates airflow limitation.

Physicians should also check the upper respiratory tract and skin for signs of atopic conditions, such as allergic rhinitis or dermatitis, which may coexist with asthma.

Objective Lung Function Measurements

Spirometry is the preferred test to evaluate reversible airway obstruction (demonstrated by rapid improvement in lung function after using a short-acting bronchodilator) and confirm asthma. It is recommended for all patients over six years old who can perform lung function tests.

The ratio of FEV1 to FVC is a key indicator of airflow obstruction. Asthma is confirmed when there is either:

An improvement in FEV1 of at least 12% and at least 200 mL within 15-20 minutes after administering an inhaled rapid-acting bronchodilator, or

An improvement in FEV1 of at least 20% and at least 200 ml. after two weeks of treatment with an anti-inflammatory agent.

In the general population, the FEV1/FVC ratio is typically greater than 0.80 (and possibly above 0.90 in children). Values below these thresholds indicate airflow limitation, supporting a diagnosis of asthma.

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Repeated Spirometry
Due to the variability of asthma symptoms, patients may not always show reversible airway obstruction during a single visit. Repeating spirometry, especially when the patient is symptomatic, enhances diagnostic accuracy.

Peak Expiratory Flow (PEF) Monitoring

When spirometry is unavailable, PEF monitoring is a suitable alternative. PEF is measured twice daily, usually in the morning and evening.

Indicators of asthma from PEF monitoring include:

A diurnal variation of more than 20%, or

An improvement of at least 60 L/min or 20% following inhalation of a rapid-acting bronchodilator.

CHALLENGE TESTING
When lung function tests are normal but symptoms suggest asthma, airway responsiveness can be evaluated through challenge testing. This involves exposing the patient to bronchoconstrictor stimuli (e.g., methacholine or histamine) or indirect challenges such as mannitol or exercise.

Challenge testing should be conducted under strict protocols in a controlled environment equipped to manage acute bronchospasms. The test measures the dose or concentration of a stimulus required to induce a significant bronchoconstriction, typically defined as a 20% reduction in FEV1.

NON-INVASIVE MARKERS OF AIRWAY INFLAMMATION
The measurement of inflammatory markers, such as sputum eosinophilia (the concentration of eosinophils in sputum) or exhaled nitric oxide levels (a gas produced by certain cells during inflammation), can aid in diagnosing asthma.

Exhaled nitric oxide levels may be more effective at identifying asthma than basic lung function tests and can also help monitor a patient's response to therapy.

Although these tests have been studied for asthma diagnosis and management, they are not yet widely used in Canada. As more clinical evidence emerges and their availability increases, these tools will likely become more commonly utilized.

ALLERGY SKIN TESTING
Allergy skin testing is recommended to assess the patient's allergic status and identify potential asthma triggers. This testing typically uses allergens relevant to the patient's geographic region.

TREATMENT
The primary objective of asthma management is to achieve and maintain control of the condition to prevent exacerbations-sudden or progressive worsening of symptoms requiring immediate medical attention or oral steroid therapy-and to reduce the risk of complications and mortality.

Assessing and Tailoring Treatment
Asthma control should be evaluated at each visit using established criteria, and treatment should be adjusted accordingly. Most patients can achieve control through a combination of avoidance strategies and pharmacological treatments.

Pharmacological Treatments
Asthma medications are categorized as:
Controllers: Taken daily for long-term management, primarily targeting inflammation

These include:
Inhaled corticosteroids (ICSS)
Leukotriene receptor antagonists (LTRAS)
Long-acting beta2-agonists (LABAs) combined with ICS
Anti-IgE therapy
Relievers: Used as needed for rapid symptom relief and bronchodilation. These includ
Rapid-acting inhaled beta2-agonists
Inhaled anticholinergics

AVOIDANCE MEASURES
Avoiding relevant allergens and irritants is a crucial aspect of asthma management.

Allergen Avoidance Strategies
House Dust Mites: Patients allergic to dust mites should use allergen-proof covers for bedding and maintain indoor humidity levels below 50% to prevent mite growth.

Pollen: To minimize pollen exposure, patients should keep windows closed, use air conditioning, and limit outdoor activities during peak pollen seasons.

Animal Dander: Removing pets from the home is the most effective strategy, often leading to symptom improvement within 4-6 months. However, as compliance is often low, using high-efficiency particulate air (HEPA) filters and keeping pets out of bedrooms or outdoors may help reduce allergen levels.

Mould Allergens: Exposure can be minimized through cleaning with fungicides, using dehumidifiers to maintain humidity below 50%, and installing HEPA filters.

Tobacco Smoke: Patients should avoid smoking and exposure to second-hand smoke.

Challenges and Adherence
Implementing these avoidance strategies can be demanding, and patient adherence is often suboptimal. To encourage adherence, physicians should provide regular reassessments, guidance, and motivation.

Combining Strategies
For optimal asthma control, patients should be advised to implement multiple avoidance measures simultaneously, as

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single interventions have shown limited effectiveness in improving asthma outcomes.

RELIEVER MEDICATIONS

Inhaled rapid-acting beta2-agonists are the preferred medications for relieving acute asthma symptoms and should be prescribed to all individuals with asthma.

In Canada, several short-acting beta2-agonists (SABAs), such as salbutamol and terbutaline, as well as one long-acting beta2-agonist (LABA), formoterol, are approved for this purpose. SABAS should only be used as needed to relieve symptoms. Frequent use (three or more times per week) suggests worsening asthma control and necessitates a reassessment of treatment to better manage symptoms.

Unlike other LABAS, formoterol has a rapid onset of action, making it suitable for relieving acute symptoms. However, due to the increased risk of asthma-related morbidity and mortality associated with LABA monotherapy, formoterol should only be used as a reliever in individuals aged 12 years or older who are also on regular inhaled corticosteroid (ICS) therapy.

Short-acting anticholinergic bronchodilators, such as ipratropium bromide, may also be used for symptom relief. However, these medications are generally less effective than inhaled rapid-acting beta2-agonists and should be considered second-line options for patients who cannot use SABAS.

In cases of moderate to severe asthma exacerbations, short-acting anticholinergics may be used in combination with SABAS. However, regular use of short-acting anticholinergic therapy is not recommended for children.

CONTROLLER MEDICATIONS

Inhaled corticosteroids (ICSs)

Inhaled corticosteroids (ICSs) are the most effective anti-inflammatory medications available for asthma treatment and are considered the cornerstone of therapy for most individuals with the condition.

Low-dose ICS monotherapy is the recommended first-line maintenance treatment for most children and adults with asthma. Regular use of ICSs has been shown to reduce symptoms, prevent exacerbations, and improve lung function and quality of life.

However, ICSs do not "cure" asthma. Symptoms often return within weeks to months after discontinuing treatment, meaning most patients will require long-term, and in some cases lifelong, ICS therapy.

If asthma remains uncontrolled despite ICS treatment, factors other than medication effectiveness should be considered. These include:

Misdiagnosis of asthma
Poor adherence to ICS therapy
Incorrect inhaler technique
Coexisting medical conditions

If these issues are addressed and asthma control is still not achieved with low to moderate doses of ICS, treatment adjustments are necessary. For most children, increasing the ICS dose to a moderate level is preferred. For patients aged 12 years and older, adding another class of medication, typically a long-acting beta2-agonist (LABA), is recommended.

Common local side effects of ICS therapy include oropharyngeal candidiasis (oral thrush) and dysphonia (hoarseness or difficulty speaking). These side effects can be minimized by rinsing the mouth and spitting after each inhalation or using a spacer device.

Systemic side effects with ICS therapy are rare but may include adrenal suppression, changes in bone density, cataracts, glaucoma, and growth suppression.

LEUKOTRIENE RECEPTOR ANTAGONISTS (LTRAS)

Leukotriene receptor antagonists (LTRAS), such as montelukast and zafirlukast, are effective and generally well-tolerated options for asthma treatment. However, because they are less effective than inhaled corticosteroids (ICSs) as monotherapy, they are typically reserved for patients who cannot or choose not to use ICSs.

LTRAS may also be used as an add-on treatment for patients whose asthma is uncontrolled despite low-to-moderate dose ICS therapy. It is important to note that in adults, LTRAS are considered less effective than long-acting beta2-agonists (LABAS) as add-on therapy.

In children, the evidence is less clear, and treatment decisions should consider the child's symptoms and any comorbid conditions. For example:
If a child with asthma also has allergic rhinitis, adding montelukast may be beneficial.

If the child has persistent airway obstruction, adding a LABA may be more appropriate.

Combination ICS/LABA Inhalers

LABA monotherapy is not recommended for asthma treatment because it does not address airway inflammation and is linked to an increased risk of asthma-related morbidity and mortality. LABAs should only be used in combination with ICS therapy.

The combination of a LABA with an ICS has proven to be highly effective in reducing asthma symptoms and preventing exacerbations. It is the preferred treatment for adolescents and adults whose asthma is not adequately controlled with low-dose ICS therapy, or for children over six years of age whose asthma is uncontrolled with moderate-dose ICS therapy.

Although ICS and LABAs can be delivered through separate inhalers with similar effectiveness, combination ICS/LABA inhalers are preferred. They prevent LABA use without an ICS, are more convenient, and may improve patient adherence.

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Three combination ICS/LABA inhalers are available in Canada: salmeterol/ fluticasone (Advair), budesonide/formoterol (Symbicort) and mometasone/formoterol (Zenhale). Combination budesonide/formoterol has recently been approved for use in Canada as a single inhaler for both daily maintenance (controller) and reliever therapy in individuals 12 years of age and older.

It should only be used in patients whose asthma is not adequately controlled with low-to moderate ICS doses or whose disease severity warrants treatment with combination therapy.

THEOPHYLLINE

Theophylline is an oral bronchodilator with modest anti-inflammatory effects. Given its narrow therapeutic window and frequent adverse events (e.g., gastrointestinal symptoms, loose stools, seizures, cardiac arrhythmias, nausea and vomiting), its use is generally reserved for patients whose asthma is uncontrolled despite an adequate trial of ICS, LABAS and/or LTRAS.

Anti-IgE Therapy

Omalizumab, an anti-IgE monoclonal antibody, has been shown to reduce asthma exacerbations by approximately 50%. It is administered via subcutaneous injection every 2 to 4 weeks and is approved in Canada for patients aged 12 years and older with moderate to severe persistent allergic asthma.

Currently, omalizumab is typically reserved for individuals with difficult-to-control asthma who have confirmed allergies and whose symptoms remain uncontrolled despite treatment with inhaled corticosteroids (ICSs).

Long-term adherence to controller therapy is often poor, as many patients stop treatment once their symptoms improve. Regular follow-up appointments are crucial to encourage adherence and ensure effective asthma management.



SYSTEMIC CORTICOSTEROIDS

Systemic corticosteroids, such as oral prednisone, are generally used for the acute treatment of moderate to severe asthma exacerbations. While chronic systemic corticosteroid therapy may also be effective for the management of difficult to control asthma, prolonged use of oral steroids are associated with well-known and potentially serious adverse effects and, therefore, their long-term use should be avoided if at all possible.

Adverse events with short-term, high-dose oral prednisone are uncommon, but may include: reversible abnormalities in glucose metabolism, increased appetite, edema, weight gain, rounding of the face, mood alterations, hypertension, peptic ulcers and avascular

Allergen-specific immunotherapy

Allergen-specific immunotherapy involves the subcutaneous administration of gradually increasing quantities of the patient's relevant allergens until a dose is reached that is effective in inducing immunologic tolerance to the allergen

Allergen-specific immunotherapy has been widely used to treat allergic asthma, but it is not universally endorsed by all clinical practice guidelines due to the potential risk of serious anaphylactic reactions.

A Cochrane review of 75 randomized controlled trials demonstrated that allergen-specific immunotherapy is effective in reducing asthma symptoms, lowering medication requirements, and improving airway hyperresponsiveness. Similar benefits have been observed with sublingual immunotherapy, which which is expecte expected to gain approval in Canada soon. Additionally, evidence evidence su suggests that allergen-specific immunotherapy may help prevent the development of asthma in atopic individuals.

Currently, allergen-specific immunotherapy should be considered on a case-by-case basis. It may be used:

As a trial before starting ICS therapy in patients with very mild allergic asthma and coexisting allergic rhinitis.

As an add-on therapy for patients already using ICSs alone.

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For patients on combination treatments, such as ICS/LTRAS, ICS/LABAS, or omalizumab, provided their asthma is well-controlled.

Due to the risk of anaphylaxis, allergen-specific immunotherapy should only be prescribed by physicians with specialized training in allergy management. Injections must be administered in clinics equipped to handle life-threatening anaphylactic reactions, with a physician present. To minimize risks, asthma must be well-controlled, and the patient's FEV1 should be above 70% of the predicted value at the time of each injection.

CONCLUSION

Asthma is the most common respiratory condition in Canada and is a major contributor to illness and death. It should be suspected in individuals experiencing recurrent episodes of cough, wheezing, chest tightness, or shortness of breath, and confirmed using objective lung function tests, preferably spirometry. Allergy testing is also recommended to identify potential triggers of asthma symptoms.In most cases, asthma can be effectively managed with avoidance strategies and appropriate medications.

Inhaled corticosteroids (ICSs) are the standard treatment for most patients. For those whose asthma remains uncontrolled with low-to-moderate ICS doses, combination therapy with an ICS and a long-acting beta2-agonist (LABA) is the preferred option for most adults. Leukotriene receptor antagonists (LTRAS) may also be considered as an add-on therapy, especially in patients with coexisting allergic rhinitis.

Anti-IgE therapy, such as omalizumab, may be beneficial for certain patients with difficult-to-control asthma. Allergen-specific immunotherapy is another potential option that may modify the course of the disease. However, it should only be prescribed by specialists trained in allergy management.

All individuals with asthma should have regular follow-up visits to assess asthma control, ensure adherence to treatment, and review proper inhaler technique.

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A REVIEW ON MEDICATION ADHERENCE IN HYPERTENSION PATIENT.

[1]Sagar G. Chavhan, [2]Swapnil P.Kulthe
Raosaheb Patil Danve College of Pharmacy Badnapur.

ABSTRACT

Hypertension is a major global health concern, affecting over 1 billion individuals worldwide. Medication adherence is crucial for effective blood pressure control and reducing cardiovascular risk. However, poor adherence to antihypertensive medications is common, particularly in patients with apparent treatment-resistant hypertension. This comprehensive literature review aims to identify the prevalence, factors, and effective interventions associated with medication adherence among hypertension patients. The prevalence of medication non-adherence ranges from 20-50%, with higher rates observed in developing countries. Poor adherence is linked to increased hospitalizations, mortality, and healthcare costs. Factors influencing medication adherence can be categorized as patient-related (e.g., age, education, health literacy), healthcare provider-related (e.g., physician-patient communication, medication counseling), and system-related (e.g., healthcare access, insurance coverage, medication costs). Effective interventions to improve medication adherence include patient education, reminder systems, pharmacist interventions, mobile health applications, and financial incentives.

Multifaceted, tailored, and technology-based interventions have shown promising results. Challenges in improving medication adherence include the complex nature of adherence behaviors and the need for personalized approaches. Future directions should focus on developing and implementing evidence-based, patient-centered interventions that address the multidimensional factors influencing medication adherence in hypertension patients. Improving medication adherence has the potential to significantly reduce the global burden of hypertension and its associated cardiovascular complications.

INTRODUCTION

Hypertension is a major public health concern, affecting over 1 billion individuals worldwide. Medication adherence is crucial for effective blood pressure control,reducing cardiovascular risk, and improving health outcomes.

As a silent and asymptomatic condition, hypertension represents the most crucial modifiable risk factor for cardiovascular diseases (CVD) and ranks as the leading cause of disability-adjusted life years.1 This widespread health concern affects individuals of both genders, with its prevalence and burden increasing on a global scale.2 Projections suggest that by 2025, hypertension will affect an estimated 1.6 billion adults worldwide, reflecting a 60% rise from the year 2000.3 A particularly alarming aspect is the disparity in prevalence increase between high-income nations and low- to middle-income countries (LMICs).

While awareness, treatment, and control rates are improving in high-income countries, these factors remain significantly lower in LMICs.4 This discrepancy can be partially attributed to an aging population, increased urbanization, and alterations in social and environmental risk factors.5 In the United States, overall prevalence is higher, with lower control rates observed among minority groups, particularly non-Hispanic blacks.6 It is noteworthy that within any hypertensive population, a subset of individuals remains unaware of their condition.

Hypertension is a leading risk factor impacting on global morbidity and mortality. In 2016, it was the largest contributor to global disability-adjusted lifeyears and its complications led to approximately 10.4 million deaths . Despite the wide range of efficacious antihypertensive treatments, blood pressure (BP) is still not adequately controlled in a considerable number of patients worldwide. In the United States (US), the age-standardized proportion of hypertension control among treated patients was reported to be 43.5%. A survey in 89 countries in 2018 found that 60% of treated patients had their BP controlled .Several factors can explain poor BP control, including poor adherence of patients to treatment, physician inertia, prescription errors, overcomplicated guidelines and unsupportive healthcare systems . Among these, poor adherence is a major challenge and is recognized as such by guidelines, especially as hypertension is a mostly asymptomatic condition requiring lifelong use of medication. Moreover, it is now acknowledged that most patients will need more than one antihypertensive medicationfor their BP to be controlled , which can have important consequences on adherence, given that patients on two-pill or three-pill antihypertensive regimens are less likely tobe adherent and more likely to discontinue treatment than patients on single-pill treatment .

Although the exact proportion of non-adherent patients may vary between studies, in part because different methods are used for its assessment, poor adherence to antihypertensive medications is common, especially in patients with apparent.

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REVIEW OF LITERATURE

1. **Seyed Mehrdad Hamrahian et.al (2022):** Medication non-adherence is an underestimated, modifiable risk factor in the management of hypertension and aTRH. Evaluation of medication adherence should become an integral part of assessment of patients with hypertension and particularly a TRH. It is true thatdrugs do not work in patients who do not take them, but medication non- adherence is a much more complex problem than simply blaming the patient. There are patient-related factors as well as healthcare-related ones.
2. **Neil R. Poulter et.al (2019):** he clear that when BP control is not achieved, non-adherence should be considered as a possible reason and measured. Also When poor adherence is detected, the patient–practitioner relationship has an important role to play in the identification of patient specific barriers to adherence.
3. **M. Burnier et.al (2017):** Cardiovascular mortality is declining in developed countries but rather increases in developing countries 87 Despite the availability of new effective and well tolerated drugs enabling to control bloodpressure effectively in almost 80% of patients, according to clinical trials, hypertension remains the number one risk factor for the development of stroke, coronary heart disease, congestive heart failure and chronic kidney diseases.
4. **Papatya Karakurt, et.al (2012):** He studied pn Factors affecting medication adherence in patients with hypertension. It was found that 57.9% of the patients did not use their medicines as prescribed. The primary reasons for non-concordance were forgetfulness/aloneness/negligence for 49.3%, high cost for 26.5%, and old age/inactivity for 16.3%that 43.6% of the patients had been hypertensive for 1 – 5 years, 94.4% knew of a special diet for hypertension, and 47.3% did not comply with their diet. According to the results of the study, it was found that 31.1% of the patients attended follow-up visits once a month
5. **Rosalie P. Patel et.al (2002):** The findings suggest that patients' greater perception of control over trying to reduce blood pressure may result in decreased reliance on medications and subsequent non-adherence to drug therapy. Implications of these findings on pharmacy practice are discuss.
6. **Hayden B. Bosworth, PhD (2011):** Poor adherence to efficacious cardiovascular-related medications has led to considerable morbidity, mortality, and avoidable health care costsThus, to these ends, we are also proposing an ongoing alliance to continue to work together to frame the problems related to medication adherence share methods and successes for improving optimal use of evidence-based treatment.

AIM & OBJECTIVES

AIM

To conduct a comprehensive review of the literature to identify the prevalence, factors, and effective interventions associated with medication adherence among hypertension patients**.**

OBJECTIVES

1. To determine the prevalence of medication non-adherence among hypertension patients.
2. To examine the patient-related, healthcare provider-related, and system-related factors influencing medication adherence.
3. To evaluate the effectiveness of various interventions (e.g., patient education, reminder systems, pharmacist interventions) in improving medication adherence.
4. To identify the most effective strategies for improving medication adherence in specific populations (e.g., elderly, low-income, minority groups).
5. To discuss the challenges and future directions for improving medication adherence Among hypertention patient.

PLAN OF WORK

Prevalence of Medication Non-Adherence

- 20-50% of hypertension patients are non-adherent to medication regimens .
- Non-adherence rates higher in developing countries .
- Poor adherence linked to increased hospitalizations, mortality, and healthcare costs .

Factors Influencing Medication Adherence:

Patient-Related Factors:

- Age
- Education level
- Health literacy
- Medication beliefs
- Social support

Healthcare Provider-Related Factors

- Physician-patient communication
- Medication counseling

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- Follow-up appointments

System-Related Factors
- Healthcare access
- Insurance coverage
- Medication costs

Interventions to Improve Medication Adherence
- Patient education
- Reminder systems
- Pharmacist interventions
- Mobile health applications
- Financial incentives

Effective Strategies
- Multifaceted interventions
- Tailored interventions
- Technology-based interventions

UNDERSTANDING TREATMENT ADHERENCE

The World Health Organization defines adherence as the degree to which an individual's actions - including medication intake, dietary habits, and lifestyle modifications - align with the recommendations provided by a healthcare professional . While adherence to lifestyle changes plays a crucial role in managing and preventing hypertension , this discussion will concentrate on medication adherence. The term 'adherence' is preferred over 'compliance' as it recognizes the patient's active agreement to recommendations , rather than implying passive obedience.

Defining adherence precisely is challenging due to the variety of real-world behaviors associated with it. However, a commonly used benchmark for distinguishing adherence from non-adherence is when a patient takes 80% of their prescribed medication , though this threshold has not been validated for antihypertensive drugs. A European consensus paper proposed that adherence comprises three elements: initiation (taking the first prescribed dose), implementation (the extent to which the patient's actual dosing matches the prescribed regimen), and discontinuation (ceasing to take the prescribed medication).

A retrospective study analyzing electronic monitoring data from 4783 patients across 21 Phase IV trials revealed that 2% of patients never started treatment, and 48% experienced at least one 'drug holiday' (skipping doses for three or more consecutive days) annually. Approximately half of the patients with available follow-up data stopped their treatment within the first year . Notably, patients who poorly followed their prescribed regimen were more likely to discontinue treatment . In real-world clinical settings, these figures appear to be even more concerning: an examination of 195 930 electronic prescriptions indicated that 28% of patients did not initiate a new prescription for antihypertensive medication .

Prevalence of Medication Non-Adherence

The global burden of hypertension, defined as blood pressure (BP, mmHg) ≥140 systolic or ≥90 diastolic or antihypertensive treatment, was projected to rise from 918 million adults in calendar year 2000 to 1.56 billion in 2025.

The projected increase in the burden of hypertension reflected an expected rise in both prevalent hypertension from 26.4% to 29.2% and the worldwide population. By 2010, these projections appeared conservative as the worldwide prevalence of hypertension was estimated at 31.1%, affecting 1.39 billion people.

The large increase in prevalent hypertension globally was explained largely by rapidly rising prevalence in low middle–income countries. In 2010, ≈349 million hypertensive adults lived in high-income countries and 1.04 billion in lowmiddle–income countries. Prevalent hypertension was lower in high- than low-middle–income countries, whereas awareness, treatment, and control were substantially lower in the latter . Among treated hypertensive adults, roughly one-half were controlled in high-income countries compared with one-fourth in low-middle–income countries.

Factors Influencing Medication Adherence

Therapy-Related Factors/Interventions.

Complex regimens with multiple medications, especially when paired with multiple daily doses, are long-recognized as barriers to adherence. Alternatively, fewer medications, and especially fewer pills, which can be implemented using once daily single-pill combinations are consistently associated with better adherence and hypertension control .45,46 Patients who reach therapeutic targets more rapidly, who require fewer adjustments in their medication regimen, and who experience no or limited adverse effects

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are more likely to adhere than patients with a longer period to control, who often undergo multiple changes to their medication regimens, and experience adverse effects, are less likely to adhere to treatment. Long-term

chronic diseases, such as hypertension, are often associated
with progressive declines in persistence on treatment with thepassage of months and years. In addition to single-pill combinations, clinicians can further improve adherence by prescribing a larger number of pills with each prescription to reduce refill frequency. Moreover, patients with hypertension often require multiple medications to control their hypertension, and they frequently have other chronic diseases requiring additional medications. Refill consolidation so that multiple medications are obtained at the same time can improve adherence.

Condition-Related Factors/Interventions
Adults with hypertension, especially with aging, often have multiple chronic conditions and polypharmacy, which may adversely affects medication adherence. Major depression and other psychoses can adversely influence adherence as can drug or alcohol abuse and dementia.Interestingly, alterations of memory in elderly patients can results in a poor adherence as well as in an overadherence, with a higher drug consumption than what has been prescribed, which may induce drug toxicity.54 Not surprisingly, major disabilities and poor quality of life are documented to adversely affect medication adherence,55 especially when the medication(s) do not attenuate the disability or enhance quality of life. On a related note, severe chronic symptomatology, similar to chronic asymptomatic disease,can adversely impact medication adherence.

Patient-Related Factors/Interventions
As noted in the 2003 WHO Report on adherence, patient-related factors are often the principal focus of efforts to understand and improve adherence, which can lessen attention to the important role played by the other dimensions of adherence. While most interventions center on patient-related factors can improve adherence, failure to account for other dimensions of adherence typically leads to suboptimal improvements in adherence and associated clinical outcomes. To highlight the importance of these other dimensions, patient-related factors, which are important, were presented last in the 2003 WHO Report and the current review. Some patients do not accept the diagnosis, which is obviously a major impediment to adherence.

While not denying the diagnosis, other patients may fail to perceive the potentially severe impact of a currently asymptomatic disease on future health risk, including symptomatic and life-threatening conditions, such as coronary heart disease, chronic heart failure, stroke, or dementia. If patients perceive that prescription medications are ineffective in controlling hypertension or are likely to have major adverse effects, then adherence is likely to be adversely impacted.

A lack of knowledge about hypertension and its consequences are logically linked to suboptimal adherence. Yet, adherence interventions based only on education often lead to suboptimal results, although education is often a component of successful multimethod interventions. One example of a common misunderstanding that adversely affects adherence is the term hypertension, which connotes too many patients that stress or behavioral issues are the root cause of the elevated BP.58 In fact, patients with this perception of hypertension are less likely to take antihypertensive medications.

Factors Contributing To Nonadherence In Hypertensive Patients
Adherence is recognized as a complex issue influenced by various interconnected factors, including socioeconomic, healthcare system, medical condition, therapy, and patient-related aspects . The interactions among patients, healthcare providers, and the healthcare system can significantly affect a patient's adherence to treatment . The healthcare system plays a crucial role in creating an environment that promotes adherence at multiple levels and can impact access to care and cost-related obstacles . At the healthcare provider level, factors such as communication abilities, knowledge of guidelines, appropriateness and intricacy of prescribed treatments, therapeutic inertia, and time limitations can all influence adherence (Table 1). At the patient level, various factors can negatively impact adherence, and these may differ from one patient to another .

Hypertension is primarily an asymptomatic condition, which may lead patients to underestimate the necessity or benefits of treatment. This is particularly true for younger, active individuals without comorbidities, who might also be concerned about potential or experienced side effects, or reluctant to incorporate treatment into their daily routines. Side effects experienced by patients during therapy are one of the primary reasons for nonadherence, especially when combined with a lack of perceived treatment benefits, whether real or imagined by the patient.

Improving Medication Adherence Among Patients with Hypertension.
Simplify the regimen.

- Encourage patients to use adherence tools, like day-of-the-week pill boxes or mobile apps.
- Work to match the action of taking medication with a patient's daily routine (e.g., mealtime or bedtime, with other medications they already take properly).

Impart knowledge

- Write down prescription instructions clearly, and reinforce them verbally.

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- Provide websites for additional reading and information.

Modify patients' beliefs and behavior.

- Provide positive reinforcement when patients take their medication successfully, and offer incentives if possible.
- Talk to patients to understand and address their concerns or fears.

Provide communication and trust.

- Allow patients to speak freely. Time is of the essence, but research shows that most patients will talk no longer than 2 minutes when given the opportunity.
- Use plain language when speaking with patients. Say, "Did you take all of your pills?" instead of using the word "adherence."
- Ask for patients' input when discussing recommendations and making decisions.
- Remind patients to contact your office with any questions.

Leave the Bias

- Understand the predictors of non-adherence and address them as needed with patients.
- Ask patients specific questions about attitudes, beliefs, and cultural norms related to taking medications

CONCLUSION

Poor adherence to medication represents a challenge in the management of hypertension and its importance is increasingly recognized. The barriers to adherence are complex, affected by several contributing and often interconnected factors at the patient level, practitioner level and healthcare system level, and they can differ depending on the patient's profile, as outlined in this review. Medication adherence among hypertension patients remains a significant concern. Understanding factors influencing adherence and implementing effective interventions can improve health outcomes, reduce healthcare costs, and enhance quality of life.

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OVERVIEW ON PHARMACEUTICAL CO-CRYSTALLIZATION TECHNIQUES

Mr. Parmeshwar Matlabe[1], Yogeshwari Bapu Pamane[2]*, Swapnil. S. Parve[3], Bhagyashri. K. Padul[4], Sonali. A. Ghorpade[5], Rutuja. N. Kabre[6]

[1]*Asst. Prof. (faculty of pharmaceutics) Raosaheb patil danve college of pharmacy, Badnapur, Jalna.*
[2]*Student of Bachelor of Pharmacy, Raosaheb patil danve college of pharmacy, Badnapur, Jalna.*
[3]*Student of Bachelor of Pharmacy, Raosaheb patil danve college of pharmacy, Badnapur, Jalna.*
[4]*Student of Bachelor of Pharmacy, Raosaheb patil danve college of pharmacy, Badnapur, Jalna.*
[5]*Student of Bachelor of Pharmacy, Raosaheb patil danve college of pharmacy, Badnapur, Jalna.*
[6]*Student of Bachelor of Pharmacy, Raosaheb patil danve college of pharmacy, Badnapur, Jalna.*
Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna 431202.

ABSTRACT

One of the most promising techniques for improving the physicochemical characteristics of APIs – solubility, bioavailability, and stability – is pharmaceutical co-crystallization. This method relies on non-covalent interactions to create a crystalline complex of an API with one or more co-formers, which are tiny organic molecules. Co-crystallization is an alternative to the widely used conventional solid-state modification methods, such as particle size reduction. The method makes it possible to create engineered materials with enhanced drug performance while maintaining the API's therapeutic action. A number of co-crystallization processes, including solvent evaporation, grinding, and slurrying, as well as the fundamental ideas behind their production, are described in the overview that follows. The most common characterization methods used to evaluate co-crystals are X-ray diffraction. The review paper presents spectroscopic and thermal analysis. In keeping with the timeframe of this work, this paper addresses the difficulties and future directions of pharmaceutical co-crystallization, including scalability and regulatory concerns as well as more general issues. The main goal was to advance our knowledge of co-crystallization.

KEY WORDS:

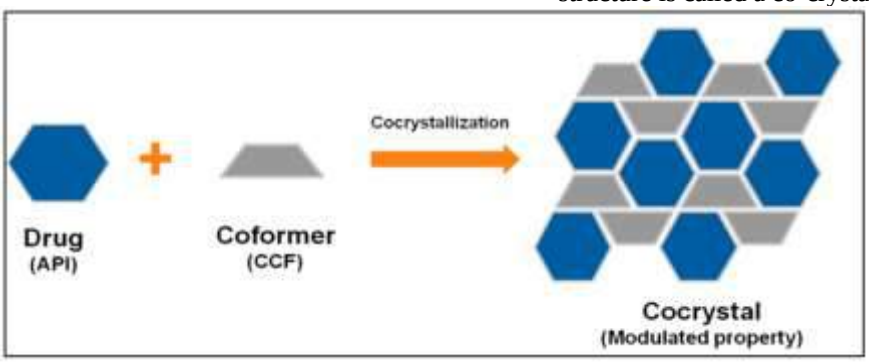
- *Pharmaceutical Co-Crystallization.*
- *Selection of Co-formers.*
- *Formulation methods.*
- *Evaluation methods.*
- *Solubility Enhancement.*

INTRODUCTION

Significant analysis, experimental research, candidate drug selection, experimental development, and fully created drug are the five separate stages that make up the intricate process of drug discovery or development. Drug design and development, wherein the "Research and Development" department employs collaborative teams to enhance drug understanding [(1)]. Many potentially promising drug candidates are discarded from late-stage development throughout the research and development process, primarily due to their low bioavailability [(2)].

Pharmaceutical scientists have been more interested in the co-crystallization process over the past ten years because they want to modify the physicochemical properties of active pharmaceutical ingredients without changing their pharmacological activity. This makes them a better choice for patents and for developing these medications into new, marketable formulations [(3)].

Pharmaceutical Co-crystallization is a process that involves combining two or more chemical substances to form a crystalline structure with unique properties. The resulting structure is called a co-crystal.



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Co-Crystal

A co-crystal is a crystalline structure made up of two or more substances, which could be molecules, atoms, or ions. To increase a drug's bioavailability in the human body, its physicochemical characteristics—such as its melting point, solubility, dissolution, and stability—are improved. Which results in the drug's optimal therapeutic impact with fewer side effects. While co-crystallization with pharmaceutically acceptable chemicals can enhance physical qualities, it has no effect on the pharmacological action of active pharmaceutical components [(4)]. Drugs are categorized into four main groups by the Biopharmceutics Classification System (BCS) according to their permeability and solubility characteristics. Drugs in BCS Class II and Class IV have limited solubility in water. Hydrophobic medications with poor aqueous solubility may have reduced bioavailability and poor absorption [(5)].

Design of Co-Crystal

The design and preparation of pharmaceutical co-crystals is a multi-step procedure. Finding the functional groups that can form intermolecular interactions with appropriate co-formers requires first studying the structure of the target API molecule. A co-former is a substance that interacts with the API in the crystal lattice in a nonionic manner; it is usually non-volatile and is not a solvent, including water.Van der Waals contacts, π-π stacking interactions, and hydrogen bonding—the most prevalent interaction in co-crystal structure—are examples of these intermolecular interactions. Selecting a co-crystal former is the next step. Being pharmaceutically acceptable—for instance, pharmacological excipients and chemicals categorized as generally as safe (GRAS) for use as food additives—is the main need for a co-former. A single crystalline phase of several components in a specific stoichiometric ratio, where the various chemical species interact through hydrogen bonds or other non-covalent bonds, is what makes up co-crystals. The hydrogen bond has been the most significant interaction in co-crystal formation due to its strength and directionality. As seen in Figure 1, strong and weak hydrogen bond synthons are frequently the basis for supramolecular configurations in pharmaceutical crystals. N–H... O, O–H... O, N–H... N, and O–H... N are examples of strong hydrogen bonds, whereas C–H... O–N and C–H... O=C[(6)] are examples of weak hydrogen bonds.

Co-Former

Co-former is a co-crystallizing agent that interacts nonionically with the API (active pharmaceutical ingredient) in the crystal lattice. Co-formers are mainly non-volatile and they are highly water soluble agent.

IDEAL PROPERTIES FOR SELECTION OF CO-FORMER.

- Low molecular weight.
- Pharmaceutically acceptable.
- Non-toxic.
- Multiple API-binding sites.
- Form strong intermolecular interaction.

Selection of Co-Formers

One of the most important and significant steps in creating co-crystals is choosing a co-former. Depending on how well the co-former works, co-crystals' physicochemical characteristics can change. The physico-chemical characteristics of co-crystals are enhanced by appropriate co-former selection, but they can also be deteriorated by biased co-former selection. The final co-crystals' physicochemical characteristics are also influenced by the drug-to-co-former ratio. To filter out appropriate co-formers for certain medicinal molecules, a variety of selection techniques are employed. Currently, there are seven distinct techniques for co-former preliminary screening [(7)].

PKa Based Model

A molecule's acidity or basicity is gauged by its acid dissociation constant, or Pka. A pka-based model is a mathematical representation used in pharmacy that forecasts the actions of ionizable medications by using the value of the acid dissociation constant (pka). To predict different pharmacokinetic and pharmacodynamic outcomes, it combines pka with other molecular characteristics. Solubility, permeability, bioavailability, and drug-target interactions are all improved by PKA.

By being aware of the acid-base characteristics of possible co-formers and API. The possibility that stable co-crystals may develop is easily predicted.

Step to select co-former by pka model

1. Determine the pka of API.



2. Identify potential co-formers.

For Acidic API  Choose Basic Co-former.

For Basic API  Choose Acidic Co-former.

Cambridge Structural Database

The Cambridge Structural Database (CSD) can be used to evaluate the likelihood of hydrogen bonds forming between molecules. A compound's crystal structure can be described using CSD single crystal x-ray crystallography. Information can be searched, accessed, and used from the database at any

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moment, and the resolved structure can be saved in CSD. Two examples of software that may be used to visualize the structure using the data gathered from the CSD are "atoms" and "powder cell" [8].

CDS is used in selecting a co-former
1. Examining molecular structures might help determine which kinds of molecules might interact effectively with a medicine by examining how particular molecules fit together in a crystal.
2. Finding Similarities: Look for molecules that resemble the drug of interest in terms of form or functional groups. This aids in their prediction of the co-formers that could create stable pairings.
3. Examining interactions: It is crucial to examine how molecules interact with one another within a crystal. Because they affect the stability and characteristics of the drug-co-former complex, these interactions are essential when choosing a co-former.
4. Identifying appropriate co-formers: co-formers can be chosen based on their desirable qualities, as well as their track record of increasing medication delivery or solubility when combined with other similar pharmaceuticals.

Hansen Solubility Parameter (HSP)
In pharmaceutical research, Hansen Solubility Parameters (HSP) are a useful tool, especially for predicting stability, formulation, and solubility. HSP measures the intermolecular forces between a solvent and a solute using three parameters: δD, δP, and δH. It improves poorly water soluble substances' solubility, permeability, and bioavailability.
Components:
1. δD (Dispersion): measures London dispersion forces (non-polar interactions)
2. δP (Polar): measures dipole-dipole interactions (polar forces)
3. δH (Hydrogen Bonding): measures hydrogen bonding interactions.

Hydrogen Bonding
The contact between the target molecule and co-former during co-crystal formation is caused by non-covalent interactions such as hydrogen bonds and van der Waals forces. Hydrogen bonding is one of these factors that is crucial to the creation of co-crystals [64,65]. Knowledge-based prediction strategies for choosing co-formers include hydrogen bond propensity (HBP) and hydrogen bond energy (HBE). The likelihood of a particular hydrogen bond forming is known as HBP, and it is influenced by the structural features of the particular functional group. [9].

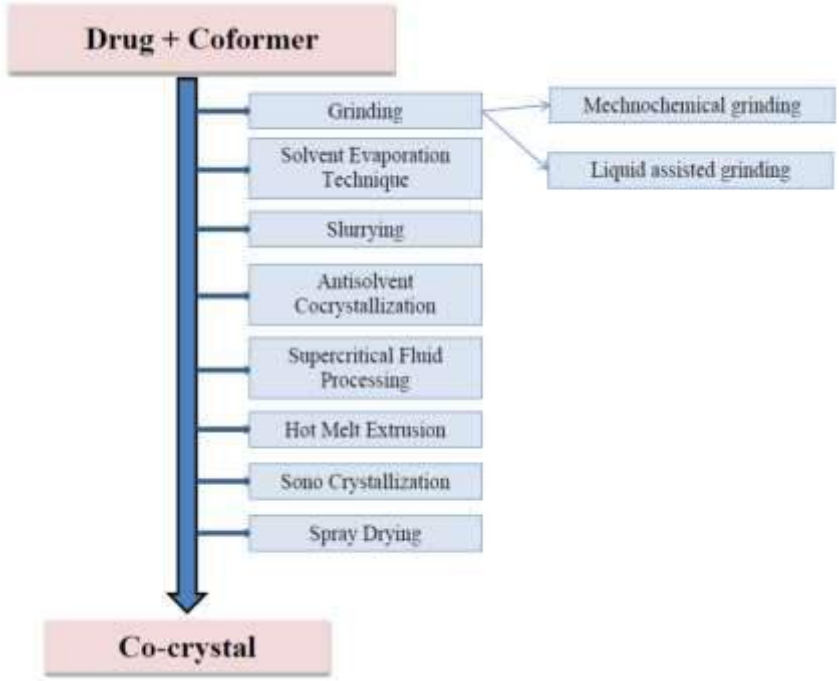
Supramolecular Synthon Approach
A regular and distinct liner relationship between molecular building blocks is known as a supramolecular synthon. Two molecules are brought together by molecular functions that interact with one another in a predictable way through non-covalent interactions to generate synthons. Because they have both a donor and an acceptor for hydrogen bonds, self-complementary functional groups like alcohols, amides, and carboxylic acids can form supramolecular homosynthons. This ability is not present in the functions of other functional groups, which solely contain donors or acceptors of hydrogen bonds. However, all functions can combine with additional complementary functional groups to generate supramolecular heterosynthons [10].

AIM: To enhance the solubility of poorly-water soluble drugs by co-crystallization techniques.

OBJECTIVES
To evaluate the potential of co-crystallization to enhance solubility, bioavailability and stability of poorly-soluble drugs.
To review co-crystallization techniques, including solution-based, solid-state, and solvent-free methods.
To examine the analytical techniques used to characterize co-crystals, such as PXRD and DSC.
To discuss the role of co-formers in co-crystallization and their selection.

FORMULATION OF CO-CRYSTALLIZATION
Co-crystals can be made in a variety of ways, but the traditional crystallization process included cooling, evaporation, and the addition of substances that decreased solubility in a solution with the right amount of super saturation.The solvent evaporation approach did not produce favorable results for CCs. Two strategies are commonly used for CCs: solution-based and grinding-based techniques.The development of CS may qualify the testing with a single XRD (SXRD), hence solution-based methods are usually preferred. Solvent drop grinding and neat-grinding are two of the grinding-based techniques [11].

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Solvent Evaporation

The most straightforward method of co-crystallization is solvent evaporation, which involves adding a solvent or chemical that changes solubility, chilling, and supersaturating the solution through evaporation [12].

Procedure:-

DRUG (API) + COFORMER

↓

MIXED WITH SOLVENT

↓

THIS SOLUTION IS EVPORATED BY USING THE HEAT.

↓

AT THE TIME OF EVAPORATION THE MOLECULES OF THE SOLITION

START FORMING HYDROGEN BOND WITH DIFFERENT FUNCTIONAL

GROUP.

Anti-Solvent Crystallization

In order to promote the precipitation of the particles, a solvent that is less soluble in the chemical is frequently added to the solution. After filtering the resultant suspension, XRPD can be used to characterize the solid that has been collected. This method's drawbacks include its poorer performance as compared to grinding and the considerable amount of solvent required [13].

Cooling Crystallization

A reactor is typically used to mix the components and solvent in cooling co-crystallization, which is dependent on temperature variations. After that, the system is heated to cause the disintegration of both components. The temperature is lowered to obtain saturation. This method can be used in conjunction with phase diagrams to anticipate the possible development of co-crystals and identify thermodynamic stable zones [14].

Grinding Method

This is a solvent-free co-crystallization technique. Using a mortar and pestle, a ball mill, or a vibrator mill, the solid ingredients that will form the co-crystal are combined in the proper stoichiometric quantities, then compressed and crushed. The typical grinding time is between 30 and 60 minutes [15].

Procedure:-

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Select the Active Pharmaceutical ingredient (drug) & co-former.

⬇

Both the drug and co-former are ground into fine powders.

⬇

Place the powder in a grinding jar (mortar & pestle) and grind the powder together.

⬇

The grinding process creates mechanical energy that can promote the formation of Co-crystal.

⬇

Grind the both the powder together for a period of time (normal milling time is 60mint.).

⬇

Grinding help to break the crystal and rearrange into a new structure, where the drug & Co-former form a co-crystal.

Slurrying Technique

By dissolving two or more separate substances—typically a medication and a co-former—in a liquid, the slurrying method of co-crystallization creates co-crystals before the solid co-crystals are produced. By allowing the components to interact in a controlled setting, this approach induces the development of solid co-crystals.

- Prepare the solid materials.
- Mix with a solvent.
- Stir the mixture.
- Co-crystal formation.
- Separation and drying.

Solvent Drop Technique

Another name for this method is liquid-assisted kneading or grinding. This entails using a tiny amount of liquid to help grind stoichiometric amounts of co-formers. This technique was created to speed up the generation of co-crystals, but it has benefits over solid state grinding, including higher yield, greater product crystallinity, and control over polymorph synthesis [16].

Supercritical fluid atomization technique.

In the supercritical atomization procedure, high pressure supercritical fluid, such as CO2, is used to combine the medication and co-formers. This solution is atomized using an atomizer to create co-crystals [17].

EVALUATION OF CO-CRYSTALLIZATON

Co-crystal evaluation is the process of identifying and characterizing co-crystals as well as figuring out their physical and chemical characteristics using a variety of procedures.

X-ray diffraction (XRD) Studies – Single Crystalline and Powder (XRD).

This analytical method is used to identify the phase of the unit cells that are connected to the co-crystal. Single and powder X-ray crystallography can yield complete structural information on co-crystals. While single crystal XRD is primarily used for structural recognition using software like "DIFFRAC.SUITE TOPAS," powder XRD is frequently used to identify different co-crystals by detecting changes in the crystal lattice because different characteristic peaks are associated with different co-crystals [18].

Differential Scanning Calorimetry

In DSC, samples are heated at a steady rate, and the energy required to do so is measured. It is possible to identify the temperatures at which thermal events take place using DSC. Thermal events include crystallization, melting, deterioration, and the transition from glass to rubber. It is also possible to quantify the energy required for melting and (re)crystallization. The amount of crystalline material can be determined using the melting energy. [19].

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Spectroscopy- Vibrational, Nuclear Magnetic Resonance.
The structural behavior of co-crystals is identified using vibrational spectroscopy (infrared and raman), where the energy absorbed or dispersed by the co-crystals' chemical bonds differs from that of the pure components [20].

Field Emission Scanning Electron Microscopy (FESEM).
The surface morphology of co-crystals is investigated using topography or FESEM. For the comparison, component and co-crystal micrographs from the FESEM investigations are used [21].

Hot Stage Microscopy
When two chemicals are heated together, the total phase number shown by the system can be visualized using hot stage microscopy or the Kofler contact method. A zone of mixing is created when compounds with a high melting point begin to melt and recrystallize before other melted compounds come into contact with them [22]. The hot stage microscopy study incorporates both thermal analysis and microscopy. A solid's physicochemical properties are examined in relation to temperature and time [23].

CONCLUSION

Co-crystallization methods provide a flexible and effective way to improve the characteristics of materials and medicinal molecules. These techniques can solve common issues in drug formulation by promoting the creation of co-crystals, which can enhance solubility, stability, and bioavailability. Researchers are able to customize their strategy according to particular requirements because different processes, such as solvent evaporation and grinding methods, each have their own advantages and considerations. Co-crystallization techniques will be further refined as the area develops thanks to developments in characterisation and predictive modeling, creating new opportunities for materials science and drug development innovation. All things considered, incorporating co-crystallization processes has a lot of potential to improve the effectiveness and functionality of a variety of applications.

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A REVIEW ON PARKINSON'S DISEASE- ETIOLOGY, PATHOPHYSIOLOGY AND EMERGING THERAPIES

Bhagyashri KalyanPadul[1*], MR. Abhijeet.Rathod[2], Yogeshwari. B. Pamane[3], Aarti.B. Narwade[4], Pooj. K. Ekhande[5]

[1]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna
[2]Asst.Prof.(Faculty of pharmaceutics) Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna
[3]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna
[4]Student of Bachelor of Pharmacy, Raosaheb Patil Danve college of Pharmacy, Badnapur, Jalna
[5]Student of bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna
Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna 431202

ABSTRACT

More than seven million people worldwide suffer with Parkinson's disease (PD), a common neurological illness that causes a variety of motor and non-motor symptoms due to the death of dopaminergic neurons.

Although the exact cause of Parkinson's disease is still mostly unknown, environmental and genetic factors are thought to be involved. Dopamine is a neurotransmitter that is involved in controlling motivation, memory, locomotion, and other physiological functions.

The death of dopaminergic neurons in Parkinson's disease patients results in a drop in dopamine levels, impairing motor function and maybe contributing to certain patients' cognitive impairments.

The goal of the review is to examine the many facets of Parkinson's disease (PD), including its history, prevalence trends, pathogenesis, difficulties in diagnosing it, and various treatment approaches.

Parkinson's disease is a progressive neurological disorder that manifests as both motor and non-motor symptoms.

Numerous variables, such as aging, heredity, and exposure to specific environmental chemicals, can contribute to Parkinson's disease. Furthermore, oxidative stress, protein aggregation, neuroinflammation, and mitochondrial dysfunction are important factors in the development of Parkinson's disease.

KEY WORDS: *motor dysfunction, neurodegenerative diseases, Parkinson's disease.*

OVERVIEW

Parkinson's disease is a progressive neurological disorder that manifests as both motor and non-motor symptoms. About 1% of people over 60 globally suffer from Parkinson's disease, which is the second most prevalent neurological illness after Alzheimer's disease.

The average beginning of Parkinson's disease is around age 60, and its incidence rises with age. With a male-to-female ratio of about, men are more prone than women to get Parkinson's disease.

In his essay "An Essay on Shaking Palsy," published in 1817, British physician James Parkinson provided the earliest description of Parkinson's disease.

This essay describes Parkinson's observations of six individuals who had tremors, stiffness, and trouble moving. He identified a neurological condition he named "paralysis agitans" as the cause of these symptoms. As more and more cases of this illness were reported during the ensuing decades, the term "Parkinson's disease" gained popularity. The biggest risk factor is aging, but genetics and environmental factors may also influence when the disease manifests.

Approximately 1 to 2 percent of the global population suffers from this neurological condition. Social, cognitive (non-motor), and motor symptoms are all present in Parkinson's disease. Because of their unique characteristics, motor symptoms such bradykinesia, tremors, and rigidity are easily recognized. Cognitive symptoms are becoming more widely acknowledged and are linked to communication and behaviour issues that hinder social interaction.

Among the motor symptoms include tremors, bradykinesia, dyskinesia, motor fluctuations, postural instability, irregularities of gait, and poor turning ability. Lethargy, sleep disorders, constipation, memory problems, and mood swings

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are examples of non-motor symptoms that may appear up to ten years before a diagnosis.Lewy bodies in the midbrain and a depletion of dopaminergic neurons in the substantia nigra are two pathological indicators of Parkinson's disease.

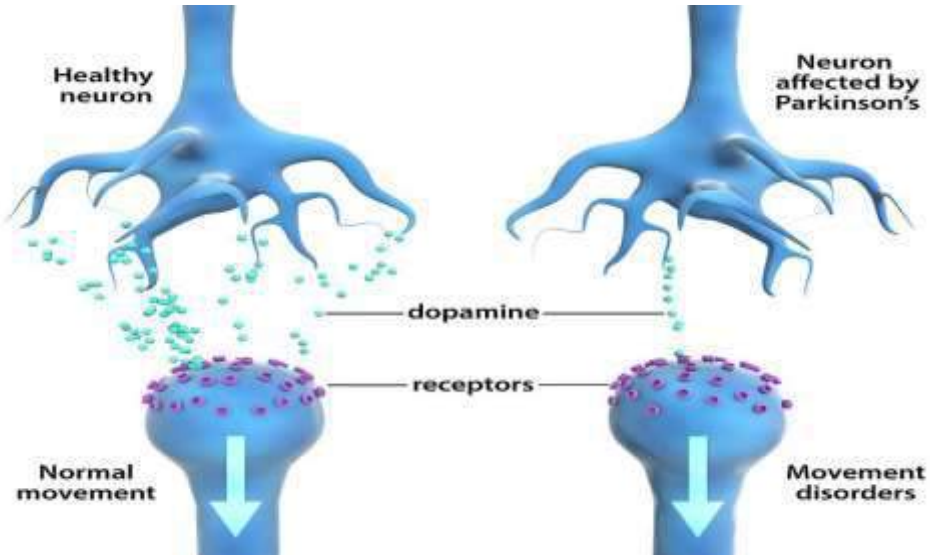


Fig.No.1

Parkinson's disease types include:

Parkinson's disease in its primary form

1. Idiopathic Parkinson's disease: 80–90% of cases are of this type, making it the most prevalent. We don't know what caused it.
2. Familial Parkinson's disease: 5–10% of cases are of this uncommon form. due to mutations in the genes.

Parkinson's disease that develops later

1. Vascular Parkinsonism: This condition is brought on by decreased blood supply to the brain, frequently as a result of small vessel disease or stroke.
2. Drug-Induced Parkinsonism: This condition is brought on by some drugs, including antipsychotics and antiemetic drugs.
3. Toxin-Induced Parkinsonism: This condition is brought on by exposure to toxins such heavy metals and pesticides.

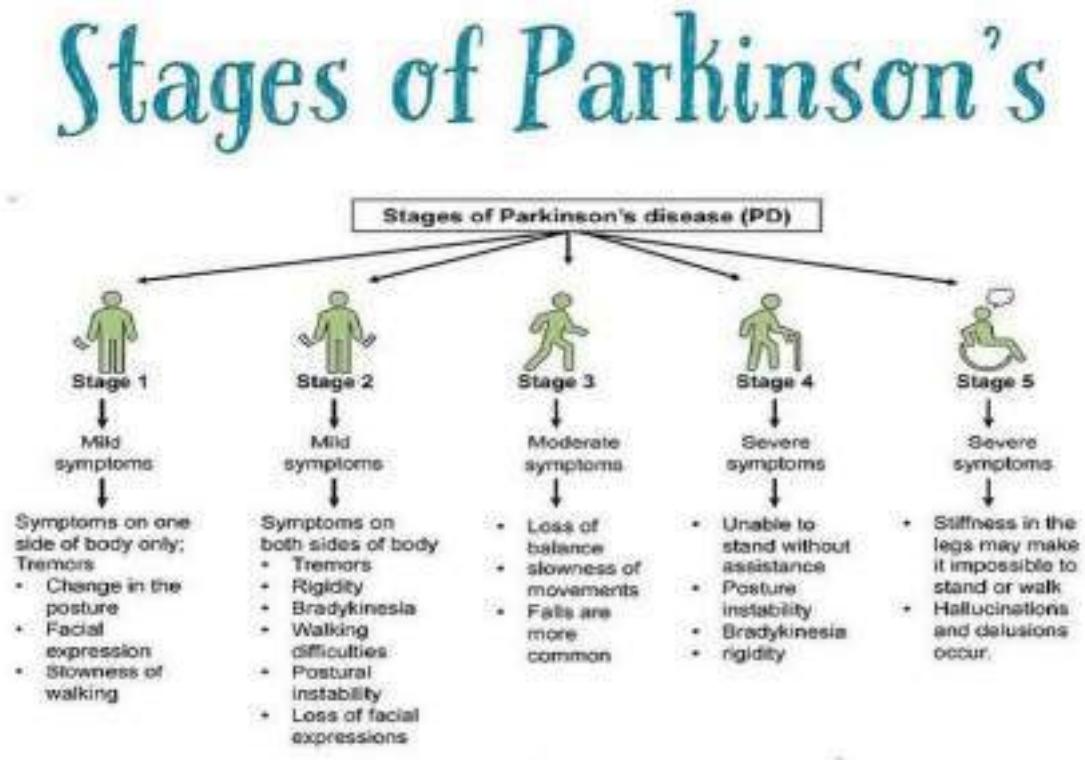


Fig No.2

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What causes Parkinson's disease?
Genetic Contributions: Parkinson's disease in the family

Environmental Aspects:
Exposure to pesticides
Exposure to heavy metals
Air contamination

Lifestyle Factors: Sleep, Exercise, and Diet
Pathophysiology:

Dopaminergic neuronal cell death in the basal ganglia's substantia nigra

Dopaminergic nigrostriatal pathway degeneration

Dopamine storage depletion
An imbalance between the corpus striatum's excitatory (acetylcholine) and inhibitory (dopamine) neurotransmitters

impairment of the extrapyramidal pathways that regulate intricate bodily motions

Bradykinesia, rigidity, and tremors

DIAGNOSIS

A thorough medical history, physical examination, and neurological tests are usually required to diagnose Parkinson's disease. A neurologist can assess a patient's symptoms and rule out other disorders, but there is no specific test for Parkinson's disease.
Pharmacologic management: Creating a disease-modifying treatment that can halt or reduce the neurodegenerative process is the main goal of PD research. To accomplish this goal, there isn't a proven disease-modifying treatment available yet.
Parkinson's disease symptoms include:

Symptoms of the Motor
1. Tremors: Jaw, arm, leg, or hand shaking
2. Rigidity: Muscle rigidity and inflexibility.

Bradykinesia: The inability to move quickly.
4.Postural Instability: Having trouble keeping your posture and balance.

Symptoms Not Related to Motors
1. Cognitive impairment: trouble focusing, remembering, and making decisions.
2. Mood Disorders: mood fluctuations, anxiety, and depression.
3. Autonomic Dysfunction: Inability to control digestion, heart rate, and blood pressure.
4. Sensory symptoms include tingling, pain, and numbness in the arms, legs, and face.

Epidemiology
One percent of adults over 65 have Parkinson's disease (PD), and its incidence and prevalence rise with age. When parkinsonian symptoms appear before the age of forty, it is known as early-onset Parkinson's disease (EOPD). It makes up 3–5% of all instances of PD.

MANAGEMENT AND TREATMENT

While monoamine MAO B inhibitors are only modestly successful in treating bradykinesia and stiffness, dopaminergic treatment is quite beneficial. Levodopa and dopamine agonists aid in slowing the progression of illness and impairment. Trihexyphenidyl and other anticholinergic medications work well for tremor, while dopamine replacement therapy has a weak and erratic effect.

Deep brain stimulation (DBS): is a surgical procedure that has FDA approval and uses implanted electrodes to provide electrical current to different areas of the brain. It turns out to be a safer approach to treating movement abnormalities than ablative techniques, with side effects that are usually reversible if the stimulation is stopped. Although more and more data points to DBS's effectiveness in treating movement disorders, including Parkinson's disease, its underlying mechanisms remain unclear

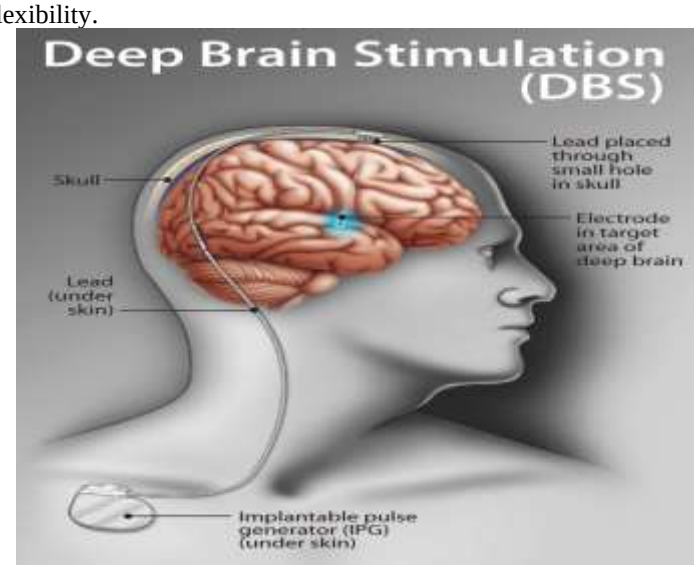


Fig no.3

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The medical procedure of implanting new cells into patients to replace those that have been harmed by illnesses in order to restore the body's compromised function is known as cell replacement therapy.

EMERGING THERAPIES: There is a lot of interest in and debate surrounding new treatment approaches for idiopathic Parkinson's disease, including neurotrophic factors, cell-based therapy, neurotransmitter targeting, and possibly neuroprotective medications. Immunotherapy by vaccination and gene therapy are the most modern treatments for Parkinson's disease.

1. **Cell-Based Treatment**
In recent years, cell-based therapy for Parkinson's disease has advanced significantly. The utilization of fetal ventral mesencephalic (VM) tissue as a source of cells for transplantation was a significant breakthrough.

Gene Therapy
In recent years, gene therapy has emerged as a rapidly growing new discipline. Its fundamental idea is to use adeno-associated viruses or other vectors to deliver DNA, RNA, antisense oligonucleotides, and DNA or RNA editing enzymes to PD patients' brains in order to restore normal gene expression. The amount of vital enzymes involved in dopamine synthesis can be increased by controlling the expression of relevant genes, which will subsequently restore the dopamine content. To increase the survival rate of DA neurons, gene therapy can also offer improved neurotrophic support.

Immunotherapy: Targeting particular proteins implicated in Parkinson's disease with antibodies or vaccinations.

Drugs
1. Levodopa/Carbidopa: Elevates dopamine levels in the brain (Sinemet).
2. Dopamine Agonists: These drugs, such as pramipexole and ropinirole, mimic the effects of dopamine in the brain.
3. MAO-B Inhibitors: These include rasagiline and selegiline, which prevent the brain's dopamine from being broken down.
4. COMT Inhibitors: Prevent the brain from breaking down levodopa (e.g., entacapone, tolcapone).
5. Anticholinergics: Reduce muscle stiffness and tremors (e.g., trihexyphenidyl, benztropine).
6. Amantadine: Enhances motor function and alleviates dyskinesia.

Oxidative stress is the pathogenesis. One of the main pathogenic factors in Parkinson's disease is reactive oxygen species (ROS), which are molecules with oxygen in their molecular composition and highly active chemical properties.

Mitochondrial dysfunction: The primary source of energy for cells, mitochondria are closely related to several physiological functions.

Inflammation Neuroinflammation and intestinal inflammation are two types of inflammation linked to Parkinson's disease. Although neuroinflammation is an immune response that is crucial for safeguarding neurons, it can also harm neurons and accelerate the onset of neurodegenerative illnesses.

Future Views
Finding cures and ways to modify the disease continues to be the main objective of PD research. The emphasis will remain on ways to manage Parkinson's disease (PD) motor symptoms without exacerbating or causing levodopa-induced fluctuations, as well as lowering disability related to symptoms like tremor and gait and balance that are either less responsive to or resistant to levodopa, until such therapies are clinically available.

Therefore, research into non-dopaminergic targets is still important. Basic science studies have consistently shown that aberrant pulsatile dopamine receptor stimulation with numerous post-synaptic non-dopaminergic neurotransmitters and neuromodulatory alterations, specifically affecting glutamate, serotonin, and adenosine, are part of the pathophysiology of levodopa-induced motor fluctuations and dyskinesia.

One of the main things that can restrict translational research is the absence of commercially available medications that can target non-dopaminergic receptors implicated from preclinical investigations.

The purpose of this review is to examine the etiology, pathogenesis, and emerging treatments of Parkinson's disease.

GOALS: 1. To give a summary of what is currently known about the pathophysiology, etiology, and clinical characteristics of Parkinson's disease.
2. To investigate the role of environmental and genetic factors in the development of Parkinson's disease.
3. To investigate novel treatments such as immunotherapy, stem cell therapy, and gene therapy.
4. To examine Parkinson's disease's clinical manifestations and course, encompassing both motor and non-motor symptoms.
5. To determine risk factors

CONCLUSION

Alpha-synuclein aggregation, neurotransmitter imbalance, and dopaminergic neuron loss are the hallmarks of Parkinson's disease, a complex and multifaceted neurodegenerative illness. A complex interaction between molecular, environmental, and hereditary factors contributes to the pathogenesis of Parkinson's disease.

The intricacies of Parkinson's disease and the advancements in our knowledge of its etiology and pathophysiology are highlighted in this study. Current research attempts to address the unmet needs of this debilitating disease, while emerging medicines give hope for bettering patient outcomes.

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FORMULATION OF POLYHERBAL ESSENSE STICK TO REPEL INSECTS

Ishwari N. Takle[1]*, Avinash G. Wagh[2], Ashwini Shelke[3], Dr. Swati. Rawat [4], Dr. Sunil S. Jaybhaye[5]

[1]Students of Institute of Pharmacy Badnapur
[2]Department of Pharmaceutics, Faculty of Institute of Pharmacy Badnapur
[3]Department of Communication Skills, Faculty of Institute of Pharmacy Badnapur
[4]Principal Institute of Pharmacy Badnapur
[5]Department of Quality Assurance, Faculty of Institute of Pharmacy Badnapur

ABSTRACT

Currently the use of synthetic mosquito repellent chemicals has several issues related to environment and human health. This project was formulated and developed to have safer mosquitorepellent free from carcinogenic chemicals and are significantly cheaper and simple to develop. Dried powdered herbs like clove, cow dung, camphor, guggul, neem leaves were used to make mosquito repellent formulation. The powdered blend were mixed with binders and additives like charcoal powder. The solid formulation was rolled in the form of incense sticks.The incense stickswhen ignited releases vapours with a pleasant fragrance and herbs which repels the mosquitoes. The incense sticks was tested for its potency by burning near the for feedback and were deemed to be very effective in controlling the mosquitos. mosquito net cage with sufficient mosquitoes. The sticks also distributed to random peoples

KEYWORDS: *Neem Leaves , Clove , Charcoal , Guar Gum , Camphor , Guggul ,Saw Dust , Lemon Extract*

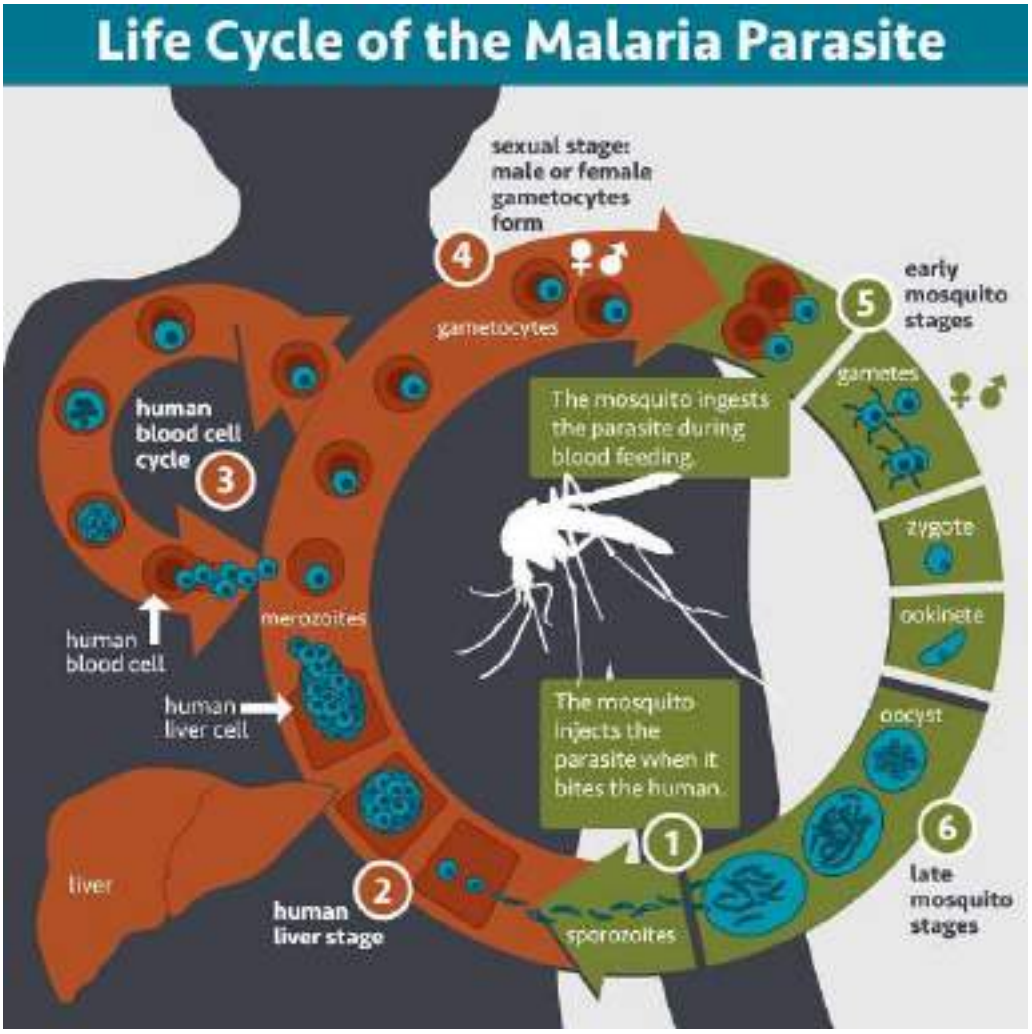
INTRODUCTION

- Mosquitoes are most irritating and blood sucking insect disturbing human beings.Some of the mosquito species which belongs to genera Anopheles,Aedes and Culex are known to be vectors for the most of the disease pathogens like Malaria,Dengue,Fever etc.In Malaria the female Anopheles mosquito carries the malarial parasite.
- The four different species of protozoa causes Malaria namely Plasmodium falciparum, Plasmodium vivax, Plasmodium ovale and Plasmodium malariae.
- It is the leading cause of premature mortality and caused more than half a million deaths according to the and the death rate has increased to one million as of 2018, according to the American Association of Mosquito control.
- Symptoms are high fever and chills.
- Dengue fever is an acute mosquito transmitted disease which is characterized by fever, headache, joint and muscle pains, skin rash, nausea followed by vomiting. The causative organism of Dengue Fever is arbovirus and is spread by genus Aedes mosquitoes.
- Some of the infections in Dengue are Haemorrhagic Fever, Shock Syndrome which can threat the patient's life by increased vascular permeability which leads shock. Over the pasttwenty years, there has been global increase in the frequency of Dengue Fever incidence.
    - Several factors which are responsible for the resurgence of dengue epidemic are:

i. Uncontrolled population growth
ii. Urbanization
iii. Improper waste management
iv. Improper water supply
v. Increased mosquitoes
vi. Improper mosquito control

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MALARIA CYCLE



[Fig No.1]

- This diagram outlines the key stages of the dengue cycle involving both humans and Aedes mosquitoes. Keep in mind that the dengue virus has four serotypes, and recovery from one serotype provides immunity only to that specific serotype, increasing the risk of severe disease upon infection with a different serotype.

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DENGUE CYCLE



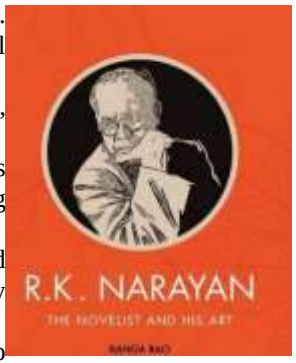
[Fig no.2]

- Dengue is transmitted through the bite of infected Aedes mosquitoes, primarily Aedesaegypti.
- Preventing mosquito breeding by eliminating stagnant water, using mosquitorepellentsand wearing protective clothing can help reduce the spread of dengue.

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HISTORY

- Ancient civilizations used various natural substances to repel mosquitoes. In ancient Egypt,people burned various plants like myrrh and frankincense to deter mosquitoes. In India, neem leaves and oil were utilized for their insect-repelling properties. In ancient China, citronella was burned as a mosquito deterrent.
- Native American tribes in North America used plants like sage and sweetgrass for their mosquito-repelling properties. Additionally, some Native American tribes used smudge sticks made from herbs like sage, cedar, and sweetgrass, which were burned to create smokethat acted as a natural insect repellent.
- These ancient methods laid the foundation for the development of modern mosquitorepellents. Today, we've refined and synthesized these natural ingredients into various commercial repellents.
- A simple man with lofty ideals, a visionary in the truest sense of the word, Sri N. Ranga Rao, displayed exceptionalentrepreneurial traits, since an early age.
- He had his share of troubles and hurdles in his formative years, but used them to hone his business and life skills. Before long, he dreamed of founding an incense stick manufacturing company, and envisaged it as a leading company in the country.
- The prolific businessman gave wings to his dream with thelaunch of Mysore Products and General Trading Company in 1948. His vision stemmed from the conviction that "Quality backed by services will pay.
- Within months of its inception, the business grew satisfactorily. It was time for brand Cycleto be born. Committed to quality, Cycle had a series of firsts in the incense manufacturing history. Cycle was the first company to obtain design copyrights to make an exciting rangeof incense sticks, cones.
- In order to create exquisite fragrances in the perfumery industry, the company set up its ownin-house fragrance creation workshop.
- Despite the heights of success that the Company went on to reach, Sri Ranga Rao remainedgrounded. He stayed devoted to the wellbeing of those around him, and committed to doingthe right thing.



INDIAN HISTORY

In India, the use of natural substances for mosquito repellent dates back thousands of years.Here are some key points in the history of mosquito repellents in India:

- **Neem :** Neem (Azadirachta indica) has been a central ingredient in traditional Indian medicine for centuries. It is known for its insecticidal and repellent properties. Neem leaveswere often used in various forms to ward off mosquitoes. Additionally, neem oil was appliedto the skin as a natural repellent.
- **Tulsi (Holy Basil) :** Holy basil (Ocimum sanctum) is another plant with insect-repelling properties. In India, it's considered sacred and is commonly grown around homes. Burning dried tulsi leaves was a method used to create a natural mosquito-repelling smoke.
- **Camphor (Kapoor) :** Camphor (Cinnamomum camphora) has a strong aroma that repels mosquitoes. It's commonly used in households, especially during religious ceremonies. Kapoor, as it's known in Hindi, is often burnt to create a mosquito-free environment.
- **Cow Dung :** In rural areas, burning cow dung cakes was a traditional method to keepmosquitoes away. The smoke produced was believed to act as a natural repellent.
- **Sandalwood:** Sandalwood (Santalum album) has a fragrance that is known to repel insects. In India, sandalwood paste was often applied to the skin, and its aromatic qualities helped deter mosquitoes.
- **Clove :** Clove oil (Eugenia caryophyllata) has mosquito-repelling properties and wassometimes used in various formulations to create natural insect repellents.
- **Turmeric :** Turmeric (Curcuma longa) has been used in Indian households for various purposes, including as an insect repellent. It was often mixed with other substances to createeffective natural repellents.

These traditional methods were based on the knowledge of local flora and their properties. Over time, some of these natural ingredients have been incorporated into modern mosquito repellent formulations. While synthetic repellents are widely used today, these traditional remedies still hold cultural significance in many parts of India.

MOSQUITO REPELLENT

A mosquito repellent is a substance or product designed to deter or prevent mosquitoes from landing on or biting humans or animals. It typically works by emitting a scent or creating a barrierthat mosquitoes find unappealing, thereby discouraging them from approaching. Mosquito repellents come in various forms, including sprays, lotions, creams, candles, coils, and electronic devices, and they may contain natural or synthetic ingredients that have been proven to repel mosquitoes. These products are commonly used to reduce the risk of mosquito-borne diseases and provide protection against irritating mosquito bites.

Mosquito repellents are substances that prevent mosquitoes from being in an environment. There are various types of synthetic mosquito repellents used in the market; these are manufactured on a large scale by industries. They are widely used and are very popular.

However, there are various drawbacks to these mosquito repellents. The ingredients used in themare harmful for the humans as well as the environment.

Harmful ingredients in synthetic herbal repellents Synthetic herbal repellents have a number of harmful ingredients, which are harmful to the health of human beings when inhaled or ingested, and are harmful to the environment either during the

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process of manufacture or during the use of these mosquito repellents in the average Indian household.

Aerosols- Many mosquito repellents are in the form of aerosols that release their content in the airwhen the coil of the machine of the repellent is heated. Aerosols can be toxic to the cardiovascularsystem and can have several nervous system side effects such as tremors and convulsions. In addition, aerosols with a pleasant fragrance can contain several harmful chemicals like xylene andformaldehyde that are carcinogens. Aerosols are also known to harm the environment

Organic Mosquito Repellent

An organic mosquito repellent is a type of insect repellent made from natural and non-synthetic ingredients. It is formulated using substances derived from plants, herbs, or other organic sourcesand typically does not contain synthetic chemicals or artificial additives. Organic mosquitorepellents work by harnessing the natural repellent properties of these botanical ingredients to determosquitoes from approaching and biting. They are often considered environmentally-friendly andmay be preferred by individuals seeking alternative options to conventional repellents that containsynthetic compounds. It's important to note that while organic repellents are generally consideredsafer for the environment, their effectiveness may vary depending on the specific formulation andconcentration of active ingredients.

HERBAL DRUGS

Herbal drugs in pharmacy refer to medications derived from plants or plant extracts, used for theirtherapeutic properties. These drugs often contain one or more active ingredients obtained from herbs and have been used traditionally for medicinal purposes. They can be available in various forms such as capsules, tablets, extracts, teas, or tinctures, and are utilized to treat various health conditions.

DRUGS	ORIGIN	USES
CLOVE	Clove comes from the dried flowerbuds of the clove tree (Syzygiumaromaticum)	Clove oil is known for its mosquito-repelling properties, and it is sometimes used in natural mosquito repellents. The high concentration of eugenol, a compound found in clove oil, is believed to be responsible for its insect-repelling effects
NEEM	Neem is obtained from the neem tree (Azadirachta indica). Different parts of the neem tree, such as its leaves, seeds, and bark, are used to extract various beneficialcompounds.	Neem is known for its ability to repel mosquitoes and other insects. It is used in various forms, such as neem oil or neem-based formulations, to create natural and eco-friendlymosquito repellents.
CAMPHOR	Camphor is derived from the woodof camphor trees, primarily the Cinnamomum camphora species.	Camphor is sometimes used as an ingredient inmosquito repellents dueto its strong and distinctodor, which mosquitoesfind repulsive.
GUGGUL	Guggul, also known as Commiphora wightii or Indian bdellium, originates from the resin produced by the Mukul myrrh tree.	It's believed to have anti-inflammatory properties and is used to treat conditions like arthritis and lipid disorders
COW DUNG	Cow dung, as a natural substance, comes from the excrement of cows.	To create smoke, and itis believed that the smoke may help repel mosquitoes to some extent.
CHARCOAL	Charcoal is derived from the incomplete burning of wood, peat, coconut shells, or other organic materials	In the context of mosquito control, the burning of charcoal or specific types of wood might produce smoke, which can deter mosquitoes due to the smoke's impact on their sensory receptors
SAWDUST	Sawdust powder is a byproduct of cutting, grinding, or sanding wood. It originates from the process of machining or processing wood, resulting in small particles or powder composed of wood fibers and dust.	Certain aromatic woods or herbs, when mixed with sawdust, can act as natural mosquito repellents
LEMON	Lemon peel extract is obtained from the outer layer or zest of lemons, the citrus fruit. Lemons (Citrus limon)	Lemon peel extract is another natural ingredient that can be used in mosquito repellents. It contains citronella oil, which has known insect-repelling properties
GUAR GUM	Guar gum is derived from guar beans, which come from the guar plant (Cyamopsis tetragonoloba). This plant is primarily grown in India and Pakistan	Guar gum's versatile properties make it valuable in a range of applications, contributing to its widespread use in various industrial sectors.

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FLAVOURING AGENT

Camphor : Use its incense to give a boost to morale and cleanse the energies of your livingor working place.

Neem : Is conventionally using for air hygiene.

Clove : Antioxidant

Guggul : Performing spiritual rituals, prayer, meditation, spa and aromatherapy

INGREDIENT USE

Cow dung : Cow dung removes mental stress and provides peace to the mind

Saw dust powder : It does not affect the smell that you have added to your incense sticksuse asburning agent

Neem : Use as burning agent **Charcoal** : Use as burning agent

Guar gum : Use as a binding agent

Lemon peel extract : Use as a binding agent









PRINCIPLE

Organic mosquito repellents operate on similar principles to conventional repellents, but they exclusively use natural, non-synthetic ingredients derived from plants, herbs, or other organic sources. Here are the key principles behind organic mosquito repellents:

1. **Natural Active Ingredients :** Organic repellents use naturally occurring substances such as essential oils, plant extracts, and botanicals. These ingredients often possess inherent insect- repelling properties.
2. **Aromatic Deterrence :** Many organic repellents work by emitting scents that mosquitoes find unappealing or confusing. These natural scents mask or disrupt the chemical signals that attract mosquitoes to potential hosts.
3. **Biochemical Disruption :** Certain organic compounds can interfere with the mosquito's sensory receptors or neurological functions, making it harder for them to locate and bite a host.
4. **Camouflage and Barrier Formation :** Organic repellents can create a protective barrier on the skin, making it more challenging for mosquitoes to land and feed. This barrier can be in the formof a lotion, cream, or oil.
5. **Plant-Based Repellent Properties :** Many plants produce compounds that naturally repel insects to protect

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themselves from herbivores. Organic repellents leverage these plant defenses todeter mosquitoes.

6. **Non-Synthetic Formulations :** Organic repellents are formulated without synthetic chemicals, artificial fragrances, or additives. This makes them a preferred choice for individuals seeking natural and eco-friendly alternatives.
7. **Environmentally-Friendly :** Organic repellents are often considered safer for the environment,as they do not introduce synthetic chemicals into ecosystems.
8. **Potential Variability in Effectiveness :** The effectiveness of organic repellents may vary depending on factors such as the specific natural ingredients used, their concentration, and individual factors like skin type and activity level.

It's important to note that while organic repellents are generally considered safer and more environmentally-friendly, their effectiveness can vary. It's recommended to choose products withproven natural repellent properties and consider factors like concentration and formulation for optimal results.

METHODOLOGY

All the dried herbs were finely powdered in a mixer and.The powder should be very fine orelse there will be problems in the binding and burning. Total 100 grams of powder premix taken to prepare 20 incense sticks.

Water was gradually added to the fine powder until it attains dough like consistency. It should bewell mixed and not too watery dough otherwise it creates problem in making sticks.

The dough was divided in portions and was rolled by hand in small quantities on plain bamboosticks.

The sticks were dried for 24 hours under shade. Tray dryer can also be used to dry the sticks faster.

ADVANTAGES

Natural Ingredients : These products often contain natural ingredients, which can be less harmfulto the environment and human health compared to synthetic repellents.

Potentially Effective : Some herbal ingredients, like neem, or lemon are known for theirmosquito-repelling properties.

Pleasant Fragrance : Many polyherbal repellents have a pleasant fragrance, making them more appealing than chemical-based repellents.

Environmentally Friendly : Using natural ingredients can be more eco-friendly, as it may havea lower impact on the environment.

Suitable for Sensitive Skin : These products may be gentler on sensitive skin compared to some chemical-based repellents.

EVALUATION TEST

1. **Field Testing :** Conduct field tests in areas with mosquito activity. Compare the performance of the Polyherbal stick with a control group (without repellent) to assess its ability to repel mosquitoes.
2. **Duration of Protection :** Measure how long the repellent remains effective. Note the duration between application and the onset of mosquito bites.
3. **User Feedback :** Collect feedback from individuals using the Polyherbal essence stick. Ask about their experience, including any instances of mosquito bites and overall satisfaction with theproduct.
4. **Safety Assessment :** Evaluate the product for any adverse effects on the skin. Ensure that the concentration of herbal extracts is safe and does not cause irritation or other side effects.\
5. **Comparative Analysis :** Compare the Polyherbal stick with existing commercial repellents containing proven ingredients. Assess its efficacy in repelling mosquitoes compared to establishedproducts.
6. **Repellent Spectrum :** Determine the range of mosquitoes the essence stick is effective against.Some repellents may target specific species, so understanding the spectrum of protection is crucial.
7. **Long-Term Studies :** Consider conducting long-term studies to assess the product's effectiveness over extended periods and potential habituation effects.
8. **Environmental Impact :** Assess the environmental impact of the Polyherbal essence stick, ensuring that its production and use are sustainable and eco-friendly.
9. Remember to conduct tests under various conditions to gather comprehensive data on thePolyherbal mosquito repellent essence stick's performance and safety

CONCLUSION

- Those we can finally estimate that aroma, odour of essence stick can have healthcare effect on human body
- A through literature survey was carried out before the development of mosquito repellent incense sticks. Plants have mosquito repellent activity like neem, camphor and lemongrass oil was selected, powdered and made the incense sticks by adding binders. The incense sticks are subjected for evaluation by using mosquito net cage method and the results were very satisfactory in repelling the mosquitos.
- The feedbacks of the product were also satisfactory when given to 20 people and the product satisfaction rating score given was 4 out of 5. The product also tested for any allergysymptoms when used and there is no such allergic symptoms like discomfort, sneezing, wheezing were reported. Overall the product is safe to use and have significant mosquito repellent activity.

RESULT

- Pollyherbal essence stick was found to be effective in manner of effect odour and activity

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REVIEW ON THE WORLDWIDE PANDEMIC SITUATION OF COVID-19 ACTIVITIES FROM THE BEGINNING TO CURRENT SCENARIO-2024

Ms. Pooja Kakasaheb Ekhande[1]*, Mr. Datta G. Korade[2], Ms Komal A. Kolhe[3], Ms. Bhagyashri K. Padul[4], Mr.Kiran R. Gaikwad[5]

[1]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[2]Asst. Prof.(Faculty of P' Chemistry) Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[3]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[4]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[5]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
Raosaheb Patil Danve College of Pharmacy Badnapur Jalna 431202

ABSTRACT

Research on COVID-19 has significantly grown since the pandemic began. A survey of the literature on COVID-19 research in public administration is given in this work. 710 articles are analyzed in this analysis using a Structural Topic Model (STM). The 27 most important subjects are identified and mapped by the analysis. We discover that most themes' popularity holds up very well over time. Additionally, we discover that the journal and the author's place of origin have a greater influence on the themes' salience than the study team's internationality. Possible directions for further study and theory development are investigated in light of this thorough investigation.

The journal and the author's place of origin have a greater influence on the themes' salience than the research team's internationality. Potential research and theoretical development areas are examined in light of this thorough examination.

everyone is aware, the world has been fighting an epidemic like COVID-19 for the past three years, and many countries are still impacted. Due to this infection, everyone had to deal with lockdown, economic, financial, food, and employment issues, among other issues. You may say that COVID-19 is a global infectious disease because it is spreading around the world. Corona viruses can cause respiratory infections in humans, ranging from the common cold to more serious conditions like Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS).

KEYWORDS: *vaccination, pandemic infection, transmission, and COVID-19.*

2) OVERVIEW

The Corona Virus is an illness that can spread around the world. The virologists J.D. Almeida, C.H. Cunningham, and D.M. Berry are the first to identify these viruses. Another name for this virus is COVID-19.This broad family of viruses can infect both people and animals. Corona viruses can cause respiratory infections in humans, ranging from the common cold to more serious conditions like Severe Acute Respiratory Syndrome (SARS) and Middle East Respiratory Syndrome (MERS).

Corona virus disease is caused by the most recently identified corona virus. COVID-19. Before the December 2019 eruption in Wuhan, China, a new virus and disease had not been found. All worlds are affected by the plague it caused.

According to reports, the local fish market in Wuhan, China, was connected to -2 (SARS-CoV-2) is a novel coronavirus strain that was discovered by a deep sequencing investigation of the lower respiratory tract secretions of the afflicted people. The strain responsible for the the first outbreak of pneumonia cases of unknown etiology. The severe acute respiratory syndrome-coronavirus 2003 SARS outbreak was distinct from this one. The coronavirus illness 2019 (COVID-19) spread quickly from Wuhan to the rest of China around the Chinese New Year.(2)

In March 2020, the World Health Organization (WHO) labeled it a pandemic due to its rapid global spread.
The coronavirus disease of 2019 was initially identified as SARS-CoV-2 in the Chinese city of Wuhan. Updates on the current state of this virus and its health measures must be developed by the World Health Organization.

History

Under an electron microscope, coronaviruses look as crowns due to spike-like projections on their surface. They are enclosed positive sense RNA viruses that range in diameter from 60 to 140 nm.
In humans, four corona viruses—HKU1, NL63, 229E, and OC43—have been found to cause minor respiratory illnesses.
In the last 20 years, there have been two instances where animal-beta corona virus crossover to humans has caused serious illness.

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One such incident occurred in Guangdong province, China, in 2002–2003, when a novel coronavirus belonging to the β genus, which originated in bats, spread to people through palmcivet cats (3).
The past:The enclosed positive sense RNA viruses known as coronaviruses range in size from

ORIGIN AND SPREAD

For an unspecified reason, persons in Wuhan with severe respiratory illness visited nearby hospitals in December 2019. To find the cause, breathing samples from patients and the control system—which was created after the SARS outbreak spread—were submitted to reference labs. China notified the WHO of the epidemic on December 31, 2019, and seafood stores in Huanan were shut down in January 2020. The virus was identified on January 7th as a coronavirus with roughly 70% resemblance to SARSCoV and 95% symmetry with coronary bat virus. Samples collected from the animals and items at the Huanan seafood market also tested positive, suggesting that seafood is the source of this virus (4).
Symptoms:

Although COVID-19 symptoms might differ greatly from person to person, typical symptoms include:
1. Chills or fever
2. Cough
3. Breathing difficulties or shortness of breath
4. Exhaustion
5. Aches in the muscles or body
6. Headache
7. A sudden loss of smell or flavour
8. A sore throat
9. Runny nose or congestion
10. Vomiting or feeling queasy

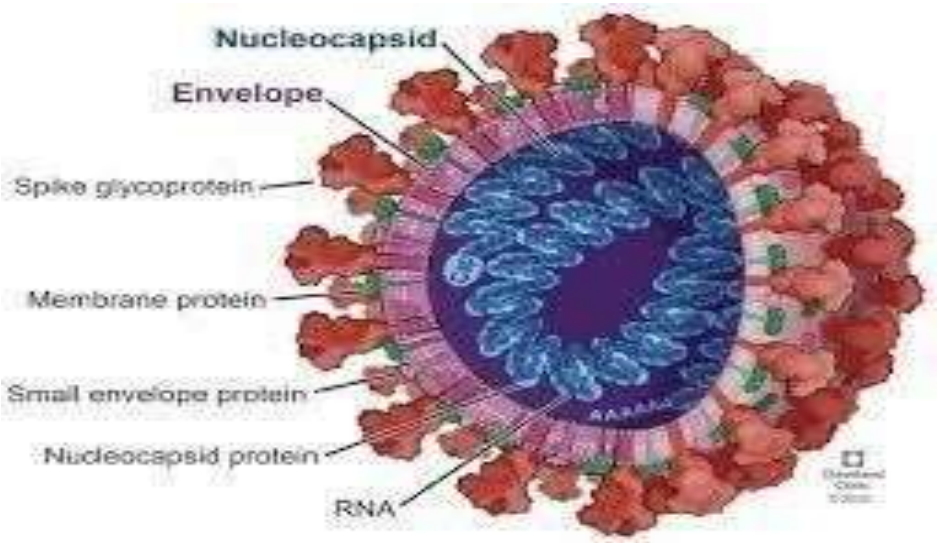


FIG.NO.1 Structure of Corona Virus

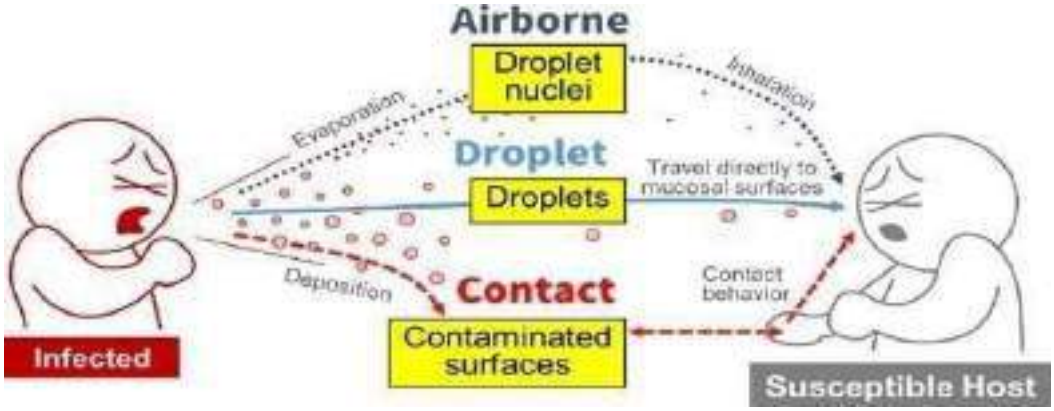


Fig.No.2 Transmission of Covid 19.

Viruses can be released into the environment via unsanitary carriers. The corona virus spike protein's edge and its corresponding cell receptor play a crucial role in determining the free virus's species diversity, tissue tropism, and infectivity.Depending on the kind of coronavirus, they can spread from one host to another through fecal-oral or aerosol routes.
The respiratory tract's epithelial cells are infected by these

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human viruses, but the digestive tract's epithelial cells are usually infected by animal corona viruses.

1. Principal Mode of Transmission: When an infected individual coughs, sneezes, talks, or breathes, respiratory droplets are the main way that COVID-19 is transferred.
2. Aerosol Transmission: In confined areas with inadequate ventilation, smaller particles, known as aerosols, have the ability to travel farther and remain in the air for longer.
3. Surface Contamination: The virus can endure for variable lengths of time on a variety of surfaces. Infection can result from contacting contaminated surfaces and then touching the face.
4. Asymptomatic Spread: Attempts to stop the virus's spread are made more difficult by the fact that infected people who do not exhibit symptoms can still infect others.
5. Close Contact: The risk of transmission is increased when one is within 6 feet (2 meters) of an infected individual, particularly in crowded or poorly ventilated areas.
6. High-Risk Settings: Higher transmission rates are linked to locations such as medical facilities ,assisted living facilities, and crowded indoor spaces.
7. Preventive Measures: The danger of transmission can be considerably decreased by wearing masks, increasing ventilation, practicing physical distance, and washing your hands frequently.
8. variations: The rate at which the virus spreads among populations may be impacted by new virus variations' varying transmissibilities
9. Impact of Vaccination: Vaccination can lower general transmission rates in populations and lessen the chance of serious illness.
10. Community Spread: Because COVID-19 can spread quickly among communities, outbreaks must be controlled through public health interventions.

CERTAIN COVID-19 TYPES

1. Original Strain: The initial epidemic was caused by the first strain discovered in Wuhan, China, at the end of 2019.
2. Variants of Concern (VOCs): Variants that exhibit heightened virulence, transmissibility, or diminished efficacy of therapies and vaccines. Important VOCs consist of:

• Alpha (B.1.1.7): More contagious than the original strain, initially discovered in the UK.
• Beta (B.1.351): Initially discovered in South Africa, this mutation may impact the effectiveness of vaccines.
• Gamma (P.1): Linked to greater transmissibility, initially discovered in Brazil.
• Delta (B.1.617.2): Initially discovered in India, this virus is much more contagious and associated with more serious illnesses.
• Omicron (B.1.1.529): Originally discovered in South Africa, this virus has several mutations that cause it to spread quickly, impair the efficiency of vaccinations, but normally cause a milder form of the illness.
• Subvariants: Variants that develop from preexisting variants, frequently include alterations that impact immune escape or transmissibility. Omicron, for instance, has many subvariants (e.g., BA.1, BA.2, XBB).
• Variants: Variants that might appear in particular regions and have an effect on the dynamics of local transmission.
• Mutations: Changes in the virus's genetic makeup give rise to variations. Certain mutations might improve the virus's ability to spread or evade immunity.
• Monitoring: To track the appearance and dissemination of novel variations, ongoing genomic surveillance is essential.
Variants: Variants that could surface to guide public health measures.
• Effect on Vaccines: Although certain variations may partially circumvent vaccine protection, vaccination is still a vital strategy for lowering hospitalization and serious illness.

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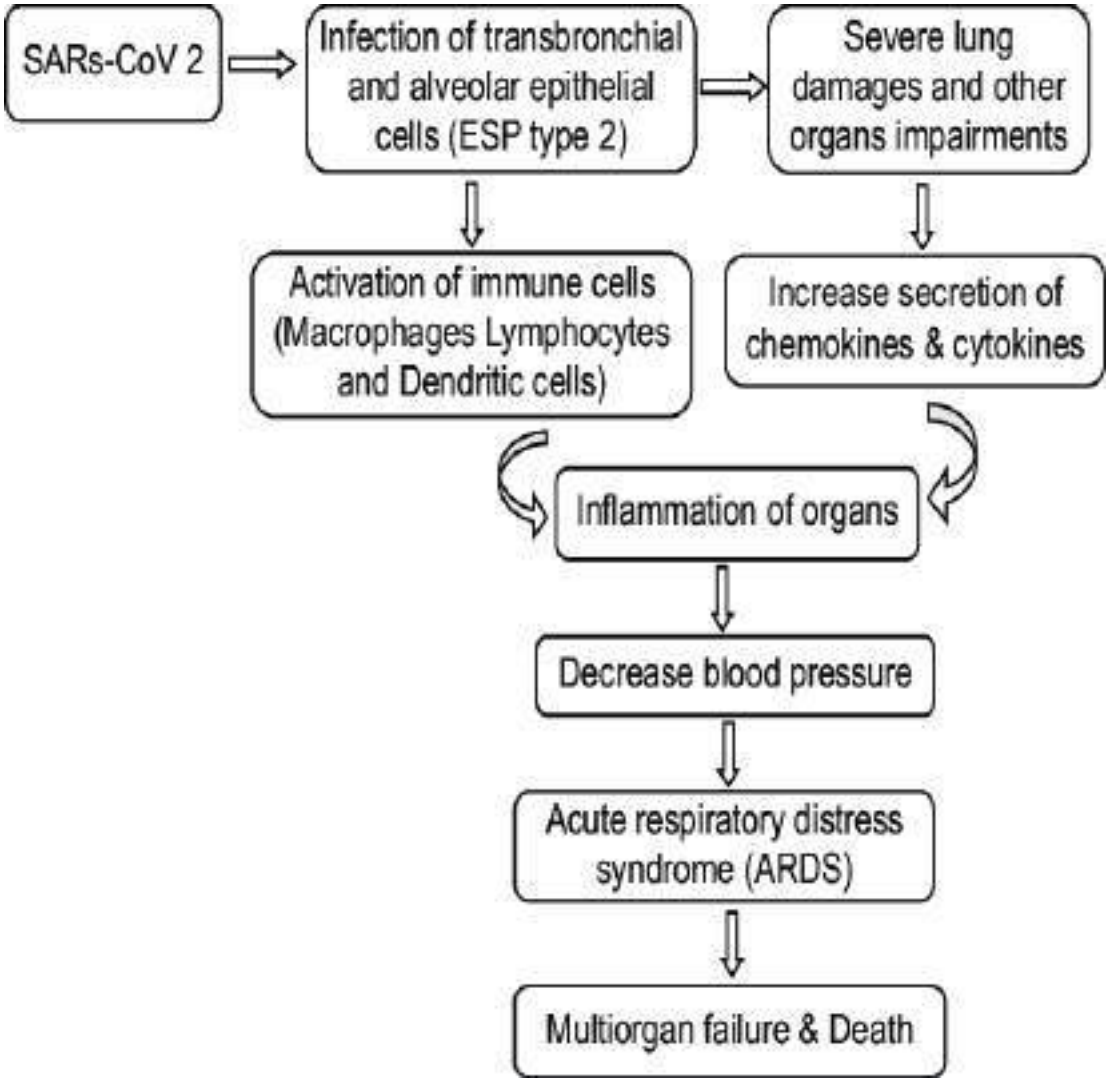


Fig.No.3 Showing the Pathophysiology of Covid -19.

The Study of Epidemiology

Early efforts focus on treating the ill, counting severe cases, and keeping people informed about the clinical progress. Experience with the Middle East respiratory disease (MERS), pandemic influenza, and recent outbreaks has prepared us to identify the need for increased public fitness measures to describe the novel virus's epidemiology and likely force in order to prevent epidemic evolution. The spread of an infection, the number of unclean people, and the range of clinical severity all affect how severe an epidemic is. During a viral pneumonia outbreak in December 2019, Wuhan, China, reported the first documented case of COVID-19. Since then, a local outbreak has quickly spread to a global pandemic that is infecting at least 124 countries.

We look at a critical need to increase public fitness actions to explain the epidemiology of the novel virus and identify its likely force, as the Middle East respiratory syndrome (MERS), pandemic influenza, and new breakout have ready to be recognized with the goal of evolving into an epidemic. The number of impure persons, along with significant sickness and mortality, determines the impact of an epidemic. The full extent of the influence on public health has not yet been determined at the time of writing. Over 438,749 persons (55,243 in the United States) have contracted the virus globally, and 19,675 of them have passed away.

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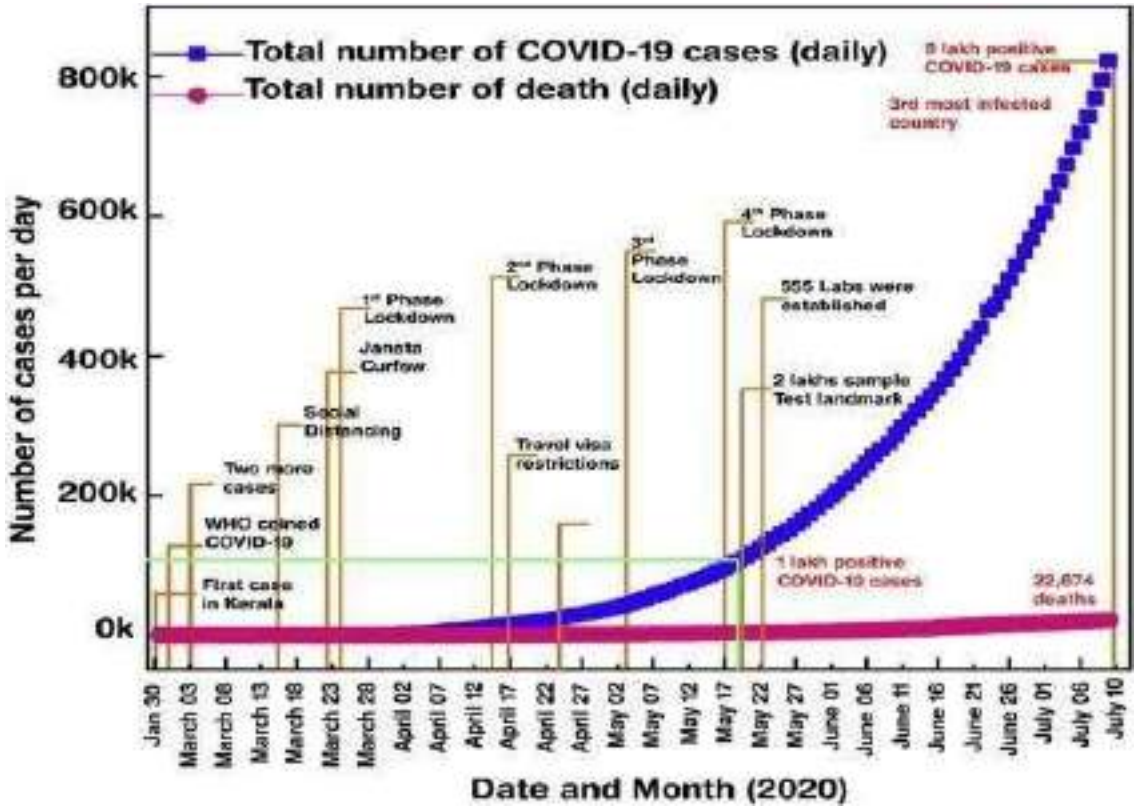


Fig.No.4 Death Ratio In 2020 Pendamic Condition

3) DAIGNOSIS

Since COVID-19 has been deemed a pandemic, any patient exhibiting any of the previously mentioned symptoms, a history of travel to one of the impacted nations, or a history of contact with sick individuals should raise the possibility of SARS-CoV-2 infection. The WHO advises obtaining samples by bronchoalveolar lavage, endotracheal aspirate, or expectorated sputum. Viral RNA is detected using the real-time polymerase chain reaction (RT-PCR) technique. It is occasionally necessary to repeat the test for confirmation if the results are negative but there is a high suspicion of COVID-19.

The diagnosis of COVID-19, or corona virus

A. A New COVID-19 Diagnostic Test The WHO states that the creation of protein and nucleic acid assays as well as point-of-care detection are the top priorities for COVID-19 diagnostics research. [39] Combining these tests into multiplex panels is a longer-term priority.

B. RNA detection of viruses The most crucial test has involved using PCR to directly detect SARS-CoV-2 virus RNA. In January, WHO created and disseminated the first quantitative reverse transcript PCR (RT-qPCR) tests for SARS-CoV-2 to labs worldwide. However, the density and expense of these widely used tests have made the development of a different PCR-based testing approach on a more targeted scale necessary. Furthermore, as these tests are still relatively new, it is important to remember that the genuine clinical sensitivity is indefinite; a negative test does not negate the danger of infection.

Tests for serology Immunoglobulins, which are typically found in blood, are being detected by an increasing number of assays. These tests use antibody–antigen recognition to determine if the host has been exposed to the virus. These tests can help cover a picture of the viral spread throughout populations and deal with social limits from side to side. They also supply diagnostic facts and spectacular information about a viral limelight when more people get the sickness and then recover from it.

VACCINATION AND VACCINES

The Can Sino anti-coronavirus vaccine has been approved by China and is being tested for military usage in small quantities. Additionally, on June 24, 2020, more than two other virus vaccinations that must be inactivated in an emergency will be utilized in high-risk jobs. Following the production of the Sputnik V vaccine by Russia, which was also utilized to quell the crisis, his scientists used the vaccine for a month before distributing small doses to the public during phase three testing on August 11, 2020.

The World Health Organization determined on April 8, 2022, that the following COVID-19 vaccinations have satisfied the mandatory safety and value requirements.

1. The Oxford/AstraZeneca vaccine
2. Johnson and Johnson

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3. Contemporary
4. BionTech/Pfizer
5. Sinopharm
6. The Sinovac
7COVAXIN
8. COVOVX
9. Nuvaxovid
10. CanSino and associates

CORONA VIRUS PREVENTION (COVID-19)
• To keep two miters apart and refrain from interacting with anyone who is ill or exhibiting symptoms.
• If at all possible, stay at home and maintain your distance.
• Steer clear of large events such as conferences, seminars, parties, and large gatherings.
• When in public, cover your face with a handkerchief, especially if you're in an area where population growth is ongoing.
•. Avoid touching your lips, nose, or eyes.
• Every day, sterilize and clean high-touch surfaces.
• Mostly wash your hands at least 20 seconds from alcohol-based hand sanitizer, and you can also use any other shop.
• To avoid winning public transportation if you're sick.
• Covid-19 vaccines also take pregnant women. It's totally safe.
• No side effects of covid19 vaccine are used for all people

4) AIM

REVIEW ON WORLD WIDE PANDEMIC SITUATION OF COVID-19 ACTIVITIES FROM BEGINNING 2019 TO CURRENT SCENARIO 2024.

OBJECTIVE

- Public Health Protection: To study minimize the spread of the virus through effectivevaccination campaigns, public health guidelines, and testing protocols.
- Healthcare System Capacity: To understand ensure healthcare systems can manage the number of cases, including adequate staffing, resources, and facilities
- .Economic Stability: To understand mitigate the economic impact of the pandemic by supporting businesses, providing financial assistance, and encouraging safe reopeningpractices.
- Community Education: To inform the public about COVID-19 prevention, symptoms, and vaccination benefits to encourage responsible behaviors
- Research and Development: To study advance research on COVID-19, including treatments, vaccines, and understanding of the virus itself
- Equity in Healthcare: To ensure equitable access to vaccines and healthcare
- Protection of Public Health: To investigate ways to reduce the virus's transmission through efficient vaccination programs, public health recommendations, and testing procedures.
- Capacity of Healthcare Systems: To make sure that healthcare systems can handle the volume of cases, including enough resources, especially for disadvantaged and vulnerable populations.
- Mental Health Support: To provide easily available support services and community initiatives to address the mental health issues brought on by the epidemic.
- International Cooperation: To promote global collaboration in vaccine distribution, research, and response tactics to control and avoid new outbreaks.

5) ASPECT OF THE FUTURE

Future COVID-19 Aspects: Important Things to Think About
• Vaccine Development and Distribution: Ongoing studies on the accessibility, safety, and effectiveness of vaccines.
• Management and Treatment: creation of potent remedies, such as monoclonal antibodies and antivirals.
• Public health infrastructure: enhancing surveillance, response, and global health systems
• Global Governance and Cooperation: Improved data exchange, policy coordination, and international cooperation.
• Economic and Social Recovery: Resolving the effects of the epidemic on the economy, society, and mental health.

6) OUTCOME

Nobody is able to forecast the future despite all of the experiments and cures. According to some studies, the virus's ability to recombine and reassort makes it more susceptible to mutation, which causes it to fluctuate from mild to severe depending on the environment. Lockdowns, sanitization, and social isolation don't seem to be enough to keep the infection at bay. The recovery rate is also higher than that of any previous virus outbreak worldwide, in spite of all of these factors. This has a significant impact on the USA, India, Russia, and Italy. Due to limited testing, the precise number of COVID-19 deaths is yet unknown.

7) FINAL RESULTS

• Public Health Response: Due to high immunization rates in many nations, hospitalization rates and case severity have dropped. Maintaining the focus on immunization, including booster shots, has been essential to controlling outbreaks. Societal Adaptation: By implementing strategies like remote employment, digital health solutions, and enhanced public health infrastructures, societies have adjusted to life with the virus. Health and hygiene awareness has permeated every aspect of daily life.

• Persistent Difficulties: Although the pandemic has improved in many ways, difficulties still exist. The virus is still evolving, and constant monitoring and preparedness to handle any new outbreaks are necessary.

• Impact on Mental Health: The epidemic has brought attention to the significance of mental health, which has raised awareness of the need for resources and assistance

• Global Inequities: The epidemic brought attention to health inequities around the world, which sparked conversations about fair access to healthcare and vaccines—two persistent issues that require attention.

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PROFILE OF ANTIBIOTICS USED AS A HEALTH CENTER

Mr. Nakul Bhausaheb Godse,[1*] Mr. Saurabh V. Mundada [2], Mr. Aniket Vasant Ingle [3]
[1]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[2]Asst. Prof. (M. Pharma Quality Assurance) Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[3]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
Raosaheb Patil Danve College of Pharmacy Badnapur Jalna 431202

ABSTRACT

The study of antibiotic usage profiles in health centers is critical for understanding prescribing patterns, evaluating antimicrobial stewardship, and managing antibiotic resistance. This review synthesizes findings from various studies on the types, dosages, and frequency of antibiotics administered in primary healthcare settings. Key antibiotics commonly prescribed include broad-spectrum agents such as penicillins, cephalosporins, and fluoroquinolones, often used for respiratory, urinary, and gastrointestinal infections. The review highlights both appropriate uses and frequent issues, such as overprescription, misuse, and lack of adherence to guidelines, which can accelerate antimicrobial resistance. Additionally, it discusses the role of healthcare providers' training, patient demand, and institutional guidelines in influencing prescription practices. Recommendations for optimizing antibiotic use include implementing strict guidelines, increasing awareness about antimicrobial resistance, and enhancing diagnostic capabilities in health centers. This review underscores the importance of careful antibiotic monitoring in primary care to ensure effective treatments while mitigating the risks associated with resistance development

KEYWORDS;*Antibiotics usage; Antibiotic resistance; Antibiotic stewardship; Antibiotic classes; Antimicrobial agents; Health center prescription patterns*

INTRODUCTION

Early Discoveries and Pre-antibiotic Era

Ancient Use of Antimicrobials:

- Before the formal discovery of antibiotics, ancient civilizations used natural substances to treat infections. For example, ancient Egyptians applied moldy bread to infected wounds, possibly utilizing naturally occurring Penicillium fungi.
- Chinese medicine and other cultures employed herbal remedies with antimicrobial properties, like extracts from plants and fungi
- Discovery of Penicillin (1928)

Alexander Fleming's Breakthrough:

- The modern era of antibiotics began in 1928 when Scottish bacteriologist Alexander Fleming accidentally discovered penicillin, the first true antibiotic. Fleming noticed that a mold (Penicillium notatum) growing in a petri dish inhibited the growth of Staphylococcus bacteria.
- Fleming's discovery remained largely unexplored for a decade because he couldn't purify penicillin effectively.

Development of Penicillin for Use:

- In the late 1930s and early 1940s, a team of scientists including Howard Florey and Ernst Boris Chain purified and mass-produced penicillin. This achievement was particularly significant during World War II, where penicillin was used extensively to treat infections in wounded soldiers.
- Penicillin became the first widely used antibiotic and is often credited with revolutionizing medicine.

The Golden Age of Antibiotics (1940s-1960s)

- 1940s: Sulfonamides and Streptomycin:
- Sulfonamides (sulfa drugs), discovered in the 1930s by Gerhard Domagk, were the first class of synthetic antibiotics. These drugs were effective against bacterial infections such as streptococcal infections.
- In 1943, Selman Waksman and his team discovered streptomycin, the first antibiotic effective against tuberculosis and other Gram-negative bacteria.

1950s-1960s: Discovery of New Classes:

This period saw the discovery of many new antibiotics:
Tetracyclines (1948)
Chloramphenicol (1949)
Erythromycin (1952)
Vancomycin (1953) Cephalosporins (1950s)

OBJECTIVES

- To Identify Commonly Prescribed Antibiotics in Health CentresTo determine the most frequently prescribed antibiotics across different therapeutic classes in health centers.
- To Analyze the Spectrum of Activity of Prescribed Antibiotics.To classify antibiotics based on their broad-spectrum or narrow-spectrum activity and the infections they are used to treat.
- To Assess the Rationality and Appropriateness of Antibiotic Use.To evaluate whether antibiotics are being prescribed in accordance with clinical guidelines, focusing on appropriate dosing, duration, and selection based on the infection type.

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- To Evaluate Patterns and Trends in Antibiotic Resistance To investigate the prevalence of antibiotic- resistant pathogens in health centers and the impact this has on prescribing patterns.
- Examine the Public Health Impact of Antibiotic Use in Health Centres.To explore the implications of antibiotic prescribing on community health, particularly in relation to antibiotic resistance and infection control.
- To Provide Recommendations for Optimizing Antibiotic Stewardship in Health Centres.To suggest evidence-based strategies for improving the use of antibiotics, including implementing stewardship programs, educating healthcare providers, and raising public awareness.



DEFINITION AND CLASSIFICATION

Definition of Antibiotics

Antibiotics are a class of antimicrobial substances that inhibit the growth of or destroy bacteria. They are used to treat infections caused by bacteria, either by killing the bacteria (bactericidal) or inhibiting their growth (bacteriostatic). Antibiotics are one of the most critical tools in modern medicine, especially in primary care settings such as health centers, where they are used to manage a variety of bacterial infections.In the context of health centers, antibiotics play a crucial role in treating common infections such as respiratory infections, urinary tract infections (UTIs), skin and soft tissue infections, and gastrointestinal infections,

Classification of Antibiotics

Antibiotics can be classified based on various criteria, such as their mechanism of action, spectrum of activity, or chemical structure. The following outlines the primary classification systems relevant to health center use:

1) Based on Mechanism of Action

- Cell Wall Synthesis Inhibitors: These antibiotics interfere with bacterial cell wall formation, leading to cell lysis and death. Examples include:
  Penicillins (e.g., amoxicillin, penicillin G) Cephalosporins (e.g., ceftriaxone, cefuroxime) Carbapenems (e.g., meropenem) Glycopeptides (e.g., vancomycin)
- Protein Synthesis Inhibitors: These antibiotics target bacterial ribosomes, inhibiting protein production, which is essential for bacterial growth.
  Macrolides (e.g., azithromycin, clarithromycin) Aminoglycosides (e.g., gentamicin, streptomycin Tetracyclines (e.g., doxycycline)
  Lincosamides (e.g., clindamycin)
- DNA/RNA Synthesis Inhibitors: These antibiotics disrupt bacterial DNA or RNA synthesis, preventing replication.
  Fluoroquinolones (e.g., ciprofloxacin, levofloxacin) Rifamycins (e.g., rifampin)
- Folate Synthesis Inhibitors: These inhibit bacterial folic acid metabolism, which is essential for DNA synthesisSulfonamides (e.g., sulfamethoxazole) often combined with trimethoprim (as in co-trimoxazole)

2) **Based on Spectrum of ActivityNarrow-**
Spectrum Antibiotics: These antibiotics are effective against a limit arange of bacteria, typically targeting either Gram-positive or Gram-negative organisms.
Examples: Penicillin G (effective against Gram-positive bacteria), vancomycin (used for resistant Gram-positive infections like MRSA).
Broad-Spectrum Antibiotics: These antibiotics are effective against a wide range of both Gram-positive and Gram-negative bacteria. They are often used when the causative bacteria are unknown.
Examples: Amoxicillin-clavulanate, ceftriaxone, tetracyclines, fluoroquinolones.

3) Based on Chemical Structure

Beta-lactams: These antibiotics share a beta-lactam ring in their chemical structure and include penicillins, cephalosporins, carbapenems, and monobactams.

Examples: Amoxicillin, ceftriaxone, meropenem.
Macrolides: These antibiotics have a macrocyclic lactone ring and are commonly used for respiratory infections.
Examples: Azithromycin, erythromycin.
Aminoglycosides: These antibiotics have an amino sugar group and are often used for serious Gram-negative infections.

Examples: Gentamicin, streptomycin.
Tetracyclines: These antibiotics have four hydrocarbon rings and are used for a variety of infections including respiratory and zoonotic infections.
Examples: Doxycycline, tetracycline.

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4. Based on Bactericidal vs. Bacteriostatic Action

Bactericidal Antibiotics: These antibiotics kill bacteria directly. They are often used in severe infections or when the immune system is compromised.

Examples: Penicillins, cephalosporins, fluoroquinolones.

Bacteriostatic Antibiotics: These inhibit bacterial growth and replication, allowing the immune system to eliminate the infection.

Examples: Tetracyclines, macrolides, sulfonamides

5. Based on Clinical Application in Health Centres

Empirical Antibiotics: These are prescribed based on clinical judgment before the exact cause of infection is known. They are typically broad-spectrum and are used for common infections in health centers.

ADVANTAGES

1) Improved Antibiotic Stewardship: A comprehensive review helps ensure the judicious use of antibiotics, reducing the risk of antimicrobial resistance. This aids in the proper selection, dosage, and duration of antibiotic treatment.
2) Optimization of Patient Outcomes: Understanding which antibiotics are most effective can improve treatment efficacy and patient recovery rates, reducing complications and hospital stays.
3) Infection Control: Reviewing the antibiotics used helps in identifying trends in antibiotic-resistant infections. This knowledge can guide the implementation of better infection prevention and control measures.
4) Data-Driven Decision Making: A review provides data that can support evidence-based decisions in treatment protocols, ensuring that healthcare providers have updated guidelines for effective antibiotic use.
5) Cost Management: By assessing which antibiotics are used and their effectiveness, health centers can make cost-effective decisions, possibly reducing unnecessary spending on expensive antibiotics when more affordable options are available.
6) Resource Allocation: The review can help prioritize the stocking of essential antibiotics, ensuring that the health center has adequate supplies of the most effective drugs.
7) Guidance for Policy Development: Findings from the review can inform the creation or update of antibiotic policies, aligning with national and international standards for antimicrobial use.
8) Education and Training: The review can serve as an educational resource for healthcare staff, increasing awareness about proper antibiotic prescribing practices and enhancing knowledge about resistance patterns.
9) Monitoring and Evaluation: Regular reviews allow for the monitoring of antibiotic use patterns over time, facilitating the evaluation of the effectiveness of implemented stewardship programs.
10) Reduction in Adverse Drug Reactions: By understanding the profiles of antibiotics used, healthcare providers can reduce the risk of adverse reactions, as more informed decisions about antibiotic selection can be made.

APPLICATION

1) Antibiotic Stewardship Programs (ASPs): The review findings can be used to establish or improve ASPs, which focus on optimizing antibiotic use to combat resistance and improve patient outcomes. Health centers can tailor antibiotic prescribing guidelines based on the reviewed data.
2) Formulary Management: The health center's pharmacy can utilize the review data to manage the formulary, ensuring that only the most effective and necessary antibiotics are stocked. This helps in resource management and reduces the risk of drug wastage.
3) Development of Treatment Protocols: Physicians can use the insights from the review to create standardized treatment protocols for common infections, ensuring that the most appropriate antibiotics are used based on local resistance patterns and patient needs.
4) Clinical Decision Support: The data gathered from the review can be integrated into electronic health record systems to provide real-time guidance to clinicians about the best antibiotic choices, tailored to patient characteristics and infection types.
5) Targeted Training for Healthcare Staff: The review results can guide training programs for healthcare providers, focusing on educating them about the current antibiotic resistance trends, proper prescribing practices, and the importance of antibiotic stewardship.
6) Surveillance and Monitoring: Health centers can apply the review to establish ongoing surveillance programs to monitor antibiotic use and resistance patterns, enabling timely responses to emerging resistance trends.
7) Policy Formulation: Health administrators can use the review to draft or update antibiotic use policies that are aligned with global standards, like those set by the World Health Organization (WHO) or the Centers for Disease Control and Prevention (CDC).
8) Patient Education Programs: Insights from the antibiotic profile review can be used to develop patient education materials that emphasize the importance of completing prescribed antibiotic courses and understanding the risks of misuse.
9) Improving Infection Prevention: By understanding which infections are most commonly treated and the antibiotics used, health centers can enhance infection prevention strategies, reducing the incidence of infections that require antibiotic treatment.

MECHANISM OF ACTION

- These are those substances which inhibit the cell wall synthesis and also inhibits protin synthesis then inhibits DNA replication

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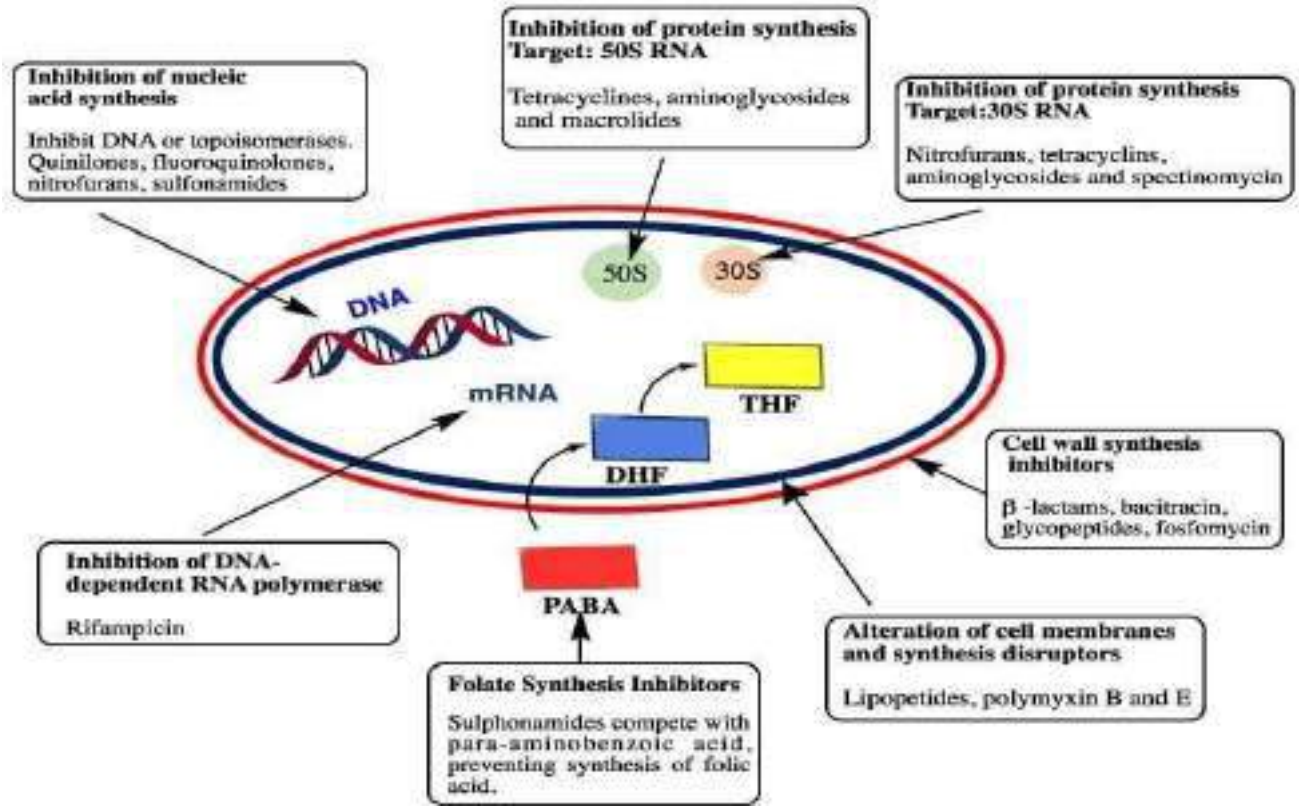


Fig No.01 Showing the Mechanism of Antibiotics

Inhibition of Protein Synthesis

Bacterial protein synthesis occurs at ribosomes, which differ in structure from eukaryotic ribosomes. Antibiotics targeting bacterial ribosomes selectively inhibit bacterial protein synthesis without affecting human ribosomes. Major classes include:

1) Aminoglycosides (e.g., gentamicin, tobramycin, streptomycin)

Mechanism: Aminoglycosides bind irreversibly to the 30S subunit of bacterial ribosomes, causing misreading ofmRNA and the incorporation of incorrect amino acids into proteins. This disruption of protein synthesis ultimately leads to cell death.

2) Tetracyclines (e.g., tetracycline, doxycycline, minocycline)

Mechanism: Tetracyclines bind reversibly to the 30S ribosomal subunit, preventing the attachment of aminoacyl-tRNA to the ribosome and inhibiting protein synthesis. This action is bacteriostatic.

3) Macrolides (e.g., erythromycin, azithromycin, clarithromycin)

Mechanism: Macrolides bind to the 50S ribosomal subunit, blocking the translocation step of protein elongation and inhibiting protein synthesis. This action is typically bacteriostatic but can be bactericidal at high concentrations.

4) Lincosamides (e.g., clindamycin)

Mechanism: Lincosamides bind to the 50S subunit and inhibit peptide bond formation by interfering with the elongation process of protein synthesis.

5 Chloramphenicol

Mechanism: Chloramphenicol binds to the 50S ribosomal subunit and inhibits the peptidyl transferase enzyme, preventing peptide bond formation. It is bacteriostatic.

AIM: Antibiotics Used In Health Care For Prevention Of Microbial Disease

Objective

- Examine the Public Health Impact of Antibiotic Use in Health Centres.To explore the implications of antibiotic prescribing on community health, particularly in relation to antibiotic resistance and infection control.
- To Analyze the Spectrum of Activity of Prescribed Antibiotics.To classify antibiotics based on their broad-spectrum or narrow- spectrum activity and the infections they are used to treat.
- To Identify Commonly Prescribed Antibiotics in Health CentresTo determine the most frequently prescribed antibiotics across different therapeutic classes in health centers.

PLAN OF WORK

Experimental work focused on profiling antibiotics in health centers plays a critical role in improving our understanding of antibiotic use and its impact. This research often involves collecting data on the types of antibiotics prescribed, the conditions they are used to treat, and the outcomes observed. The findings from such studies are crucial for informing better clinical practices and enhancing antibiotic stewardship programs. Here is a review of the key aspects of experimental work in this field:

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Data Collection and Analysis: Experimental studies typically involve gathering data on antibiotic prescriptions, patient demographics, and treatment outcomes. Advanced statistical methods are often used to identify patterns and trends.The analysis can reveal insights into which antibiotics are most effective for specific infections and highlight instances of overuse or misuse that could contribute to resistance.

Antibiotic Susceptibility Testing: Experimental work often includes testing bacterial strains from patients to determine their susceptibility to different antibiotics. This helps identify the effectiveness of various antibiotics and detect emerging resistance.Such testing provides real-time data that can guide treatment decisions and improve the accuracy of antibiotic prescribing.

Impact on Antibiotic Stewardship:Research findings are used to design or refine antibiotic stewardship programs. These programs aim to ensure antibiotics are used appropriately, which is essential for reducing resistance and improving patient outcomes.Experimental work also explores the effectiveness of stewardship interventions, such as educational campaigns or changes in prescribing guidelines, to see how they influence antibiotic use.

Developing Diagnostic Tools: Experimental studies may also involve testing new diagnostic technologies that quickly identify infections and determine the best antibiotics to use. These tools have the potential to revolutionize antibiotic use by making treatments more targeted and effective.Research in this area focuses on improving the accuracy and speed of diagnostics, which could significantly reduce the use of broad-spectrum antibiotics.

Exploring Patient Outcomes:Experimental research often looks at how antibiotic use impacts patient recovery, side effects, and overall treatment success. This helps determine the best practices for using antibiotics in different clinical scenarios.Such work can also identify patient populations that may need tailored antibiotic approaches, such as those with weakened immune systems or chronic illnesses.

Environmental Impact Studies:Some experimental research examines how antibiotic use at health centers affects the environment, such as through waste management practices. This research is important for developing sustainable practices to reduce the ecological impact of antibiotics.

Experimental work on the profile of antibiotics used at health centers is essential for advancing medical knowledge and improving healthcare practices. It provides the evidence needed to make informed decisions about antibiotic use, design effective stewardship programs, and develop new diagnostic tools. The outcomes of such research can help reduce the threat of antibiotic resistance, ensure better patient outcomes, and promote sustainable antibiotic use.

RESEARCH OBJECTIVES

1. **Primary Objective**: To comprehensively analyze and profile antibiotics used at a health center, evaluating their effectiveness, patterns of prescription, and resistance trends.
2. **Secondary Objectives:**Identify inappropriate or overuse of antibiotics.Assess the impact of antibiotic use on patient outcomes.Investigate environmental and public health implications of antibiotic use.
3. **Study Design and Methodology**
   A. Study Setting and PopulationHealth Center Selection: Choose a representative health center that serves a diverse patient population.Target Population: Include a wide demographic of patients, such as different age groups, genders, and those with various health conditions.
   B. **Data Collection Methods**Prescription Data Collection:Collect detailed records of all antibiotics prescribed over a set period (e.g., one year).Document the indications for each prescription, dosage, duration, and the physician's rationale.
4. **Patient Health Records:**Access patient medical histories to correlate antibiotic use with health outcomes.Record any adverse effects, treatment success rates, and hospital readmissions related to antibiotic use.
5. Microbial Cultures and Susceptibility Testing:Collect samples (e.g., blood, urine, respiratory swabs) from patients before and after antibiotic treatment.Conduct susceptibility testing to measure bacterial resistance and determine the most effective antibiotics.
6. Resistance Pattern Analysis:Use lab results to identify resistance patterns and compare them with regional and national data.Analyze whether commonly prescribed antibiotics are still effective or if resistance is increasing.
7. Diagnostic Tool Evaluation:Test new rapid diagnostic tools on a subset of patients to evaluate their accuracy and impact on antibiotic prescription practices.Compare outcomes between traditional diagnostic methods and new technologies.
8. Patient Surveys and Interviews:Conduct surveys to gather patient feedback on their antibiotic treatments, understanding of antibiotic use, and adherence to prescriptions.Interview healthcare providers to understand their decision-making processes for prescribing antibiotics.

3. Experimental Interventions

Antibiotic Stewardship Program (ASP)
Implementation:Introduce an intervention where physicians receive training on evidence-based prescribing practices.Use decision-support tools that provide recommendations based on patient data and local resistance patterns.Evaluate the impact of ASP on prescription behavior and patient outcomes.

Educational Campaigns: Run educational sessions for patients on the importance of proper antibiotic use. Measure the effectiveness of these campaigns in improving patient adherence and reducing self-medication.

4. Environmental Impact Assessment

Wastewater Analysis:Analyze the health center's wastewater

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for traces of antibiotics to assess environmental contamination.Identify which antibiotics are most commonly found and suggest waste management improvements.Antibiotic Degradation Studies:Investigate how long different antibiotics remain active in the environment and their impact on local ecosystems.

5. Data Analysis Techniques

Statistical Analysis:Use descriptive statistics to summarize prescription patterns.Apply inferential statistics to compare patient outcomes before and after the introduction of stewardship programs.Use regression models to identify factors associated with successful treatment or resistance development.

Machine Learning Models: Develop machine learning models to predict antibiotic resistance based on patient demographics, health conditions, and treatment history.Use AI to analyze large datasets and uncover hidden patterns in antibiotic usage.Comparative Effectiveness Research:Compare the effectiveness of different antibiotics used for the same infections.Evaluate the cost-effectiveness of different antibiotic regimens.

6. Expected Outcomes Comprehensive Antibiotic Profile:A detailed report on which antibiotics are most commonly used, their indications, and the patterns of effectiveness and resistance.Antibiotic Resistance Trends: Identification of bacteria that are developing resistance and recommendations for alternative treatments.Impact of Stewardship Programs:Evidence showing whether educational and intervention programs lead to better prescribing practices and improved patient outcomes.
Environmental Recommendations:Strategies to mitigate the environmental impact of antibiotic waste.Policy Recommendations:Suggestions for health center policies based on research findings, such as guidelines for antibiotic use and strategies for reducing resistance.

7. **Potential Challenges and Limitations**

Data Accessibility: Gaining access to comprehensive patient records and laboratory data may be difficult.Patient Compliance: Ensuring patients follow antibiotic regimens and attend follow-ups for monitoring.Environmental Variables: Controlling for external factors that may influence the environmental impact of antibiotics.

8. **Implications for Future Research**The study could provide a foundation for developing national guidelines on antibiotic use.Future research could expand to a multi-center approach, comparing data across different healthcare facilities.



Antibiotic Usesd In Health Center

1)**Penicillins**

Amoxicillin: Used for respiratory infections, urinary tract infections (UTIs), and some skin infections. Penicillin G: Effective against streptococcal infections and syphilis.

2. Cephalosporins

Cephalexin (Keflex): Commonly used for skin infections and UTIs.
Ceftriaxone: Often used for more severe infections like pneumonia, meningitis, and sepsis.

3. Macrolides

Azithromycin (Zithromax): Used for respiratory infections, sexually transmitted infections (STIs), and some skin infections.
Clarithromycin: Used for respiratory infections and H. pylori eradication.

4. Fluoroquinolones

Ciprofloxacin: Commonly used for UTIs, respiratory infections, and gastrointestinal infections. Levofloxacin: Used for pneumonia and complicated UTIs.

5. **Tetracyclines**

Doxycycline: Effective against a variety of infections including respiratory tract infections, STIs, and skin infections.
Minocycline: Often used for acne and respiratory infections.

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6. **Aminoglycosides**
Gentamicin: Used for severe infections, particularly in a hospital setting, and often in combination with other antibiotics.
Neomycin: Primarily used topically or orally for gastrointestinal infections.
7. **Glycopeptides**
Vancomycin: Used for serious infections caused by Gram-positive bacteria, particularly MRSA (Methicillin- resistant Staphylococcus aureus).
8. **Sulfonamides**
Trimethoprim-sulfamethoxazole (Bactrim, Septra): Used for UTIs, certain respiratory infections, and some gastrointestinal infections.
9. **Lincosamides**
Clindamycin: Often used for skin and soft tissue infections, especially those caused by anaerobic bacteria

DRUG AND DOSE

ANTIBIOTIC	CHILDREN	ADULT	USES
Penicilin-G	25-50 mg/kg	250-500 mg	bacterial infection pneumonia
Cephalosporins	25-50 mg/kg	250-500 mg	Severe infection syphilis
Carbapenems	15-25 mg/kg	500 mg	Broad -spectrum infection
Vancomycin	15 mg/kg	15-20 mg	Serious infection
Azithromycin	10 mg/kg	500 mg	Respiratory infection STIs
Gentamicin	3-5 mg/kg	5-7 mg/kg	Tuberculosis
Tetracyclines	25-50 mg/kg	250-500 mg/kg	Respiratory infection

FUTURE SCOPE

1. **Better Monitoring**: Improved systems to track and analyze how antibiotics are used, helping to manage and reduce antibiotic resistance.
2. **Advanced Diagnostic** Tools: New technology to quickly identify infections and match the right antibiotic, making treatments more effective.
3. **Personalized Treatment**: Using patient data to customize antibiotic treatments, improving outcomes and minimizing side effects.
4. **Smarter Prescribing**: AI and smart software to help doctors choose the best antibiotics based on real- time data and infection patterns.
5. **New Antibiotics Research**: Continued research to discover new antibiotics to combat resistant bacteria.
6. **Improved Training**: Enhanced training programs for healthcare workers to ensure proper use of antibiotics.
7. **Combating Antibiotic Resistance**;Future efforts will focus on using antibiotic profiles to combat resistance. By id-entifying patterns of resistance, health centers can adjust their prescribing practices to prevent bacteria from becoming resistant to current antibiotics.
8. **Better Patient Outcomes:**Profiling antibiotics can lead to more effective treatments by ensuring patients receive the right antibiotic at the right dose. This could reduce the risk of treatment failures and minimize side effects.
9. **Advanced Diagnostic Tools**:The development of faster and more accurate diagnostic tests will enable healthcare providers to select the most appropriate antibiotics quickly, improving patient care and reducing unnecessary antibiotic use.
10. **Data-Driven Decisions:Health** centers will increasingly use data analysis to make informed decisions about antibiotic use. This means using technology to track which antibiotics are most effective and understanding how they should be prescribed.
11. **Education and Awareness**:The future will also involve more education for healthcare workers and the public about the responsible use of antibiotics. This will help reduce misuse and overuse, which are major contributors to resistance.
12. **Global Collaboration**: There will be more collaboration between health centers worldwide, sharing data on antibiotic use and resistance to develop better global strategies for managing infections.

GUIDLINES

General Principles Use antibiotics based on evidence of infection and confirmed diagnosis.

1. Follow antimicrobial stewardship programs to reduce resistance.
2. Choose narrow-spectrum antibiotics whenever possible.
3. Avoid antibiotics for viral infections unless secondary bacterial infection is suspected.
4. Tailor antibiotic doses to the patient's weight, renal, and liver function.
5. Use the shortest effective duration of therapy to minimize side effects.
6. Avoid empirical broad-spectrum antibiotics unless severely ill or immunocompromised.
7. Monitor therapeutic drug levels for medications like vancomycin and aminoglycosides. 8)Double-check high-risk antibiotics with another healthcare professional.
8. Educate patients on the importance of completing the full antibiotic course.
9. Ensure pediatric and geriatric patients receive appropriately adjusted doses.

RESULT

1) **Antibiotic Utilization PatternsCommonly Used Antibiotics**: A review indicates that commonly prescribed antibiotics in health centers include penicillins (e.g., amoxicillin), cephalosporins (e.g.,ceftriaxone), macrolides (e.g., azithromycin), and fluoroquinolones

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(e.g., ciprofloxacin). Thechoice of antibiotics often depends on the type of infections being treated and local prescribing practices.Empirical Therapy: Many health centers rely on empirical therapy, which means antibiotics are chosen based on the most likely pathogens causing the infection, particularly in urgent cases.

2) **Resistance PatternsAntibiotic Resistance Rates:** Studies show an alarming increase in antibiotic resistance among common pathogens such as Escherichia coli, Staphylococcus aureus, and Klebsiella pneumoniae. This has led to higher resistance rates for commonly used antibiotics, affecting treatment efficacy.Pathogen-Specific Resistance: Specific resistance patterns vary by region. For example, methicillin-resistant Staphylococcus aureus (MRSA) is prevalent in certain areas, while other regions may see high rates of extended-spectrum beta-lactamase (ESBL) production among E. coli.

3**). Infection Types and Antibiotic ChoicesRespiratory Infections**: The review indicates that respiratory infections, such as pneumonia and bronchitis, are among the most common reasons for antibiotic prescriptions. Amoxicillin and azithromycin are frequently used for these infections.Urinary Tract Infections (UTIs): UTIs are also prevalent, with nitrofurantoin and trimethoprim-sulfamethoxazole commonly prescribed, though resistance to these agents is rising.

4.) Antibiotic Stewardship Implementation of Stewardship Programs: Many health centers have started implementing antibiotic stewardship programs aimed at optimizing the use of antibiotics, reducing unnecessary prescriptions, and monitoring resistance patterns.Educational Initiatives: Training and educating healthcare professionals on appropriate prescribing practices have shown to improve antibiotic use and reduce resistance rates.

5.) Patient OutcomesImpact on Treatment Success: Appropriate antibiotic selection based on local resistance patterns is crucial for successful treatment outcomes. Patients treated with the correct antibiotics demonstrate improved recovery rates and shorter hospital stays.Adverse Effects: The review highlights that misuse or overuse of antibiotics can lead to adverse effects, including allergic reactions and Clostridium difficile infections, further complicating patient management.

CONCLUSION

The antibiotic used in health center plays the important role in management of various diseases by inhibiting the growth or killing the micro-organism. The timely commencement of adequate and appropriate antibiotic therapy has strong impact on patients' outcomes The development of a permanent awareness program for private practitioners, the prescription antibiotics, and the implementation of a hospital antibiotic stewardship program are also recommended.

The review of antibiotic profiles used in health centers underscores the critical role these medications play in managing infectious diseases while highlighting the challenges posed by antibiotic resistance. Understanding the specific antibiotics employed, their efficacy, and their spectrum of activity is essential for optimizing treatment protocols and ensuring patient safety.

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MATH DRILL TO IMPROVE THE COMPUTATIONAL FLUENCY OF GRADE 9 STUDENTS IN ADDITION AND SUBTRACTION OF INTEGERS NUMBERS

Dara Faye Alfante[1], Jessziel D. Antolihao[2], Rose Vee Joyce Del Rosario[3], Jovie Ann G. Geraldo[4], Rafhy M. Pabilar[5], Sinley L. Torcino[6], Rose A. Villaflor[7]

[1]ORCID No.: 0009-003-8498-6099
Student Researcher, Kapalong College of Agriculture, Sciences and Technology
Maniki, Kapalong, Davao del Norte, Philippinesnes
[2]ORCID No.: 0009-0005-0781-5186
Student Researcher, Kapalong College of Agriculture, Sciences and Technology
Maniki, Kapalong, Davao del Norte, Philippiness
[3]ORCID No.: 0009-0002-7565-5020
Student Researcher, Kapalong College of Agriculture, Sciences and Technology
Maniki, Kapalong, Davao del Norte, Philippiness
[4]ORCID No.: 0009-0005-7273-6513
Student Researcher, Kapalong College of Agriculture, Sciences and Technology
Maniki, Kapalong, Davao del Norte, Philippines
[5]ORCID No.: 0009-0005-8716-3682
Student Researcher, Kapalong College of Agriculture, Sciences and Technology
Maniki, Kapalong, Davao del Norte, Philippiness
[6]ORCID No.: 0009-0001-7809-6060
Student Researcher, Kapalong College of Agriculture, Sciences and Technology
Maniki, Kapalong, Davao del Norte, Philippiness
[7]ORCID No.: 0009-0006-9613-8742
Student Researcher, Kapalong College of Agriculture, Sciences and Technology
Maniki, Kapalong, Davao del Norte, Philippiness

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ABSTRACT

The purpose of the study was to determine the impact of the Olympic Integer intervention on the computational fluency of students in adding and subtracting integers. Hence, the purpose of this study was to determine the significant difference between the pretest and post-test scores of the students. A pre-experimental research design was utilized to measure the effect of the intervention. Data were gather from 30 Grade 9 students at Doña Carmen Soriano National High School, selected through purposive sampling. Data collection was done through pretest and post-test administration. Findings revealed a substantial difference in the scores before and after the intervention. The mean pretest score was 9.90 (Moderate), while the mean post-test score was 17.70 (Very High). The paired t-test results indicated a significant improvement in students' scores from the pretest to the post-test, with t (29) = -15.144, p < .001. This substantial difference suggests a strong effect of the intervention on students' ability to add and subtract integers, indicating a highly significant and positive impact on their computational fluency.

KEYWORDS: *Intervention, Computational Fluency, Olympic Integers, Pre-experimental Design, Integer Operation, Philippines*

INTRODUCTION

Computational fluency denotes the proficiency in employing strategies to rapidly and effectively deduce mathematical facts. A student endowed with computational fluency possesses the capacity to adeptly integrate strategies with existing factual knowledge to solve more intricate mathematical problems. Computational fluency is a vital skill for mathematical success. It involves the ability to quickly and accurately perform basic arithmetic operations, such as addition, subtraction,

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multiplication, and division. Integers constitute one of the basic math topics in secondary education. Understanding integers is important for laying the foundation of various other topics to be covered in the future like algebra. However, basic concepts and operations involving integers are among the math concepts that are most difficult to understand in secondary education. Although integers are a math topic, they are frequently used to represent many real-world situations, such as temperature, profits and losses of money and location.

In Recep Tayyip Erdoğan University, in Rize Turkey students do not understand addition and subtraction at a conceptual level especially due to the intensive use of operational approaches. One of the reasons for having difficulty is that students proceed to addition and subtraction operations without learning integers and their characteristics at the conceptual levels. Strong computational fluency in integers tallows students to solve problems more efficiently, develop a deeper understanding of mathematical concepts, and prepare for more advanced mathematical skills (Ipek, 2020).

In Philippines, specifically in Manila, students often have difficulty with the concept of integers which makes them struggle when they algebraic solve equations. Performing operations on integers involves signs of the numbers and the signs of required operation. This makes students get confused and struggle when asked to perform operations on integers. Mathematics teachers have identified that the students' low mastery level in mathematics is not solely attributable to a deficit in skill acquisition but is also influenced by the students' sluggish pace in solving mathematical problems. Many standardized tests and entrance exams for higher education institutions place a significant emphasis on computational skills, making it essential for students to develop the speed and accuracy necessary to excel in these assessments. Their lack of speed and accuracy in performing calculations can hinder their overall performance and prevent them from demonstrating higher levels of proficiency (Rubin, 2019).

In the Division of Davao del Norte, particularly in Doña Carmen Soriano National High School it was reported by Maria Laica Lumbay, a teacher of the said school states that there are number of students struggle with the computation of addition and subtraction of integers numbers. This deficiency hinders their ability to solve mathematical problems efficiently and accurately, ultimately affecting their overall mathematical proficiency. While students may possess a basic understanding of these concepts, their lack of computational fluency prevents them from applying their knowledge effectively.

Our inquest on this study arose since this dilemma is existing. As a student teacher it is very important to improve student's computational fluency in addition and subtraction of integers numbers. Computational fluency is a cornerstone of mathematical proficiency, enabling students to solve problems efficiently and accurately. Without strong computational skills, students struggle to grasp higher-level mathematical concepts and face significant challenges in problem-solving, ultimately hindering their overall academic achievement.

Research Objectives/Questions

In this study, it was emphasized what would happen to the pretest and post-test of the study. The following were the set of objectives:

1. To determine the level of computational fluency among students during the pre-test.
2. To determine the level of computational fluency among students during the post-test.
3. To determine if there was a significant relationship between the pre-test and post-test score of the students.

Methodology

This study presents the methodology that will be employed in this study. This includes the research design, research participants, and data gathering. The research design chosen for this study is Quasi-Experimental, providing a structured and systematic approach to investigating the two groups, the control group and the experimental group.

RESULTS

This chapter presents the findings and results of Integer Olympic as a strategy for enhancing the computational fluency among Grade 9 student of Doña Carmen Soriano National High School. Analyses and interpretations of data were done parallel to the research objectives.

Presented in Table 1 are the results of the pretest, showing the performance levels of 30 students in the experimental group in computing addition and subtraction of integers. The overall mean score was 9.90, indicating moderate performance by the students in the pretest. The highest score achieved was 13, while the lowest score was 3. The most frequent score was 10, obtained by 7 students.

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Table 1 Pretest Result

PRETEST SCORES	FREQUENCY	PERCENTAGE
3	1	3.33%
5	1	3.33%
6	1	3.33%
7	1	3.33%
8	2	6.67%
9	5	16.67%
10	7	23.33%
11	4	13.33%
12	3	10.00%
13	5	16.67%
TOTAL	30	100.00%
MEAN PERCENTAGE SCORE		9.90
DESCRIPTION		MODERATE

Presented in Table 2 are the results of the post-test, showing the performance levels of 30 students in the experimental group in computing addition and subtraction of integers. The overall mean score was 17.70, indicating very high performance by the students in the post-test. The highest score achieved was 20, while the lowest score was 14. The scores 18 and 19 were both obtained by 8 students each, making them the most frequent scores.

Table 2 Post-test Result

POST-TEST SCORES	FREQUENCY	PERCENTAGE
14	1	3.33%
15	4	13.33%
16	1	3.33%
17	5	16.67%
18	8	26.67%
19	8	26.67%
20	3	10.00%
TOTAL	65	100.00%
MEAN PERCENTAGE SCORE		17.70
DESCRIPTION		VERY HIGH

Presented in Table 4 are the results of the significant difference between the pretest and post-test scores, indicating the performance levels of 30 students in the experimental group computing addition and subtraction of integers, $t(29) = -15.144$, $p < .001$. Since the probability value ($p < .001$) is less than the level of significance ($\alpha = 0.05$), the null hypothesis is rejected. This means that there is a significant difference between the pretest and post-test scores.

In terms of the mean scores, the pretest showed a mean of 9.90, with a standard deviation (SD) of 2.44, while the post-test showed a mean of 17.70, with a standard deviation of 1.64. This indicates a notable increase in performance from the pretest to the post-test among the experimental group

Type of Test	N	df	Mean	SD	t-value	P-value	Decision $\alpha = 0.05$
Pre-Test	30	29	9.90	2.44	-15.144	< .001	Significant
Post-Test	30		17.70	1.64			

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CONCLUSION

The study revealed a significant improvement in students' computational fluency in addition and subtraction of integers numbers, demonstrated by the marked difference between pretest and post-test scores. This improvement highlights the effectiveness of the INTEGER OLYMPIC intervention. Initially, students' computational fluency was moderate, but after the intervention, their performance was rated as very high.

The INTEGER OLYMPIC proved to be a valuable tool in mathematics education, specifically for teaching integers. The drill helped students enhance their skills in adding and subtracting integers. Over a one-month period, students showed significant progress in adding and subtracting integers with different sign.

The findings align with previous research, such as the study by Rau et al., (2019), which supports the idea that effective instructional strategies for cultivating computational fluency positively influences the students learning in mathematics. The importance of Integer Olympic on computational strategies and procedures, coupled with opportunities for practice and feedback. The use of adaptive, personalized practice activities that adjust to individual student needs and progress. Similarly, Hemmati (2018), found the potential of computational tools to visualize mathematical concepts. These tools can create interactive representations of mathematical ideas, making them more engaging and easier to grasp for students. This increased engagement can lead to a deeper understanding of mathematical concepts and a more positive attitude towards math learning.

Moreover, educational drill like INTEGER OLYMPIC not only make learning enjoyable but also foster critical thinking and analytical skills. By integrating academic content into an interactive format, these drills enhance students' cognitive abilities and creativity.

Furthermore, the INTEGER OLYMPIC drill is an effective educational tool that significantly improves students' computational fluency. It provides a practical, engaging, and enjoyable method for students to enhance their mathematical skills, resulting in improved academic performance and a deeper grasp of complex mathematical concepts.

RECOMMENDATION

Based on the findings of this study, several recommendations can be made to further to enhance the learning experience and effectiveness of teaching addition and subtraction of integers. It is highly recommended that teachers incorporate the Integer Olympics into their mathematics classes. This approach has proven to significantly improve students' abilities in solving addition and subtraction of integers, making the learning process both engaging and effective.

Additionally, conducting further action research to evaluate the effectiveness of Integer Olympics in other mathematical topics, such as trigonometry, statistics, and calculus, is essential. This research can determine whether the positive outcomes observed in solving addition and subtraction of integers can be replicated across different areas of mathematics. Furthermore, exploring the potential of this game-based intervention in other subjects beyond mathematics could provide insights into its broader educational benefits and versatility.

Moreover, educational institutions should consider providing professional development for teachers on how to effectively implement learning strategies like Integer Olympics. This training can equip the teachers with the necessary skills and knowledge to utilize these innovative methods to enhance student learning outcomes. Additionally, further studies should be encouraged to explore and document the long-term impacts of such interventions on student performance and engagement in mathematics and other subjects.

Furthermore, fostering a collaborative learning environment where students can engage in peer-to-peer learning while using Integer Olympics can also be beneficial. This approach can promote individuality and teamwork, communication, and collaborative problem-solving skills, which are valuable beyond the classroom.

Lastly, given the successful implementation of the Integer Olympics in teaching adding and subtracting integers, it suggests its potential as a valuable educational tool. Expanding its use and conducting further research can contribute to a more effective and enjoyable learning experience for students across various subjects and educational levels.

The recommendations based on this study emphasize the importance of integrating innovative game-based learning approaches into mathematics education, conducting rigorous research across different mathematical topics, providing adequate professional development for teachers, and fostering collaborative learning environments. These efforts aim to enhance student engagement, improve learning outcomes, and explore the broader educational benefits of such interventions.

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NANOEMULSION OF ACECLOFENAC AND ALMOND OIL

Prof Gajanan D Mogal[1], Ajay V Bramhane[2], Shivam P Zanvar[3] , Jaypal N Barwal[4] Pratiksha V Khade[5] , Kalyani S Marathe[6]

ABSTRACT

The present study was to determine the potential of a nanoemulsion for drug delivery of aceclofenac using different excipients (almond oil) having good solubility.

The nanoemulsion was formulated in o/w type emulsion by using different method of preparation that is High-Pressure Homogenization

Method.this type of nanoemulsion contains aceclofenac which has anti-inflammatory property and almond oil make skin hydrated

Aceclofenac-loaded nanoemulsions were prepared using a high-energy emulsification method, optimizing factors like surfactant concentration, oil-to-water ratio, and homogenization conditions. The resulting nanoemulsion demonstrated a droplet size below 200 nm, a narrow polydispersity index, and high drug encapsulation efficiency. Physicochemical properties such as pH, viscosity, and stability under various storage conditions were evaluated.

Nanoemulsions are advanced drug delivery systems known for their potential to enhance the solubility, stability, and bioavailability of poorly water-soluble drugs. This study focuses on the development and characterization of a nanoemulsion containing aceclofenac, a non-steroidal anti-inflammatory drug (NSAID), and almond oil as a lipid carrier. Almond oil, rich in essential fatty acids and antioxidants, serves as a natural and biocompatible oil phase, improving drug stability and promoting skin penetration.

INTRODUCTION

- Nanoemulsions are emerging as a powerful drug delivery system, particularly in enhancing poorly watersoluble drugs' solubility, stability, and bioavailability. One such drug is Aceclofenac, a non-steroidal antiinflammatory drug (NSAID) widely used in the treatment of pain and inflammatory conditions such as osteoarthritis and rheumatoid arthritis. Despite its therapeutic efficacy, Aceclofenac's clinical application is limited by its poor solubility in water, leading to suboptimal absorption and potential gastrointestinal side effects when administered orally..
- Almond Oil, a natural oil rich in vitamins, fatty acids, and antioxidants, serves as an excellent oil phase in the formulation of nanoemulsions. Known for its emollient and anti-inflammatory properties, Almond Oil not only facilitates the solubilization of hydrophobic drugs like Aceclofenac but also contributes to the therapeutic effect of the formulation, especially in topical applications. The combination of Aceclofenac and Almond Oil in a nanoemulsion formulation holds the potential to enhance the drug's therapeutic profile while minimizing adverse effects.
- This review aims to provide a comprehensive overview of the formulation and characterization of nanoemulsions containing Aceclofenac and Almond Oil. It will explore the physicochemical properties, therapeutic applications, and potential benefits of this novel drug delivery system. The review will also discuss the challenges associated with the development of nanoemulsions and suggest future research directions for optimizing their clinical use.
- Nanoemulsion-based formulations have gained significant attention to address these challenges. Nanoemulsions are submicron-sized emulsions with droplet sizes typically ranging from 20 to 200 nm, which offer several advantages over conventional formulations. These include enhanced drug solubility, improved bioavailability, controlled drug release, and the ability to bypass first-pass metabolism when used for transdermal delivery

LITERATURE OF SURVEY

- Rao and Jain (2024)et.al: provided a comprehensive study on the fabrication and characterization of Aceclofenac-loaded nanoemulsions with almond oil for anti-inflammatory drug delivery. The study focused on optimizing the formulation for maximum stability and drug release. The authors highlighted the importance of selecting appropriate surfactants and oil phase components to achieve stable nanoemulsions with controlled drug release. The formulation was found to exhibit both good stability and efficient anti-inflammatory activity, making it a viable option for sustained drug delivery
- Patel and Verma (2023)et.al: explored the transdermal potential of Aceclofenac-loaded nanoemulsions containing almond oil. This study demonstrated that the nanoemulsions significantly improved the drug's ability to penetrate the skin barrier, making it suitable for treating localized inflammation. The formulation was characterized by its small droplet size, which facilitated

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deeper skin penetration, and the almond oil acted as both a solubilizer and a skin penetration enhance

- Patel and Patel (2023)et.al: investigated the potential of almond oil-based nanoemulsions for enhancing the skin delivery of Aceclofenac in topical applications. The study focused on the formulation and characterization of the nanoemulsions, emphasizing their ability to improve skin penetration and reduce systemic side effects. The researchers found that the almond oil-based nanoemulsions were more effective in delivering Aceclofenac to the targeted site, thereby enhancing its local anti-inflammatory effects while minimizing adverse effects
- Mittal (2023) et.al:optimized Aceclofenac-loaded nanoemulsions using almond oil and evaluated their anti-inflammatory activity both in vitro and in vivo. The study demonstrated that the optimized nanoemulsions exhibited significantly higher anti-inflammatory activity compared to conventional formulations. In vitro assays revealed better cellular uptake, while in vivo animal models showed a noticeable reduction in inflammation and pain, suggesting that the formulation can be an effective treatment for inflammatory disease
- Singh and Verma (2020) et.al:conducted a comparative study to explore the efficacy of various natural oils, including almond oil, in nanoemulsions for enhanced anti-inflammatory effects. The study found that Aceclofenac-loaded nanoemulsions with almond oil exhibited superior antiinflammatory activity compared to other oils, likely due to the synergistic effects of the drug and the oil's natural anti-inflammatory properties. The formulation also enhanced drug solubility and stability, making it a promising candidate for anti-inflammatory treatments

AIM: to prepare nanoemulsion of aceclofenac with almond base

OBJECTIVE

- The primary objective of this review is to explore the formulation and potential therapeutic benefits of a nanoemulsion system incorporating Aceclofenac and Almond Oil.
- Drug Solubility and Bioavailability: Investigate the challenges associated with the poor solubility and bioavailability of Aceclofenac and how nanoemulsion technology can address these issues. This includes understanding the mechanisms by which nanoemulsions enhance drug solubility and absorption.
- Reduction of Side Effects: Explore how nanoemulsion formulations could potentially minimize the gastrointestinal side effects commonly associated with oral administration of Aceclofenac by providing alternative routes of delivery, such as transdermal application.
- Physicochemical Properties: Analyze the physicochemical properties of Almond Oil that make it a suitable oil phase in nanoemulsion formulations. This includes its fatty acid profile, emollient properties, and compatibility with Aceclofenac.
- Therapeutic Synergy: Assess the potential for synergistic therapeutic effects when Aceclofenac is combined with Almond Oil, particularly in terms of enhanced anti-inflammatory activity and skin penetration in topical applications.
- To examine the stability of the nanoemulsion under different environmental conditions to ensure long-term usability.
- To analyze the drug release profile of the nanoemulsion and compare it with conventional aceclofenac formulations
- To evaluate the physicochemical properties of the nanoemulsion, including droplet size, polydispersity index (PDI), zeta potential, viscosity, and drug encapsulation efficiency.

➢ Overview of Nanoemulsion Technology

Introduction to Nanoemulsions

Nanoemulsions are even colloidal dispersions consisting of two immiscible liquids, typically oil and water, stabilized by surfactants. They are characterized by their small droplet sizes, generally ranging from 20 to 200 nm, which contributes to their unique physicochemical properties. Nanoemulsions differ from conventional emulsions in that they have a much smaller droplet size, resulting in a larger surface area and greater stability, which allows for improved solubility and bioavailability of hydrophobic drugs.

Types of Nanoemulsions

Nanoemulsions can be classified based on the relative distribution of the oil and water phases:

- Oil-in-Water (O/W) Nanoemulsions: In this type, oil droplets are dispersed in a continuous aqueous phase. O/W nanoemulsions are often used for parenteral or topical drug delivery, making them suitable for drugs that require rapid absorption.
- Water-in-Oil (W/O) Nanoemulsions: Here, water droplets are dispersed in a continuous oil phase. W/O nanoemulsions are typically used in topical formulations for their ability to provide a moisturizing effect.
- Bi-continuous Nanoemulsions: These contain both oil and water channels, creating a unique structure that allows for the simultaneous release of hydrophilic and lipophilic drug

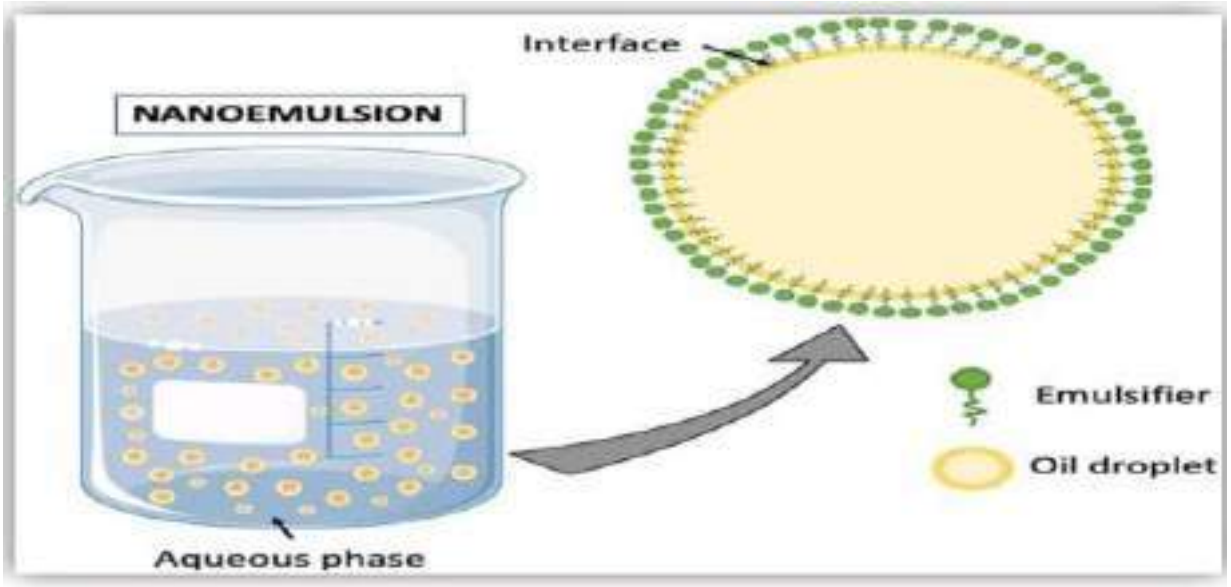
Advantages of Nanoemulsions

- Nanoemulsions offer several advantages over traditional drug delivery ystems, including:
- Enhanced Bioavailability: The reduced droplet size increases the surface area for absorption, significantly improving the solubility and bioavailability of poorly water-soluble drugs.
- Stability: Nanoemulsions are less prone to coalescence and phase separation compared to conventional emulsions, leading to longer shelf life and greater formulation stability.
- Controlled Release: The nanoemulsion formulation can be designed for controlled and sustained release of the

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drug, enhancing therapeutic efficacy and patient compliance.

- Versatile Routes of Administration: Nanoemulsions can be utilized for various routes of administration, including oral, topical, parenteral, and even inhalation, allowing for flexible therapeutic applications.
- Reduced Side Effects: By enhancing the targeted delivery of the drug, nanoemulsions can minimize systemic exposure and associated side effects, particularly in topical application



➢ **Materials Required**

1. **Active Pharmaceutical Ingredient (API)**: Aceclofenacis a non-steroidal anti-inflammatory drug (NSAID) primarily used to relieve pain and inflammation in conditions like osteoarthritis, rheumatoid arthritis, and ankylosing spondylitis. It works by inhibiting the enzyme cyclooxygenase (COX), which plays a role in the synthesis of prostaglandins, chemicals in the body that promote inflammation, pain, and fever
2. **Oil Phase:** Almond Oil (serves as the oil phase and solubilizing medium for Aceclofenac)
3. **Surfactants**: Non-ionic surfactants such as Tween 80 (Polysorbate 80) or Span 20 (Sorbitan monolaurate) for stabilizing the nanoemulsion
4. **Co-Surfactants**: Ethanol, Propylene Glycol, or Polyethylene Glycol (PEG) to enhance the effectiveness of the surfactant
5. **Aqueous Phase**: Purified water or a suitable buffer solution (e.g., phosphate buffer) **6. Preservatives (Optional):** To prevent microbial growth during storage

➢ **Preparation Methods**

There are several methods to prepare a nanoemulsion,

A. High-Pressure Homogenization Method

Step 1: Preparation of the Oil Phase

- Dissolve a pre-weighed amount of Aceclofenac in the Almond Oil. Stir the mixture gently to ensure complete dissolution of the drug.

Step 2: Preparation of the Aqueous Phase

- In a separate container, mix the surfactant (e.g., Tween 80) and co-surfactant (e.g., Ethanol) with purified water or buffer solution. Stir the mixture until the surfactants are fully dissolved.

Step 3: Emulsion Formation

- Gradually add the oil phase (containing Aceclofenac and Almond Oil) to the aqueous phase while stirring continuously. This pre-emulsion should be stirred at a moderate speed to avoid phase separation

Step 4: High-Pressure Homogenization

- Pass the pre-emulsion through a high-pressure homogenizer. This process typically involves forcing the emulsion through a narrow gap at high pressure (e.g., 5000-20,000 psi). The high shear forces generated help reduce the droplet size to the nanometer range.

Step 5: Cooling and Adjustment

- After homogenization, allow the nanoemulsion to cool to room temperature. Adjust the pH if necessary using a pH adjuster to ensure the formulation is suitable for the intended route of administration (e.g., topical, oral).

Step 6: Filtration (Optional)

- For parenteral applications, sterile filtration may be necessary to remove any particulate matter

B. Ultrasonication Method

Step 1: Oil Phase Preparation

- Similar to the high-pressure homogenization method, dissolve Aceclofenac in Almond Oil.

Step 2: Aqueous Phase Preparation

- Mix the surfactants and co-surfactants in the aqueous phase as described above.

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Step 3: Pre-Emulsion Formation

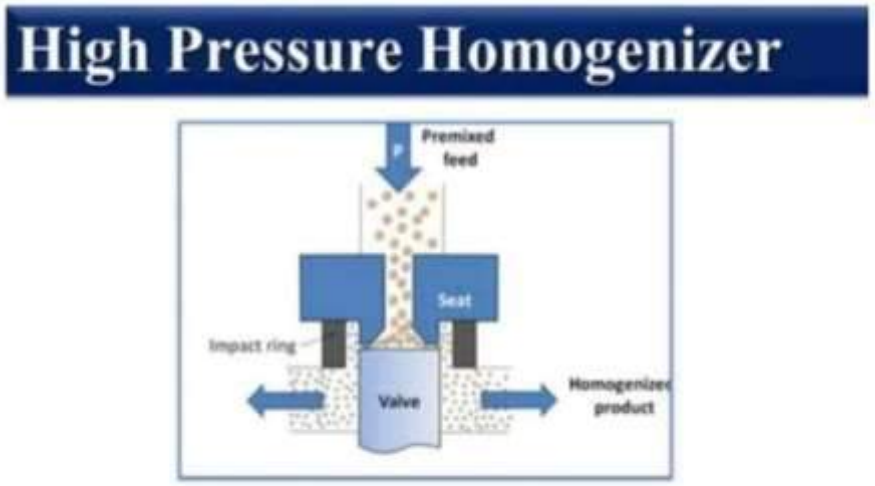
- Combine the oil phase with the aqueous phase under gentle stirring to form a coarse emulsion.

Step 4: Ultrasonication

- Subject the coarse emulsion to ultrasonication using a probe sonicator. Typically, sonication is performed at a frequency of 20 kHz for 10-15 minutes. Ensure that the mixture is kept in an ice bath to prevent overheating during sonication, which could degrade the Aceclofenac.

Step 5: Final Adjustments

- After ultrasonication, allow the nanoemulsion to cool. Adjust the pH and viscosity as needed to meet the desired space



➢ **Mechanisms of Action of Aceclofenac**

Aceclofenac is a widely used non-steroidal anti-inflammatory drug (NSAID) that exerts anti-inflammatory, analgesic, and antipyretic effects. It is commonly prescribed for conditions like osteoarthritis, rheumatoid arthritis, and ankylosing spondylitis. The therapeutic action of Aceclofenac is primarily mediated through the inhibition of inflammatory processes.

1. Inhibition of Cyclooxygenase (COX) Enzymes

- The primary mechanism of action of Aceclofenac is the inhibition of the cyclooxygenase (COX) enzymes, which are key in the synthesis of prostaglandins. Prostaglandins are lipid compounds that play a crucial role in promoting inflammation, pain, and fever. There are two main types of COX enzymes:
- COX-1: Involved in the production of prostaglandins that protect the stomach lining, maintain kidney function, and support platelet aggregation.
- COX-2: Induced during inflammatory processes and is primarily responsible for the production of pro-inflammatory prostaglandins.

2. Reduction of Prostaglandin Synthesis

- By inhibiting COX-2, Aceclofenac effectively reduces the production of prostaglandins, especially Prostaglandin E2 (PGE2), which is a major mediator of inflammation. The reduction in prostaglandin levels leads to the following therapeutic effects:
- Anti-inflammatory effect: Decreased levels of PGE2 and other inflammatory mediators result in reduced swelling, redness, and inflammation in the affected tissues.
- Analgesic effect: By lowering prostaglandin levels in the central nervous system and at peripheral sites of injury, Aceclofenac reduces pain perception.
- Antipyretic effect: Inhibition of PGE2 in the hypothalamus leads to a decrease in fever by regulating the body's temperature set poi **3. Inhibition of Free Radicals and Oxidative Stress**
- Aceclofenac may exhibit antioxidant properties by reducing the production of reactive oxygen species (ROS) and free radicals generated during the inflammatory response. This reduction in oxidative stress helps prevent further tissue damage and inflammation

➢ **Future Prospects of Nanoemulsion of Aceclofenac**

Nanoemulsion technology offers a promising future for the formulation of poorly water-soluble drugs like Aceclofenac. As a non-steroidal anti-inflammatory drug (NSAID) used to manage pain and inflammation, Aceclofenac's therapeutic effectiveness can be enhanced through nanoemulsion systems, which improve solubility, stability, and bioavailability

1. Enhanced Bioavailability

One of the major challenges with Aceclofenac is its poor water solubility, which limits its oral bioavailability. Nanoemulsions, with droplet sizes in the nanometer range, increase the surface area for absorption, leading to enhanced drug solubility and better gastrointestinal absorption. This technology has the potential to improve the oral bioavailability of Aceclofenac, resulting in faster onset of action, reduced dosing, and improved patient compliance.

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2. Improved Drug Targeting and Controlled Release

Nanoemulsion systems can be engineered to provide site-specific drug delivery. This can be particularly beneficial for treating localized inflammation in conditions such as osteoarthritis or rheumatoid arthritis. By incorporating Aceclofenac into a nanoemulsion, the drug can be directed more efficiently to inflamed tissues, potentially improving efficacy and reducing systemic side effects.

3. Reduction in Side Effects

The selective action of nanoemulsions can help reduce the systemic side effects associated with

NSAIDs, such as gastrointestinal irritation and ulceration. By improving the absorption and bioavailability of Aceclofenac, smaller doses may be required to achieve therapeutic efficacy, thereby minimizing the risks of adverse effects. In the future, nanoemulsion-based Aceclofenac formulations may offer safer alternatives for long-term pain and inflammation management.

4.Use in Injectable Formulations

Aceclofenac nanoemulsions could also be formulated as injectable preparations for more rapid and direct administration into the bloodstream, bypassing the gastrointestinal system altogether. Injectable nanoemulsions could be used in scenarios requiring rapid pain relief, such as postoperative pain or acute inflammatory episodes. This method can improve drug bioavailability while reducing the volume of injections due to the highly concentrated nanoemulsion.

CONCLUSION

- The development of a nanoemulsion of aceclofenac using almond oil as a carrier offers promising benefits due to their small droplet size and high surface area, improve drug absorption and provide a more controlled release profile compared to traditional. Formulations almand oil is base which also give antioxidant effect also benefit the make skin hydration
- aceclofenac in a nanoemulsion can also potentially reduce its gastrointestinal side effects, which are a common concern in oral NSAID therapy.
- Future research should focus on optimizing formulation parameters, evaluating long-term storage conditions, and conducting comprehensive in vivo studies to fully understand the pharmacokinetics and therapeutic potential of aceclofenac nanoemulsions.

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A REVIEW ON MOUTH DISSOLVING TABLET

Ms. Komal Ankush Kolhe[1*], Mr. Ashwinkumar R. Deshmukh[2], Ms. Pooja K. Ekhande[3] Ms. Renuka V. Wagh[4], Ms Seema P. Giram[5]

[1]*Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna*
[2]*Asst. Prof.(Faculty of Pharmacology) Raosaheb Patil Danve College of Pharmacy Badnapur Jalna*
[3]*Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna*
[4]*Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna*
[5]*Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna*
Raosaheb Patil Danve College of Pharmacy Badnapur Jalna 431202

ABSTRACT

Over the past ten years, there has been an increase in demand for mouth dissolving tablets, especially among elderly, pediatric, and patients who have swallowing difficulties. Tablets that dissolve quickly in saliva without the need for liquid and disintegrate in the mouth are known as mouth-dissolving tablets.

For many medications, the oral route or dosage form is the most recommended method of administration; nevertheless, there are several limitations, such as first-pass metabolism, patients in psychiatric hospitals, bedridden patients, and patients who are recalcitrant.

FDT formulations contain superdisintegrants to increase the pace at which tablets dissolve in the oral cavity and are made to dissolve in saliva amazingly quickly – within a few seconds, less than 60 seconds Orodispersible, mouth-dissolving, orally disintegrating, and melt-in-mouth are other names for fast-dissolving pills.

KEYWORDS: *Super disintegrant, Fast Dissolving Tablet, Mouth Dissolving Tablet*

2) INTRODUCTION

Because of its precise dosage, low cost, self-medication, noninvasive approach, and convenience of administration, which results in a high degree of patient compliance, the oral route is still the recommended technique for administering therapeutic agents. Approximately 60% of well-known small-molecule pharmaceutical medicines that are sold commercially are taken orally. According to current estimates, oral formulations account for approximately 90% of the global market share of all pharmaceutical formulations meant for human consumption. Solid dosage forms are widely used due to their affordability, simplicity of use, precise dosage for self-medication, ability to prevent pain, and—above all—patient compliance. Tablets and capsules are the most often used solid dose forms. The mouth dissolving pill is something that The term "mouth dissolving tablets" refers to solid dosage forms that dissolve quickly in the oral cavity and dissolve into saliva, creating a solution that doesn't require water to administer. Many patient populations have trouble swallowing traditional dosage forms, including tablets, including the elderly, children, intellectually impaired, uncooperative, and nauseous. Conditions like a lack of water, allergic reactions, and coughing fits will make it more difficult to swallow traditional tablets.

Other names for the oral dissolving tablet include freeze-dried wafers, quick disintegrating tablet, rapid melting tablet, fast dispersion tablet, and rapid dissolve tablet.The most widely used dose forms are tablets and capsules. However, a significant disadvantage of these dose formulations is

1. Parkinson's disease
2. Motion sickness
3. Ignorance
4. Senior citizens
5. Kids
6. People with mental disabilities
7. The absence of water

Rapidly disintegrating and dissolving tablet dosage forms for oral administration can address these issues because they dissolve in saliva and don't require water to swallow. The primary strategy is to create mouth-solving or mouth-disintegrating tablets that dissolve quickly in saliva in a few seconds without the need for water due to the super-disintegrant in the formulations.

MECHANISM: A drug's bioavailability is dependent on its absorption, which is influenced by its permeability across the gastrointestinal membrane and its solubility in gastrointestinal fluid.

A drug's solubility is mostly determined by its physiochemical characteristics. Tablet disintegration has a significant impact on the rate of medication breakdown. When a tablet comes into contact with an aqueous fluid, it breaks up. This process of desegregating the constituent particles before the drug dissolves is called the disintegration process, and the excipients that cause this process are called disintegrants. Disintegrants are an essential part of the tablet formulation.

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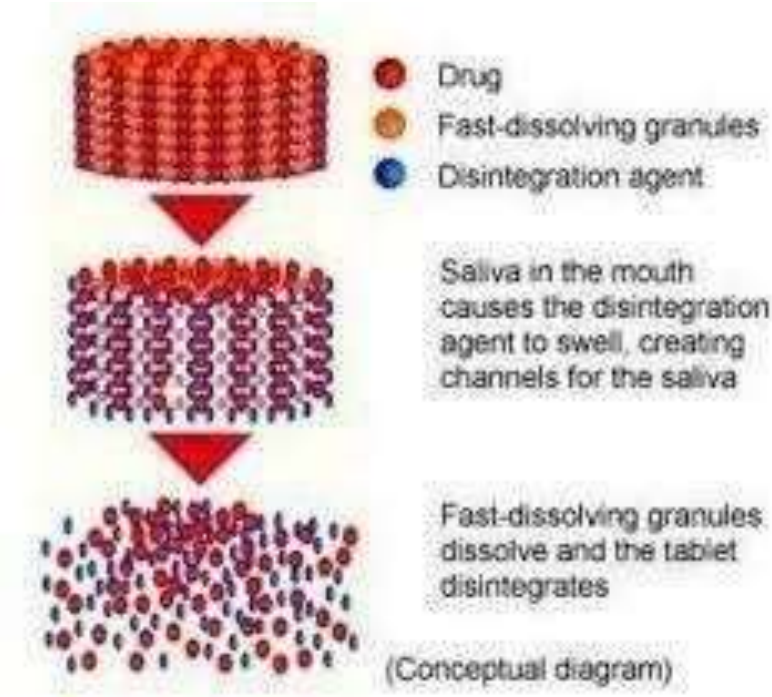


Fig No : 1 Disintegration Mechanism Of MDT

Characteristics of MDTs
• Simpleness of administration for patients—such as young children, elderly patients, and psychiatric patients—who refuse to take a tablet.
• Accurate dose and ease of administration in contrast to liquids.
• The dosage form dissolves and disintegrates quickly; it doesn't require water to swallow, which is a very practical feature for patients who are traveling and don't always have access to water.

MDT's ideal qualities include: * Having a pleasant mouthfeel;
* Not requiring water for oral administration.
* Possess a passable ability to hide flavor.
* Be less friable and tougher.
* After administration, leave little to no residue in the mouth.
* Show minimal susceptibility to external factors (temperature and humidity) *
Permit the production of tablets using standard processing and packaging machinery.

Benefits of MDT
Convenience: Patients find tablets convenient to use because they are portable and simple to administer.
Accurate Dosing: They make sure patients get the right amount of medication by giving them exact dosages.
Stability: Tablets are more stable and easier to store than liquid forms of medication since they typically have a longer shelf life. Taste Masking: A lot of tablets can be coated to cover off bad flavors, which increases patient adherence.
Production Ease: Compared to alternative dose forms like injections or liquids, making tablets is frequently simpler and less expensive.

3) GOAL AND PURPOSE

AIM: ANALYSIS OF MOUTH DISSOLVING TABLET GOALS

1. To Create a Novel MDT Formulation: Create and refine a formulation for mouth-dissolving tablets that guarantees quick dissolution and disintegration.
2. To Assess Patient Compliance: Determine whether MDTs can help various patient populations adhere to their prescription regimens.
3. To Increase Bioavailability: Examine how the MDT formulation affects the bioavailability of medications that are poorly soluble in comparison to traditional dose forms.
4. Geriatric and pediatric care: Simple administration for those who have trouble swallowing.
5. Better Stability and Taste Masking: Stable formulations and taste-masking agents were included in the design to enhance the patient experience.
6. Mouth-dispersing tablets dissolve or break down in saliva and can be eaten without water.

The following are the materials and excipients:
1) SUPERDISINTEGRANT: An excipient called a superdisintegrant is added to a tablet blend to help break up the compacted mass when it is placed in a fluid environment. To guarantee quick disintegration and high dissolution rates, it is crucial to choose the right superdisintegrant in the right concentration.

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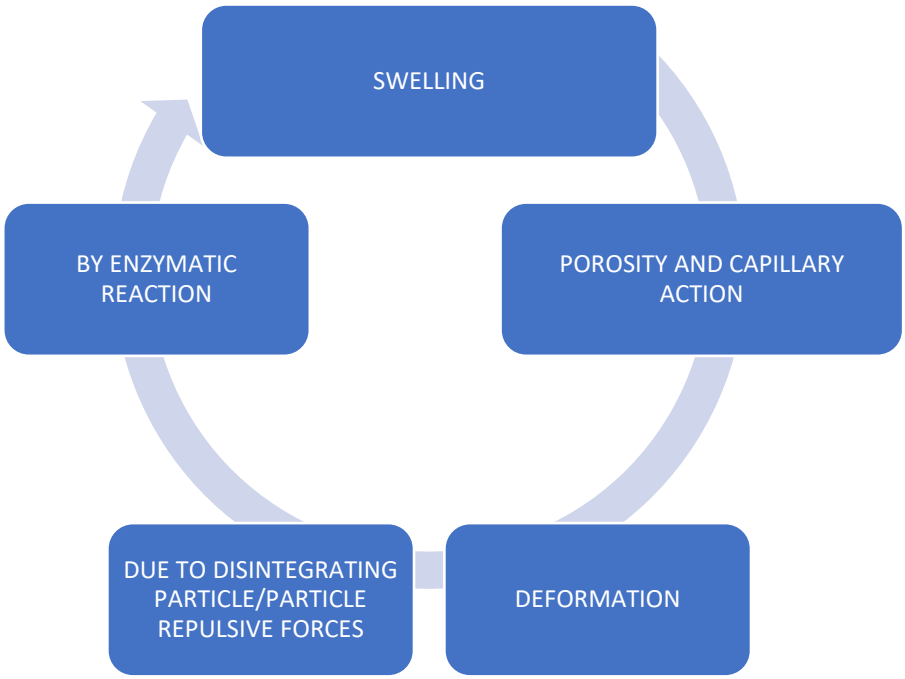


Fig Mechanism of Superdisintegrant

a. Natural Superdisintegrants: These substances are frequently employed in formulations for fast-dissolving tablets to facilitate the disintegration and disaggregation of tablets. Banana powder, apple pectin, plantago ovata mucilage, hibiscus rosa sinesis mucilage, gum karaya, fenugreek powder, and so on are examples of natural superdisintegrants.

b. Synthetic Superdisintegrants: These substances are most frequently utilized in the formulation of fast-dissolving tablets to facilitate the disintegration and disaggregation of the tablets. Sodium starch glycolate, crosspovidone, croscarmellose sodium, ion exchange resin, and others are examples of synthetic superdisintegrants.

- Swelling: Through this process, some disintegrating ingredients, such as starch, break down tablets by imparting a dissolving effect when they come into contact with water. For instance, Plantago ovata and sodium starch glycolate.
- By capillary action: The initial phase is always disintegration by capillary action. The tablet breaks into fine particles when it is placed in an appropriate aqueous medium because the medium seeps into the tablet and replaces the air that has been adsorbed on the particles, weakening the intermolecular connection.
- By enzymatic action: In this case, the body's natural enzymes serve as disintegrants. These enzymes aid in disintegration by destroying the binder's binding activity.
- Deformation: The starch grains undergo deformation when pressure is applied, and they return to their normal shape when the pressure is released. However, after they were compacted into tablets,

2) Emulsifying Agents Are

Emulsifying agents are crucial excipients in the formulation of fast-melting tablets because they facilitate the drug's quick disintegration and release without the need for chewing, swallowing, or water consumption. Additionally, adding emulsifying agents—such as propylene glycol esters, alkyl sulfates, and others—helps stabilize immiscible mixtures and improve bioavailability.

3) Lubricants: Although they are not necessary excipients, lubricants can help make these tablets more appealing once they dissolve in the mouth. Lubricants eliminate grit and support the process by which drugs pass from the mouth into the stomach. he two emulsifying agents are:

4) Sweeteners and flavors: Patients find the items more pleasant and agreeable when they contain flavors and taste-masking substances. The bitterness and unfavorable flavors of several active substances are lessened with the inclusion of these ingredients. E., clove oil, peppermint oil

5) Saliva stimulating agent To accelerate the rate of disintegration and breakdown in the oral cavity, some MDT formulations can make use of saliva stimulating chemicals.

6) Bulking material: When creating fast-melting tablets, bulking ingredients are important. The substance serves as a filler, diluent, and cost-cutting agent. In addition to lowering the concentration of the active ingredient in the composition, bulking agents improve the textural qualities, which in turn promote the disintegration in the mouth. For example, DCL, lactitol, polydextrose, and mannitol

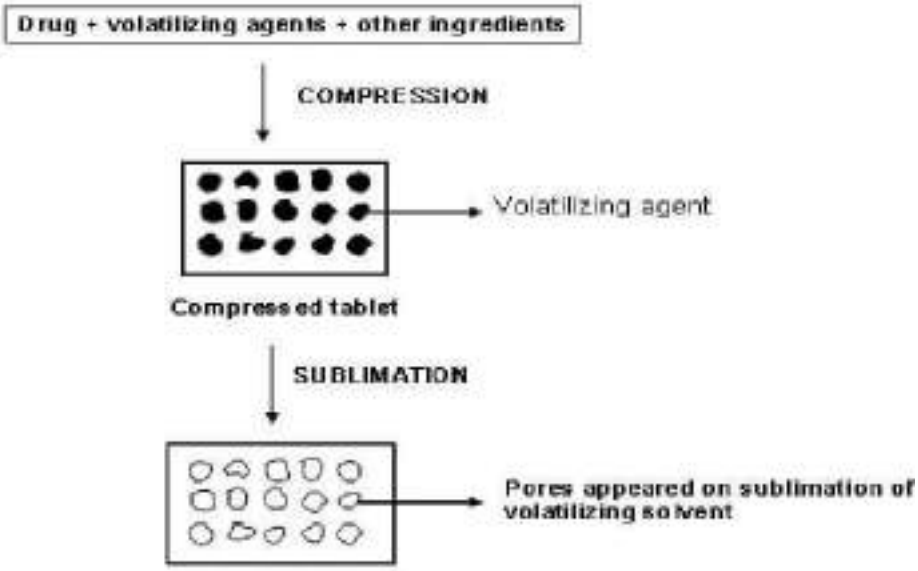
1) Direct Compression

The first method of preparation is direct compression, which is the most straightforward and economical way to make tablets. Using this process, tablets are made directly without any prior treatment by compressing the medication and additive mixture. The mixture that is going to be compressed needs to have good flow characteristics. This approach takes three stages to finish. i.e., a) grinding the medicine and additives

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b) combining the aforementioned Tablet compression (c)

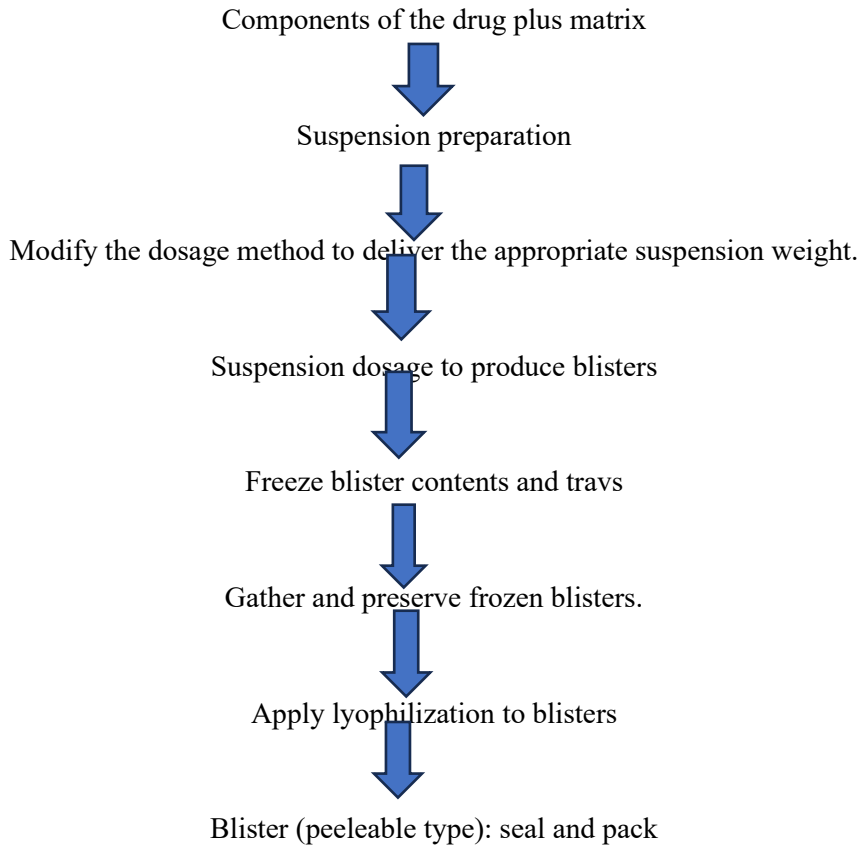
2) **Sublimation**



3) Spray Drying

Gelatin is utilized as a matrix and a supportive agent in the spray drying process. The superdisintegrants are crosspovidone, sodium starch glycolate, and crosscarmellose sodium. The purpose of mannitol is bulking. It has been observed that tablets made from spray-dried powder dissolve in an aqueous solution in less than 20 seconds.The formulation included sodium starch glycolate and crosscarmellose sodium as superdisintegrants, lactose and mannitol as bulking agents, and citric acid as an acidic component. Ultimately, the spray-dried powder was compacted into tablets, which demonstrated a rapid rate of dissolution and disintegration.

4) Technology for lyophilization and freeze drying



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5) The Tablet Molding Technique: The solvent method and the heat method are the two types of molding processes. In order to create wetted mass, the solvent method entails moistening the powder combination with a hydroalcoholic solvent and then compressing it under low pressure in mold plates. The solvent is subsequently eliminated by air drying. The resulting tablets have a porous structure that speeds up dissolving and are less compact than compacted tablets. In the heat molding technique, a suspension containing the medicine and agar sugar (such as lactose or mannitol) is prepared, then the suspension is poured into blister packing wells, allowed to solidify at room temperature to form jelly, and then dried under vacuum at 300 degrees Celsius. One major challenge is the mechanical robustness of tablets in their molded state. Agents that bind

LIST OF MARKETED MOUTH DISSOLVING TABLET

- Antipsycotic Agent :- Clozapine , Olanzapine
- Antiparkinsonism Agent :- Selegiline
- Antihypertensive Agent :- Valsartan, Nifedipine,
- Antiemetics Agent :- Ondansetron
- Antidiabetic Agent :- Glipizide , Rosiglitazone Maleate
- Antiulcer Agent :- Famotidine
- Antiasthmatic Agent :- Montelucast

4)FUTURE ASPECT

❖ Technological advancement :- 1) Nanotechnology:- Enhanced bioavailability and targeted delivery 2) Freeze drying:- Improved stability and shelf- life

❖ Growing demand :-

1) Geriatric population:- easy administration for elderly patient
2) Pediatric care:- convenient dosing for children
3) chronic condition:- MDT for diabetes, hypertension and asthma
4) Emerging markets:- increasing access to health care

5) CONCLUSION

Mouth dissolving tablets have potential advantages over conventional dosage forms, with their improved patient compliance, convenience, bioavailability and rapid onset of action had drawn the attention of many manufacturers over a decade. Mouth dissolving tablets formulations obtained by some of these technologies have sufficient mechanical strength. Quick disintegration or dissolution in the mouth without water. Mouth dissolving tablets are cost-effective with the addition of advantage to dysphasic patients as they disintegrate and dissolve in mouth within a few minutes and release active agents. The new technologies of manufacturing provide tablets with rapid onset of action, increased bioavailability, low side effects and better safety

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A REVIEW ON NANOROBOTS IN CANCER TREATMENT

Ms. Aarti Bhausaheb Narwade[1]*, Mr. Abhijeet Rathod[2], Ms Bhagyshri Padul[3]
[1]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[2]Asst. Prof. (Faculty of Pharmaceutics) Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[3]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[4]Student Of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy Badnapur Jalna
[5]Student Of Bachelor Of Pharmacy, Raosaheb Patil Danve College Of Pharmacy Badnapur Jalna

ABSTRACT
Nanorobots are small devices that target cancer cells while sparing healthy cells in order to treat the disease. By delivering medication straight to tumors, they improve treatment outcomes and lessen the negative effects of conventional therapies like chemotherapy. Because these robots are designed to exclusively deliver medications at cancerous locations, they can provide precise treatment without endangering healthy tissues. Nanorobots may be able to treat illnesses like Alzheimer's in addition to cancer. Nanorobots are becoming a reality thanks to recent technical developments. Future cancer treatments could include injecting nanorobots to remove tumors without the unpleasant side effects of radiation or chemotherapy, which would allow patients to recover more quickly and feel more comfortable.

KEYWORDS:- *Nanobots, Nanomachine, Nanomedicine, Nanosensors, Nanomotors*

A BRIEF OVERVIEW OF CANCER

A illness known as cancer occurs when some body cells proliferate out of control and spread to other bodily organs. With trillions of cells, cancer can begin practically anywhere in the human body. The body uses cell division to create new cells, which is how human cells normally develop and proliferate. Cells die and are replaced by new ones when they age or sustain injury. [1]

The Greek physician Hippocrates (460–370 BC), who is regarded as the father of medicine, is credited with coining the term "cancer." Hippocrates used the terms "carcinos" and "cancer" to refer to tumors that did not produce ulcers and those that did.

According to Hippocrates, the body contains four humors, or bodily fluids: blood, phlegm,

CANCER CAUSES

1) Genetic factors.
2) Environmental aspects
3) Aspects of lifestyle
4) Infections
5) Hormonal factor
6) Age
7) Function of the immune system

Cancer Symptoms Include

1. Weight loss without explanation
2. Exhaustion and Pain
3. Skin alterations
4. Modifications to bowel or bladder habits
5. Unusual discharge or bleeding
6. Swallowing difficulties
7. Swelling or lumps
8. Night sweats or a fever

SIDE EFFECTS OF CANCER TREATMENT

Chemotherapy: Changes in appetite, weight loss, nausea and vomiting, mouth sores, and low blood counts.

Radiation Therapy: Skin Responses and Long-Term Consequences

Pain, infection, scarring, and changes in function following surgery

Symptoms of the flu, skin reactions, and autoimmune reactions are examples of immunotherapy.

Targeted therapy for skin changes, liver problems, and diarrhea.

Hormonal therapy for mood swings, hot flashes, and loss of bone density.

NANOTECHNOLOGY

The field of science and engineering known as "nanotechnology" is focused on creating, utilizing, and developing systems, devices, and structures through nanoscale atom and molecular manipulation.[4] When considering technical breakthroughs, nanotechnology has been at the forefront and has garnered a lot of attention over time. composed of biological materials, metal, metal oxides, or carbon[5].

A vital component of biotechnology and medicine, nanomedicine enhances illness prevention, diagnosis, and therapy. Nanotechnology has improved healthcare and aided in the development of novel illness diagnosis and treatment approaches [6].

Nanotechnology is being used in medicine by researchers to enhance instruments such as purification kits, sensors, and diagnostic surfaces. For early detection and therapy, new gadgets that operate inside the body are being developed. By fusing technology, medicine,

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Application of Nanotechnology in different subfields of the medical industry



Fig: 2 Application Of Nanotechnology In Different Subfields In Medical Industry

NANOROBOTS

The study of robots at the nanoscale is defined as nanorobotics, and incorporated technology is known as nanotechnology. Nanorobots are devices capable of sensing, actuating, signalling, processing information, intelligence, or exhibiting swarm behaviour at the nanoscale [9]. They are comprised of various components that carry out specific tasks; the components are constructed at the nanoscale size and can range from 1–100 nanometers . Nanobots (A.K.A. nanorobots), which are currently the focus of an emerging field of research, are also referred to as nanites, nanoids, nanomachines, or nano-mites ; however, in general, nanobot consists of two words—'nano' and 'bot'. 'Nano' refers to very small or minute, and 'bot' refers to a device that can be controlled by a program, i.e. a short term for a robot [1].

Nanorobots have several potential applications in the medical field including cancer treatment , surgery, precision medicine [7], diabetes monitoring, dentistry, blood monitoring and drug delivery . Currently, mobile phones are proving to be a useful feedback device in accomplishing data transmission for communication, control, and energy supply inside the body.[10] Due to their small sizes, nanorobots can directly interact with cells and even penetrate them, providing direct access to the cellular machineries. As an interdisciplinary technology, nanorobots address the assembly and utilization of functional nano-to-molecular scale machines and have been widely used in cancer diagnosis and treatment. [11]

Cancer is the 3rd leading cause of death globally as almost every six deaths is caused by it [1]. By 2030, it's expected to be 26 million new cases of cancer with almost 17 million deaths per anum [2]. The countries with low-to-middle income account for most cancer cases that are expected to be 61% by 2050 [3]. In 1965, the International Agency for Research on Cancer (IARC) was established, with the mission of conducting multidisciplinary investigations into the causes of human cancers [4]. After conducting several studies, particularly on the structure of genes, experts have concluded that changes in human lifestyle, diet, and environmental factors have resulted in an increased number of cancer cases . [12]

CONVENTIONAL METHODS OF CANCER THERAPY TREATMENTS

Most people with cancer receive surgery, chemotherapy, radiation therapy, or other conventional therapies at some point during treatment, and many will have a combination of these treatments. Injection of drugs affects both cancerous and non cancerous cells in conventional method. So, the main types of cancer treatment include : Surgery, Radiation Therapy, Chemotherapy, Immunotherapy, Targeted Therapy, Hormone Therapy.

THE MAJOR DRAWBACKS OF THE CONVENTIONAL METHODS USED IN THE CANCER THERAPY

Injection of drugs affects both cancerous and non cancerous cells in conventional method. There are various side effects with the conventional methods as it effects both the cancerous and non cancerous cells. Surgery and radiation therapy remove, kill, or damage cancer cells in a certain area which also effects healthy cells. The time to heal is longer with the conventional methods that includes methods like surgery, radiation therapy. Some of the side effects that that occur when conventional method

THE MODERN TECHNOLOGY USED TO CURE CANCER THERAPY

Nanotechnology offers promising advancements in cancer therapy. Nanorobots, like Nanokillers, can target cancer cells directly and deliver drugs precisely where needed, minimizing side effects. These tiny robots can find and repair damaged organs, detect tumors, and even destroy them with controlled doses of chemotherapy drugs.

Respirocytes are nanorobots that help identify tumors and release drugs directly at cancer cells. They can also track their progress, reporting the number of cancer cells they've encountered and treated. Nanomedicine enables non-invasive devices that can enter the body, detect cancer in early stages,

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and deliver targeted treatments with minimal harm to healthy tissue. These nanorobots have vibrating cilia-like structures and nanosensors to identify cancerous tissues, while gold-coated shells allow them to attach to and treat malignant cel

CHEMOTHERAPY DRUG DELIVERY USING NANOROBOTS IN CANCER TREATMENT

Recent advancements in drug delivery use nanorobots with nanosensors to target specific cancer cells and regulate drug release. Traditional chemotherapy drugs kill rapidly dividing cells, but they also harm healthy cells, causing side effects like immune suppression, hair loss, and organ damage. Nanorobots can deliver chemotherapy drugs directly to cancerous cells, minimizing damage to healthy tissue. By targeting only tumor cells, they reduce side effects and improve treatment effectiveness. These robots help maintain the correct drug levels in the bloodstream for longer, ensuring better outcomes for cancer therapies [20].

TYPES OF NANOROBOTS

1. Drug Delivery Nanorobots: Targeted delivery of chemotherapy drugs directly to tumor cells, minimizing side effects.
2. Diagnostic Nanorobots: Equipped with sensors to detect cancer biomarkers, enabling early diagnosis
3. Thermal Nanorobots:Use heat to destroy cancer cells selectively, often in combination with imaging techniques.
4. Gene Editing Nanorobots:
   Deliver CRISPR/Cas9 systems to modify genes in cancer cells, potentially reversing maligImmunotherapy Nanorobots: Enhance the body's immune response against tumors by delivering immune-modulating agents.

Applications

1. Medical Applications: o Drug Delivery: Targeting specific cells (e.g., cancer cells) to minimize side effects.
   o Surgery: Performing precise operations at a microscopic scale.
   o Diagnostics: Detecting diseases or biomarkers at an early stage.

2. Environmental Applications:
   o Pollution Cleanup: Breaking down pollutants at a molecular level.
   o Monitoring: Detecting hazardous materials in the environment.

3. Industrial Applications:
   o Manufacturing: Assembly of components at the nanoscale for electronics or materials.
   o Quality Control: Monitoring the properties of materials at the molecular level.

ADVANTAGES

1. Targeted delivery
2. Enhanced Efficacy
3. Reduce Dosage
4. Immunotherapy Enhancement
5. Multi Functionality

DISADVANTAGS

1. Cost
2. Public Acceptance
3. Limited Control

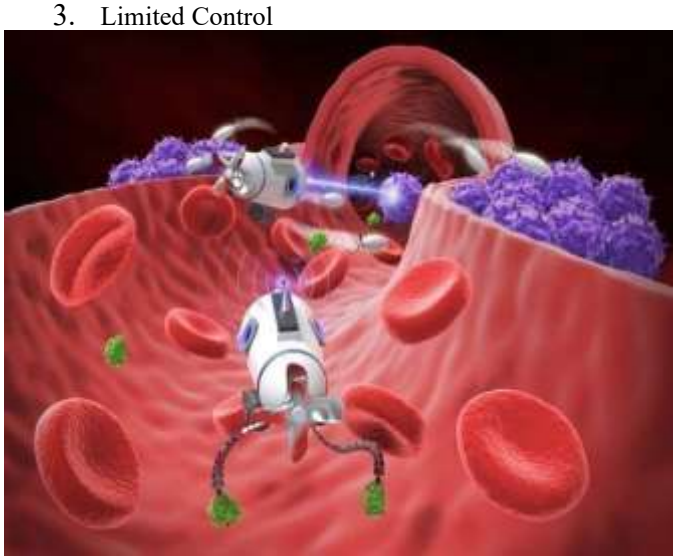


FIG**: 3 Nanorobots In Bloodstream**

The key components of nanorobots [Particularly in the context of cancer treatment.]

\focusing on sensors

1. actuators
2. propulsion systems.

1.Sensors

- Detect cancer-specific markers like proteins or enzymes.
- Types include chemical (biomarker detection), optical (fluorescence for visualization), and biosensors (antibody-based).
- Help monitor tumors in real time and target cancer cells precisely.

2.Actuators

- Convert sensor signals into actions like drug release or movement.
- Types: chemical (pH-triggered), electrochemical (electric field-driven), and thermal (temperature-based).
- Ensure controlled drug delivery and assist in navigation.

3.Propulsion Systems:-

- Allow nanorobots to move through the body to target tumors.
- Methods: flagellar motion, magnetic fields, or ultrasound waves.
- Enable precise navigation and adaptability in various environments.

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MECHANISM OF ACTION OF NANOROBOTS

Drug Loading
⬇
Nanorobots are equipped with the anticancer drug for precise delivery.
Targeting Cancer
⬇
Nanorobots use specific ligands to locate and bind to cancer cells.
Cell Entry
⬇
The cancer cell internalizes the nanorobots through endocytosis.
Drug Release
⬇
Inside the cancer cell, nanorobots release the drug into the cytoplasm.
Cancer Cell Death
⬇
The released drug causes the cancer cell to die by disrupting its function.

AIM: An Overview of Nanorobots in the Treatment of Cancer

The following are the goals

- Targeted Drug Delivery
  minimize harm to healthy tissue by precisely delivering chemotherapy or other treatments to tumor cells.
- Early Detection
  Improve biosensing and imaging capabilities to find cancer early.
- Minimally Invasive Surgery:
  Reduce recovery time and hazards by performing accurate cellular-level surgical treatments.
- Feedback and Monitoring:
  Provide real-time data for therapy modifications and continuously track tumor responses.
- Gene therapy:
  Make it easier for genetic material to enter cancer cells and alter or repair their DNA.

FUTURE ASPECTS

1. Precision Targeting
↓
2. Early Detection
↓
3. Minimally Invasive
↓
4. Multimodal Therapy
↓
5. Immune System Activation
↓
6. Overcoming Drug Resistance
↓
7. Theranostics
↓
8. Real-Time Feedback
↓
9. Cost and Accessibility
↓
10. Future Research
↓
Challenges:
Safet
Scalability
Regulatory Hurdles

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THE OUTCOME IS

Because they provide individualized therapeutic approaches, early diagnosis, and focused, precise medication administration, nanorobots have the potential to revolutionize the treatment of cancer. Drug resistance may be circumvented and more effective therapies with fewer adverse effects result from these developments. But there are obstacles to overcome, including making sure it's safe, scalable, and approved by the government. Nanorobots have the potential to be a vital tool in cancer treatment in the future, greatly enhancing patient outcomes, if certain challenges are resolved.

CONCLUSION

Through individualized therapy, early diagnosis, and targeted medication administration, nanorobots hold great potential for revolutionizing cancer treatment. They could provide a more efficient, less intrusive method of treating cancer by reducing side effects, improving therapeutic efficacy, and conquering obstacles like drug resistance. Furthermore, their combination of therapy and diagnostics (theranostics) creates new opportunities for dynamic treatment and real-time monitoring. But there are obstacles to overcome, such safety, scalability, and governmental approval. Nanorobots have the potential to transform cancer treatment and enhance patient outcomes and quality of life with further technological and scientific development

REFFERENCE

1. *U.S. Department of Health and Human ServicesNational Institutes of HealthNational Cancer InstituteUSA.gov.*
2. *© 2024 American Cancer Society, Inc. All rights reserved. The American Cancer Society is a qualified 501(c)(3) tax-exempt organization. Tax ID Number: 13-1788491.*
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A BRIEF REVIEW ON AN EMERGING TREND "LIVE-IN RELATIONSHIP"

Dr. K.V Amarnath, MA., Phd.
Former Teaching Assistant, Department of Sociology, Sri Krishnadevaraya University, Anantapur 515001. Andhra Pradesh. India.

ABSTRACT

In India, a Live-in relationship is no more an alien concept considering the changes in societal fabric and its choices. Still, the issue of acceptability of the live-in relationship sometimes crops up which mandates recognition of its existence and the need to accord legitimacy to the same. Considering, that right to marriage has been maintained as a fundamental right via a plethora of judgments; and further protection has been given in such relationships which do resemble marriage-like institutions; it is high time that live-in relationships should be given statutory recognition with similar conditions of eligibility which are applicable in marriage. Various committees and judgments have indicated the same, yet the live-in relationship has not achieved the statutory recognition which is long due. The issue is not of existence but of protection which is at risk considering occasional draconian judgments which refuse to consider the right to companionship as a fundamental right and put unwarranted insistence on morality and ethics even to protect life and liberty. The institution of marriage has itself undergone a major change, yet some parts of the society and legal system simply refuse to acknowledge the same. This paper is an attempt to focus on the need for legalization and legislation pertaining to live-in relationships which would recognize the right of companionship beyond marriage and would also accord protection of life and liberty in such relationships.

KEYWORDS: *Live-in-relationship, Marriage, Cohabitation*

INTRODUCTION

The institution of marriage is the foundation of peace and order of society and is considered as sacred even by those who view it as a civil contract. Under traditional Hindu Law, it is more religious than a secular institution. Marriage, whether considered as a sacrament or a contract, gives rise to a status. It confers a status of husband and wife on parties to the marriage, and a status of legitimacy on the children of a marriage. For a valid marriage, in most systems of law, two conditions are necessary; one is parties must have capacity to marry, and second is they must undergo the necessary ceremonies and rites of marriage.According to Ancient Hindu Law, marriage is the last of the 10 sacraments and is a tie, a sacred tie, a tie which can never be broken. It is a relation established by birth to birth. According to Smritikars even death cannot break this relation of husband and wife which is not only sacred and religious but is a holy union also. Once created this sacred tie cannot be untied. It is not a mere contract wherein a consenting mind is indispensable. The institution of marriage is a sacrament and not a mere socio- legal contract. Marriage improves, refines and ennobles the character.

In this era of urbanisation and industrialisation, when India is developing at a rapid pace, where the concept of morality is changing, marriage still holds an important and sacramental position. But it is also a harsh reality that in Indian society we are witnessing a change in the institution of family by way of live- in relationship. Live- in relationship has become an emerging trend of the modern society. The concept of live in relationship has posed an open challenge to the family system. A continues war is going on between the morals and the legal system as the former does not recognise live relationship because it is the institution of marriage and at large affects the basic unit of society that our family, whereas the latter does not constitute this act of living together by a man and woman as an offence. Live in relationship has posed several questions before Indian society. Marriage confers status of husband and wife on the parties of marriage, provides legitimacy to the children and confers certain rights on the spouses and the children. But accepting live in relationships and giving rights to women and children under it will certainly act as a challenge to the institution of marriage.

Since in our country certainly, marriage is still viewed as a Sacrament, the very mention of living in relationship has an alternative to marriage is hackles and sometimes even results in tragic consequences. The intelligence is not entirely sure what stand they should take and the law is ambivalent and about what is presently referred to as "Common Law relationship" or "cohabitation". The usual agreements offered by the antagonist of living relationship are that they are immoral, encourage promiscuity and anti-family. The central assumption in all of these relationship will we the strong family familiar ties that we, as Indian. see as emblematic of our culture perhaps it would be appropriate in today's climate of growing concern over climbing divorce rates to examine the issue of living relationship in slightly greater depth, a cursory glance at history suggest that marriage has been socially sanctioned form of fort of a better word co-habitation. In our country, marriage has been seen as a subset of the overall family structure and as an

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integral entity in family formation. Arguably, no other social institution has been accorded sacramental status, as have marriage and inevitably when an institution is considered sacrosanct, and attempt at tinkering with it bound to lead too much distress and even agitation. The expression live in relationship is synonymous with the term cohabitation. According to the Oxford advanced learner's Dictionary, Cohabitation means relation of living together of usually an unmarried couple. It has been explained as a living arrangement in which an unmarried couple lives together in a long term relationship that resembles a marriage. In other words, it can be said that live in relationship is an arrangement where two unmarried couples live together as husband and wife on a long term or permanent basis. The term cohabitation is also used to indicate the relation of long-standing living together of two homosexual people or of an unmarried woman with a married man.

Meaning of Live-In-Relationship

The relationship between law and society are intermixed with each other. And as per the Sociological school of Jurisprudence. "A functional study of law is applied to concrete social problems existing in the society in order to make law as an effective instrument of social control for harmonizing the conflicting interest of individuals in the society."

Definitions of Live-In Relationship

Some definitions of Live-in relationship are provided below:

1. American Psychological Association (APA) defined it as: "a living arrangement in which an unmarried couple lives together in a long-term relationship that resembles a marriage".
2. Cambridge dictionary defined it as: "Two people cohabit in the same house and have a sexual relationship, but are not married. They often referred to like live-in partners".
3. Oxford dictionary: "To live in the same house to share a home and have a sexual relationship without getting married".
4. Pew Research Center defined it as: "Unmarried couples who live together in a long-term relationship and share a household".
5. As per Merriam-Webster Dictionary: "an arrangement in which two people live together as if married".

The legal definition of live in relationship is "an arrangement of living under which the couple which is unmarried lives together to conduct a long-going relationship similarly as in marriage."

In brief, live-in relationship is a domestic arrangement where unmarried couples choose to live together in a long-term partnership, sharing a household and often resembling a marital relationship in terms of commitment and shared responsibilities, without the legal formalities of marriage.

Existence of Live-In-Relationship: Live in relationship have been there for many years, the only difference is that back then people were indecisive in revealing their status due to the fear of society, however a part of Indian population are openly accepting this kind of relationship in today's era. Although, this new form of family is unstable, it is natural and thus prevailing in western world. Therefore, it becomes necessary to know the rights & obligations for the partners living together without the marriage all around the world. In metropolitan cities of India this form has become an alternative to marriage where individual gives priority to freedom and people try to stay away from the responsibilities and obligations of a married life. The ambit and definition of live-in relationship is not much clear, there is lack of specific legislation in India on this subject as the laws to govern such relationship are in the form of court judgment. The verdict depends on the circumstances of each case.

Causes for increasing Live-in Relationship in India

1. Compatibility is the most important for the couples: Well in a country like India where the society is so closely associated with the rituals and usage, there is very little chance for the concept like Live in Relationship, but it's very astonishing to watch that the concept of Live in Relationship is tremendously increasing amongst youth in India and the first reason for spreading of live-in relationship in India is that in Live-in relationship you can check the compatibility with your partner and if after having a Live-in Relationship your personal bonding is not good then you can separate your ways easily and without any legal procedure but this is not possible in marriage. The marriage involves lot of legal and paper works for separation. Moreover there is lot of mental and physical, financial harassment in taking the divorce. So the concept of Live-in relationship is easy in terms of harassment marriage.

2. Inter religion or Love Marriages: Earlier in India marriage was performed under the guidance of family and societies. The Bride or Groom was selected according to the choice of elder people of the family. But now the concept of love marriages or inter-caste or inter-religion are spreading in India but the real problem lies in the marriage only so when two people are unable to do love marriages then they choose the way of live in relationship because the Live-in relationship is also a form of cohabitation where two people can live together without completing the formalities of marriage. Moreover the concept of Live-in relationship is also a secular process so people of two different religion, different age, different belongings, and different thinking can live together without any hurdle of religion or caste.

3. Fear of getting failed in the marriage: In the present time people are full of their work and professional life where there is no time for personal life and communication. So hectic lifestyle where people are busy with their own works and there is lack of communication are one of the reason for failure of marriages because people don't know how to manage the time problems and how to sort out the things. So people choose Live-in relationship because in most of the Live-in relation couples chooses same time job and they manage their time in efficient way for their relationship.

4. Hectic Court Procedure: After the failed marriage many couples faces lot of harassment and legal paper work for getting the divorce. Moreover having divorce is a expensive procedure as well lengthy procedure. The expenditure of lawyers, paper formalities and pending dates of the court are the biggest

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reason. So people are now afraid of marriages and aftermath of the failed marriage such as alimony, court cases etc. and the biggest is social stigma where the couple has to face lots of taunt and people used to watch them with a disgraceful eyes. People who have had failed marriages are moving towards a relationship in which they do not want to be tied up formally and where they can live a peaceful and respectful life and where they can avoid responsibility of marriage and aftermath.

5. Marriage is now a showoff event : Earlier the marriage was a sacrament but now with the changing time the marriage has became an event which is very expensive and people with limited income has started avoiding it because for marriage u need lot of money and u should be financial sound for bearing all the expenses of marriage. But in Live -in relationship there is no extra expenditure and people are also free from social boundaries of the society. Going in different cities for higher studies in this competitive world the youth is going away from their family for higher studies or for employment and when they go far away from their family then in the need of a company they opt for this concept of Live-in relationship. Earlier the youth especially the female folks were not allowed to go out for studies or for a job, but now the times is changed and girls are also doing great as boys so now parents are also allowing their and girls this trend has changed which has also given rise to live-in relationships because the youth finds it easy for themselves.

6. Globalization World: In the last century India has open the door for the world and for their economies so after the entry of various foreign economies and introduction of LPG concept in 1991 the Indian came in contact with the global world became more strong and transfer of technology to ideas were started and with the introduction of LPG the foreign MNC were setup and people of foreign came and with the arrivals of foreigners their culture also came and flourished in India this is another factor that is contributing to make the Indians understand that there is no harm in living in a relationship because this live in Relationship concept is very common in foreign countries where you can find a partner for yourself yet you do not lose your independence and do not come under any form of family pressure16.there are various social media platforms and dating apps which are prevalent in foreign countries with the help of them they can find a suitable live in partner for themselves.

7. Changing Lifestyle of the Present Generation: In the last generation the people were not too much interactive and there was no social media so people were not connected globally generally the people were less interacted and the people were not having scope of falling in love or adopting the concept of Live-in Relationship to the children or teenagers. But today's time is full of social media platform and after the emerging of Covid19 people started giving their time on various social media platforms like Instagram, facebook and online dating websites most where a person can easily come in touch with another random person and then he or she may exchange their information and choice and if they find themselves comfortable for each other then they may plan the things for staying together.

8. Use of Social Media: Today's young generation and middle aged person like to share their personal ,professional life events on various social media such as instagram, facebook, twitter and they prefer to make new friends through social media and now people make their fans on new apps like instagram, tinder and all so this gives them a enough opportunities to make new friends and to fall in love if they find compatible with each other. And use of social media is one of the reason for increase in Live in Relationship rate in India and reason why social media is boosting the rate of live in relationship because the social media is really popular and its‟ safe and secure where you can hide their personal identity and they can pretend someone else. But active platforms like Face book, Instagram bring anonymous people together and in big cities they can easily get connected with each other.

Another reason for the growth of Live-in relationship is that our movies although it's a minor cause but the impact of movies is too much on the people and youth starts following blindly so this is also one of the reason.

9.Delay age of Marriage : In the past decades the age of marriage was very less and in British time the age of the girl was just 14 years so the average age of Indian boys and girls was very less and the concept of child marriage was so high so person's were unable to enjoy their single life and they don't even get the opportunity to think about the Live-in-Relationship But with the change in time and society the situation is just opposite with the increase in the age of marriage, or with the late marriages there is ample opportunities for a person to enter into the concept of Live-in Relationship and due to various factors like education, age and search for job, unemployment the time period for

10. Economic Independence of the younger generation: Earlier the youth, especially in metro cities wants to be financially independent and they want to have their life as per their choice and for that they don't want to depend financially on their parents. And after the pandemic time lots of youth are engaged in various online platforms from which they are earning enough money for their survival for example making Web series and YouTube contents from their home and thus they are giving less burden on their parents. So through various means and sources the youth is getting financially stable. Thus, their dependence on their respective families marriage is getting increase. has reduced and when they are not economically dependent on their families then can live their life's in their own ways.

11. Decline of moral and social ethics amongst present generation: India is the land of culture, values, tradition and in early times the joint families were existing in early times. The emphasis was given on the social, moral values of the children. The parents used to teach their children's to preserve the cultural bond but at present times things are changed parents are busy in their personal lives and there is clear cut communication gap between the family members and in this world of globalization and social media everyone is busy in doing personal works and the younger one don't get the proper moral values in the family so they become emotionally weak

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and they cut of themselves from the families and they make their own world where the interference of the family and family members is very less and usually people lacks emotional support which they get from other people.

12. Staying Away from home : Now-a-days many people, either for the purpose of education, jobs or for any other purpose etc., live out of town or out of country or from their homes because they are not getting jobs in their local cities or in their respective areas or state. Thus, they are not in the direct control to their families. Also, the builders are giving pressure to give their flats to married couples or family members so for dividing the rents and other expenses in an metro cities areas they go for live in relationship and they find the Live-in relationship as pocket friendly and at the same time giving opportunity to have a enjoyment.

13. To reduce stress and to remain independent lives: When a girl or a boy goes outside then they feel many unaccepted situations where they get stress and apart from un expected stress they also have the stress of the families, work pressure, future problems and many other types of problems so they start finding someone with whom they can have a tension free lives and at the end they get success by finding someone with whom they can enjoy their lives.

14. Today's life is full of work pressure: pressure of job and when a person thinks about live in relationship his or her priority is to find someone who is exactly as like him or her means they should be from same job or profession or if they are from different job then their level of compatibility should be good enough.

Benefits of having a Live-in Relationship

In India every coin has two perspectives one is positive and second is negative and same is with Live in relationship there are various pros and cons of live in relationship so we will analyze. The world is created by the god and man is consider as the most wisest creature amongst all of the creature which is created by the god but people for their benefits enter into the concepts of Live-in relationship some of the pros and cons of having Live-in relationship. The Live-in relationship offers various types of freedom to the person and some of them are;

1. Freedom from Social Bonds and tie-ups: Like marriage, Live-in relationship is not surrounded with any legal contract or any social contracts or social bonds. So man and woman having a Live-in relationship are free to live their lives as per their choices and in their comfort zone. They cannot be forced to attend family events and other events against their wishes. Moreover the problems of social bonds are less in Live-in relationship and mostly they don't care about the society. Moreover the couple gets enough time for themselves to know their partner in better way.

2. Freedom: The most important reason for choosing for the Live-in relationship by the majority of youth is that they wants freedom and they want to enjoy that freedom in every possible manner in which they can enjoy. The Live-in couple can live together as per the wishes and will of each other. They can divide their work, can share professional life's and can do whatever they want to in their life as per their choice. If they feel that they should go outing on Sunday then they are free for to go out on Sunday so no one is their to prevent them. On the other hand in marriage you have so much work load plus there is so much of pressure of family as well as the society. Plus in marriage the interference of the society is very much as compare to live-in relationship. Plus in Live-in relationship the couples are sole responsible for their good and bad present & future. So it's the sole responsibility of the partner for their acts and all. In Live-in relationship people enjoy their life as per need and comfort zone.

3. Financial Relaxation: This is the most important thing that creates a huge difference in the concept of marriage and Live-in relationships. Generally in married life couples are worried for their present and future as well they are concerned for their savings and deposit. Moreover the married couples show more attention to balance the needs of the family and to act the earning potential of the couple. But in Live relationship both the parties earn and spend as per their needs and it's totally up to them weather to save the money or not to share the savings.

4. Less Responsibility in Live-in relationship: The marriage is full of responsibilities first of the families then for personal responsibility and at the end for their children's and societies. Couple is occupied always with burden of responsibilities and they don't get time for themselves but in the Live-in relationship the people are having less responsibility for themselves so there is peace , love and personal space they can love their life with less tension and they life is better than married couples.

5. No need of divorce just replaces the partner: In marriage if partner is not happy then they don't have chance to leave or separate themselves from their married partner without obtaining the divorce. But If a partner is not happy or bored of living with him/her then he/she can quit from live-in relationship and choose another partner without any feelings and legal procedures as they define themselves before entering into the landscape that their journey would be a temporary drive. Whilst in a marriage, you cannot quit from the knotted relation if not interested to stay anymore. You need to go for legal proceedings to get divorced with the acceptance of both the parties in the presence of the court.

Disadvantages of Live-in Relationship: The biggest disadvantage of having a Live-in relationship in country like India is that it's against the cultural and traditional aspect of the India. Because as we all know that India is the land of culture beliefs and rituals and Indian love to protect the culture and marriage in India is a culture only so the concept of Live-in Relationship is not accepted by the society members easily plus the marriage is socially and legally accepted form of staying together. Plus in Live-in relationship women's and children if born in Live-in relationship are most suffering person.

So if a person is having a Live-in Relationship in India and if he or she is living in non metro city then it's very difficult for them to sustain in society because the view of society is not

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appreciating in India and If you are in love with someone and you are serious for his or her then trust him or her and what is the hesitation of giving someone his or her name so if someone is serious marry him and start your life together because in India at present time the marriage is the best approved and stable form of cohabitation because there is stability and people come with the intention of staying together, there is support of family and elders guide and share their experience in tough time of the marriage and all these things generally lack in the Live-in relationship Because most of the people of our parents will not accept the concept of Live-in relationship in present times. Even in India the Bollywood actor and actress even prefer to get married and have a settled life with their partner because Live-in relationship is a complicated arrangement of staying together where things aren't clear and nor the rights are clearly mentioned in any law or ordinance.

Secondly the present form of Live-in relationship is inspired from the foreign countries so here question arises things which are suitable for foreign countries are suitable for Indians too? Does everything the western do is correct or we should follow them blindly ? Answer is NO. Indian's have their own culture and traditional beliefs so why to adopt the foreign culture and beliefs when we have our own form of cohabitation which is best in the world and most approved form of cohabitation. So instead of giving priority to the concept of Live-in relationship which is not socially nor legally acceptable at current tie the youth go for the marriage. India is also known for its moral values and ethics. And now the western countries are getting attracted towards and now the western people are attracting towards India because the love & care they found in Indian families (note family can be created only when a person get married), is it reasonable to follow live-in-relationship, just to show you modern and trendy.

The opinion of Couple having a Live-in relationship is different some finds it that it helps in growth of the individual so are they saying that marriage does not let grow any one? But we have seen so many successful marriages and the real thing is that growth does not depend on the type of relationship but on how you handle the difficulties. One more severe problem with the Live-in relationship is that Live-in relationship are not stable form of relationship and they are fully in secure, it gives the joy of four days but there is no guarantee that it will help you for long life .Moreover the Live-in relationship has became a source for fulfilling the physical needs of the body nothing more than that. And after all we all are human so we should show a civilized behavior can help to clear the difference between them and to make marriage best option.

The biggest disadvantage of Live-in relationship means the Live-in relationship lacks the "commitment". A small fight, disagreement can end this relationship and any of the partner walk out from a small fight. Whereas, when couples are married they try to make every possible efforts to save their relationship and they seeks to find a permanent solution for that problem and to save the marriage from divorce. In marriage there is pressure of families to both husband and wife so in case of arguments or misunderstanding the families. It is true that in a live-in relationship where there is no financial, social and legal binding, so the door out is always open for the couples. The women's in the Live-in relationship is biologically, physically, mentally and emotionally is at worst receiving and when Live-in relationship gets failed then they get hurts emotionally, mentally and physically.

In our existing society, which is patriarchal in nature and where patriarchal norms are followed where women are the ones who suffer the most and burns of stepping out of conventions. Then it becomes very difficult for them to find a good and understanding spouse after being in a live-in relationship with someone else because they have already lose their trust their confidence and their love so it's very difficult for them to trust again someone. In many cases we have witness that women are subject to cruelty and they are openly misbehaving with them so it's a tuff call for the women to choose the Live-in relationship wisely.

The concept of live in a relationship, like homosexual is not just an ordinary thing for Indians now. Some of the Indians have adopted western culture and are very happy with it. But, still there are majority of people who know their culture, rituals, morals and values and are responsible citizens of India who are in favor of following the culture of India and are the torch bearers of Indian culture and traditions in our society.

The people having a Live in relationship, thinks that it will reduce the rate of divorce or chances of divorces but at the same time the concept of Live-in relationship increases the chances of un wanted pregnancies and there are probable chances that women are treated with cruel nature and in most of the cases they are physically tortured too. So live-in relationship is not everyone cup of tea it is a roller coaster where you have to face up & downs. The Live-in relationship is also shameful for the parents also because the people of the societies question about the upbringing of the children because having a Live-in relationship is very tuff call and it's still practiced as a taboo and its seen with disgraceful eyes.

The concept of Live-in relationship is still a taboo and it has societal pressure so the nature and behaviors of the couples gets changed and they start behaving in unusual way so it's very difficult for them to handle the same relationship but with attitude and changed circumstances. The Live-in relationship lacks the respect and there are enough chances that both man and women are exploited in Live-in relationship so it's a risky concept.

Although there are hundreds of couples who choose to Live-in relationship society still applies a stigma to such marriage. The most of the people from our society see Live-in relationship as taboo and moreover the people watch it as taboo or sin. On the different side the marriage is still worshipped, despite the rise in number of judicial separation, divorce and relationship problems. Subsequently it can be said that pattern of Live-in relationship generally exist in metro cities or in corporate cultural societies but not in rural and various legal social and violation of cultural trends.

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So the marriage is the best approved form of cohabitation in the present time and there is need for having a proper codified law on the Live-in relationship else things will be problematic for the couples as well as for the societies.

Impact of Live-in Relationship

Since India is gradually adopting the western culture and ideas and mainly the concept of live- in. Years ago, live-in relationships were considered to be a sin or something the society would never accept in India, but now that belief has started to change and a lot of couples have started to adopt the trend of live-in. While the live-in trend has started to grow a lot but still there are couples who are not able to take the big step due to the huge embarrassment or an assault they have to face from society.

Few of the couples are lucky enough to find an approach to legal rights, while few still struggle with the fact of being considered as legal strangers living together. Looking at the brighter side, we can consider that couples really get to spend time in knowing each other before making the big decision of getting hitched. However, legal rights have been given to people who really do not wish to tie the knot and make a decision to carry on with the live-in instead of marriage.

One thing which we have to consider is that our Indian society does not and would never give the same respect to the couples in live-in as they give to the ones who are married. Even in the 21st century, couples in live-in are seen as some sought of criminals. Another big issue which arises when the couple is in live-in is that what if there are children born out of the relationship and as per The Hindu Marriage Act,1955 "children born out before marriages are considered to be the legitimate children of their parents, however, the problem arises when the couple decides to live apart and none of the parents is keen to take responsibility of the child", in that case, one of the parents have to adhere to the responsibility of their child and for securing the respective legal rights for the child. One of the guardians has to take the responsibility and the child must get his rights in all the properties out of their father or mother. An example is a famous case of SPS Bala subramanyam v. Scruttayan, which was held by the Supreme Court that stated, "that if a man and women are living together for a considerable period of time then it would be presumed within Section 114 of the Evidence Act that they are husband and wife and children born will be legitimate children".

One thing which we can clearly see in Indian society is how much they value and protect their traditions. Live-in, according to the society is totally opposite from the traditions of the Indian society that is the reason for the low acceptance rate of live-in relationships in India. The couples are not wrong for the conceptual fact that if they have to spend their whole lives with someone, they must get to know them completely but on the other hand, we cannot judge people who do not support live-in relationships. Hindu marriages are seen as an eternal union of two souls and according to them live-in relationships are unrighteous but we should realize that everyone should have the right to live their lives according to their own will and however they want. It has been highly appreciated that the Indian judiciary has given legal rights to the couples for live-in. India is a developing country and any changes or developments should be openly welcomed. The problem lies only in the Indian society and our habit of judging people for making choices they want. It has also been found out that people fear marriage because of the fear of divorce and hence, they prefer live-in relationships. But as we say nothing really escapes without its drawbacks and hence there are some pros and some cons to live-in relationships.

CONCLUSION

Live –in-relationship has increasingly seen in India's metro cities, though through it adult couples get the freedom of choosing their partners in a better way even without taking any responsibilities and commitment. But the concept of marriage is still hold its position in the society because it is an universal phenomenon for the adult couple to stay together with all kind of emotions, responsibilities and respect to each other. The females and the children are getting better acceptance in the society through marriage rather live ins. Live-in relationship may be ok in some circumstances but the importance of the institution of marriage for maintaining the social order cannot be denied.

We may conclude by saying that if we compare the Live-in Relationship with the marriage then we come to know that the couples who are practicing the Live-in relationships are not married and they are not having intention to marry each other also but because of some reasons they are living together under a same roof and enjoying the company of each other. With the growing time and evolution of the society the concept of cohabitation also got changed previously marriage was the single form of cohabitation between man & women which was prevalent their at that time but with the passage of time and our Indian society and culture has got a tremendous change and the living style as well as another form of cohabitation got introduced in the Indian society and that form of cohabitation is known as Live-in- Relationship. There are various causes for increasing Live-in Relationship in India like Compatibility is the most important for the couples, Inter religion or Love Marriages, fear of getting failed in the marriage, hectic court procedure, marriage is now a showoff event, going in different cities for higher studies, globalization world, changing lifestyle of the present generation, use of social media, delay age of marriage, economic independence of the younger generation, decline of moral and social ethics amongst present generation, staying away from home, to reduce stress and to remain independent lives and today"s life is full of work pressure.

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LIVED EXPERIENCES OF COMBATIVE SPORTS ATHLETES IN THE FACE-TO-FACE SET-UP: MAINTAINING WEIGHT DIVISION IN FOCUS

Lyka E. Delos Reyes, Dominic M. Dizon
Master of Arts in Education major in Physical Education, St. Mary's College of Tagum, Inc. Graduate School Department, Tagum City, Philippines

ABSTRACT

This phenomenological study aimed to describe and understand the experiences of combative sports athletes in maintaining weight division in the face-to-face set-up. In addition, this study also wanted to know the coping strategies and mechanisms of combative sports athletes and their insights into maintaining weight division. This study involved fourteen (14) students, seven (7) of the 14 participants were subjected to an in-depth interview (IDI), while the remaining seven (7) took part in a focus group discussion (FGD). Purposive sampling was used to select participants; data were gathered through in-depth interviews and focus group discussions. The results revealed six (6) major themes of the participants' experiences: acquisition of essential attributes, progress in health and wellness, negative feelings from weight loss struggles, issues in physical and mental health, issues with food management, and achievement of set goals. Moreover, the participants revealed their coping strategies and mechanisms to confront their challenges in maintaining weight resulting in the emergence of four (4) themes: employing self-help techniques, managing food and drink intake, seeking guidance from mentors, and acquiring practical and emotional support. Lastly, the participants shared their insights that revealed four (4) major themes: giving value to weight management, having a positive disposition, ensuring a healthy lifestyle, and advocating the importance of preparation. Regardless of the difficulties presented in maintaining weight division during the face-to-face set-up, combative sports athletes work hard to overcome the challenges and explore different strategies to achieve the set goal.

KEYWORDS: *athletes, combative sports, weight division, maintaining weight, weight management, experience, face-to-face set-up, phenomenological inquiry, qualitative research, Carmen District, Davao del Norte.*

INTRODUCTION

Weight divisions are typically used to separate competitors in combat sports to promote fair competition. Combat sports events include boxing, arnis, wrestling, judo, karate, taekwondo, wushu, and mixed martial arts. Moreover, athletes prioritize their nutrition and focus on training exercises to achieve the desired weight requirement and be qualified to compete in their sports events, these athletes are consciously trying to reduce, increase, or maintain their weight. However, for the past years since the pandemic, the closure of schools and suspension of organized sports activities have directly affected student-athletes. Thus, inactivity and poor nutrition among combat sports athletes increased, resulting in weight gain as observed in the return of face-to-face classes.

In Malaysia, combat sports athletes who weighed more and had a high body mass index were under pressure to lose weight and turned to more extreme loss of body weight procedures to reach their weight division (Xiong, et al., 2017; Castor-Parga, et al., 2021). In Japan, a study by Kobayashi and Kida (2022) states that during the return of classes, high school Japanese boxers gained weight and had to reduce weight through diets and a reduction in water intake to obtain an edge over opponents' physiques, which places a physical and mental strain on the athlete. Furthermore, in Korea, combat sports athletes go to extreme lengths of fasting, saunas, vomiting, and laxatives to lose weight quickly and to be categorized into a lower weight division (Sundgot-Borgen & Garthe, 2013; Miles-Chan & Isacco, 2021).

Moreover, in Manila City, Philippines, a study by Puen et al. (2021) showed reports of reduced exercise and an increase in sedentary lifestyles among student-athletes during school closure. The implications of this observation could be connected to the findings that both male and female combative sports athletes experienced weight gain and an increase in BMI (He et al., 2021). In the Division of Davao del Norte, particularly in Carmen District, coaches in combat sports had noticed the weight gain of athletes as they returned to face-to-face classes. In support of this claim, athletes were having struggles in losing weight before the sports competition and some of them did not qualify to compete in their division due to weight problems. Despite the efforts of the coaches to provide weight management strategies, there were still

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athletes who forgot the importance of weight practices and made unwise dietary decisions.

PURPOSE OF THE STUDY

The purpose of this phenomenological study was to describe and understand the lived experiences of combative sports athletes in the Division of Davao del Norte, particularly in the Carmen District in maintaining their weight division in the face-to-face setup. Furthermore, this study encouraged them to share their coping strategies and insights in maintaining their weight.

RESEARCH QUESTION

The study aims to answer the following research questions:
1. What are the lived experiences of combative sports athletes in maintaining weight division during the face-to-face set-up?
2. How do combative sports athletes cope with the challenges of maintaining weight division during face-to-face set-up?
3. What insights can the athletes draw from their experiences on maintaining weight during face-to-face set-up?

REVIEW OF RELATED LITERATURE

Combative Sports in the Weight Division

Athletes are classified into weight divisions, primarily known as combative sports (Barley et. al., 2019). Combat sports weight division regulations were created to provide each participant with a fair opportunity to participate in their respective category (Lakicevic et al., 2020). Similarly, weight divisions in combative sports are employed to guarantee that athletes' body masses are equivalent, considering that this could have an impact on the endurance, strength, and power of players. Establishing safe and equitable competition is the main objective of this sport (Taim et. al., 2023).

Experiences of Combative Sports for Student-Athletes in Maintaining Weight Division

Maintaining a particular weight division is essential both for fair competition and success in combative sports. This is made more difficult for student-athletes by the additional demands of their extracurricular activities and academics (Santos & Mallari 2021). Athletes trying to lose weight often suffer from emotional and intellectual issues, which impact their studies and sports performance (Zhong et. al., 2024). Moreover, student-athletes' performance is impacted by weight management and changes in physical composition, which are essential components for tournament preparation (Langan-Evans et al., 2020).

Coping with Challenges in Maintaining Weight Division in Combative Sports

Coping strategies help student-athletes when faced with disappointments, problems, and stresses of life due to maintaining weight division being affected by the objectives of seeking performance success (Vealey, 2024). Thus, appropriate coping techniques, including optimism, seeking social support, and proactive stress management are beneficial for maintaining combative sports athletes' well-being and aiding them in overcoming discomfort and stress (Daumiller et. al., 2022).

Insight of Maintaining Weight Division in Combative Sports

Athletes choose the desired food that addresses recovery and enhances performance by carefully planning, testing, and consulting with a sports nutrition specialist (Štangar et. al., 2022). Also, coaches and athletes ought to engage with nutrition and educate themselves on tactics for maintaining weight before significant matches and constantly improve this procedure to optimize opportunities according to the sport's rules (Rueda Flores et. al., 2023).

METHODS

Research Design

This qualitative research utilized the phenomenological design in delving into the lived experiences of combative sports athletes in maintaining their weight division in the face-to-face setup. Bhandari (2023) asserted that qualitative investigation is utilized to gain insight into how others perceive the world. This methodology appears to be adaptable and focuses on maintaining rich meaning while evaluating data. In this study, the researcher chose a qualitative phenomenological design considering that the data was collected based on the actual experiences of combat sports athletes in maintaining their weight division by means of interviews. Every information collected was utilized for analysis, interpretation, and understanding of the phenomena highlighted in this study.

RESEARCH PARTICIPANTS

The participants of this phenomenological study were high school combative sports athletes. There was a total of 14 participants in this study, 7 of them underwent in-depth interviews while the other 7 were asked to join a focus group discussion. Moreover, in determining the number of participants, the researcher adhered to the recommendation of Creswell (2013) as cited by Ishtiaq (2019) that the studied group have three to 14 members. Purposive sampling was used by the researcher to select participants for this study. As stated by Andrade (2021), purposive sampling is defined as having characteristics that are relevant to the study. The participants were determined by using criteria that allowed the researcher to collect accurate data on the combative sports athletes' lived experiences with the phenomenon that is under investigation.

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RESULTS

Table 1
Major Themes and Core Ideas on the Lived Experiences of Combative Sports Athletes in Maintaining Weight Division During the Face-to-Face Set-Up

Major Themes	Core Ideas
Acquisition of Essential Attributes	• earned self-discipline and a positive mindset in overcoming challenges • attained self-control and adjustments in maintaining weight • perceived improvement in performance during training and physical activities • gained self-confidence after the consistent training experience • felt fearless after gaining self-confidence every weigh-in
Progress in Health and Wellness	• acquired health benefits and social relations because of losing weight • improved eating habits and achieved a balanced diet for a healthier body • performed actively both work and school-related activities after losing weight • enjoyed training activities with friends when maintaining weight • expressed satisfaction and enjoyment in training and maintaining weight with teammates
Negative Feelings from Weight Loss Struggles	• felt hopeless amidst weight challenges • experienced difficulties during weigh-in as it is a must before playing a game • confused and doubtful of the chosen sports because of the difficulties • developed fear and trauma during weigh-in due to a bad experience
Issues on Physical and Mental Health	• experienced physical and mental health issues due to the demands of losing weight • struggled in balancing school duties and sports responsibilities because of keeping up with the demands of losing weight • had trouble losing weight which resulted in taking supplements for weight loss with side effects • obtained injuries and health risks due to extreme weight loss methods
Issues on Food Management	• felt hopeless despite the effort of food resistance and training due to weight loss • had an imbalanced diet leads to a lack of bodily strength • had trouble in resisting and overcoming temptations to achieve the target weight • had internal conflict in dealing with eating habits to maintain weight • experienced food restrictions and extreme limitations amidst weight loss
Achievement of Set Goals	• achieved target weight and won the game because of persistence • attained goals due to hard work and persistence • achieved target goals regarding the desired weight • appreciated the impact of coach and trainers towards acquiring control and self-discipline • attained satisfaction and mindfulness after getting the desired weight • thought of enjoying the game despite the agitation felt during weigh-in.

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Acquisition of Essential Attributes

This was supported by the claims of IDI-01 who mentioned:

The positive thing that I have experienced is that I acquired self-discipline. I always think that I can do it, I can lose weight, and that I will not lose hope even if it's hard.

IDI-03 also added that:

I can easily adjust and control what I eat to maintain my weight according to the category that I'm in. I'm happy that I can just play without thinking of any problems.

Progress in Health and Wellness

Most of the participants expressed their notable progress in their health and wellness.

My body can't easily acquire disease. IDI-02

I learn how to maintain my weight and the proper way of eating to have a balanced diet. IDI-04

Negative Feelings from Weight Loss Struggles

Participants shared their struggles and the challenges they had to face to achieve their desired category.

Negative experience that I have is that I cannot avoid being hopeless. I keep on thinking that I cannot keep up with my weight and just want to give up. IDI-03

During training, it is so painful. I am doubtful as to why I have chosen this sport but I realize that it's my passion. FGD-02

Issues on Physical and Mental Health

Participants pointed out their troubles, frustrations, various side effects, and health risks due to the demands of losing weight.

It's one of those times when I got sick. I would lose my appetite and I would stop eating. It was difficult because I kept thinking about my weight, and my mental health was also affected. IDI-05

I don't have a proper cycle of sleep, diet, school, and training. I cannot rest well. It's difficult to keep up with both school activities and training. I don't have enough sleep and proper food intake. IDI-07

Issues in Food Management

The participants spoke about the issues they encountered in food management such as extreme food limitations and restrictions.

When it comes to food, I rarely eat, I only ate 2 spoons when losing weight. IDI-01

I tend to skip meals and sometimes forget to eat 3x a day. I only eat biscuits. IDI-04

Achievement of Set Goals

Athletes in combat sports have stated that one of the most crucial abilities to have is goal setting, which helps them provide their best effort. They shared how it helped them focus on what is important and gave them a sense of control and positive self-direction.

I continued training even if it was difficult. I hit my target weight and I won. I didn't give up even though my mind kept telling me that I couldn't do it but I fought and gave my all just to win. IDI-01

I felt relieved knowing the result of what I did. When I qualified, I was the happiest. IDI-03

Table 2
Major Themes and Core Ideas on the Coping Strategies of Combative Sports Athletes with the Challenges in Maintaining Weight Division During Face-to-Face Set-Up

Major Themes	Core Ideas
Employing Self-Help Techniques	• training independently and imposing self-discipline and self-control to maintain weight • innovating own techniques such as jogging and walking that are all relevant for weight loss • overeating by underweight athletes before or on the day of weigh-in to avoid unnecessary problem • focusing more on training than losing weight alone to ensure effective game performance • applying regular exercise and weight loss methods to maintain weight
Managing Food and Drink Intake	• eating healthy foods such as vegetables and fruits to overcome challenges • controlling food intake and avoiding temptations to maintain weight. • drinking warm water and avoiding sugary foods and drinks to avoid gaining weight • training and eating twice as much for underweight athletes before the game • Drinking only half-glass of water to maintain weight
Seeking Guidance of Mentors	• receiving the dos and don'ts of being an athlete from the coach which is essential for weight loss • getting constant reminders from coaches and trainers on food consumption • listening and following coaches' instructions to be productive

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	• looking for assistance and guidance from a coach regarding a healthy diet
Acquiring Practical and Emotional Support	• making relevant people a source of motivation to overcome challenges • looking after rewards and motivation from important people • working together with my coach, friends, family, and teammates to avoid being disqualified • getting constant reminders and guidance from loved ones to be ready for the game • sharing weight loss journey with family to build a support system • recognizing family, friends, coaches, and trainers as sources of motivation

Employing Self-Help Techniques

As to the exact example of how athletes innovate, IDI-01 narrated:

Our strategy during training is even though we don't have a trainer, we still do our best to learn about our sports. We are trying to train even if it's just me and my teammate. We jog and we maintain the food that we eat, we avoid eating much.

Comparatively, IDI-05 stated:

I was doing my own strategy to lose weight. It was effective so I did it every day. When I come home from school, I jog around the oval for about an hour with a weighted sandbag attached to my feet.

Furthermore, FGD-02 explained a strategy that was used to lose weight by sharing:

When we did some kicking every morning, we wore heavy clothing. We also wear weighted sandbags to lighten our kick.

Managing Food and Drink Intake

Combative sports athletes divulged their ways and strategies in managing the food and drink that they consume through eating healthy foods and drinking the right liquid.

Just eat fruits, vegetables, and healthy foods. Don't overeat. Get exercise and warm up. IDI-02

Drink warm water instead of cold. Also, avoid soft drinks because it adds up to my weight. Then, less your sugar intake. FGD-01

Seeking Mentors' Guidance

Combative sports athletes maintain weight division, they also appreciate the guidance of their mentors, trainers, and coaches.

Our coach kept reminding me about self-discipline, they told me about the dos and don'ts of losing and gaining weight, and always on my side reminding me about the restrictions. IDI-01

I listen to the coaches on how to maintain and lose weight. I follow instructions on what to eat. I also exercise alone after training and sometimes we jog outside. IDI-04

Acquiring Practical and Emotional Support

Participants make relevant people as their source of strength and motivation.

One of the strategies is that I get strength from people around me. That is my motivation. IDI-03

My teammates, coaches, and even my friends motivated me. They told me that I could get the prize if I kept on training. IDI-04

I can say that my family, loved ones, and relatives are my supporters. IDI-07

Table 3
Major Themes and Core Ideas on Insights of the Combative Sports Athletes on Maintaining Weight During Face-to-Face Set-Up

Major Themes	Core Ideas
Giving Value to Weight Management	• Emphasize the need to maintain weight to avoid disqualification • Striving hard to overcome the fear of disqualification by maintaining weight • Considering weight as a responsibility of an athlete to qualify for a game • Right weight is a prerequisite to qualify for a game • Stress the importance of maintaining weight to avoid self-loathing and regrets • Emphasize the importance of self-discipline, a balanced diet, and active listening to coaches • Implementing a healthy diet and strict weight management
Having a Positive Disposition	• Determination and discipline is important in overcoming struggles • Promoting the right attitude in managing weight • Advocate self-discipline and respect for teammates and sport • Encourage self-discipline and a positive mindset to achieve target weight
Ensuring a Healthy Lifestyle	• Being careful of what you eat is important in maintaining weight • It is a must to have a balanced diet and regular exercise

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	• Promote a healthy diet and self-control to avoid difficulties • Food consumption is integral in maintaining weight
Advocating the Importance of Preparation	• Preparing for weight loss should be done ahead of time rather than forcing it. • Emphasize training time as preparation time to ensure an equipped body. • Emphasize the importance of preparing ahead of time to avoid unnecessary weight loss methods.

Giving Value to Weight Management

For combative sports athletes, maintaining weight division is very important to be qualified in the game and to avoid disqualification. Since maintaining weight is undeniably challenging, the participants of this study gave value to weight management.

This is especially true as IDI-01 said:

What's important is that you maintain your weight so that you can play all the time. If you are underweight or overweight, most likely you will be disqualified. You will not be able to play, and will not be given the chance if you don't meet your expected weight.

In addition, IDI-02 commented:

Maintaining weight is important, if you can't maintain your weight, you will be disqualified.

IDI-03 also emphasized the importance of weight management:

It is important because in combative sports, weight is one of the athlete's responsibilities. Maintaining your weight is needed because if you can't qualify for your weight category, you will no longer be able to play.

Having a Positive Disposition

Through learning determination and discipline in maintaining weight, IDI-01 exclaimed:

I've learned that it's never easy to catch up with your desired weight. There will be a lot of struggles that you must go through, but you need to overcome them, you must be determined to maintain your weight. Determination is important because if you're too lazy, you won't gain anything.

Moreover, FGD-03 emphasized self-discipline and respect:

It is not just about health, it's also about your discipline as an athlete and respect. You should respect the sport and your teammates because if your weight is affected, the rest of the team will be affected too.

Ensuring a Healthy Lifestyle

According to the responses of the athletes as participants, the best approach to keeping healthy is to lead an active lifestyle, engage in regular exercise, and follow a balanced diet

Be mindful of what you eat, listen to whatever that coach says, eat healthy foods, and drink lots of water. IDI-02

Have a balanced diet, then exercise. IDI-04

If you are trying to lose weight, make sure to have a healthy diet. You should know how to have a balanced diet, and how to control and limit yourself. FGD-01

Advocating the Importance of Preparation

Don't neglect your weight. Be prepared as early as possible, and pay attention to getting the right weight. IDI-03

You should prepare ahead of time so that during weigh-in or game day, you don't have to worry about your weight anymore. FGD-06

The responses of the participants imply the importance of preparation to them as athletes.

DISCUSSION

The Lived Experiences of Combative Sports Athletes in Maintaining Weight Division During the Face-to-Face Set-Up

Acquisition of Essential Attributes

Participants increased their willingness to participate in combative sports by acquiring self-discipline, a positive mindset, self-control, and self-confidence. This study result is supported by the study of Bédard Thom et al., (2021) states that attributes assessed in combative athletes include self-efficacy, self-confidence, self-expectations and motivation. In addition, Kostorz et al., (2019) expressed that combative sports are intended to foster self-control, determination, and self-discipline.

Progress in Health and Wellness

Combat sports athletes acknowledged that combat sports provide a dynamic and effective way to manage their weight and improve their health and wellness. Relevant to this, Görner et al., (2019) stressed that fitness, autonomy, mental wellness, and physical health are the four main goals for martial arts practice. Furthermore, this result supported the study of Theeboom et al., (2021) which indicated that combative sports practice is primarily motivated by four factors: self-determination, physical activity, mental wellness, and physical well-being.

Negative Feelings from Weight Loss Struggles

Student-athletes shared that they also felt hopeless amidst their weight challenges and that they experienced difficulties during weigh-in as it is a must before playing a game. In consonance with this notion, studies by Steen and Brownell (2020) specified that weight-loss athletes showed low energy levels, unfocused, low self-esteem, and memory retention. Likewise, Degoutte et al., (2021) mentioned that athletes undergoing weight loss, struggled with attention and concentration which easily got distracted during the game, leading to low performance.

Issues on Physical and Mental Health

Participants experienced physical and mental health issues due to

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the demands of losing weight. To support this idea, Martínez-Aranda et al., (2023) revealed that restricting the water and food intake of combative sports athlete while seeking to lose weight can have a detrimental effect on their physical and mental health by increasing stress, frustration, exhaustion, anxiety, and weakening their fitness level.

Issues in Food Management

Combat sports athletes shared how they had an imbalanced diet that led to a lack of bodily strength and that they had trouble resisting and overcoming temptations to achieve the target weight. According to the findings of the study conducted by Bagot et al., (2024), shows that athletes participating in combat sports frequently follow diets that defy these guidelines and start restricting their calorie intake by fasting and dehydration. Furthermore, combat athletes drastically restrict their carbohydrate intake, especially in losing weight (Štangar et. al., 2022).

Achievement of Set Goals

Combat athletes believed that goal setting improved their performance, influenced their motivation, and helped athletes reach their potential. This study on the achievement of goals is supported by Williamson (2022) explaining that in sports, goals are commonplace. Setting goals is a common way for combat sports athletes to push themselves and get better. Furthermore, it is supported by the study of Wilson & Brookfield (2019) suggested that those who are physically active can benefit from goal-setting tactics and procedures, especially if they intend to improve exercise compliance.

Coping Strategies of Combative Sports Athletes with the Challenges in Maintaining Weight Division During Face-to-Face Set-Up

Employing Self-help Techniques

Participants exhibited training independently and imposing self-discipline and self-control to maintain weight. They were also innovating own techniques such as jogging and walking that are all relevant for weight loss. Employing self-help techniques is further supported by the study of Englert & Taylor (2021) which highlighted that athletes frequently create their own fitness methods. In addition, Devi et al., (2022) stated that in this contemporary era, it has become commonplace to innovate one's training methods and techniques given the unwavering focus on enhancing athletic performance.

Managing Food and Drink Intake

To cope with the challenges of maintaining weight division combat sports athletes shared eating healthy foods, controlling food intake and avoiding temptations, avoiding sugary foods and drinks helped them to avoid gaining weight. In relation to this, the study of Ali et al., (2020) stated that in managing food and drink intake the significance and advantages of nutrition and dietary tactics are frequently addressed concerning this particular requirement in order to avoid fatigue and maximize training adaptations. Moreover, the study conducted by Petri et al., (2021) mentioned that good eating and nutritional habits are indicated by high dietary habit scores.

Seeking Guidance of Mentors

Combat sports athletes shared their utmost appreciation to their coaches who served as their mentors. They shared how they received the dos and don'ts of being an athlete from the coach which is essential not only for weight loss but in their entire being. From an educational perspective, the study of Randell et al., (2021) mentioned that to enhance player performance, coaches viewed feedback as an essential component of their job duties. Likewise, the study of Adams et al., (2020) stated that student-athletes can always turn to their scholastic adviser, coaches, and sports administrators for additional assistance if they need it.

Acquiring Practical and Emotional Support

Combat sports athletes shared how the discipline of combat sports equips them for success, both in their academic pursuits and in life. They shared how getting constant reminders and guidance from loved ones helped them to be ready for the game. In connection, social support has also been recognized as a significant factor in maintaining physical health and psychological health (Malinauskas, 2018).

Insights Athletes Draw from Their Experiences on Maintaining Weight During Face-to-Face Set-Up

Giving Value to Weight Management

Combat sports athletes shared that optimal body weight for sports should strive to minimize health risks, including sports injuries, and promote good health and eating habits. This is further supported by the study of Tektunalı Akman et al., (2024) who mentioned that for everyone, creating a weight-management strategy is important. Also, a study by Lebron et al., (2024) highlighted that to acquire a competitive advantage over opponents, combat sports athletes frequently resort to weight management techniques that result in phases of rapid weight loss, reluctant weight loss, and even regaining weight.

Having a Positive Disposition

Athletes valued determination as an important tool in overcoming struggles, as well as having the right attitude and mindset to achieve weight goals. This finding on having a positive disposition is further supported by the study of Johnson et al., (2020) explaining that sports optimism improves performance because a positive interpretative approach is a key factor in determining how well a player performs. Relevant to this, having a positive disposition or optimism has benefits such as enhanced motivation and success across multiple domains (Shepperd et al., 2019).

Ensuring a Healthy Lifestyle

Combat sports athletes believe that maintaining healthy habits can aid in the prevention of long-term illnesses and chronic disorders. In addition to living a healthy lifestyle and taking care of your body, they mentioned how important it is to eat a balanced diet and get enough exercise. This is supported by the study of Hita

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(2024) indicates that a healthy lifestyle has significant positive effects on athletes. Healthy lifestyle practices, including good nutrition and stress management, also contribute to athletes' mental well-being. In addition, the World Health Organization (WHO) identifies that the psychological and psychomotor balance of one's body is the basis for a holistic functional understanding of health.

Advocating the Importance of Preparation

For combat sports athletes, preparation and conditioning are the most important. The study of Andrade et al., (2021) highlighted that athletes in the majority of sports require exceptional physical preparation to execute activities and physical abilities including flexibility, muscle strength, agility, and muscle endurance. Additionally, sports preparation can also be referred to as mental and skills training (Napolitano et al., 2021) this is often interpreted as the use of strategies intended to enhance and develop behavioral, social, emotional, and mental skills in addition to the abilities of athletes.

IMPLICATION FOR TEACHING PRACTICE

The participants expressed their varied experiences on the phenomenon being studied. This implies that teacher-coaches should always be willingly upskilled to advance their skills in sports training, be more open to the trends, and in general be more humane to overcome any possible, unexpected, and drastic changes that may occur in the future. In addition, they also expressed the effective coping strategies they employed in facing the challenges of maintaining weight in combative sports training. This implies that teaching is equivalent to continuous learning, hence, teachers must be diligent in finding timely methods, approaches, and strategies in teaching new breed of student-athletes and be even more resourceful in finding or creating training tools and materials appropriate for the present context and needs. Lastly, the varied insights of the participants on maintaining weight indicate that it can be further utilized in the years to come. This also implies that to fully experience the effectiveness of combat sports particularly weight management, its gaps, and limitations should be carefully assessed and be immediately addressed with the utmost support of authorized personnel, concerned sports, and educational officials.

RECOMMENDATION FOR FURTHER RESEARCH

This research has shown that a particular field of study demands further emphasis. Further research could focus on formulating guidelines for appropriate weight management among combative sports student-athletes. This may include examining the consequences of existing weight management malpractice in school and creating a list of rational suggestions that promote athletes' mental and physical well-being. Another recommendation is determining the influence of coach assistance on weight management techniques. It involves investigating coaches' knowledge and skills in weight management, their constructive support of athletes' psychological state, and compliance with safe weight guidelines.

CONCLUSION

This study revealed that combative sports athletes frequently resort to drastic weight loss methods, which negatively impact their athletic performance and health. The results emphasize the necessity of well-rounded, scientifically supported weight-management plans that promote long-term wellness to stop the malpractice that still happening until now. Moreover, coaches should assist athletes in maintaining weight divisions without harm, improving well-being and athletic performance by cultivating an environment that prioritizes sustainable strategies and offering them appropriate guidance and help.

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HOSPITAL CRIMES IN KERALA: A COMPREHENSIVE REVIEW AND IDENTIFICATION OF RESEARCH GAPS

Alona Thomas
International Centre for Technological Innovations, Alappuzha, Kerala

ABSTRACT

Hospital crimes pose significant challenges to healthcare delivery by compromising the safety of patients and healthcare professionals. This paper aims to review existing research on hospital crimes in Kerala, India, to identify gaps in the current literature. A systematic literature review was conducted, focusing on studies published up to November 2024. The findings indicate that while workplace violence against doctors has been studied extensively, other forms of hospital crimes, such as theft, sexual harassment, cybercrimes, corruption, and illegal organ trade, remain under-researched. There is also a lack of comprehensive data on systemic factors contributing to these crimes. Addressing these gaps is crucial for developing targeted interventions to enhance hospital safety in Kerala.

KEYWORDS: *Hospital crimes, Kerala, workplace violence, healthcare security, research gaps, cybercrime, corruption, illegal organ trade.*

1. INTRODUCTION

Hospital crimes encompass a range of illegal activities occurring within healthcare settings, including violence against staff, theft, fraud, cybercrimes, and illegal organ trade. These crimes not only jeopardize the safety of patients and healthcare workers but also undermine the integrity of healthcare systems (Chang, 1995). In Kerala, a state in southern India known for its advanced healthcare indicators, incidents of hospital crimes have been reported, raising concerns about the adequacy of existing legal and preventive measures (The Times of India, 2023a; Shibimol, 2024a).

Despite the critical nature of this issue, there appears to be a paucity of comprehensive research addressing the spectrum of hospital crimes in Kerala. Previous studies have primarily focused on workplace violence against doctors (Kunnath et al., 2023; Kallivayalil et al., 2022), often neglecting other forms of crimes and affected groups. This paper seeks to fill this gap by reviewing existing literature on hospital crimes in Kerala and identifying areas that require further investigation.

2. OBJECTIVE

The primary objective of this paper is to review existing research on hospital crimes in Kerala to identify gaps in the current literature. By analyzing published studies, this paper aims to uncover patterns, risk factors, and the prevalence of various crimes in healthcare settings within Kerala, thereby informing future research and policy interventions.

3. METHODS

A systematic literature review was conducted to identify studies related to hospital crimes in Kerala. The following steps were undertaken:

Search Strategy: Databases searched included PubMed, Scopus, Google Scholar, and credible news outlets. Keywords used were "hospital crimes," "workplace violence," "Kerala," "healthcare security," "medical negligence," "cybercrime in hospitals," "healthcare fraud," and "illegal organ trade."

Inclusion Criteria: Studies were included if they: (1) focused on hospital crimes in Kerala; (2) were published in English; (3) were peer-reviewed articles, reports, official documents, or credible news reports; and (4) provided empirical data or comprehensive reviews.

Exclusion Criteria: Studies were excluded if they: (1) were not specific to Kerala; (2) were opinion pieces without empirical data; or (3) focused solely on patient health outcomes unrelated to crimes.

Data Extraction: Relevant information was extracted, including study design, population, sample size, methods, key findings, and conclusions.

4. RESULTS

A total of twelve references were identified as relevant to hospital crimes in Kerala. The findings are summarized below:

4.1. Legal Framework and Law Enforcement Initiatives

The Kerala Healthcare Service Persons and Institutions (Prevention of Violence and Damage to Property) Act, 2012, aims to protect healthcare workers and infrastructure from violence (Ministry of Home Affairs, 2024). Following the tragic murder of Dr. Vandana Das in 2023, there have been calls for stricter enforcement and amendments to enhance penalties (The Times of India, 2023b; Onmanorama, 2024a). The introduction of the 'Code Grey' protocol seeks to standardize hospital responses to violence, incorporating measures like incident reporting, staff training, and alert systems (Onmanorama, 2024a; Shibimol, 2024b).

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4.2. Prevalence of Workplace Violence Against Doctors

Kunnath et al. (2023) conducted a cross-sectional study with 2,400 doctors practicing in Kerala. The study found that 65.6% of doctors experienced workplace violence, predominantly verbal abuse (89.9%) and intimidation (32.7%). Most incidents occurred during the day.

Kallivayalil et al. (2022) surveyed doctors in Kerala to assess the association between workplace violence and clinical anger. Results indicated a significant correlation, suggesting that exposure to violence impacts doctors' emotional well-being and may affect patient care.

4.3. Factors Influencing Workplace Violence

Davey et al. (2020) conducted a qualitative study among 63 emergency department (ED) healthcare providers across India, including Kerala. The study highlighted that workplace violence is prevalent, with unique challenges such as financial stressors, inadequate enforcement of rules, and frequent violence from patient family members.

Joshi and Joshi (2018) explored perceptions among junior doctors in India, identifying factors like materialism, negative media portrayal, and lack of protection as contributors to workplace violence.

4.4. National Context of Workplace Violence

Jain et al. (2021) found that workplace violence against resident doctors in Indian teaching hospitals is prevalent, with 86% experiencing violence, primarily verbal abuse. The study emphasized the need for better communication, strict laws, and strengthened security measures.

Grundmann et al. (2017) compared workplace violence experiences between emergency medicine physicians in India and the USA, revealing that 89% of Indian respondents witnessed verbal violence, impacting job satisfaction and workplace safety.

4.5. Cybercrimes in Hospitals

Cybersecurity threats in hospitals, such as ransomware attacks, pose significant risks to patient care and operational stability (Argaw et al., 2020). While no specific studies were found on cybercrimes in Kerala hospitals, the global trend suggests that healthcare facilities are increasingly vulnerable due to complex infrastructures and resource limitations (Jalali and Kaiser, 2018). Hospitals can mitigate risks by simplifying systems, aligning stakeholders with security protocols, and providing regular staff training (Wasserman and Wasserman, 2022).

4.6. Illegal Organ Trade

Cases of illegal organ trade have been reported in Kerala. Shibimol (2023) reported that a Kerala court issued summons to a private hospital and eight doctors for violating organ transplantation norms. Another incident involved the alleged organ harvest of a victim taken into custody by Kerala police (The New Indian Express, 2024). These incidents highlight the need for stringent enforcement of regulations to prevent exploitation and corruption in organ transplantation practices.

4.7. Corruption in Healthcare

Corruption and poor governance hinder the delivery of quality healthcare services, leading to poor health outcomes and increased costs for patients (Naher et al., 2020). Kumar (2003) noted that healthcare is among the most corrupt service sectors in India, with common forms of corruption including bribery and absenteeism. These practices can lead to inadequate patient care and undermine public trust in healthcare institutions.

4.8. Other Crimes in Hospitals

Incidents of medical negligence, financial fraud, and sexual offenses have been reported in Kerala hospitals (The Times of India, 2024a; Onmanorama, 2024b). For example, a physiotherapist was charged with molesting a woman patient, and a doctor was involved in a financial fraud investment scam. These cases emphasize the need for robust legal and preventive mechanisms to address a broader range of hospital crimes.

5. DISCUSSION

The reviewed literature confirms that workplace violence against doctors is a significant issue in Kerala's hospitals. Verbal abuse emerges as the most common form, often perpetrated by patients' family members (Kunnath et al., 2023). The high prevalence of such incidents highlights a critical area of concern for healthcare administrators and policymakers.

However, the literature exhibits notable gaps:

- Limited Scope of Research: The focus on doctors overlooks other healthcare professionals, such as nurses, administrative staff, and support personnel, who may also be victims of workplace violence or other crimes.
- Neglected Types of Crimes: There is a lack of research on other forms of hospital crimes, including theft of medical equipment, sexual harassment of staff and patients, medication fraud, cybercrimes targeting hospital information systems, and corruption within healthcare facilities.
- Systemic Factors: Few studies examine the systemic and infrastructural factors contributing to hospital crimes, such as inadequate security measures, poor lighting, lack of surveillance systems, and ineffective reporting mechanisms.
- Psychological Impact: The long-term psychological effects of workplace violence on healthcare workers, including stress, burnout, and decreased job satisfaction, are underexplored.
- Legal and Policy Frameworks: Limited research assesses the effectiveness of existing legal provisions, such as the Kerala Healthcare Service Persons and Institutions Act, 2012, and their enforcement in preventing hospital crimes.

6. CONCLUSION

Hospital crimes in Kerala present a multifaceted challenge that extends beyond workplace violence against doctors. The existing literature primarily focuses on this aspect, leaving other critical areas insufficiently addressed. There is an urgent need for comprehensive research encompassing various types

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of hospital crimes, their prevalence, contributing factors, and impact on healthcare delivery.

Addressing these gaps will require:

- Broadening Research Focus: Future studies should include a wider range of crimes and affected groups within hospital settings.
- Interdisciplinary Approaches: Collaborations between healthcare professionals, criminologists, sociologists, and legal experts can provide holistic insights.
- Policy Evaluation: Assessing the effectiveness of current laws and policies will inform necessary reforms.
- Preventive Strategies: Research should inform the development of targeted interventions, such as staff training, security enhancements, and public awareness campaigns.
- By advancing research in these areas, stakeholders can develop evidence-based strategies to enhance safety, improve patient care, and support healthcare professionals in Kerala.

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A REVIEW ON GENETIC DISORDER SUPPRESSOR

Rutuja Parmeshwar Pathade[1*], Shraddha. S. Lasgare[2], Bhagyashri. K. Padul[3]
Prajwal. R. Nagre[4]
[1]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna
[2]Asst.Prof.(Faculty of Quality Assurance Technique) Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna
[3]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna
[4]Student of Bachelor of Pharmacy, Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna
Raosaheb Patil Danve College of Pharmacy, Badnapur, Jalna 431202

ABSTRACT

Due to recent developments in genetics and genomics, genetic disease suppressors have been discovered, providing new therapeutic approaches for genetic disorders, which are caused by mutations in DNA and constitute a substantial global health burden. This article explores genetic disorder suppressor kinds, mechanisms, and examples, emphasizing their ability to reduce or eliminate the severity of disease. We talk about suppressor genes, RNA-based suppressors, and gene editing technologies, highlighting the difficulties and potential paths forward.

OVERVIEW

The discovery of the CRISPR/Cas 9 system has revolutionized genetics and created previously unheard-of possibilities for accurate genome alteration. this adaptive immune system of bacteria. Researchers can target precise DNA accuracy through the repurposing of materials for gene editing. Adaptive immunity against viral and plasmid DNA is provided by the CRISPR-cas systems seen in bacteria and archaea. There are two primary parts to these systems. a little RNA that targets DNA (CrRNA).

A new knowledge of gene regulation and a field for investigating RNA-based mechanisms in different animals were made possible by the discovery of RNAs. Since then, RNA technology has emerged as a useful resource in the fields of biotechnology, function genomics, and pharmaceutical research. One of the most effective tools for comprehending gene function and creating therapeutic therapies is the capacity to precisely inhabit the expression of a single gene. Gene function in Caenorhabditis elegans has been widely studied using genetic mutations and the animal. (3). Therefore, gene therapy seeks to close the gap between the pathophysiology of disease and effective treatment that targets the root causes of illness. This innovative substitute for traditional small-chemical pharmacology gains benefit from the application of gene therapy to alleviate symptoms.

Suppressor of Genetic Disorders

Some of the most effective instruments for examining gene expression, function, and interaction are gene suppressors. Genetic disorders are illnesses brought on by anomalies in a person's DNA. Numerous health issues may result from these anomalies. modest to severe in severity. Genes or genetic components that can lessen or completely eradicate the consequences of genetic illnesses are known as genetic disorder suppressors. In addition to its potential to heal genetic diseases, the CRISPR/Cas 9 system has broad implications for basic science, biotechnology, and medicine. Boost agricultural output and create new biological pathways. Repurposing CRISPR-Cas systems for genome editing in eukaryotic cells has been demonstrated by recent research.

Therefore, we examine what is currently known about the CRISPR-Cas system, emphasizing its structural and functional link.For this discovery, Andrew Fire and Craig Mello were granted the 2006 Nobel Prize in Physiology or Medicine. Nonetheless, these methods have made it easier to analyze how genes work.

The most often utilized systems are CRISPR/Cas9 and Type 2, whereas CRISPR/Caf1 is an alternate method with a different PAM requirement.

Type 2 CRISPR/Cas:

1.One gRNA design
2. gRNA-Cas complex structure
3. Recognition of the target site
4 Cleavage of DNA
5 Activation of repair machinery

One gRNA designgRNA is made to target particular DNA sequences.
Two gRNA-Complex formulation of cas 9:gRNA attaches itself to the Cas9 enzyme.
3. The intended location Appreciation:Complementary DNA sequences are bound by guide RNA (gRNA).
4 Cleavage of DNA:The Cas 9 enzyme causes a double-strand break in DNA by cutting it at the target location.
5 Fix:Edits are introduced by the cell's repair mechanism through homologous recombination (HR) or non-homologous end joining (NHE).

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• Use

The following are the challenges and limitations:
1 Gene Knockout/Knockdown;
2 Gene Replacement/Editing;
3 Gene Regulation; And
4 Genome Engineering
2 Mosaicism 1 Off-Farget Effect
Three Ways Of Distribution
4 Efficiency & Specificity
CRISPR/Caf1:A protein complex called CAF1 (Chromatin Assembly Factor 1) is involved in DNA replication and chromatin assembly. It is essential for controlling gene expression and preserving genomic stability.

Numerous cellular functions have been linked to CAF1, including:

1. Chromatin assembly: CAF1 deposits histones onto freshly duplicated DNA to aid in chromatin assembly.
2. DNA replication: CAF1 plays a role in maintaining the stability of the genome and controlling DNA replication.
3. Gene regulation: By controlling chromatin accessibility and structure, CAF1 can affect how genes are expressed.

The Process of Modifying Genes

1. Target recognition: Grna binds to DNA sequences that are complimentary.
2. DNA cleavage: The Cas9 enzyme snips DNA at the desired location.
3. Repair: changes are introduced by the cell's repair machinery

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Aim

To investigate and comprehend the potential of several therapeutic modalities, such as gene editing, RNA-based treatments, and small molecule therapies, in preventing or curing genetic illnesses, and to talk about the state of research, obstacles, and potential future directions in this area.
The goal is
1. To examine the state of knowledge on genetic illnesses and the molecular mechanisms behind them.
2. To talk about the fundamentals and uses of gene editing technologies (like CRISPR/Cas9)
3. to investigate the function of RNA-based treatments (such as antisense oligonucleotides and RNA interference).
4. To look into how tiny molecule therapeutics could be able to suppress hereditary disorders.
5. To draw attention to the shortcomings and difficulties of the existing methods.
6. to determine prospective therapy approaches and future research avenues.

RESULTS

One promising treatment and management option for genetic disorders is the use of genetic disease suppressors. developments in gene editing. Small molecule and RNA-based treatments have demonstrated great promise in preventing or eradicating genetic mutation. Even while there are still obstacles to overcome, continued research and clinical trials are moving us closer to a successful cure.

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INNOVATIVE FUNDING AND SUSTAINABILITY OF PUBLIC SECONDARY SCHOOLS IN CROSS RIVER STATE, NIGERIA

Nwokonko, Roberta Nwadiuto Ph.D[1], Difoni, Nadesh Njanje[2], Vita-Agundu, Uche Calusta Ph.D[3]

[1]*Department Of Educational Administration and Planning, Faculty of Education, Abia State University, Uturu, Nigeria*

[2]*Department of Educational Management, Faculty of Educational Foundation Studies University of Calabar, Nigeria.*

[3]*Department of Educational Foundations, Faculty of Education, University of Nigeria, Nsukka*

Corresponding Author: Edut Egbe

ABSTRACT

This study investigated innovative funding and sustainability of secondary schools in Cross River State, Nigeria. Specifically, it examined the relationship between strategic fundraising programs, collaboration with non-governmental organizations (NGOs), and sustainability of secondary schools. Two null hypotheses were formulated to guide the study. The study adopted a correlational research design, with a population consisting of all 297 principals in public secondary schools in Cross River State. A census sampling method was employed, involving all 297 principals. Data collection was conducted using a researcher-designed questionnaire titled "Innovative Funding and Sustainability of Public Secondary Schools Questionnaire (IFSPSSQ)." The instrument was structured on a four-point Likert scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The validity of the questionnaire was established by three experts from the Departments of Educational Management and Educational Foundations (Measurement and Evaluation Unit) at the University of Calabar. The reliability of the instrument was determined using the Cronbach alpha method, yielding coefficient values of 0.78 and 0.84, respectively. Data analysis was performed using Pearson Product-Moment Correlation with the aid of the Statistical Package for Social Sciences (SPSS), version 26. The results revealed a statistically significant relationship between strategic fundraising programs, collaboration with NGOs, and sustainability of secondary schools in Cross River State. Based on the findings, the study concluded that innovative funding has a statistically significant relationship with sustainability of secondary schools in Cross River State, Nigeria. This study contributes to knowledge by emphasizing the role of innovative financial practices in addressing funding gaps, enhancing resources, and supporting educational infrastructure. The findings offer valuable insights for policymakers, administrators, and stakeholders on achieving long-term educational sustainability, particularly in developing regions. Among the recommendations, it was suggested that school principals actively seek collaborations with NGOs to establish partnerships that can provide additional resources and expertise for implementing innovative educational programs and enhancing school infrastructure.

KEYWORDS: *Innovative Funding, Strategic Fundraising Programs, Collaboration with Non-Governmental Organizations, Sustainability.*

INTRODUCTION

Education is one of the key instruments for achieving sustainability. Secondary education in Nigeria represents a vital tier of the educational system. It is the level of education students receive after primary school and serves as a pathway to tertiary education. This aligns with the broad goals of secondary education as defined by the Federal Government of Nigeria (FGN, 2013), which include preparing students for useful living and higher education attainment, among others. Madukwe et al. (2024) argue that no society can achieve significant growth and development without quality education. Achieving and sustaining the goals of secondary education depends, among other factors, on ensuring the long-term success and progress of these institutions.

In this context, the sustainability of secondary schools refers to their ability to maintain effective and high-quality operations over the long term. According to Ekpoh and Okpa (2017), sustainability entails the capacity to support, maintain, and ensure that systems function properly. For secondary schools, it implies keeping all programs and activities functional to meet the current needs of students without compromising the ability to meet the needs of future generations (Igbokwe & Oteh, 2018; Obona et al., 2021). Nwogu and Moses (2020) emphasize that education, being the primary tool for achieving sustainability, must receive adequate attention.

The sustainability of secondary schools is a multifaceted concept aimed at ensuring the institutions' long-term success while fostering the development and well-being of students and their communities. This concept extends beyond financial stability to include academic excellence, community engagement, and environmental responsibility. In the secondary education system, sustainability involves maintaining and enhancing academic programs, the learning environment, and the school curriculum, which are essential

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instruments for imparting knowledge, values, and skills that prepare students to face future challenges.

A central principle of sustainability is the understanding that initiating a program is insufficient without plans for its continuation. The objectives of secondary education, in line with the Sustainable Development Goals (SDGs), include ensuring that all learners have free access to equitable and quality education that leads to relevant outcomes. This requires providing the necessary tools for learners' success and strengthening national capacity to support the education sector (Bourn et al 2017; Culala & Vinuya, 2020). Another critical goal is eliminating gender disparities in classrooms by promoting equal access to education and vocational training for minorities, indigenous people, and children with disabilities (Education International, 2017). Inclusivity must also extend to conflict areas to ensure education's benefits reach all members of society. Consequently, sustainability in secondary schools involves aligning with the objectives of secondary education to preserve its benefits for students and society. Education for sustainability, as described by Ukpong and Uzoigwe (2020) and Obona et al (2021) involves learning how to create sustainable communities globally and locally.

Achieving sustainable secondary education goals requires a supportive learning environment, adequate facilities, and a relevant curriculum to foster students' positive attitudes toward sustainable learning (Ameh et al., 2018). There can be no sustainable development without quality education, as education trains the human mind to function effectively. A refined and transformed mind can discern right from wrong and understand the essence of living a meaningful and beneficial life. Education also facilitates the transfer of desirable qualities and values to others. The development of Nigerian society depends on its citizens receiving quality education, particularly at the tertiary level.

However, concerns about the quality of teaching, teacher attitudes, school management, and limited funding persist. Breadth et al (2014) highlight the poor state of secondary schools in Nigeria. Osha et al (2024) laments limited funding of secondary schools. Studies report that many public secondary school teachers demonstrate poor work attitudes, frequently miss work, lack dedication, and show reluctance to take on additional responsibilities. Other issues include unprofessional behavior regarding punctuality, instruction, and record-keeping (Obona et al., 2023; Obona & Sampson, 2019; Obona et al., 2024). Adaku and Obona (2024) further note that many school principals neglect the physical environment, making it unsafe for meaningful learning. Irikana and Weli (2019) observe that the education system often fails to equip students with the necessary knowledge, skills, and capacities for productivity due to inadequate infrastructure, learning facilities, and poor libraries. This shortfall results in the production of unqualified human resources lacking practical, technical skills and competencies essential for sustainable national development. If unaddressed, these challenges can hinder the sustainability of secondary education and the attainment of its goals.

The researchers observed an increasing concern about the quality of teaching and schooling, largely stemming from the belief that literacy impacts an individual's employability and the overall economic well-being of society. Poor education has become one of the greatest barriers to socio-economic transformation in Nigeria today. It is evident that graduates of secondary institutions in Nigeria often fail to acquire the skills necessary for employment or to contribute effectively to national development. This challenge is exacerbated by incessant and sometimes prolonged strikes by both academic and non-academic staff, which disrupt academic programs and negatively affect the learning process. These frequent disruptions have far-reaching implications for the quality of education, which is critical for sustainable development.

Providing sustainable education for the citizenry is an essential endeavor. However, achieving this goal is unattainable without adequate funding, which determines the rate at which the education system can develop and be sustained. Funding, as defined by Ogundele and Danbaba (2017), involves sourcing the necessary resources without solely depending on governmental capital and recurrent grants. It plays a pivotal role in the development of any educational system. Unfortunately, underfunding has been a significant issue in many African nations, including Nigeria. Ahmed (2011) noted that gross underfunding is a major challenge confronting education, particularly in secondary schools. This challenge is further compounded by reduced government revenues, economic instability, and the need to meet heavy and rising debt service obligations.

The Nigerian government, which is statutorily responsible for funding education, faces tight budget constraints due to the collapse of the oil market and increasing financial burdens. The issue of inadequate resources has resulted in declining staff welfare, reduced remuneration, and deteriorating working conditions and environments. In response to these challenges, the Federal Government, through the National Universities Commission (NUC), directed universities to generate 10% of their funds internally through various revenue diversification strategies (Ojule, 2016). This directive is also applicable to the secondary education sector. Furthermore, the Federal Government of Nigeria (FGN, 2013) acknowledged that education is an expensive social service, and its funding is a joint responsibility of the Federal, State, and Local governments, as well as the private sector. Consequently, school administrators are increasingly compelled to seek alternative funding sources to effectively manage their institutions.

Innovative school funding involves exploring creative and novel approaches to securing financial resources for educational institutions. While traditional methods rely on government allocations and local taxes, innovative strategies focus on diversifying revenue streams to enhance financial sustainability and support effective educational programs. These strategies require thinking beyond conventional funding sources and embracing forward-thinking approaches to meet the evolving needs of educational institutions. Ekpoh et al as cited in Ameh et al (2018), identified alternative funding

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modes, such as providing consultancy services, establishing university farms, leasing university lands to private developers, expanding endowment earnings, creating small and medium-scale industries, commercializing sports facilities, and offering hotel services. Innovation, derived from the Latin word "*innovates"* meaning "altered," in this context involves introducing new ideas or modifying existing approaches to generate funds for the education sector.

This study focuses on funding patterns that include strategic fundraising programs, and collaboration with non-governmental organizations. Strategic fundraising programs are carefully planned and organized activities designed to align with an organization's goals and objectives, maximizing the impact of fundraising initiatives and ensuring long-term sustainability. These programs often involve engaging communities, alumni, and local businesses to secure donations. Non-governmental organizations (NGOs) also play a crucial role in funding education. Their participation addresses educational needs, particularly in areas where government resources are insufficient. Education is an expensive social service, and Osha et al. (2024) lament that secondary schools face challenges due to limited funding. As a result, financial contributions from NGOs, local communities, individuals, and other organizations are essential for the successful implementation of educational programs. According to Nakpodia (2011), various groups, such as business enterprises (especially oil companies), parent-teacher associations, alumni, and community development committees, contribute significantly to funding education in Nigeria. Their involvement highlights the importance of collaborative efforts in addressing the financial challenges facing the education sector.

STATEMENT OF PROBLEM

In public secondary schools in Cross River State, Nigeria, the sustainability of education faces significant threats due to insufficient government funding. This inadequacy manifests in poor infrastructure, inadequate teaching materials, underpaid teachers, and a lack of technological resources. Additionally, economic hardships within the community further reduce parental financial support for schools. The challenges are compounded by inconsistent power supply, limited opportunities for teacher development, outdated curricula, and low levels of community engagement. These interconnected issues jeopardize the quality and sustainability of the school system, necessitating a comprehensive approach to address financial, infrastructural, and educational deficiencies.

Managing secondary schools under these circumstances has become a monumental challenge for administrators, making the attainment of educational goals increasingly difficult. Teachers lack the necessary facilities and enabling environments to perform effectively. Consequently, students suffer the most, as they are deprived of proper training and development, leaving them ill-equipped to be productive and contribute meaningfully to society after graduation.

This dire situation raises critical concerns about the possibility of achieving meaningful and sustainable national development when students are not receiving adequate training. The absence of modern facilities, instructional materials, and a conducive learning environment stemming from poor funding of secondary education further exacerbates the problem. In light of these challenges, developing alternative means of funding secondary education emerges as a potential solution to this persistent issue. Thus, the pertinent question arises: what is the relationship between innovative funding and the sustainability of public secondary schools in Cross River State, Nigeria?

PURPOSE OF THE STUDY

This study investigated innovative funding and sustainability of secondary schools in Cross River State, Nigeria. Specifically, the study sought to find out the relationship between:

1. Strategic fund-raising programmes and sustainability of public secondary schools in Cross River State.
2. Collaboration with non-governmental organizations and sustainability of public secondary schools in Cross River State.

RESEARCH HYPOTHESES

The following hypotheses were raised to guide study:

1. Strategic fund-raising programmes does not significantly relate with sustainability of public secondary schools in Cross River State.
2. Collaboration with non-governmental organizations does not significantly relate with sustainability of public secondary schools in Cross River State.

SIGNIFICANCE OF THE STUDY

The study may provide significant benefits to principals, teachers, students, and the government.

For principals, the findings can assist in optimizing resource allocation, enabling them to enhance educational programs, improve infrastructure, and invest in teachers' professional development. This can lead to more effective management of school resources.

Teachers may benefit from the study through the promotion of training and professional development opportunities. By staying updated on innovative teaching methodologies, emerging technologies, and current educational research, teachers can enhance classroom instruction and improve student learning outcomes.

Students stand to gain improved educational experiences as a result of the study. This could include access to advanced technologies, expanded extracurricular activities, and enrichment programs that contribute to a more holistic and well-rounded education.

For the government, the study can provide insights to optimize resource allocation within the education sector. By improving the overall quality of education, the government can help develop better-prepared students, a more skilled workforce, and enhance national competitiveness on a global scale.

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LITERATURE REVIEW

Strategic Fund-Raising Programmes and Sustainability of Secondary Schools

Educational financing involves contributions from federal, state, and local governments, as well as the private sector. Organizations such as the Education Tax Fund, Industrial Training Fund, and National Science and Technology Fund also address education funding needs (Akeke et al, 2020). Seimogha and Richard (2019) explored strategies for funding secondary education to achieve educational goals. Their study, involving 166 sampled principals from 286 public senior secondary schools, utilized a questionnaire titled "School Funding Strategies Questionnaire (SFSQ)" with a reliability coefficient of 0.72. The analysis identified five sources of funding and five challenges to secondary education funding. The study emphasized evaluating funding strategies to ensure effective and efficient funding and recommended leveraging internal and external funding sources, such as allied school businesses, to mitigate funding challenges.

In a study, Ubi and Egwu (2022) investigated the extent of fund-generation strategies in public secondary schools in Cross River State. The study examined fundraising through non-governmental organizations and fundraising programs, applying a descriptive survey design. All 286 principals in public secondary schools in the Ogoja, Ikom, and Calabar Education Zones participated, with 213 male and 73 female respondents. A structured questionnaire, “Extent of Strategies for Funds Generation in Public Secondary Schools Questionnaire (ESFGPSSQ),” was used, yielding a reliability coefficient of 0.77. The analysis revealed a low extent of fund-generation strategies through both non-governmental organizations and fundraising programs. In another study, Jack and Nwaogazie (2021) studied the management of innovative education in universities in Rivers State for sustainable development goals. Using a descriptive survey design, they sampled 400 respondents from three universities (one federal and two state universities) using proportionate stratified random sampling. Data collection relied on a questionnaire titled “Management of Innovative Education in Universities for Sustainable Development Goals in Rivers State Questionnaire (MIEUSDGQ),” with a reliability coefficient of 0.74. The findings identified strategic fundraising programs as effective management strategies for innovative education in universities.

Joseph et al (2023) examined the contribution of the parents-teachers platform fundraising strategy to the financial sustainability of public secondary schools in Moshi District Council, Tanzania. Guided by the Resource Dependence Theory, they adopted a mixed-method approach with a convergent design. The study sampled 12 schools, 12 heads of schools, 144 teachers, 12 parents, and 1 District Secondary Education Officer using various sampling techniques. Data collection employed questionnaires, interview guides, and document analysis, with validity ensured by research experts and a reliability coefficient of 0.721. The study revealed a lack of engagement with communities, alumni, and local businesses in fundraising, along with insufficient use of social media and crowdfunding. Recommendations included enhancing fundraising strategies by engaging local businesses, alumni, and the broader community.

Collaboration with Non-Governmental Organizations and Sustainability of Secondary Schools

The rising demand for quality education and the associated financial constraints have emphasized the need for supplementary funding sources. Anthonia et al (2023) investigated the involvement of organizations and local communities in promoting access to Universal Basic Education (UBE) in South-West Nigeria. Using a descriptive survey with a sample of 1,920 teachers from Lagos, Ogun, and Oyo States, the study employed the Fee-Free Policy Impact of Universal Basic Education Descriptive Questionnaire (FPIUBEDQ) and analyzed the data using Simple Linear Regression Analysis. Results revealed that participation by non-governmental organizations (NGOs) and local communities positively impacted UBE access and the provision of materials. Recommendations included fostering collaboration between the government and these entities to enhance UBE funding.

Similarly, Ehiaghe et al. (2021) examined the contributions of the government and NGOs to secondary education in Benin City. Using a sample of four refurbished schools in Benin Metropolis and administering 40 questionnaires, their analysis with Chi-Square and percentage distribution techniques indicated that both the government and NGOs significantly improved the educational system in Benin City and Nigeria since independence. In a study by Bamidele and Abioye (2017), the role of NGOs in promoting literacy education was explored. This study highlighted the establishment of literacy centers by NGOs, particularly for individuals unable to attend formal education. The research concluded that NGOs positively impact literacy promotion, enabling beneficiaries to achieve their educational goals through adult literacy programs. Ehigiamusoe (2012) focused on private sector participation in secondary education in Nigeria and its implications for national development. Sampling 200 providers and recipients of private secondary education in the Federal Capital Territory, the study utilized the Private Sector Participation in Secondary Education (PSPSE) instrument and Chi-Square analysis. Findings revealed that students in private schools outperformed those in public schools, supported by better infrastructure. However, public schools contributed more to human resource development. Recommendations included enhanced private sector and NGO involvement to align private education with societal needs.

Additionally, Adu-Baffoe and Bonney (2023) explored the contributions of NGOs to basic education delivery in Tamale Metropolis, Ghana, focusing on ActionAid Ghana. Using a mixed-method approach guided by Oregon’s Quality Education Model, the study engaged 114 respondents through purposive sampling. Quantitative data were analyzed descriptively, while qualitative data were analyzed with NVivo10 software. Results highlighted NGO contributions to infrastructure development, teacher capacity building, provision of learning materials, and community sensitization, all of which improved the quality of teaching and learning. These studies collectively emphasize the vital role of NGOs, local communities, and the private sector in

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supplementing government efforts to enhance education access and quality in Sub-Saharan Africa.

SUMMARY OF LITERATURE REVIEW

The literature review revealed a significant relationship between the independent sub-variables (strategic fundraising programs and collaboration with non-governmental organizations) and the dependent variable (sustainability of public secondary schools). The reviewed studies highlighted the importance of developing revenue-generating strategies to supplement the low government budget allocations for schools. The literature review provided valuable insights into existing knowledge, aiding the researcher in constructing the study instrument, selecting an appropriate research methodology, and identifying research gaps. Notably, most of the studies cited were conducted in other regions of Nigeria. Furthermore, earlier research did not integrate the specific variables examined in this study nor provide empirical evidence on their interrelationship. Additionally, the purpose and methodologies of previous studies differed from those adopted in the present study. To address these gaps, this study was deemed necessary to investigate the relationship between innovative funding and sustainability of public secondary schools in Cross River State, Nigeria. By doing so, the study contributes to the existing body of knowledge and fills a critical gap in the literature.

METHODOLOGY

The study adopted a correlational research design, with a population consisting of all 297 principals in public secondary schools in Cross River State. The census method was utilized, involving all 297 principals. Data were collected using an instrument titled "Innovative Funding and Sustainability of Public Secondary Schools Questionnaire (IFSPSSQ)", structured on a four-point Likert scale: Strongly Agree (SA), Agree (A), Disagree (D), and Strongly Disagree (SD). The questionnaire was preceded by a cover letter explaining the purpose of the study. The instrument was divided into two sections: Section A gathered demographic information such as sex, age, marital status, and educational background. Section B focused on the sub-variables of the study.

The validity of the instrument was confirmed by three experts from the Department of Educational Management and the Department of Educational Foundations (Measurement and Evaluation Unit) at the University of Calabar. Their suggestions were incorporated into the final draft of the instrument. The reliability was assessed using the Cronbach alpha method, yielding coefficient values of 0.78 and 0.84, respectively.

For data collection, five research assistants were recruited and trained on the process. They obtained permission from school authorities before administering the questionnaire to respondents. All completed questionnaires were retrieved by the researchers, who then carefully reviewed them to ensure completeness. Out of 305 questionnaires distributed, 297 were correctly completed, representing an approximate return rate of 99%.

The questionnaire responses were organized according to the variables they were designed to measure. Positively worded items were scored as follows: Strongly Agree (SA) = 4 points, Agree (A) = 3 points, Disagree (D) = 2 points, and Strongly Disagree (SD) = 1 point. For negatively worded items, the scoring pattern was reversed. The summed scores for each respondent were entered into statistical software for analysis.

Data analysis was conducted using Pearson Product-Moment Correlation, facilitated by the Statistical Package for Social Sciences (SPSS) version 26, and was based on the null hypotheses guiding the study. Results were presented in tabular format.

RESULTS

Hypothesis one

Strategic fund-raising programmes does not significantly relate with sustainability of public secondary schools in Cross River State. The two variables in this hypothesis are strategic fund-raising programmes and sustainability of public secondary schools. The result of the data analysis is presented in table 1. Table 1 showed the correlation coefficients between strategic fund-raising programmes and sustainability of public secondary schools. The correlation coefficient was statistically significant for sustainability of public secondary schools ($r = .69$, $p<.05$). Since $p(.000)$ is less than $p(.05)$, hypothesis one is rejected in terms of sustainability of public secondary schools. The result of the analysis implied that there is a statistical positive significant relationship between strategic fund-raising programmes and sustainability of public secondary schools in Cross River State, Nigeria.

TABLE 1

Pearson product moment correlation analysis of the relationship between strategic fund-raising programmes and sustainability of public secondary schools (n=297)

Variables	$\bar{X}$	S.D	r	Sig.
Strategic fund-raising programmes	19.80	3.23		
Sustainability of public secondary schools	19.18	3.18	.69*	.000

*Significant at p<.05 df=295

Hypothesis two

Collaboration with non-governmental organizations does not significantly relate with sustainability of public secondary schools in Cross River State. The two variables in this hypothesis are collaboration with non-governmental organizations and sustainability of public secondary schools. The result of the data analysis is presented in table 2. Table 2 showed the correlation coefficients between collaboration with non-governmental organizations and sustainability of public secondary schools. The correlation coefficient was statistically significant for sustainability of public secondary schools ($r = .80$, $p<.05$). Since $p(.000)$ is less than $p(.05)$, hypothesis one is

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rejected in terms of sustainability of public secondary schools. The result of the analysis implied that there is a statistical positive significant relationship between collaboration with non-governmental organizations and sustainability of public secondary schools in Cross River State, Nigeria.

TABLE 2

Pearson product moment correlation analysis of the relationship between collaboration with non-governmental organizations and sustainability of public secondary schools (n=297)

Variables	$\bar{X}$	S.D	r	Sig.
Collaboration with non-governmental organizations	19.20	4.37		
Sustainability of public secondary schools	19.18	3.18	.80*	.000

*Significant at p<.05 df=295

DISCUSSION OF FINDINGS

The result of hypothesis one indicated that there is a statistical positive significant relationship between strategic fund raising programmes and sustainability of public secondary schools in Cross River State. This result is not surprising because it shows that as public schools face budgetary constraints, school administrators constantly seek alternative ways of raising funds for school operations. Through strategic fundraising initiatives they are able to secure additional resources for essential needs such as facility maintenance, educational materials, extracurricular activities, and professional development for teachers. These funds contribute to creating an enriched learning environment, fostering student engagement, and improving academic outcomes. Moreover, this initiative helps secondary schools to develop partnerships with local businesses, community members, and alumni, thus establishing a sense of shared responsibility for the school's success. This implies that by diversifying revenue streams through well-planned fundraising efforts, public secondary schools can mitigate financial challenges, ensuring their long-term sustainability and the delivery of quality education to students. This level of relationship simply gave strength to a related findings by Seimogha and Richard (2019) whose study concludes that the evaluations of funding strategies is necessary for effective and efficient school funding in order to achieve secondary educational goals. This is also in harmony with the findings of Jack and Nwaogazie (2021) that strategic fund raising programmes are management strategies for innovative education in universities.

The result of hypothesis two indicated that there is a statistical positive significant relationship between collaboration with non-governmental organizations and sustainability of public secondary schools in Cross River State. This result is possibly because the increasing demand for better education is a motivation for secondary school administrators to seek for supplementary sources of funds through collaboration with non-governmental organizations. This plays an indispensable role in the development of secondary school across the nation. Collaboration with non-governmental organizations (NGOs) helps to bring in additional resources, expertise, and support crucial for addressing multifaceted educational challenges. Beyond financial contributions, NGOs may offer mentorship, teacher training, and capacity-building programs to enhance the professional development of teachers. This is integral to the sustainability of public secondary schools. This implies that by diversifying revenue streams through alliances with NGOs, public secondary schools can tap into a broader network of resources and knowledge to help foster resilience and sustainability in the face of evolving educational demands and societal needs.

The study finding of this study is similar to that of Anthonia et al (2023) who reveal that the participation of non-governmental organizations and local communities had a significant positive impact on access to Universal to Universal Basic Education. The finding equally aligns with that of Ehiaghe et al (2021) who found that the contributions of both Government and NGO were responsible for the positive improvement in the educational system in Benin City and in Nigeria since independence. Similarly, the findings of Adu-Baffoe and Bonney (2023) is not at variance with the finding of this study. Their study showed that infrastructure development, provision of teaching and learning materials, capacity development of teachers, contribute to improved quality teaching and learning.

CONCLUSION

The findings of this study revealed that strategic fundraising programs and collaboration with non-governmental organizations have a significant relationship with the sustainability of secondary schools in Cross River State. Based on these findings, it was concluded that innovative funding has a statistically significant relationship with the sustainability of secondary schools in the state

Recommendations

Based on the findings of this study, the following recommendations were made:

1. Principals should design and implement comprehensive strategic fundraising programs tailored to meet the specific needs of their secondary schools, promoting community involvement and ensuring sustained financial support.
2. Principals should proactively pursue collaborations with non-governmental organizations to establish partnerships that offer additional resources and expertise, supporting innovative educational initiatives and enhancing school infrastructure.

Contribution to Knowledge

This study contributes to knowledge by providing empirical evidence on the effectiveness of alternative funding strategies, such as strategic fundraising programs and collaborations with non-governmental organizations, in ensuring the sustainability of secondary schools. It highlights the practical role of innovative financial practices in addressing funding gaps,

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improving resource availability, and supporting educational infrastructure and programs. The findings offer insights for policymakers, school administrators, and stakeholders on effective approaches to achieve long-term educational sustainability. Additionally, it adds to the body of literature on education finance, particularly in developing regions, and serves as a basis for future research in similar contexts.

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Declaration of conflicting interests
No potential conflict of interest was reported by the authors during and after the study completion.

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A COMPREHENSIVE REVIEW ON THE SCREENING MODEL FOR THE PHARMACOLOGICAL ASSESSMENT OF ANTIULCER DRUGS

Pravin Vitthal Ghule, Mr. Ashwinkumar R. Deshmukh
Raosaheb Patil Danve College of Pharmacy, Badnapur

ABSTRACT

- *Peptic ulcer disease (PUD), primarily caused by excessive gastric acid secretion, Helicobacter pylori infection, or the use of nonsteroidal anti-inflammatory drugs (NSAIDs), remains a significant global healthconcern. The pharmacological management of PUD relies on the development of antiulcer drugs that targetthe underlying mechanisms of ulcer formation and promote mucosal healing. Screening models play a crucial role in the preclinical assessment of potential antiulcer agents, helping to evaluate their efficacy, safety, and mechanisms of action. This review provides a comprehensive overview of the various in vitro and in vivo screening models used for the pharmacological assessment of antiulcer drugs.*
and high-throughput screening, in advancing drug development is also discussed.
- *This review aims to provide researchers and clinicians with a thorough understanding of the critical role that screening models play in the pharmacological evaluation of antiulcer drugs, highlighti ng both their current applications and future directions in drug development. By improving preclinical testing, more effective and safer antiulcer therapies can be developed forthe management of peptic ulcer disease.*

KEYWORDS: *peptic ulcer disease, antiulcer drugs, screening models, pharmacological assessment, Helicobacter pylori, gastric acid secretion, drug efficacy, pharmacodynamics, pharmacokinetics, toxicity, safety evaluation,*

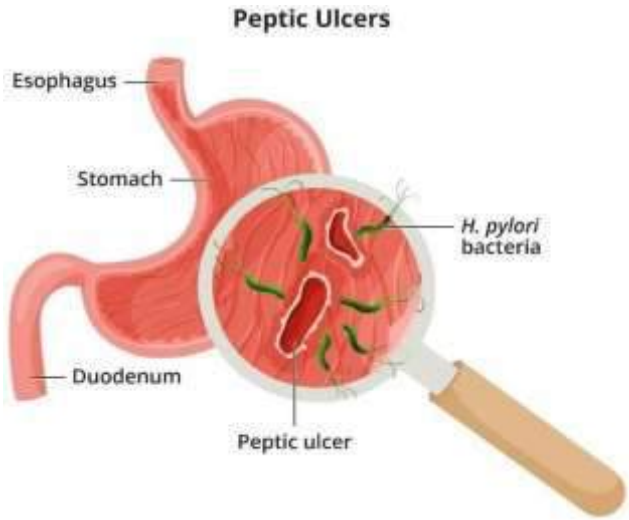
INRODUCTION

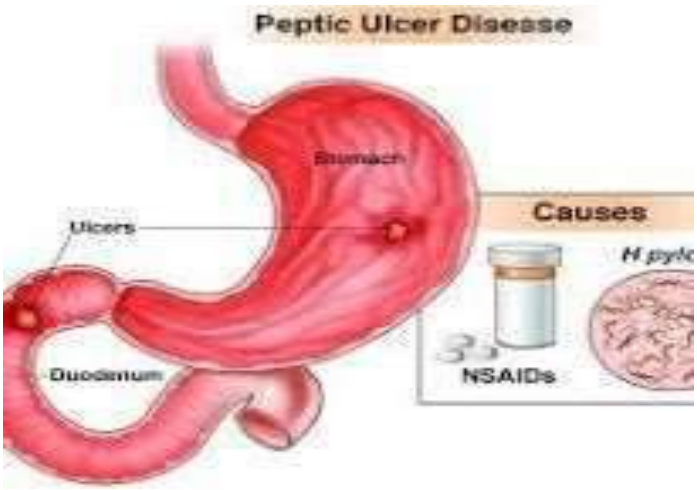
- Gastrointestinal diseases are very serious and common problems, which are causing maximum discomfort, morbidity, and mobility in human beings. It occurs in 10-15% of thepopulation at a time. Apeptic ulcer is a group of disorders which is responsible for the ulcerformation or mucosal lesions formation in the esophageal lining (swallowing pipe), stomachor duodenum (the first part of the small intestine).
- PEPTIC ULCER: It is a chronic inflammatory condition involving a group of disorders characterized by ulceration in regions of upper gastrointestinal tract where parietal cells secret pepsin and hydrochloric acid .
- The symptoms of peptic ulcer are: severe pain and irritation in the upper abdomen. If it is not treated properly, it may result in perforations in the wall of the gastrointestinal tract.
- The small sores are formed due to the imbalance between mucosal defensive factors (bicarbonate, mucin, prostaglandin, nitric oxide, and otherpeptides and growth factors) andinjurious factors (pepsin, helicobacter pylori, nsaids gastric acid). Ulcer in the stomach is known as gastric ulcer while ulcer in thefirst part of the intestine is also known as a duodenalulcer.
- **Aggressive factors:** HCl, pepsin, refluxed bile, NSAIDs, alcohol, pancreatic proteolytic enzymes, ingested irritants, bacterial toxins, physiochemical trauma; all of these factors increase the acid secretion.
- **Digestive factors**: Mucus, bicarbonates, blood flow, resolution of epithelium, the current status of therapy.
- Disruption of the gastrointestinal (GI) mucosa due to gastric acid secretion or pepsin causespeptic ulcerdisease (PUD). It penetrates the gastric epithelium all the way down to the muscularis propria layer. It typically affects the stomach and the first part of the duodenum.
- The jejunum, distal duodenum, and lower oesophagus could be affected. In individuals witha stomach ulcer, epigastric pain typically develops within 15-30 minutes after a meal, but in patients with a duodenal ulcer, the pain typically occurs 2-3 hours after a meal.
- sometimes, people feel that upper abdominal pain may increase after lunch or dinner, and sometimes people vomit materials which looks like coffee grounds , blood comeswith stool, have black or tarry stools, all thesesymptoms cause severe abdominal pain. The gastric ulcer pain may increasewith eating and we feel burning-like sensation in our stomach.
- By vagal postganglionic neurons, a neurocrine transmitter, acetylcholine is released which stimulates hydrogen ion generation directly via a parietal cell m3 muscarinic receptor.
- on parietal cells, paracrine transmitter name histamine binds with h2-specificreceptors. In response to this, adenylate cyclase is activated which increases adenosine 38, 58-cyclic monophosphate (camp) levels, and subsequently stimulates the generation of hydrogen ions.
- Gastrin secretion from astral g-cell which follows the endocrine pathway and stimulates the hydrogenionsecretion both directly or indirectly, in corpus and fundus, increases

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the stimulation of histamine secretion from enterochromaffin-like cells.

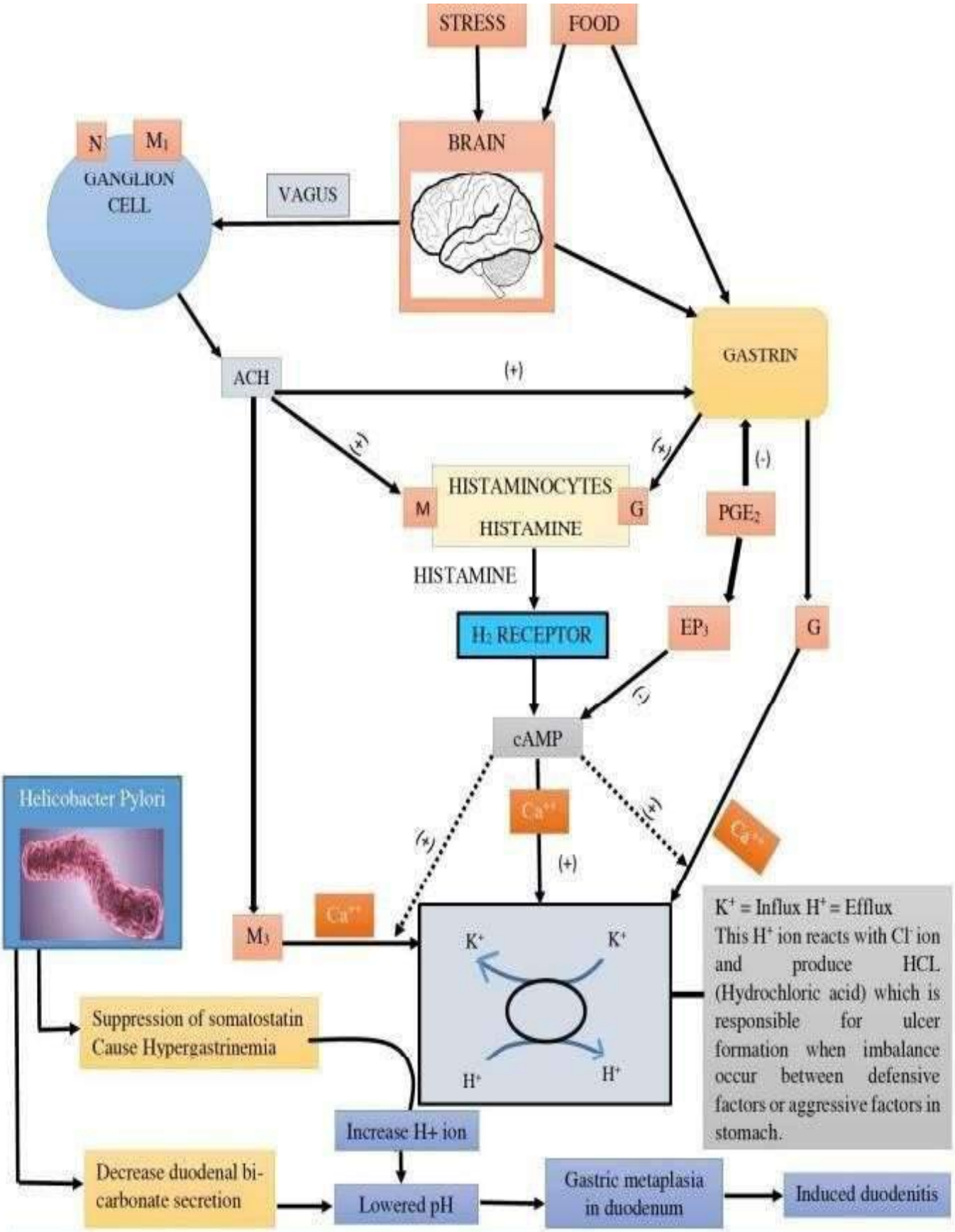
- Gastric acid secretions Gastric acid is established as one of the major ulcerogenic factor for the induction of gastric ulcer disease. It has been reported that about 50% of gastric ulcer patients are pepsin and acidhypersecretors. But, on the other hand, gastric acid plays a stringent role in gastric defense. It is the first line of mucosal defense to prevent bacterial colonization and reduced their ability to entrance in the mucosal layer. Acid secretion is suggested to be stimulated by three principlesecretagogues histamine, acetylcholine and gastrin. Gastrin stimulates acid secretion either by directWhile the duodenal ulcer increases with improper sleep or waking up late at night and eating.
- when these types of symptoms are not controlled by the counter drug, then thepatient may be referredtoa specialist called a gastroenterologist.
- The microbe helicobacter pylori (h. Pylori) play a critical role in peptic ulcer disease. This microbe can minimize the complication of this disease. Many studies reveal that more than half of the world's population is affected by chronic h. Pyloriinfection which directly affects. Gastroduodenal mucosa.
- Mammalian stomach has an ability to secrete concentrated hydrochloric acid in a very large quantityas we know that proteolytic enzyme pepsin and gastric acid arerequired to initiate digestion. Gastric aciddoes play a very significant and important role in protein hydrolysis and other digestive processes.





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PATHOGENESIS



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SIGN AND SYMPTOMS

- A dull or burning pain in the upper abdomen, between the breastbone and belly button
- Pain that occurs between meals or wakes you up at night
- Pain that worsens with eating
- Feeling full after eating a small amount of food
- Nausea and vomiting
- Bloody or dark stools
- Weight loss or weight gain
- Chest pain
- Fatigue
- Ongoing heartburn

TREATMENT OF PEPTIC ULCER

CLASS	SUBCLASS	DRUGS
RIC ACID SECRETIONINHIBITORS	PROTON PUMP INHIBITORS	1. OMEPRAZOLE 2. LANSOPRAZOLE 3. PANTOPRAZOLE 4. RABEPRAZOLE 5. ESOMEPRAZOLE 6. DEXRABEPRAZOLE
	H2 RECEPTOR ANTAGONIST	1. CIMETIDINE 2. RANITIDINE 3. FAMOTIDINE 4. ROXATIDINE 5. LOXATIDINE
	ANTICHOLINERGICS	1. PIRENZEPINE 2. TELENZEPINE 3. PROPANTHEKLIN 4. OXYPHENONIUM
	PROSTAGLANDINANALOUGE	1. MISOPROSTOL 2. ENPROSTIL 3. RIOPROSTIL
GASTRIC ACIDNEUTRALIZERS(ANTACIDS)	SYSTEMIC	1. SODIUM BICARBONATE , 2. SODIUM CITRATE
ULCER PROTECTIVE		1. SUCRALFATE, 2. COLLOIDAL BISMUTH SUBCITRATE.
ANTI H- PYLORI		1. AMOXICILLIN, 2. CLARITHROMYCIN, 3. METRONIDAZOLE 4. TINIDAZOLE 5. TETRACYCLINE 6. CBS

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LITRATURE REVIEW

1. **Bajpai Ankit,et.al. Pharmacological screening on antiulcer agent 2023,** when an imbalance occurs between the defensive factor and aggressive factor of the stomach, ulcer formation in the esophageal lining, stomach, or duodenum takes place. The quantitative assessment of experimentally induced gastric and duodenal ulcers has been a prob lem for investigators in this field of research.
2. **Michael Buenor Adinortey,et.al ,in-vivo model used for antiulcer agent.2022** peptic ulcer diseases comprise heterogeneous disorders, which manifest as a break in the lining of the gastrointestinal mucosa bathed by acidand pepsin.
3. **Raghuvendra Singh, et.al.effect of h-pylori on peptic ulcer,2022,**various creature models are utilizingto influenced ulcer to identifying the antiulcer activity of many new existed drugs such as pylorus ligated (shay) rats.
4. **Mohd. Shahid Khan,et.al a review on antiulcer activity ,2020,** research for a potential anti-ulceragent involves appropriate in vitro or in vivo models. Due to their anatomical,physiological, and genetic similarities to humans, rodents like mice and rats are ideal among the various animal models.
5. **Neetesh K Jain,et.al pharmacological screening of antiulcer agents,2020,** The life time prevalence of peptic ulcer diseases is 5 to 10% in the general population. There are approx 3.9 millionpatients with peptic ulcer diseases in United States with 200,000 to 400,000 new cases reported eachyear. The peak incidence is between 50 to 70 years of age.
6. **Abhinav Prasoon Mishra, et,al A Comprehensive Review on the Screening Models for the Pharmacological Assessment of Antiulcer Drugs,2019,** A literature search was conducted on various database sources (like science direct, PubMed) with the help of the combination of differentkeywords: Anti-ulcer model, In vitro In-vivo models of ulcer activity.
7. **Raghuvendra Singh,et,al, Pharmacological Screening Model and Its Treatment of Peptic Ulcer Disease,2018,** Peptic ulcer, otherwise called stomach ulcer, is a break in the coating of stomach, initial segment of the small digestive tract and at times in the lower throat.

AIM AND OBJECTIVES

AIM: A Comprehensive Review On The Screening Model; For The Pharmacological Assessment Of Antiulcer Drugs**.**

OBJECTIVES

1. TO EVALUATE THE EFFICACY OF ANTIULCER DRUGS

- **Objective:** To assess the ability of antiulcer drugs to reduce or heal ulcers through various in vivo and invitro models (e.g., pyloric ligation, ethanol-induced ulcers, stress-induced ulcers).
- **Purpose:** To determine how well the drug prevents or heals ulcers, which is the primary therapeutic goalfor antiulcer agents.

2. TO ASSESS THE MECHANISMS OF ACTION

- **Objective:** To understand the pharmacodynamics of antiulcer drugs, including how theyaffect gastric acid secretion, mucosal protection, and the healing of damaged gastric tissues.
- **Purpose:** To identify the specific molecular and cellular targets (e.g., proton pump inhibition, H2-receptor antagonism, mucosal cytoprotection) that explain the drug's therapeutic effect.

3. TO EVALUATE THE SAFETY PROFILE

- **Objective:** To identify any potential toxic effects or side effects of antiulcer drugs in preclinical models,such as damage to organs (e.g., kidneys, liver), gastrointestinal effects, or long-term toxicity.
- **Purpose:** To ensure the drug is safe for further clinical trials and eventual human use, minimizing the riskof adverse effects.

4. TO ASSESS THE PHARMACOKINETIC PROPERTIES

- **Objective:** To evaluate how the drug is absorbed, distributed, metabolized, and excreted (ADME) in the body.
- **Purpose:** To understand the drug's bioavailability, half-life, and the most effective dosing regimens, whichare crucial for designing clinical studies and maximizing therapeutic outcomes.

5. TO INVESTIGATE DRUG INTERACTIONS

- **Objective:** To determine whether the antiulcer drug interacts with other commonly used medications, especially those that affect gastric acid secretion (e.g., NSAIDs, corticosteroids).
- **Purpose:** To predict potential drug-drug interactions that could compromise the safety or efficacy of the antiulcer drug.

6. TO EVALUATE THE LONG-TERM EFFICACY AND HEALING

Objective: To assess whether the drug promotes long-term healing and prevents recurrence of ulcers,which is essential for chronic ulcer treatment.

- **Purpose:** To simulate long-term clinical treatment and determine the drug's potential for preventingrelapse and healing ulcers permanently.

7. TO ANALYZE THE IMPACT ON GASTRIC MUCOSAL DEFENSE

- **Objective:** To assess the drug's effect on enhancing mucosal defenses, such as stimulating mucussecretion, improving blood flow, or promoting the repair of damaged epithelial cells.
- **Purpose:** To evaluate how the drug supportsthe natural healing and protection mechanisms ofthe stomachlining, which is critical for ulcer treatment.

8. TO SIMULATE HUMAN-LIKE CONDITIONS

- **Objective:** To use animal models or in vitro systems that mimic human ulcer conditions, including acidsecretion, infection (e.g., *H. pylori*), and stress.
- **Purpose:** To ensure that the screening model reflects real-world clinical situations, improving thepredictive accuracy of preclinical findings.

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9. TO IDENTIFY POTENTIAL FOR COMBINATION THERAPY

- **Objective:** To explore whether the antiulcer drug can be used in combination with other treatments (e.g., antibiotics for *H. pylori* or proton pump inhibitors with cytoprotective agents).
- **Purpose:** To identify synergistic effects that may improve treatment outcomes or reduce treatment duration for patients with complex ulcer conditions.

10. TO INVESTIGATE THE EFFECT ON GASTRIC ACID SECRETION

- **Objective:** To evaluate the drug's role in modulating gastric acid secretion, either by reducing excess acid production or by balancing acid levels.
- **Purpose:** To determine if the drug is effective in lowering gastric acidity, which is a major contributing factor in ulcer formation.

11. TO INVESTIGATE THE DRUG'S EFFECTIVENESS AGAINST H. PYLORI

- **Objective:** To assess whether the antiulcer drug is effective against *Helicobacter pylori* infections, which are a major cause of peptic ulcers.
- **Purpose:** To determine if the drug has antibacterial properties and can treat ulcers caused by *H. pylori*,either alone or in combination with other antibiotics.

- **TYPE OF SCREENING MODEL FOR ANTIULCER ACTIVITY:**
  ANIMAL MODELS IN EXPERIMENTAL PEPTIC ULCER:
  Studies on animal models helps to understanding the etiology and screening of anti-ulcer agents.
  1. Ethanol-Induced Ulcers
  2. Cold Restraint Stress-Induced Ulcers
  3. Stress-Induced Gastric Ulceration
  4. Pylorus Ligated (PL)-Induced Ulcers
  5. Acetic Acid-Induced Ulcers
  6. Histamine- Induced Ulcers
  7. Indomethacin-Induced Ulcers
  8. Serotonin- Induced Ulcer
  9. Aspirin-Induced Ulcers
  10. Reserpine - Induced Ulcers Alcohol Induced Gastric Ulcer

1. ALCOHOL INDUCED GASTRIC ULCER

- **Principle:** Alcohol causes secretion of gastric juice and decrease mucosal resistance due to which protein content of gastric juice is significantly increased by ethanol. This could be leakage because of plasma protein inthe gastric juice with weakening of mucosal resistance barrier of gastric mucosa,this leading to peptic ulcer.
- **Procedure**: Albino rats of either sex weighing between (150-200 gms) are divided into six groups of animals in each group. The animals are fasted for 24 hours with free access water. Animals are given test drugs or standard drug. 1 hour later 1ml/200gm of 99.80% alcohol is administered p.o to each animal.
- Animal are sacrificed 1 hour after alcohol administration, stomach is isolated and cut open along the greater curvature and pinned on a soft board. The length of each gastric lesion is measure in mm. The %inhibition is expressed as sum of the length of the control-mean lesion index of text / mean lesion indexof control × 10.

2. H. PYLORI- INDUCED GASTRIC ULCER:

- **Principle:** It is a gram negative bacteria found in gastric an duodenal mucosa of most persons particularly the elderly. They, while in the mucosa, split into ammonia and thus elevates the local region of the mucosa by high alkalinity. In this way they strongly help the peptic ulcer development.
- **Procedure:** Albino Wistar rats of either sex weighing between (150-200 gms) are divided into fivegroups of six animals in group. In this method albino rats are fasted in individual cages for 24 hours.Care was being taken to avoid coprology. Test drug or standard drug or control vehicle is administered 30 minute prior to pyloric ligation. Under light ether anaesthesia, the abdomen is openedand the pyloruswas ligated. The abdomen is then sutured. At the end of 4 hours after ligation the animals are sacrificedwith excess of anaesthetic ether , and the stomach is dissected out gastric juiceis collected were drained into tubes and were centrifuged at 1000 rpm for 10 minutes and the volumeis noted. The pH of gastric juice is recorded by pH meter. Then the contents are subjected to analysis for free and total acidity. The stomachs are then washed with running water to see for ulcers in the glandular portion of the stomach.
- The numbers of ulcers per stomach are noted and severity of the ulcers scored microscopically with thehelp of hand lens (10x) and scoring was done as per Kulkarni (1987).
  - ❖ 0 = Normal stomach
  - ❖ 0.5 = Red coloration
  - ❖ 1 = Spot ulcers
  - ❖ 1.5 = Haemorrhagic streaks
  - ❖ 2 = Ulcer > 3 mm but > 5 m
  - ❖ 3 = ulcers > 5 mm
  - ❖ Percentage protection = 100- ut / uc × 100 Mean ulcer score for each is expressed as ulcer index. The percentage protection is calculated using the above formula.
  - ❖ where, ut = ulcer index of treated group.
  - ❖ uc = ulcer index of control group.

3. STRESS- INDUCED GASTRIC ULCER

- **Principle :** Stress can arise from prolonged anxiety, tension, and emotion, severe physical discomfort, haemorrhage and surgical shock, burns and trauma, thereby resulting in severe gastric ulceration. The mechanism of gastric ulceration is poorly understood. Recently research has shownthat resistant cold stress causes severe haemorrhage ulcer through derangement of the mucosal antioxidant enzyme such as super oxide,dismutase and peroxides. This is the stress condition arising mainly from physiology discomfort and themechanism of ulceration caused in this case should be different from ulcer caused due to

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other factors. The stress generate highly reactive OH* radicals thatcauses oxidative damage of the gastric mucosa andthat the radicals is formed by metal catalysed. Herber weiss reaction between O2 – and H2O2 followinginduction of the superoxide dimutase andoxidative damage of gastric peroxides.

- **Procedure:** Albino Wistar rats of either sex weighing between (150-200 gms) are divided into fivegroups of six animals in group.
- Cold resistance stress (CRS) induced ulcer-to 18 hours fasted rats, cold resistance stress is given by strapping the rats on a wooden plank and keeping them for 2 hours at 4o -6oc. The animals are then sacrificed by cervical dislocation and ulcers are scored on the dissected stomachs.

4. ASPIRIN- INDUCED GASTRIC ULCER

- **Principle:** NSAIDs inhibits the PG synthesis of gastric mucosa, PG gives cytoprotection. Enhancement of leukotriene synthesis, exhibits damage effect. Aspirin also inhibit gastric peroxidase&may increase mucosal H2O2 & hydroxyl ions level to cause oxidative mucosal damage.
- **Procedure:** Albino rats of either sex weighing between 150-200 gms are divided into five groups of sixanimals in group. The animals are fasted for 24 hours. The test drug in varying concentrations based onthe design of the experiment is administered orally in 2% gum acacia solution 30 minute prior to aspirinat dose of 200 mg/kg. 4 hours later the rats are sacrificed by using anaesthetic ether and their stomachs dissected. for the determination of gastric lesions.
- **Parameter studied - ulcer index:** The numbers of ulcers per stomach is noted and severity of the ulcersscored microscopically with the help of hand lens (10x) and scoring is done as per Kulkarni (1987).

❖ 0 = Normal stomach
❖ 0.5 = Red coloration
❖ 1 = Spot ulcers
❖ 1.5 = Haemorrhagic streaks
❖ 2 = Ulcer > 3 mm but ‹ 5 mm
❖ 3 = ulcers > 5 mm
❖ Percentage protection = 100- ut / uc × 100 Mean ulcer score for each is expressed as ulcer index. The percentage protection is calculated using the formula.
❖ Where, ut = ulcer index of treated group.
❖ Use = ulcer index of control group.

5. ACETIC ACID- INDUCED GASTRIC ULCER

- **Principle:** Acetic acid is reported to produce ulcers by gastric obstruction leading to increase in acidicgastric juice.
- **Procedure:** The rats were anesthetized with phenobarbitone (35 mg/kg, i.p.). the abdomen was openedand the stomach was visualized. Gastric ulcers were produced in rats at the anterior serosal surface of the glandular portionof the stomach 1 cm away from the pyloric end by 50% acetic acid (0.06ml/animal).Test drug and standard drug was given on day 1,orally, 4h after the application of acetic acid and continued for either up to 3 or 7 days after induction of ulcer. The animals were sacrificed after 18 h of the last dose of test drug either on 4th day or 8th day of experiment to assessthe ulcer size and healing.

6. INDOMETHACIN (IND)-INDUCED GASTRIC ULCERS

- **Principle:** Oral administrations of indomethacin (20 mg/kg) resulted in production of gastric lesions predominantly on glandular segment of the stomach and few or non in the antrum.lesions were producedlinearly on mucosal folds and had appearance of mucosal erosions.
- **Procedure:** IND (20mg/kg b.w.) suspended in 0.5% carboxymethyl cellulose was given as a singlei.p.dose to induce gastric ulcers after 30 min of test or standard drug treatment. After 5h, the animalswere killed and lesions in the gastric mucosa were scored. After identification of ulcer areas, the length of the ulcer was measured along the greater diameter. Number of haemorrhagic spots was considered equivalent to 1mm of ulcer. The mean ulcer size was calculated by dividing the total length (in mm) of ulcers for all the animals divided by total number of animals.

7. HISTAMINE-INDUCED GASTRIC ULCER

- **Principle:** Histamine-induced gastric ulceration is recognised to be mediated through both enhance gastric acid secretion and vasosplastic action of histamine
- **Procedure:** Guinea pigs weighing 300-400 g were fasted for 36 hr. with water ad libitum prior to the experiment and were divided into two groups of six animals each. Gastric ulceration was induced by i.p. administration of histamine acid phosphate (Sigma USA) (50 mg. base.). To protect the animals againsthistamine toxicity, 5 mg. of promethazine hydrochloride was injected i.p. to each animal 15 min after histamine administration. The test drug or control vehicles (Dist. water) were given orally 45 min beforehistamine administration.

8. RESERPINE-INDUCED GASTRIC ULCER

- **Principle:** Reserpine-induced gastric ulceration has been attributed to the degranulation of gastric mast cells and consequent liberation of histamine which is believed to be a cholinergacally mediated10.
- **Procedure:** Adult albino rats were fasted for 24 hr. following water ad libitum. Reserpine (5mg/kg) administered intramuscularly to four groups of six rats each. 30 min after the administration of the test drug or control vehicle (Distilled water) intraperitoneally. All the animals were sacrificed after 18 hr, there stomachs were removed, opened along the greater curvature and sum of lengths(mm) ofall lesions for each rat was used as “ulcer index”10.

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9. SEROTONIN-INDUCED GASTRIC ULCER

- **Principle**: Serotonin-induced gastric ulceration is believed to arise from a disturbance of gastric mucosal microcirculation. The development of ulcers by serotonin and reserpine usually takes about18 hr10.
- **Procedure:** Serotonin creatinine sulphate (Sigma USA) (20mg/kg) were administered subcutaneously to four groups of rats (24 hr. fasted). The test drug or control vehicle
- (Distilled water) was administered intraperitoneally after 30 min prior to the serotonin injection. The animals were sacrificed after 18 hr, their stomachs were removed, and the ulcer index was determined as described earlier.

CONCLUSION

- For validation of the presence of antiulcer activity in the newly synthesized drug which is going tobe used by the practitioner to treat gastric mucosal lesions or ulcer, then it is essential to investigatethe antiulcer property of the synthesized drug.
- The various number of antiulcer screening model have been developed over the past years in a different part of the world in which some are very good and some are not.
- Each and every model has its own pros and cons. The main objective for doing this review is to present an overview of antiulcer models which can be most frequently used by investigators for their gastrointestinal protection studies.
- After the study of antiulcer models, we found that the above mention models are widely used nowadays as per drug requirement and choice of the model also depends upon their result and timing.
- In-vitro models are less used in comparison with in-vivo but as per our study, we suggest that if bothin-vitro and in-vivo models are used together then there is a chance to increase the efficacy of result
  and it will help to find the better antiulcer activity of new drug molecules.

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