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CONTENTS

S.NO	TITLE	AUTHOR/S	PAGES
1	MUTRAUTSANGA: AYURVEDIC AND MODERN APPROACHES TO URINARY RETENTION	Dr. Sarvesh Dubey, Dr. Jyoti Dubey, Dr. Lata Arya	1-2
2	ADVANCED COMPUTING: BEST PRACTICES FOR AUTOMATING IMAGE DEPLOYMENT USING DOCKER, CLOUD, AND HPC FOR AI/ML APPLICATIONS	Kamalakaran Balasubramanian	3-5
3	CRAFTING SYNTHETIC DATA: A STRATEGIC APPROACH TO ENHANCE AI/ML APPLICATIONS	Kamalakaran Balasubramanian	6-7
4	SECURITY CONCERNS WITH CLOUD COMPUTING PRACTICES	Kamalakaran Balasubramanian	8-11
5	MODELLING OF THE OPERATING PERIOD OF A COMPRESSOR UNIT ON A SHIP FROM THE SEISMIC INDUSTRY I PART	I Bakalov, K Petrov	12-16
6	MODELLING OF THE OPERATING PERIOD OF A COMPRESSOR UNIT ON A SHIP FROM THE SEISMIC INDUSTRY II PART	I Bakalov, K Petrov	17-21
7	MEDICINAL VALUE OF AMORPHA FRUTICOSA	Kosbaulieva Bayan Zharylkasynovna	22-23
8	CHARACTERISTICS OF MORPHOFUNCTIONAL PROPERTIES OF FEMALE ATHLETES LIVING IN THE REPUBLIC OF KARAKALPAKSTAN	Shirlieva Guncha Davletgeldievna	24-25
9	BIOLOGICAL CHARACTERISTICS OF INSECTS WITH INCOMPLETE METAGNOSIS (INSEKTA: HEMIMETABOLA) OF THE NORTHWESTERN PART OF THE KYZYL KUM DESERT	Yusupova Asya	26-27
10	HEART RATE VARIABILITY IN FOOTBALL PLAYERS AND TRACK AND FIELD ATHLETES	Doniyorov Bakhridin Bakhrom Ugli, Mavlyanova Zilola Farkhadovna, Djurabekova Aziza Takhirovna, Shamsiddinova Madinabonu Shuxrat kizi	28-32
11	ROLE OF WOMEN IN ENVIRONMENTAL PROTECTION	Dr. Neetu Maurya, Tabassum Khan	33-37
12	SUITABLE INSECTICIDE FOR INTEGRATED PEST MANAGEMENT	Khodjaev Sh. T., Khakimov A. A, Akhmedov A. T., Yuldashev F. E	38-41
13	A TECHNIQUE TO SECURE DATA TRANSMISSION IN WIRELESS BODY AREA NETWORKS	Joshua Auko, Richard Omollo	42-48
14	BEST PRACTICES FOR IMPLEMENTING HYPERCONVERGED INFRASTRUCTURE	Vengada Narayanan Balakrishnan	49-50

	(HCI) IN MODERN DATA CENTERS		
15	PERINATAL PATHOLOGY AS A RISK FACTOR FOR THE DEVELOPMENT OF BRONCHIAL ASTHMA IN CHILDREN	Khaidarova Sarvinoz Khaidarzhonovna, Mavlyanova Zilola Farkhadovna, Sharipov Rustam Khaitovich	51-56
16	EXPLORING CASTE AND RACE THROUGH THE LENS OF GENDER IN THE NOVELS OF P. SIVAKAMI AND GLORIA NAYLOR: A COMPARATIVE STUDY	Krishnakant Patil	57-60
17	THE TECHNIQUE IS THE BASIS OF THE FORMATION OF PROFESSIONAL AND BASE COMPETENCIES IN HIGHER EDUCATIONAL INSTITUTIONS ON THE BASIS OF INTERDISCIPLINARY COMMUNICATION.	Sakieva B.B	61-63
18	THE ROLE OF PSYCHIATRIC NURSES IN SUPPORTING PATIENTS WITH DUAL DIAGNOSES: MENTAL HEALTH AND INTELLECTUAL DISABILITIES	Dr.(Prof.) Jomon Thomas	64-69
19	ECONOMIC EFFICIENCY OF GREENHOUSE FARMING IN UZBEKISTAN- A CASE FOR ESG-DRIVEN GROWTH	Akmal Durmanov	70-79
20	THE IMPACT OF GAMIFICATION ON EMPLOYEE LEARNING AND DEVELOPMENT: A COMPARATIVE STUDY OF TRADITIONAL AND GAMIFIED TRAINING METHODS	Anjana.M.R, Seema.K.S	80-84
21	HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC): A COMPREHENSIVE REVIEW	Parth Patel, Dr. Sachin B. Narkhede, Dr. Shailesh Luhar	85-86
22	COMPETENCIES OF THE DRUG ENFORCEMENT OFFICERS BASIC COURSE PROGRAM OF INSTRUCTION: BASIS FOR PROGRAM ENHANCEMENT	Jeanette Christy Batulan Matugas	87-91
23	A GLIMPSE ON PHARMACEUTICO-ANALYTICAL STUDY OF SWETA PARPATI	Dr. Jyoti Prakash Mishra, Dr. Jitendra Kumar Chhatra, Dr. Chandan Kumar Sahoo, Prof. (Dr.) Rajib Kishore Jena	92-96
24	THE ROLE OF MARMA POINTS IN MUSCULOSKELETAL HEALTH: AN ANATOMICAL PERSPECTIVE	Dr. Syeda Tanzeel Saher	97-103
25	LEGISLATIVE FRAMEWORK FOR WOMEN EMPOWERMENT IN INDIA	Mr. Kamal Kumar	104-108
26	PROJECT WRITE ON: A REMEDIAL INSTRUCTION TO ADDRESS WRITING SKILL DIFFICULTIES ON ENGLISH LANGUAGE COMPOSITION	Rodriguez Herma H, Tumanday Liana L.	109-122
27	MODERN POSSIBILITIES OF EARLY DIAGNOSTICS LARYNX NEOPLASMS	Muminov Sanzharbek Khaidaralievich	123-125
28	SUSTAINABLE DEVELOPMENT GOALS IN KARNATAKA- A STUDY OF 'NO POVERTY' GOAL WITH SPECIAL REFERENCE TO HAVERI DISTRICT	Hemanth C N	126-134
29	A STUDY ON CUSTOMERS SATISFACTION ON JIO MOBILE SERVICES-A STUDY ON THE CAPITAL OF ODISHA	Mr. Ajay Kumar Naik, Dr. Aditya Prasad Sahoo	135-141

30	COMPREHENSIVE TREATMENT PROGRAM FOR BRONCHIAL ASTHMA IN CHILDREN WITH A HISTORY OF PERINATAL CENTRAL NERVOUS SYSTEM PATHOLOGY	Haidarova Sarvinoz Haydarjonovna, Sharipov Rustam Khaitovich, Mavlyanova Zilola Farhadovna, Akhtamova Shahzoda Fazilovna, Shamsiddinova Madinabonu Shuxrat Kizi	142-146
31	ANALYSIS OF MARX AND ENGELS' THOUGHTS ON THE INDUSTRIAL REVOLUTION	Danfeng Zeng, Shengfeng Wang, Lushan Xiao	147-153



Mutrautsanga: AYURVEDIC AND MODERN APPROACHES TO URINARY RETENTION

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ABSTRACT

*Mutrautsanga is an Ayurvedic term used to describe urinary retention, a condition characterized by the inability to fully void the bladder. This disorder, primarily related to the vitiation of Vata dosha, aligns with the modern medical condition of **urinary retention**, which can arise from neurological disorders, mechanical obstructions, or infections. While modern medicine addresses this condition through catheterization, medications, and surgery, Ayurvedic management focuses on balancing the body's doshas and restoring natural urinary function. Ayurvedic therapies such as Basti (**medicated enema**) and Uttarbasti, along with herbal remedies like Varuna, **Punarnava**, and Gokshura, play a vital role in treating Mutrautsanga by promoting diuresis, clearing obstructions, and tonifying the urinary system. This review highlights both the Ayurvedic and modern perspectives on urinary retention, discusses the strengths and limitations of each approach, and suggests that a complementary strategy combining both systems of medicine may provide a more holistic and effective solution for long-term management and prevention of recurrence.*

KEYWORDS: *Mutrautsanga, urinary retention, Vata dosha, Basti, Uttarbasti, Varuna, Punarnava, Ayurvedic management.*

INTRODUCTION

*Mutrautsanga is a urinary disorder described in Ayurveda under the umbrella of **Mutraghata**, where the flow of urine is obstructed due to the vitiation of **Vata dosha**. **Mutrautsanga** manifests primarily as urinary retention, where a person finds it difficult to pass urine or experiences incomplete voiding. In modern medicine, this condition aligns with urinary retention caused by various factors, including neurological conditions, prostate enlargement, or infections. While modern treatments focus on quick symptomatic relief, such as catheterization or medications, Ayurveda offers a holistic approach aimed at addressing the root cause of the disorder and restoring normal urinary function. This article explores the Ayurvedic management of **Mutrautsanga**, its modern medical equivalent, and the potential benefits and limitations of both approaches.*

In modern medicine, urinary retention refers to the inability to empty the bladder fully or at all. It can be caused by multiple factors, including Prostatic hypertrophy in men (common cause in older adults), Neurogenic bladder (due to conditions like spinal cord injuries or nerve disorders), Urinary tract infections (UTIs), Medications that affect bladder function (such as anticholinergics or opioids). Most immediate form of treatment to relieve retention and drain the bladder is Catheterization. Drugs such as alpha-blockers and 5-alpha reductase inhibitors to relax the bladder and improve urine flow, particularly in cases of prostate enlargement for chronic cases, surgery like TURP (Transurethral Resection of the Prostate) or other corrective surgeries may be necessary. However, these treatments come with limitations can lead to infections or long-term complications like bladder atrophy, urinary incontinence. Medications often bring side effects. Given these drawbacks, Ayurveda offers a more comprehensive approach to managing **Mutrautsanga**. it aims to correct the imbalance of doshas and improve the natural elimination process.

According to Ayurvedic principles, **Mutrautsanga** is caused by the vitiation of **Vata dosha**, especially **Apana Vayu**, which governs the excretory functions of the body. When **Vata** becomes imbalanced due to improper diet, lifestyle, or aging, it causes obstruction in the urinary passages, leading to **Mutraghata** (urinary obstruction). In this context, **Mutrautsanga** occurs when there is a blockage in the normal flow of urine, leading to incomplete or difficult urination.

Ayurvedic Management of **Mutrautsanga**

1. Diet and Lifestyle Modifications



- *Vata*-pacifying diet: Foods that are warm, light, and easy to digest, like soups, stews, and ghee, are recommended to pacify aggravated *Vata*. Dry, cold, and hard-to-digest foods should be avoided .
 - Hydration: Proper hydration is emphasized to flush out toxins and support urinary health. Herbal teas like coriander tea or cumin-infused water can be beneficial.
 - Exercise and Yoga: Gentle exercises and yoga postures like *Bhujangasana* (cobra pose) and *Pavanamuktasana* (wind-relieving pose) can help promote healthy digestion and elimination, balancing *Apana Vayu* .
2. *Panchakarma* Therapies *Panchakarma* is a cornerstone of Ayurvedic treatment for *Vata*-related disorders, including *Mutrautsanga*:
- *Basti* (Medicated Enema): *Basti* is one of the primary treatments for *Vata*-related conditions. It helps balance *Apana Vayu* and aids in the proper elimination of urine. Oils like *Dashmooladi Taila* or *Baladi Taila* are used to nourish the urinary tract and improve bladder function.
 - *Uttarbasti*: A specialized treatment for urinary disorders, *Uttarbasti* involves the administration of medicated oils directly into the bladder or urethra. It is particularly useful for conditions like *Mutrautsanga* that involve obstruction in the urinary system .
 - *Abhyanga* (Oil Massage): Regular oil massages using *Mahanarayan Taila* or Sesame oil can help pacify aggravated *Vata* and improve circulation in the pelvic region, aiding in the proper function of the bladder and urinary system .
3. Ayurvedic Herbal Formulations Ayurveda utilizes various herbs and formulations to manage urinary retention. These herbs work by improving urinary flow, reducing inflammation, and supporting bladder health:
- *Gokshura* (*Tribulus terrestris*): Known for its diuretic properties, *Gokshura* helps in increasing urine flow and reducing retention. It is also useful in reducing inflammation in the urinary tract .
 - *Punarnava* (*Boerhavia diffusa*): *Punarnava* is an excellent diuretic that helps relieve water retention and improve the excretion of urine. It is also anti-inflammatory and is often used to treat urinary tract infections.
 - *Varuna* (*Crataeva nurvala*): *Varuna* is effective in breaking down urinary stones and facilitating the smooth flow of urine. It works by opening up the urinary channels and reducing blockages .
 - *Shilajit* (Asphaltum): *Shilajit* is an important Ayurvedic remedy that strengthens the urinary system, reduces inflammation, and promotes healthy bladder function
4. *Rasayana* (Rejuvenative) Therapies
- *Shilajit* and *Ashwagandha* are also prescribed as *Rasayana* therapies to rejuvenate the urinary tract and improve bladder health in chronic cases of *Mutrautsanga* .

Ayurvedic treatments can be used in conjunction with modern medical interventions for a more comprehensive approach to managing urinary retention. While modern treatments provide quick relief in acute situations, Ayurvedic therapies aim to restore balance, prevent recurrence, and support long-term bladder health.

CONCLUSION

Mutrautsanga, or urinary retention, is a complex condition that can be effectively managed through Ayurvedic therapies aimed at pacifying *Vata dosha*. The use of herbal formulations, *Panchakarma* therapies, and *Rasayana* herbs offers a natural, holistic approach to the treatment of urinary disorders. While modern medicine provides immediate relief through catheterization and medications, Ayurveda works on the root cause of the disorder, offering long-term solutions with fewer side effects. Future research and integration of modern and traditional practices could enhance treatment outcomes for individuals suffering from urinary retention.

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ADVANCED COMPUTING: BEST PRACTICES FOR AUTOMATING IMAGE DEPLOYMENT USING DOCKER, CLOUD, AND HPC FOR AI/ML APPLICATIONS

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INTRODUCTION

Docker has revolutionized how applications are packaged, making it easy to bundle an application with all its dependencies into a standardized unit. When paired with cloud platforms (AWS, GCP, Azure) and High-Performance Computing (HPC) servers, Docker enables rapid deployment and scaling of complex applications, including those utilizing AI/ML (Artificial Intelligence/Machine Learning) algorithms.

This document outlines best practices for automating the deployment of AI/ML applications using Docker, cloud infrastructure, and HPC servers. The focus is on streamlining the development, testing, and production pipeline, particularly in environments where resource-intensive models or datasets are processed.

Abbreviations

Abbreviation Expansion

HPC	High-Performance Computing
AI/ML	Artificial Intelligence/Machine Learning
AWS	Amazon Web Services
GCP	Google Cloud Platform

Problem Statement

In cloud environments like AWS or GCP, where large-scale AI/ML applications are deployed, numerous patches and updates are frequently released, requiring rigorous testing before they are certified. This creates a significant challenge, as testing AI/ML models involves large datasets and computation-heavy processes. In traditional setups, this testing would lead to:

- Long testing cycles due to the manual creation of virtual machines (VMs) and containers.
- Overuse of hardware resources due to the need for multiple VMs for testing and certification.
- Increased complexity in managing resources, especially for large AI/ML datasets and models.

Additionally, AI/ML models often require specialized computing environments that can handle parallel processing and distributed training, which traditional VM setups cannot adequately support.

Solution Approach: Docker on Cloud with HPC for AI/ML Applications

Integrating Docker with cloud platforms (such as AWS or GCP) and HPC servers offers a robust solution for managing the deployment and testing of AI/ML applications. HPC servers provide enhanced computational power, allowing large-scale AI/ML models to be trained and tested efficiently, while Docker simplifies container management.

Key Strategies

1. Automated Image Deployment: Using Docker to automate image creation for AI/ML applications and integrate patches in a single container.
2. HPC Integration: Leveraging HPC servers available in cloud environments to handle the intensive compute requirements of AI/ML applications, including training neural networks or processing large datasets.
3. Automated Testing and Cleanup: Developing scripts to automate container creation for testing and to destroy containers after testing to reduce resource usage.



Docker Workflow with HPC for AI/ML

Build

Using Docker, create lightweight and portable containers that include the necessary AI/ML libraries, frameworks (e.g., TensorFlow, PyTorch), and dependencies. HPC servers allow these applications to scale across multiple nodes for faster processing.

Ship

Enable seamless distribution of AI/ML containers across cloud environments and HPC clusters (such as those offered by AWS or GCP). Docker ensures consistency across environments and allows for faster iteration during development.

Run

Run complex AI/ML models on HPC-powered cloud environments. Docker's scalability and HPC's high-performance capabilities enable faster training and testing cycles for AI models, handling large-scale computations and datasets efficiently.

Steps for Automating AI/ML Image Deployment Using Docker, Cloud, and HPC

1. Provision a Cloud VM with HPC Resources: Create a VM in a cloud environment (AWS, Azure, GCP) with access to HPC resources.
2. Install Docker: Set up Docker on the VM to manage containers.
3. Configure HPC for Docker: Ensure that the cloud instance is optimized for high-performance tasks, including parallel processing for AI/ML workloads.
4. Run AI/ML Models in Containers: Start by deploying AI/ML applications in containers, leveraging Docker's efficiency to bundle all dependencies.
5. Use Pre-existing AI/ML Docker Images: Leverage Docker Hub to use pre-built images for common AI/ML frameworks like TensorFlow, PyTorch, or Scikit-learn.
6. Customize and Build AI/ML Images: Create custom Docker images for your AI/ML workflows, including models, datasets, and dependencies.
7. Push AI/ML Images to Repositories: Publish your custom images to Docker Hub or a private repository for reuse.
8. Automate Testing with HPC: Write scripts to automate the creation and destruction of containers for testing AI/ML models, ensuring they can run on HPC clusters in cloud environments.
9. Monitor and Optimize Resource Usage: Utilize HPC metrics from cloud platforms to monitor resource allocation and optimize performance during model training and testing.

Benefits of Using Docker and HPC for AI/ML Workflows

Quantitative Benefits

- Portability Across Environments: AI/ML models and their dependencies can be easily transferred between different environments without compatibility issues.
- Improved Performance: HPC servers available in cloud environments (AWS, GCP) reduce the training time for AI/ML models by leveraging parallel processing capabilities.
- Faster Testing Cycles: Automating container creation and destruction significantly reduces time spent on repetitive testing tasks.
- Optimized Resource Usage: HPC enables more efficient use of hardware resources, allowing AI/ML applications to scale effectively.

Qualitative Benefits

- Scalability: Docker and HPC allow you to scale AI/ML applications across large clusters of machines, speeding up complex model training.
- Version Control: Track and manage different versions of AI/ML models within Docker containers, simplifying the process of testing and deployment.
- Simplified Maintenance: With Docker, dependencies and environmental configurations are handled within containers, reducing potential compatibility issues.
- Collaboration: Docker containers can be shared easily, enabling collaborative AI/ML development across teams.



Applicability to AI/ML Projects

This best practice can be applied across various AI/ML projects that involve heavy computational requirements, including:

- **Model Training:** Use HPC for faster training of deep learning models.
- **Data Processing:** Efficiently process large datasets in parallel using HPC-enhanced Docker containers.
- **Continuous Integration/Continuous Deployment (CI/CD):** Automate the deployment of AI/ML models across environments while testing in parallel using Docker and HPC.

Learning/Improvements

Future improvements include leveraging advanced orchestration tools like Kubernetes to manage AI/ML containers at scale, ensuring that workloads are distributed effectively across HPC clusters. Additional tools like TensorFlow Serving can be integrated to manage model serving in real-time applications.

CONCLUSION

The combination of Docker, cloud platforms (AWS, GCP), and HPC infrastructure offers a powerful solution for deploying and testing AI/ML applications. By automating image creation, utilizing scalable HPC resources, and streamlining testing processes, organizations can drastically improve their AI/ML deployment cycles, reduce resource consumption, and accelerate innovation.



CRAFTING SYNTHETIC DATA: A STRATEGIC APPROACH TO ENHANCE AI/ML APPLICATIONS

INTRODUCTION

Kamalakannan Balasubramanian

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INTRODUCTION

Data is the fuel that drives the testing and development of AI/ML applications. Whether for machine learning models, generative AI systems, or multimodal and large language models (LLMs), synthetic data enables rapid iteration, secure testing, and reliable performance assessments. Poorly designed test data can limit coverage of real-world scenarios, leading to unreliable outcomes. By leveraging synthetic data, teams can overcome challenges associated with real-world data acquisition while maintaining the high-quality standards required for machine learning, deep learning, and reinforcement learning systems.

The Role of Test Data in AI/ML Development

Test data plays a critical role in validating the functionality and performance of AI/ML applications. Accurate and diverse synthetic data enables the simulation of real-world conditions, helping to train, tune, and test models effectively. This is especially important for:

- **Machine learning:** Models require large datasets to learn patterns and make predictions, and synthetic data can fill gaps where real-world data is unavailable.
- **Deep learning:** Synthetic datasets can support training complex neural networks with large amounts of labeled data, enabling recognition tasks like image classification or sensory perception.
- **Reinforcement learning:** Simulation environments for AI agents often need synthetic data to evaluate and optimize decision-making algorithms, crucial in industries such as autonomous driving and robotics.

Data Challenges in Large AI/ML Applications

AI applications rely on vast amounts of data from diverse sources, ranging from user logs to telemetry from hardware systems. These datasets must be replicated, enriched, and integrated into cloud ecosystems, which adds complexity. In addition, emerging AI techniques like generative models or large multimodal systems require not only high-volume but also high-quality data that reflects the complexity of real-world interactions.

Industries such as healthcare, finance, and telecommunications face significant challenges in acquiring and processing this data securely and at scale. Testing new features in these industries demands access to accurate data that reflects various operational conditions, including multiple products, configurations, and compliance factors (e.g., GDPR, CCPA).

Synthetic Data as a Solution

To address these challenges, I propose implementing a **Data as a Service (DaaS)** tool designed to generate secure, scalable synthetic data. The DaaS platform would automate data generation aligned with product requirements, ensuring that data is tailored for specific use cases, training, and testing.

This service provides several key benefits:

- **AI assurance and assessment:** By offering synthetic data for use across all development and operational phases, it allows for consistent validation of AI models, reducing the risk of biased or incomplete datasets.
- **Foundation models and generative AI:** Synthetic data can train and fine-tune generative models that rely on large, diverse datasets to function correctly.
- **Trust and safety:** Using synthetic data helps ensure that no sensitive or personally identifiable information (PII) is exposed during development and testing, enhancing compliance with data security laws.



Best Practices for AI/ML-Driven Synthetic Data Creation

- Data Acquisition and Ingestion:** Integrate real-time or batch data pipelines from diverse sources, including telemetry, hardware performance logs, and external APIs. AI/ML models require a continuous flow of clean, structured data for training and evaluation. Automated ingestion workflows can ensure seamless data integration for industries like finance and healthcare, enabling rapid experimentation and model evolution.
- Data Preprocessing for Machine Learning:** Implement robust data preprocessing pipelines for cleaning, normalization, and feature extraction. Machine learning models are highly sensitive to data quality, making preprocessing essential for the success of projects in sectors such as e-commerce or healthcare, where AI/ML applications depend on highly accurate predictions and decisions.
- Deep Learning and Multimodal Systems:** Train deep learning models with synthetic data that includes diverse feature sets, such as sensory perception data, object recognition tasks, or user behavioral patterns. Synthetic data must be designed to reflect real-world scenarios to optimize model performance in tasks requiring deep neural networks (e.g., autonomous vehicles, medical imaging).
- Generative AI Systems:** Use synthetic data to fine-tune generative AI systems like large language models (LLMs) and multimodal AI, which require high-quality inputs to produce coherent outputs. This practice accelerates innovation in conversational AI, content creation, and personalized recommendations across industries.
- Model Optimization and Distributed Training:** Leverage distributed computing frameworks like Apache Spark or TensorFlow to scale training across vast datasets. The use of synthetic data allows for quick adaptation of models and ensures continuous improvement in areas like predictive maintenance or fraud detection.
- AI Safety, Trust, and Security:** Implement technologies for improving AI safety and responsible use, including secure synthetic data generation techniques that align with regulatory standards. Ensure data pipelines are monitored, and AI models undergo continuous evaluation to maintain transparency, trust, and compliance with safety frameworks such as explainability, fairness, and bias mitigation.
- Feedback Loops and Model Evolution:** Set up end-to-end monitoring and feedback loops to track AI models' performance, latency, and real-time adaptation. Regular updates to synthetic data can keep models current with changing user behaviors, regulatory requirements, or operational contexts in industries like telecom and social media.

CONCLUSION

The integration of synthetic data generation into AI/ML development processes enables faster, more secure, and scalable deployment of AI models. By following this strategic approach, organizations across various industries can maintain agility, ensure regulatory compliance, and foster innovation in their AI systems while adhering to responsible AI principles and maintaining high standards for trust and security.



SECURITY CONCERNS WITH CLOUD COMPUTING PRACTICES

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ABSTRACT

In order to have more compute and storage facilities, cloud computing is one of the fastest growing sectors with the fastest acceptance and adoption rate. However, as more enterprises migrate to the cloud, data security and plausibility become a big concern for both the organisations migrating to the cloud and the cloud providers themselves. In general, it is the obligation of both suppliers and consumers to collaborate in order to improve the security of deployed models.

KEYWORDS: *Cloud, Computing, bandwidth, storage.*

I. INTRODUCTION

A cloud is a network-accessible organisation that is hidden from users. Cloud computing is a collection of technologies that work together to deliver hosting and storage services through the Internet. Depending on the use cases for a certain individual or organisation, clouds can be defined as public, private, or hybrid cloud.

With the increasing popularity of Total cloud-based systems, cloud operators have been concentrating on their consistency, security, privacy, and cost-effective cloud design. Cloud programme requirements vary greatly depending on the resources that are requested as services. As a result, the sources may also upward thrust to heavy computation sources, large garage sources, large community sources, and so on. In other words, cloud computing is a popular term for delivering hosted artwork over the Internet. It does, however, provide significant benefits to the project; but, as with any new technology, it also has a number of drawbacks. One of the most important topics is the security and privacy of customer information in terms of its location, accessibility, and security. Cloud computing can also be defined as the ability for a community or a remote server to store, manipulate, and manage data over the internet.

II. HEURISTIC SEARCH METHOD

Customers and businesses can use programmes on any computer connected to the Internet thanks to cloud computing. Without any previous connections or access to private files, directly. Users simply need to use the information and resources and pay for the service, which saves time and money by avoiding the usage of third parties.

Businesses provide cloud computing services, which users can access via the Internet.

III. DEPLOYMENT OF CLOUD SERVICES

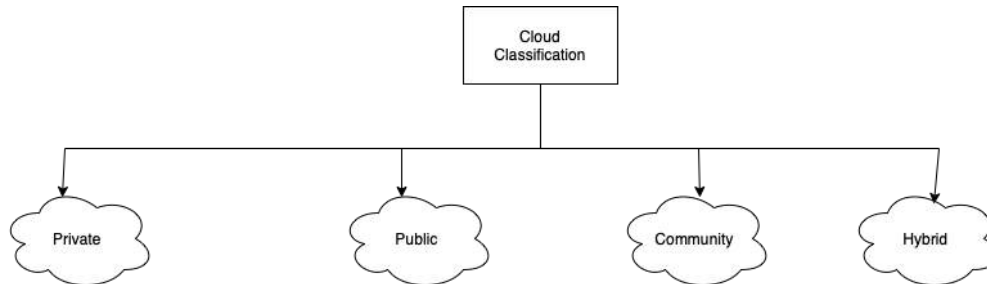
Private cloud, public cloud, hybrid cloud, and community cloud are the four types of cloud readiness models.

- **Private Cloud:** This cloud computing is comparable to public cloud computing in that it incorporates "scalability" and "reliability." The fundamental distinction between a public cloud and a private cloud is that a private cloud is created particularly for a single company.
- **Public cloud:** In terms of "scalability" and "reliability," this cloud computing is similar to public cloud computing. The primary difference between a public and private cloud is that a private cloud is designed specifically for a single enterprise.
- **Hybrid cloud:** This is essentially a collaboration between the public and private cloud systems.
- **Community cloud:** a cloud that is shared by several organisations and is set up to meet their specific needs. The framework may be owned and operated by the businesses themselves or by the cloud service provider.
- Three primary models characterise the nature of the services that cloud computing providers give to their cloud customers: 1. Software as a Service (SaaS): SaaS, often known as "on-demand software," is a cloud computing layer that allows users to access information and applications via the Internet rather than locally. Customers can use computers, desktops, mobile phones, browsers, and other devices to access these services.



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The Various models are depicted in the diagram below.



IV. SECURITY IN CLOUDS

Gartner, a research and consultancy firm based in the United States, has stated that cloud computing for provider-enabled programmes will take another seven years to attain commercial maturity. Scalability, interoperability, shared environment, and security are just a few of the issues it has faced thus far, not to mention other business-related issues. There's no arguing that cloud resources are virtualized; outstanding cloud provider customers share the same infrastructure and platform for developing software and storing data. Structure set, asset alienation, and information segregation are three key hobbies. Any unauthorised and violent access to a cloud provider's sensitive information might also compromise its integrity, confidentiality, and privacy.

A. Cloud Threats

Some of the threats have been studied over time, and it has been discovered that theft and illegal access have compromised enormous amounts of data. Losses, combinations, IT incidents, and incorrect disposal made up the rest of the security threats.

B. Technical Issues

- **Security:** "How can information be locked safely?" is how security is defined. The fact that sensitive business data would be stored outside the company's firewall raises serious issues. If adequate precautions are not followed, a great deal of very sensitive information could be made public. Even if only one site is hacked, hacking and other assaults on cloud infrastructure will affect several clients. Using security apps, encrypted data file schemes, data loss software, and acquiring security hardware to track out-of-the-way conduct across servers helps reduce these dangers.
- **Distributed-Responsibilities:** Users must check before uploading sensitive data to cloud storage, which is the biggest security risk. You should also use 32-bit encryption as part of your security procedures. This is critical because you may safeguard your data on the cloud by encrypting it before storing it.
- **Fault tolerance and failure recovery:** The data center's sole function is to process massive amounts of data every day. Cloud services may experience data loss if the cloud system fails. Breakdown can be caused by a lack of power, a lack of room, or a failure of the primary system.

V. CHALLENGES FACED IN CLOUD COMPUTING

These are some of the security challenges and their knowledge is needed for mitigation purposes.

Privileged User Access: To avoid data breaches, clients who access data outside the business must get authorization or purchase membership.

Data Location: The client should be completely unaware of the location of data storage and distribution.

Availability: Even if the company's service is now unavailable, the data should be available elsewhere. Always-on software availability is the term for this situation.



Regulatory Compliance: Even if the company's offer is temporarily unavailable, the data should be available everywhere. Always-on software availability is the term for this.

Recovery: In the event that data is lost due to man-made or natural disasters, the provider must be able to deliver backup data to the customer in a timely manner.

VI. SECURITY RISKS IN CLOUD COMPUTING

Cloud computing allows you to access an organization's data and information. Hackers and attackers have discovered a number of ways to gain access to this data, including:

IP Spoofing: The examination of data transmitted via a network is known as IP spoofing. The attacker manipulates the data as it is transferred over the network. The procedure is carried out in such a way that the trusted system's IP address is adjusted, then the packet information is edited and forwarded to the receiving system.

DDOS attack: The server becomes perplexed, unsure how to handle all of these requests, and authenticated data is leaked.

Insecure Interface: Customers can use interfaces to comply with cloud-based internal software. These APIs are used for data administration, identity management, monitoring services, and other cloud-based operations. If the interface is insecure, data theft is quite straightforward.

Data Loss or Leakage: When data is sent from the host to the client, two procedures take place. The data is first stored in faraway locations, and then it is transported from one run mode to a plethora of others. As a result, any modifications you make now will lead to data loss or leakage.

Malware attack on VM: Unwanted VM-based malware or toolkits used to obfuscate information transferred to the server can jeopardise cloud security. When data is transferred from the server to the client, the same thing can happen. Data such as registry information, system logs, and security programme details are also stored by these viruses or malware. The relationship between these risks is depicted in this flow chart.

He concludes, however, that the loss of control, invalid storage, access control, and data limits that hackers, crackers, and many security researchers cause are due to a lack of control, invalid storage, access control, and data restrictions. Cloud computing is insecure, and various efforts have been taken to lessen such dangers throughout time.

Some attacks are illustrated in below figure [figure2]

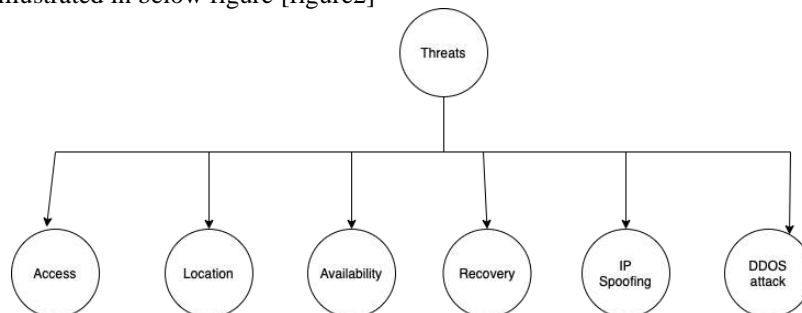


Figure 2: Cloud Security Treat

VII. CONCLUSION

Cloud computing is a fantastic technology that is rapidly gaining popularity. It's a technology that's growing in popularity, with applications in fields including testing and development, big data analytics, and file storage. Although cloud computing and its services are new, many new businesses are adopting them, yet there are always concerns of data breaches. Because of the increased network dependency, firms that use cloud services have more chances for data breaches than traditional organisations. Malware injection is also a major issue in the cloud. An attacker can easily steal important organisational data as a result of this. Those seeking competitiveness in today's economy can gain from cloud companies. The fact that sensitive data is shared while businesses share data is the biggest and most worrisome fear about cloud computing, and the potential for data breaches and data loss is apparent. As a result, all businesses must establish trustworthy security measures in order to protect their



consumers' data. Firewalls and intrusion prevention systems are available in many clouds, but they are not suited to your individual system.

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MODELLING OF THE OPERATING PERIOD OF A COMPRESSOR UNIT ON A SHIP FROM THE SEISMIC INDUSTRY I PART

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ABSTRACT

A possibility of extending the time between overhauls period of a compressor unit on a ship from the Seismic Industry by using pre-synthesized predictive mathematical models is considered. The latter are created by processing experimental data and refer to cases of before and after overhaul of the Seismic compressor. In part one, results of synthesizing predictive mathematical models of the relationship between the duration of the operating time of the Seismic compressor and the pressure change in the first stage – screw compressor are proposed. In Part Two, results of synthesizing predictive mathematical models of the three piston stages of the Seismic Ship compressor are proposed.

KEYWORDS: *Offshore Oil Industry, Seismic Vessel, Seismic Air Compressor, Synthesizing Predictive Mathematical Model, Least Squares Method, Regression Analysis*

1. CHARACTERISTICS AND FEATURES OF THE RESEARCH OBJECT

Two are the most important characteristics of the Seismic Vessel: safety in navigation to guarantee the possibility of manoeuvring and the normal functioning of the seismic equipment with which the ship fulfils its purpose. Examining the problem of mathematical modelling of the operational period of the seismic compressors of a Seismic Ship is required by considerations of realizing the possibility of using prognostics for extending the operational time. According to the manufacturer's recommended schedule, the operating time of the screw compressor is 12,000-16,000 operating hours, after which it should come in for a major overhaul. The overhaul of the piston part of the Seismic compressor is carried out every 8000 working hours. The seismic vessel is a complex equipment operating in harsh conditions. Extending the time between overhauls period is desirable to realize savings. [3, 5, 7, 8]. Three NEA GROUP SAPS-62E seismic compressors with a maximum compressor power of 406 kW and a nominal power of the drive electric motor of 1100 kW are installed on the Seismic Vessel. The maximum working pressure is limited to 175 bar. The rotation speed of the compressors is regulated by frequency converters, and when starting, the idle speed is limited to 600 min⁻¹, and the maximum rotation speed is 1200 min⁻¹. The maximum flow rate of the compressor is 62.7 m³/min at 1200 min⁻¹ [5, 9]. Fig. 1 shows the complete compressor unit.



Fig. 1 Seismic Compressor NEA GROUP SAPS-62E

The seismic compressor has four compression stages. The first stage is a Kaeser Kompresoren GmbH screw type of compressor model Sigma 5 – G, and the second, third and fourth stages are a NEUMAN&ESSER V-shaped piston compressor model 3SEV63-162/142/78 [5].



The first stage of the reciprocating compressor is located independently on a crankpin of the crankshaft. The second and third stages are mounted on the other crankpin. Since the piston of the second and third stage is a complex type, the two cylinder blocks for second and third stage are located on top of each other [5].

The screw compressor consists of two screws that compress the air to a pressure of 12-15 bar. The compressed air together with the oil that lubricates the screw compressor passes through an oil separator, where the oil is separated from the air, passes through an oil cooler and filter, and then is returned to the screw compressor at a temperature of 95 °C. The compressed air, in turn, passes through an air cooler and then enters the first stage of the piston compressor, where it is compressed to 32-36 bar.

2. INFORMATION PROVISION OF THE STUDY

Seismic Compressor 1 parameters of interest to the study were collected using the Seismic Compressors operation and control software "Phoenix Contact". The parameters were recorded at a fixed mode of operation of the Seismic Compressor with a rotation speed of 1059 min⁻¹ during the operation of the vessel in Seismic mode. Data recording was done every 10 days at the same time of the day. 20 data records were collected before the overhaul period of Seismic Compressor 1 and 20 data records after the overhaul period.

In the screw compressor, the air pressure and temperature change slightly at the end of the study period.

3. DATA PROCESSING FROM THE NEA GROUP SAPS-62E SEISMIC COMPRESSOR EXPERIMENT

The experimental-statistical study of the dependence between the length of the time of operation of Seismic Compressor 1 and the pressure variation is considered in two cases: when the compressor has undergone an overhaul and before it. The number of data collected during a certain period of time in both cases is the same-20 times and is considered as Factor X =[1 2 318 19 20]. The results of the operation of the compressor in both cases differ by the time of the experiment - before the overhaul PK1pr(1) and after it PK1sr(1).

3.1 Modelling the dependency: operating time of Seismic compressor 1 - pressure change PK1(1), bar

The results of the scientific search for a qualitative, workable model giving the relationship between the operating time of Seismic Compressor 1, considered as Factor X and its effect on the pressure change PK1(1), during that time is denoted by “y”. The search for a high-quality, workable model presupposes the study of many models and choosing among them the best compromise: accuracy and simplicity of its structure.

3.1.1 Dependency Modelling: operating time - pressure change after overhaul PK1sr(1), bar.

The following experimental data for the pressure variation in first stage PK1sr(1) were used, written as a row vector PK1sr(1) =[10.8 10.6 10.9 10.6 10.9 11.2 11.3 11.2 11.5 11.4 11.5 11.6 11.8 11.7 11.9 11.8 11.9 12 11.9 12];

The results of the research of the influence of Factor X on the pressure change of Seismic compressor 1, after the overhaul PK1sr(1) are given in the following table.

Table 1: Results of the research of the influence of the operating time of Seismic Compressor 1, Factor X on the pressure, PK1(1) bar, after the overhaul PK1sr(1)

PK1sr(1)		
Model	$PK1sr(1) = 10.6300 + 0.0757.x$	$PK1sr(1) = 10.4638 + 0.1210.x - 0.0022.x^2$
Adequacy	Fem= 198.7336 F(0.05;1;18)=4.41 Conclusion: yes	Fem= 125.6297 F(0.05;2;17)=3.59 Conclusion: yes
Standard error SE	SE=0.1385	SE=0.12449
Jacques-Berra test for normality	JBem = 1.5601 JB _T (0.05;2) = 5.99 Conclusion: normal distribution	JBem= 1.5931 JB _T (0.05;2) = 5.99 Conclusion: normal distribution
Homoscedasticity according to Glejser test	FFem = 1.3658 Ft(0.05;1;18)=4.41 Conclusion: yes	FFem=10.0464 Ft(0.05;1;18)=4.41 Conclusion: no
Pearson's Ryx	R _{lin} =0.95757	R _{lin} = 0.9678

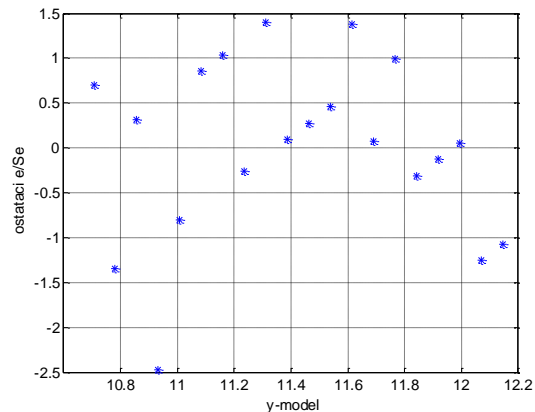
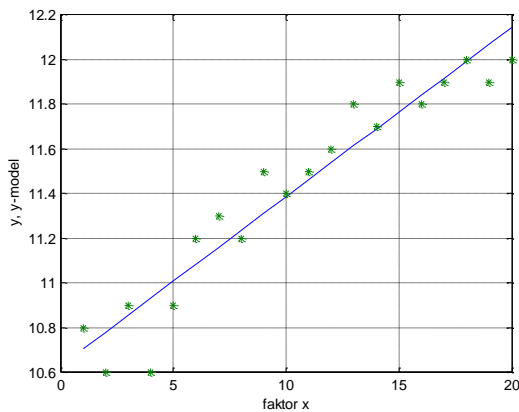


Correlation check by the Durbin-Watson test	$d = 1.7586$ $1\alpha = 5\%$; $dL = 1.201$ $dU = 1.414$ $dU < d < 4 - dU = 2.59$ Conclusion: no autocorrelation	$d = 2.3286$ $3\alpha = 5\%$; $dL = 1.201$ $dU = 1.411$ $dU < d < 4 - dU = 2.59$ Conclusion: no autocorrelation
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In the first row of the table, the general appearance and structure of the model are shown, and in the following, its characteristics and the values of the criteria that must be satisfied for effective use of the Least Squares Method, respectively Regression Analysis [1]. The second column gives the results using a first-order model.

From the analysis of the table, it can be seen that all the criteria for this model are satisfied. Below are plots of the real data (*) and the model data with solid line as a function of Faktor X, as well as the stochastic distribution of the normalized residuals e/Se , the second plot. The model is qualitative and used for prognosis. This was done in a prognostic horizon of 5 values:

$y_prognozal_PK1sr(1) = [12.22 \ 12.2957 \ 12.3714 \ 12.4471 \ 12.5229]$;



The last column of the table gives results for a second-order parabolic model. It does not satisfy the conditions for homoscedasticity according to the Glejser test [4]. A check was also made according to a second criterion for checking homoscedasticity according to the Breusch-Pagan criterion, which is also negative $FFem = 5.4134 > 4.41$ [6].

3.1.2 Dependency Modelling: operating time - pressure change before overhaul PK1pr(1), bar.

The results of the research of the influence of Factor X on the pressure variation of Seismic Compressor 1, before overhaul PK1pr(1) is given in table 2. The following data were used for the modeling, PK1pr(1):

$PK1pr(1) = [11.2 \ 11.3 \ 11.2 \ 11.6 \ 11.7 \ 11.5 \ 11.8 \ 12.2 \ 12.4 \ 12.3 \ 12.4 \ 12.9 \ 13. \ 13.1 \ 13.6 \ 13.5 \ 14.0 \ 14.2 \ 14.6 \ 15.4]$;

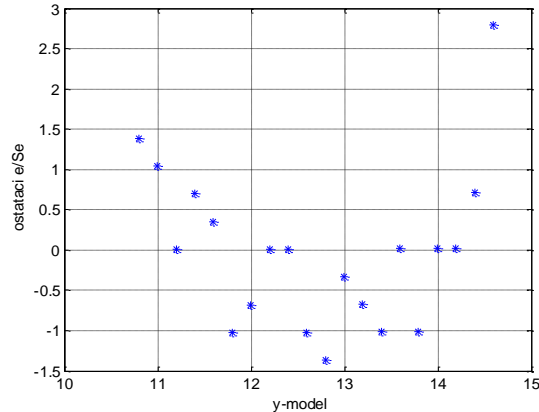
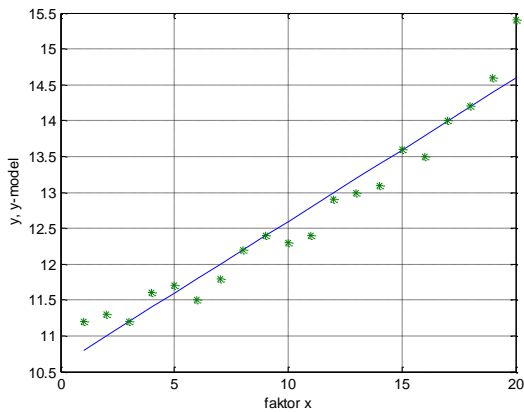
Table 2: Results of the research of the influence of the operating time of Seismic Compressor 1, Factor X on the pressure, PK1(1) bar, before the overhaul PK1pr(1)

PD3pr		
Model	$PK1pr(1) = 10.5989 + 0.1996 \cdot x$	$PK1pr(1) = 11.1968 + 0.0366 \cdot x + 0.0078 \cdot x^2$
Adequacy	$Fem = 300.1132$ $F(0.05; 1; 18) = 4.41$ Conclusion: yes	$Fem = 440.9659$ $F(0.05; 2; 17) = 3.59$ Conclusion: yes
Standard error SE	$SE = 0.29715$	$SE = 0.17677$
Jacques-Berra test for normality	$JBem = 4.5895$ $JB_T(0.05; 2) = 5.99$ Conclusion: normal distribution	$JBem = 0.9411$ $JB_T(0.05; 2) = 5.99$ Conclusion: normal distribution
Homoscedasticity according to Glejser test	$FFem = 0.2474$ $Ft(0.05; 1; 18) = 4.41$ Conclusion: yes	$FFem = 2.2954$ $Ft(0.05; 1; 18) = 4.41$ Conclusion: yes



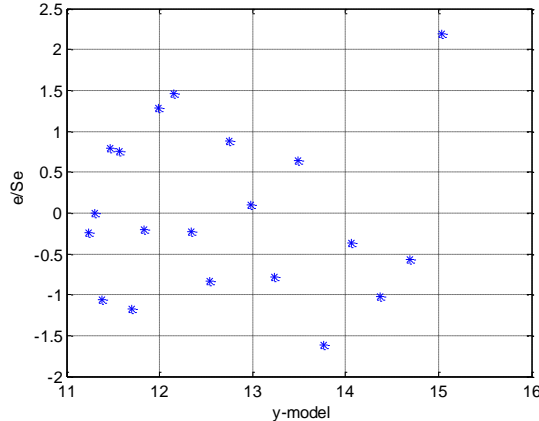
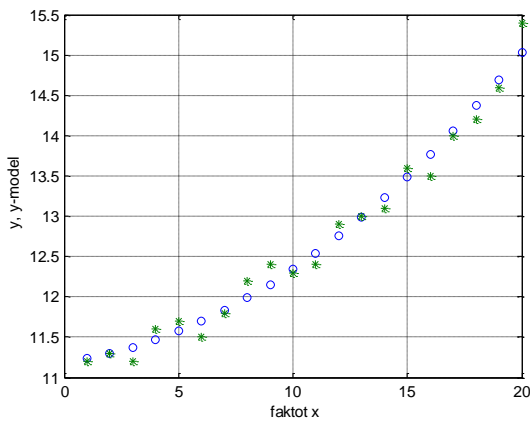
Pearson's R _{yx}	R _{lin} = 0.9713	R _{lin} = 0.9905
Correlation check by the Durbin-Watson test	d = 0.7804 1 _{alpha} =5%; dL= 1.201 dU= 1.4.14 0<d<dL Conclusion: positive autocorrelation	d = 1.8862 3 _{alpha} =5%; dL= 1.201 dU= 1.411 dU<d<4-dU=2.59 Conclusion: no autocorrelation

The second column gives the results of the first-order synthesized model. Analysis of the table shows that the Durbin-Watson test for correlation of residuals is not satisfied [2]. Below are the plots that resulted from the research. The model is of poor quality and cannot be used for prognosis.



The second figure, giving the distribution of the standardized residuals e/Se, as a function of the value of the model shows a non-linearity, which gives us information that the mathematical model wanted has a non-linear form.

The last column of the table shows the results for a second-order parabolic model. The model satisfies all the requirements for applying the Method of Least Squares and Regression analysis. Below are plots of the real data (*) and the model data with (o) as a function of Faktor X, as well as the stochastic distribution of the normalized residuals e/Se, the second plot [1].



According to the second-order model, a prognosis was made in a prognostic horizon of 5 values:

$$y_prognosa2PK1pr(1) = [15.3889 \ 15.7593 \ 16.1452 \ 16.5467 \ 16.9637 \];$$

4. CONCLUSION

- As a result of the scientific search for a qualitative mathematical model approximating the relationship between the seismic compressor operating time, Factor X and the pressure change in first stage, after the overhaul PK1sr(1) , a first-order model



was chosen. It meets the requirements for implementing the Regression analysis. The model prognosticates the pressure variation of Seismic Compressor 1, after overhaul PK1sr(1), depending on the compressor operation time.

- A second-order mathematical model of the connection: time of operation - change of pressure in first stage, before the overhaul PK1pr(1) was also obtained. A prognosis was made on it.
- From the analysis of the primary data, a significant increase in the pressure of this compressor before the overhaul, PK1pr(1) was found. This relates to the nature of its operation. An increase in the temperature PK1(5) of the screw compressor is also observed in this case. The statistical relationship between them has been determined, the correlation coefficient is very high, $R = 0.9763$.

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MODELLING OF THE OPERATING PERIOD OF A COMPRESSOR UNIT ON A SHIP FROM THE SEISMIC INDUSTRY II PART

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ABSTRACT

A possibility of extending the time between overhauls period of a compressor unit on a ship from the Seismic Industry by using pre-synthesized predictive mathematical models is considered. These mathematical models were created by processing experimental data and refer to cases of before and after overhaul of the Seismic compressor. In the second part, results from the synthesis of predictive mathematical models of the three piston stages of the Seismic compressor are proposed.

KEYWORDS: *Offshore Oil Industry, Seismic Vessel, Seismic Air Compressor, Synthesizing Predictive Mathematical Model, Least Squares Method, Regression Analysis*

1. CHARACTERISTICS AND FEATURES OF THE RESEARCH OBJECT

The first part of the report shows the technological process of creating the high pressure required for the seismic process. The compressed air from the screw compressor has a temperature of 95 °C. Its temperature is then lowered through an air cooler and introduced into the second stage of the Seismic compressor, where it is compressed to 32-36 bar. According to the technological process, air cooling and moisture separation follow after each compression stage until the working pressure for seismic activity is reached. In the third stage of the compressor unit, the air is compressed to 75-85 bar. In the fourth and last stage, the air is compressed to the pressure set by the operator, limited to 175 bar. Only now, after the final cooling and moisture separation, the compressed air enters the seismic air manifold, where it is distributed for the respective seismic purposes [6].

2. INFORMATION PROVISION OF THE MODELLING OF THE PISTON PART OF THE COMPRESSOR UNIT

The necessary data for the mathematical modelling was collected through the Seismic Compressors operation and control software "Phoenix Contact". These were recorded at a fixed mode of operation of the Seismic Compressor with a rotation speed of 1059 min⁻¹ during the operation of the vessel in Seismic mode. Data recording was done every 10 days at the same time of day. 20 data records were collected in the period before and the period after the overhaul of the three stages of the piston side of Seismic Compressor 1.

Overhaul of the piston side of the Seismic compressor is carried out every 8000 operating hours. During this time, all suction and discharge valves on the three stages of the piston compressor are replaced. Pistons are cleaned of deposits and rust, all seal rings and guide rings are replaced. The stuffing boxes of the two piston rods are disassembled and the sealing elements and springs are replaced with new ones [3, 4, 7, 8].

3. PROCESSING DATA FROM THE NEA GROUP SAPS-62E PISTON COMPRESSOR EXPERIMENT

The experimental-statistical study of the dependence between the length of the time of operation of the piston stages of the compressor and the change in their pressures is considered in two cases: when the compressor has undergone an overhaul and before it. The number of data collected during a certain period of time in both cases is the same-20 times and is considered as Factor X = [1 2 318 19 20].

3.1 Modelling the dependency: operating time of the piston stages of the compressor and pressure in the three stages PK1(2), PK1(3), PK1(4), bar

Results are presented from the scientific search for qualitative, workable models giving the relationship between the operating time of the piston stages of the compressor, considered as the influence of Factor X and the variation of the corresponding pressures during this time. The presentation of the results is for 2nd, 3rd and 4th stage data of the compressor unit after and before overhaul, in the following sequence: data used, obtained mathematical models and satisfying the criteria guaranteeing the quality of the



models. Only the final results are presented, without showing the multitude of the mathematical modelling structures investigated. [2, 5].

3.1.1 Dependency Modelling: operating time - pressure change after overhaul of stages PK1sr(2), PK1sr(3), PK1sr(4), bar

As a result of the effect of the operating time Factor X, on the pressure in the piston stages of the compressor, the following data were recorded and used for the purpose of modelling after overhaul of the three piston stages:

PK1sr(2)=[34.7 34.4 34.4 34.5 34.5 34.5 33.8 34.2 33.8 33.5 33.3 33.1 32.9 32.6 32.3 32.1 31.8 31.7 31.6 31.5];

PK1sr(3)=[83.5 83.6 83.4 83.5 83.3 83.2 83.0 82.7 82.7 82.5 82.3 82.4 82.0 81.8 81.6 81.4 81.3 81.1 80.9 80.7];

PK1sr(4)=[144.2 143.8 144.1 143.7 143.3 143.6 143.8 143.2 143.0 142.7 142.5 142.2 142.3 141.7 141.4 141.1 140.8 140.5 140.2 139.9];

The structure and coefficients of the mathematical models were determined, giving the relationship between the working time of the piston stages Factor X and the pressure variation of the three stages of Seismic Compressor 1. The results are shown in Table 1. In the first row of the table, the general appearance and structure of the models are given, and in the following, their characteristics and the values of the criteria that should be satisfied for effective use of the Method of Least Squares, respectively Regression Analysis. [1].

Table 1: Results of the research of the effect of the operating time of Seismic Compressor 1, Factor X on the pressure PK1sr(2), PK1sr(3), PK1sr(4), bar, after overhaul

PK1sr(2), PK1sr(3), PK1sr(4)			
Model	PK1sr(2) = 34.8263 - 0.0805.x - 0.005. x ²	PK1sr(3) = 83.7476 - 0.0876.x - 0.0034. x ²	PK1sr(4) = 144.1619 - 0.0596.x - 0.0079. x ²
Adequacy	Fem = 314.0242 F(0.05;2;17) = 3.59 Conclusion: yes	Fem = 939.2052 F(0.05;2;17) = 3.59 Conclusion: yes	Fem = 536.8194 F(0.05;2;17) = 3.59 Conclusion: yes
Standard error SE	SE = 0.19324	SE = 0.094731	SE = 0.18062
Jacques-Berra test for normality	JBem = 1.5846 JBTr(0.05;2) = 5.99 Conclusion: normal distribution	JBem = 0.4253 JBTr(0.05;2) = 5.99 Conclusion: normal distribution	JBem = 2.1206 JBTr(0.05;2) = 5.99 Conclusion: normal distribution
Homoscedasticity according to Glejser test	FFem = 0.0647 Ft(0.05;1;18) = 4.41 Conclusion: yes	FFem = 2.9768 Ft(0.05;1;18) = 4.41 Conclusion: yes	FFem = 3.5182 Ft(0.05;1;18) = 4.1 Conclusion: yes
Pearson's Ryx	R _{lin} = 0.98673	R _{lin} = 0.99551	R _{lin} = 0.99218
Correlation check by the Durbin-Watson test	d = 1.4495 3alfa = 5%; dL = 1.201 dU = 1.411 dU < d < 4-dU = 2.59 Conclusion: no autocorrelation	d = 1.8975 3alfa = 5%; dL = 1.201 dU = 1.411 dU < d < 4-dU = 2.59 Conclusion: no autocorrelation	d = 2.1242 3alfa = 5%; dL = 1.201 dU = 1.411 dU < d < 4-dU = 2.59 Conclusion: no autocorrelation

An analysis of the table shows that the obtained mathematical models describing the relationship between the working time and the change in the respective pressures of the piston stages PK1sr(2), PK1sr(3), PK1sr(4) are adequate and satisfy all the criteria for the effective use of the Regression analysis [1]. According to the models, mathematical prognostics were made in 5 intervals:

proгноза2PK1sr(2) = [30.92 30.6235 30.3169 30.0002 29.6735];

proгноза2PK1sr(3) = [80.4239 80.1916 79.9526 79.7068 79.4542];

proгноза2PK1sr(4) = [139.4188 139.0187 138.6028 138.1711 137.7236];

3.1.2 Dependency Modelling: operating time - pressure change before overhaul of stages PK1pr(2), PK1pr(3), PK1pr(4), bar

As a result of the influence of Factor X, the following data were recorded and used for the modeling, before overhaul of the piston stages of the compressor:

PK1pr(2)=[32.8 32.8 32.8 32.9 32.8 32.5 32.1 31.8 31.6 31.3 31.0 30.6 30.2 29.8 29.5 29.2 28.8 28.3 28.0 27.6];

PK1pr(3)=[82.4 82.3 82.3 82.4 82.4 82.0 81.5 81.1 80.6 80.0 79.6 79.2 78.4 77.5 76.8 76.0 75.3 74.7 74.2 73.7];



PK1pr(4)=[144.3 143.6 143.5 143.6 141.8 142.8 141.6 140.3 139.7 138.9 138.2 137.3 136.5 135.6 134.2 133.5 132.3 131.8 130.6 129.7];

The results of the study of the influence of Factor X on the pressure variation of the three piston stages of Seismic Compressor 1, before overhaul is given in Table 2.

Table 2: Results of the study of the effect of the operating time of Seismic Compressor 1, Factor X on the pressure PK1pr(2), PK1pr(3), PK1pr(4), bar, before overhaul

PK1sr(2), PK1sr(3), PK1sr(4)			
Model	PK1pr(2) = 33.5307 - 0.1580.x - 0.0071. x ²	PK1pr(3) = 82.9790 - 0.1111.x - 0.0189 x ²	PK1pr(4)=144.9151- 0.4056.x-0.0186x ²
Adequacy	Fem= 2552.3 F(0.05;2;17)=3.59 Conclusion: yes	Fem=1038.4 F(0.05;2;17)=3.59 Conclusion: yes	Fem=1342.26 F(0.05;2;17)=3.59 Conclusion: yes
Standard error SE	SE=0.11178	SE=0.29313	SE=0.39891
Jacques-Berra test for normality	Jbem= 2.3923 JB _T (0.05;2) = 5.99 Conclusion: normal distribution	JBem=1.0807 JB _T (0.05;2) = 5.99 Conclusion: normal distribution	JBem= 2.8440 JB _T (0.05;2) = 5.99 Conclusion: normal distribution
Homoscedasticity according to Glejser test	Ffem= 0.0647 Ft(0.05;1;18)=4.41 Conclusion: yes	FFem= 0.2014 Ft(0.05;1;18)=4.41 Conclusion: yes	FFem= 1.7647 Ft(0.05;1;18)=4.41 Conclusion: yes
Pearson's R _{yx}	R _{lin} = 0.99834	R _{lin} = 0.99593	R _{lin} = 0.99685
Correlation check by the Durbin-Watson test	d = 2.5697 3alfa=5%; dL= 1.201 dU= 1.411 dU<d<4-dU=2.59 Conclusion: no autocorrelation	d = 1.4309 3alfa=5%; dL= 1.201 dU= 1.411 dU<d<4-dU=2.59 Conclusion: no autocorrelation	d = 2.2663 3alfa=5%; dL= 1.201 dU= 1.411 dU<d<4-dU=2.59 Conclusion: no autocorrelation

The three mathematical models characterizing the pressure in the three piston stages of the compressor unit of the Seismic Ship are adequate and satisfy all the criteria for effective use of the Regression Analysis [1]. Based on them, prognostics were made in 5 intervals of change of the corresponding pressures over the course of the operation time. The same are given below:

$$\text{prognoza}_{2PK1pr(2)} = [27.0728 \ 26.6086 \ 26.1302 \ 25.6376 \ 25.1307];$$

$$\text{prognoza}_{PK1pr(3)} = [72.2943 \ 71.3688 \ 70.4055 \ 69.4043 \ 68.3652];$$

$$\text{prognoza}_{PK1pr(4)} = [128.2035 \ 126.9989 \ 125.7572 \ 124.4783 \ 123.1623].$$

The following plots show, in one coordinate system, the change in pressure in the three stages of the piston compressor: after and before overhaul, in pairs, as well as the values estimated by the models in 5 intervals. A solid line shows the model values, and (*) and (o) show the experimental data. Observations 1 to 20 correspond to the time of data collection, and 21 to 25 are estimated values.

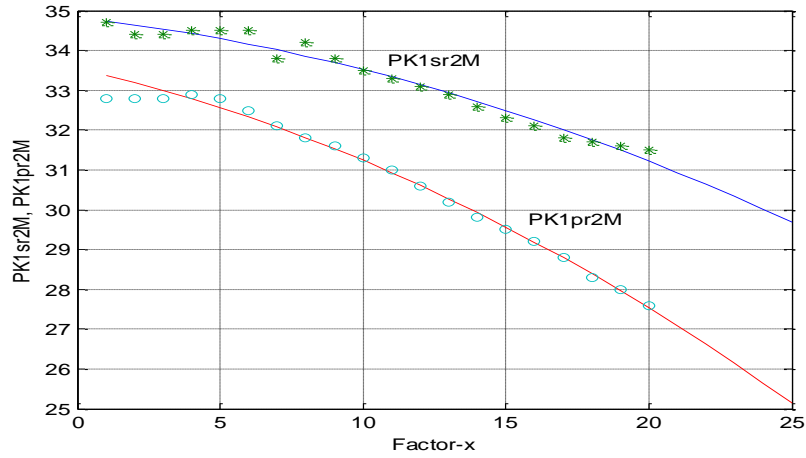


Fig. 1 Second stage pressure change and prognosis

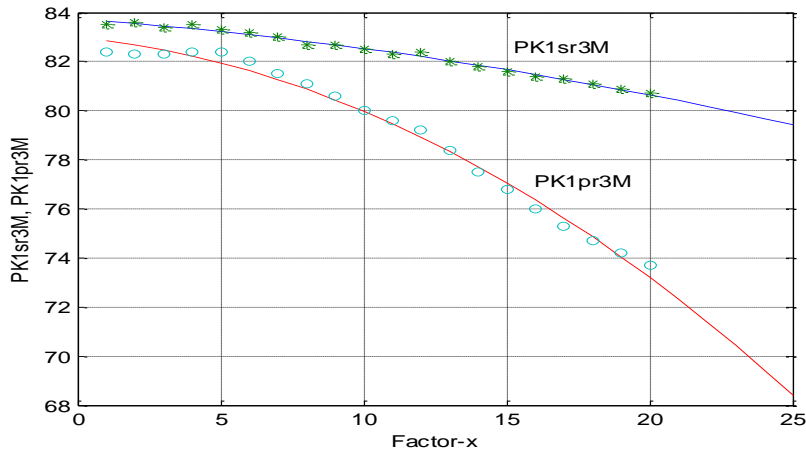


Fig. 2 Third stage pressure change and prognosis

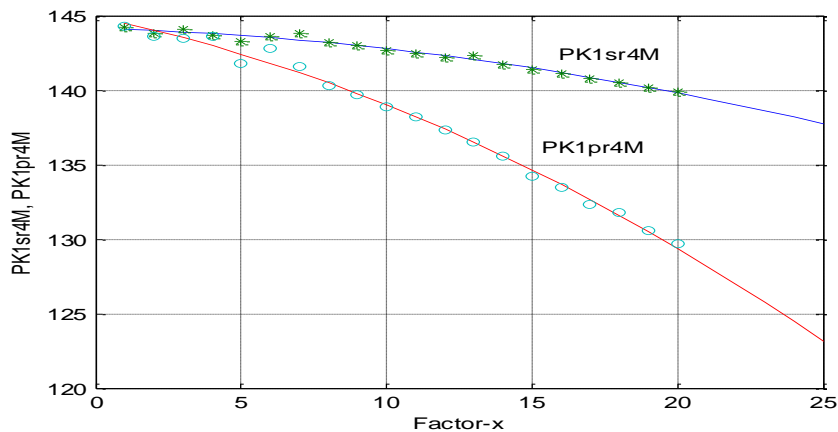


Fig. 3 Fourth stage pressure change and prognosis

4. CONCLUSION

- As a result of the scientific search for appropriate mathematical models approximating the dependence between the operating time of the three piston stages of Seismic Compressor 1, 2nd order models were selected. These models are adequate and meet the requirements for the implementation of the Regression analysis.



- Based on the models, prognostics were made for the pressure change in the piston stages of Seismic Compressor 1, in 5 intervals.

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UDC 633.88

MEDICINAL VALUE OF *AMORPHA FRUTICOSA*

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ABSTRACT

*The article discusses the medicinal value of *Amorpha fruticosa*. *Amorpha fruticosa* is not just a shrub plant, but a valuable biological resource that plays a significant role in ensuring the stability and health of ecosystems. Due to its unique adaptability and a wide range of ecological functions, this species continues to attract the interest of scientists and ecologists around the world.*

KEY WORDS: *shrub, family, ecosystem, root system, leaves.*

Amorpha fruticosa, also known as wild indigo or pigweed, is a perennial deciduous shrub in the legume family (Fabaceae). This species serves as an important component of ecosystems due to its unique biological features and ecological adaptations.

Widespread in North America, *Amorpha fruticosa* is often found along the banks of rivers, lakes, and other bodies of water. This plant has a powerful root system that allows it to gain a foothold on coastal slopes, preventing soil erosion and promoting the formation of stable coastal ecosystems. The leaves of the shrub are complex, pinnately divided, with lush greenery that acquires bright shades in the fall.

Amorpha fruticosa blooms in late spring to early summer, producing long, dense panicles of deep purple flowers with golden stamens. These flowers attract a variety of pollinators, including bees, butterflies, and other insects. The fruits are small strakas containing several seeds that can remain viable in the soil for a long time.

One of the key features of *Amorpha fruticosa* is its ability to fix nitrogen, which significantly increases soil fertility and helps restore damaged ecosystems. Thanks to its symbiotic relationship with bacteria of the genus *Rhizobium*, the plant is able to absorb nitrogen from the atmosphere and convert it into a form accessible to other plants. This makes the plant an important element of ecological medicine aimed at restoring soil resources.

In addition to its ecological significance, *Amorpha fruticosa* was used by the indigenous peoples of North America in traditional medicine. The leaves and bark of the plant were used to treat wound infections and skin diseases. In Europe and Asia, this species was introduced into cultivation as an ornamental shrub, often used in landscaping parks and gardens.

The *Amorpha fruticosa* shrub, popularly known as false indigo, has long attracted attention not only for its decorative qualities, but also for its exceptional medicinal properties. Popular in both Western and Eastern folk medicine, this plant is included in many recipes aimed at combating various diseases.

Amorpha fruticosa contains many bioactive compounds, including flavonoids, coumarins, saponins and alkaloids. The most attention has been paid to flavonoids, such as amorphadine and amorphine, which have significant therapeutic effects. These components have a powerful antimicrobial, anti-inflammatory and antioxidant effect, which allows the plant to be used as an effective remedy for healing the body.

Studies have shown that extracts from the leaves and bark of *Amorpha fruticosa* have pronounced antimicrobial activity. Flavonoids and coumarins extracted from the plant are effective against various pathogenic microorganisms, including bacteria, fungi and viruses. This makes the plant a promising source for the development of new antimicrobial drugs.



Flavonoids isolated from the leaves and flowers of the shrub are actively used in the treatment of cardiovascular diseases. They help strengthen capillary walls, reduce vascular fragility and prevent the development of atherosclerosis. In addition, flavonoids reduce cholesterol levels in the blood, thereby reducing the risk of strokes and heart attacks.

Research shows that *Amorpha fruticosa* may also be effective in fighting cancer cells. Flavonoids and other active ingredients in the plant exhibit antiproliferative properties, which opens up prospects for the development of new anticancer drugs.

Coumarins found in the seeds and fruits of the plant exhibit antimicrobial and antifungal activity. These substances are indispensable in the fight against bacterial and fungal infections of the skin and mucous membranes. They are actively used in the preparation of tinctures and ointments intended for the treatment of dermatitis, eczema and other skin diseases.

Triterpenes present in the bark and roots of *Amorpha fruticosa* demonstrate pronounced anti-inflammatory properties. They help reduce inflammatory processes in the body and are effective in the treatment of arthritis, rheumatism and other joint diseases. Triterpenes also have a positive effect on the immune system, increasing its resistance to infections.

Essential oils contained in flowers and leaves have antispasmodic and calming effects. They are used in aromatherapy and phytotherapy to relieve nervous tension, improve sleep and generally strengthen the nervous system. Inhalations using essential oils help with colds, help cleanse the respiratory tract and make breathing easier.

Amorpha extracts are used in folk medicine to treat various dermatological diseases. They promote skin regeneration, wound healing and eczema treatment. For women, *amorpha* is useful in treating gynecological diseases, due to its properties to balance hormonal levels.

Infusions and decoctions of *Amorpha fruticosa* are widely used in folk medicine not only for internal but also for external use. They are used to wash wounds, relieve inflammation and accelerate the healing process of tissues. In addition, extracts from this plant are added to cosmetics due to their antioxidant and regenerative properties.

Amorpha fruticosa is a valuable natural remedy with multifaceted healing potential. Regular use of preparations based on this plant can help improve the general condition of the body, prevent and treat various diseases, and maintain health and longevity.

Thus, the *Amorpha fruticosa* shrub is not just a shrub, but an important biological resource that plays a significant role in maintaining the health and sustainability of ecosystems. Due to its amazing adaptations and diverse ecological functions, this species continues to attract the attention of researchers and ecologists around the world.

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UDC 612

CHARACTERISTICS OF MORPHOFUNCTIONAL PROPERTIES OF FEMALE ATHLETES LIVING IN THE REPUBLIC OF KARAKALPAKSTAN

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ABSTRACT

The article presents the characteristics of the morphofunctional properties of female athletes living in the Republic of Karakalpakstan. A thorough and in-depth study of the morphofunctional characteristics of female athletes of the Republic of Karakalpakstan, as well as the use of the obtained information to develop personalized support programs is the basis for their success in sports and life.

KEYWORDS: *properties, parameters, physiology, anthropometry, biochemistry, sports, analysis.*

To study the morphofunctional properties of female athletes living in the Republic of Karakalpakstan, it is necessary to conduct a thorough analysis of various parameters, including anthropometric, physiological and biochemical measurements. In Karakalpakstan, as elsewhere, sport plays an important role in the formation of health, physical fitness and functional capabilities of young girls.

Anthropometric studies include measurements of height, body weight, chest, waist, hips and limbs. These parameters allow us to determine the proportionality of the body, muscle mass and percentage of fat tissue. It is important to note that female athletes involved in different sports may differ significantly in these parameters. For example, gymnasts, as a rule, have lower body weight and thin limbs, while female athletes involved in weightlifting may have more developed muscle groups and greater body weight.

Additionally, anthropometric data can be used to analyze the impact of the training process on the physical development of female athletes. Regular measurements allow you to track progress and adjust training loads to achieve optimal shape and prevent injuries. The season of observations also plays an important role: during the competitive period, the indicators may differ from the off-season, when active recovery and weight gain occur.

In addition, differences in anthropometric parameters may depend on genetic factors, age of initiation of sports and intensity of training. For example, swimmers usually have long limbs and developed shoulder girdle muscles, which improves their hydrodynamic qualities. In contrast, long-distance runners may have a lower percentage of fat tissue and more pronounced muscular motor coordination.

In recent years, there has been growing interest in the use of modern technologies in anthropometry, such as 3D body scanning and image analysis software. These methods allow for greater measurement accuracy and a more detailed picture of body structure. They also open up new opportunities to study the influence of various factors, such as age, gender, lifestyle, and genetics, on anthropometric measurements.

Physiological studies include determining the parameters of the cardiovascular system, respiratory system and muscular endurance. One of the key parameters is the heart rate at rest and after physical exertion. Normally, the heart rate of female athletes at rest is lower than that of their non-training peers, which indicates a high level of cardiovascular fitness. It is also necessary to measure the lung capacity and maximum minute ventilation to assess the functional state of the respiratory system.

Biochemical tests include blood and urine analysis to determine levels of various metabolites and hormones that play an important role in regulating energy metabolism and recovery processes. For example, hemoglobin and red blood cell levels can indicate the degree of tissue oxygenation and overall endurance of the body. Levels of creatine phosphokinase and other muscle enzymes will provide an idea of the extent of muscle damage after intense training.



In addition, it is important to consider the psycho-emotional state of female athletes. Stress associated with training and competitions can have a significant impact on physical condition and athletic performance. Therefore, the psychological aspect of the training process should also be included in the comprehensive study.

Based on the data obtained, it will be possible to give a full description of the morphofunctional properties of female athletes living in the Republic of Karakalpakstan. This will allow not only to optimize the training process, but also to develop individual recommendations for nutrition, recovery and psychological support, which will ultimately lead to improved athletic performance and overall health.

It is important to note that a comprehensive approach to the study and interpretation of morphofunctional parameters includes not only anthropometric measurements, but also the analysis of physiological indicators, such as the level of physical fitness, endurance, strength and recovery rate after exercise. This will create the basis for a personalized approach to each athlete, which is especially important in the context of high-intensity training and competitions.

Particular attention should be paid to the impact of social and environmental factors on the health and athletic performance of female athletes. In the conditions of the Republic of Karakalpakstan, with its unique climate and socio-economic conditions, these aspects play a key role. The creation of individual programs that take these parameters into account will not only increase the effectiveness of the training process, but also reduce the risk of injury and chronic diseases. Ultimately, this will contribute to achieving the highest results in regional and international competitions, strengthening the health and well-being of athletes, and promoting the development of sports culture in the region.

In addition, it is important to consider psychological aspects - motivation level, emotional state, stress resistance and other personal characteristics that play an important role in achieving high sports results. Professional psychological support and counseling, along with physical and medical recommendations, will help create harmonious conditions for the development and self-realization of female athletes.

Modern approaches to training female athletes include a comprehensive analysis of their psychophysical state. This allows for the training process to be adjusted taking into account individual characteristics, which in turn contributes to more effective achievement of the set goals. Sports psychologists work to strengthen self-confidence, improve concentration, and develop stress management and emotion management skills in competitive conditions.

No less important in working with young athletes is attention to their social environment. Support from family, coaches and the team has a significant impact on the formation of their motivation and self-discipline. A harmonious combination of all these aspects allows not only to achieve high sports results, but also promotes personal growth and self-realization of athletes in life.

A multifaceted approach, including psychological, physical and social components, is becoming a key element in the preparation of female athletes. It is important to remember that each of these aspects requires a careful and professional approach to create optimal conditions for successful development and achievement of high results in sports.

Thus, a comprehensive and in-depth study of the morphofunctional properties of female athletes of the Republic of Karakalpakstan and the use of the obtained data to create individual support programs is the key to their success in sports and life.

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UDC 595.7

BIOLOGICAL CHARACTERISTICS OF INSECTS WITH INCOMPLETE METAGNOSIS (INSEKTA: HEMIMETABOLA) OF THE NORTHWESTERN PART OF THE KYZYL KUM DESERT

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ABSTRACT

The article discusses the biological features of insects with incomplete metamorphosis (Insekta: Hemimetabola) in the northwestern part of the Kyzylkum Desert. One of the key features of Hemimetabola is their metamorphosis, which does not include a pupal stage, and this ensures a faster transition to active adult life.

KEY WORDS: *egg, adaptation, temperature, desert, energy, moisture, metamorphosis, stage.*

Insekta, or insects, are the most numerous and diverse group of animals on planet Earth. Among them is the subclass Hemimetabola, which is distinguished by the peculiarities of its life cycle and morphology. Hemimetabola, or incompletely metamorphosed insects, are a group in which development from egg to adulthood occurs without the pupa stage, which can be observed in such representatives as grasshoppers, cockroaches, and orthoptera.

The biological characteristics of insects with incomplete metamorphosis (Insekta: Hemimetabola) in the northwestern Kyzylkum region represent a unique adaptation to the extreme conditions of this region. Kyzylkum, a significant part of which is covered by deserts and semi-deserts, is characterized by extremely variable temperatures, limited water availability, and specific vegetation. These conditions pose specific challenges to Hemimetabola, to which they respond with a number of morphological, physiological, and behavioral adaptations.

One of the main adaptations of these insects is their ability to withstand extreme temperatures, which can range from scorching summer heat to cold winter nights. In terms of survival mechanisms, they have a slow metabolic state, which helps reduce energy expenditure when food is scarce or temperatures are not suitable for active life.

Structurally, many of the insects in this region have a dense chitinous covering that protects them from moisture loss. This covering also acts as a barrier to sudden temperature fluctuations, allowing them to maintain a stable internal state. Some species also have protective coloration that helps them blend into the environment, as sand dunes and sparse vegetation create conditions for mimicry and secrecy from predators.

One of the key features of Hemimetabola is their metamorphosis, which does not include a pupal stage, allowing for a faster transition to active adulthood. In the Kyzylkum environment, this clearly facilitates a quick start to reproduction and reduces the resource expenditure on long-legged stages of development, which might otherwise be more vulnerable to extreme climatic factors.

Many Hemimetabola species have evolved mechanisms to minimize moisture loss. They have dense exoskeletons and are often nocturnal, which helps them avoid excessive heat stress and moisture loss during hot daytime hours. Some species are able to accumulate moisture from food or minor precipitation, and to occupy niches where morning dew condenses.

The diet of these insects is also adapted to the local flora, which often has high concentrations of defensive compounds. Some Hemimetabola develop the ability to tolerate or even use these chemicals in their metabolism, allowing them to exploit niches inaccessible to less adapted competitors.



Finally, social and defensive strategies among Hemimetabola species include both solitary and group modes of existence. Some species form temporary communities to increase their chances of survival and reproduction, while others specialize in moving quickly between temporary resource sources, outrunning their competitors.

A study of the biological characteristics of Insekta: Hemimetabola in northwestern Kyzylkum reveals a wide range of adaptations that allow these insects to survive and thrive in one of the harshest corners of Central Asia.

One of the key features of Hemimetabola is that they have three main stages in their life cycle: egg, larva (or nymph), and imago (adult). Unlike the Holometabola, which have a pupal stage, Hemimetabola go through a series of molts to eventually become adults. At each stage, the nymph looks like the adult, but is usually smaller and lacks fully developed wings and reproductive organs.

The morphological features of Hemimetabola also include various adaptations to the environment and lifestyle. For example, grasshoppers have powerful hind legs designed for jumping, and cockroaches have antennae that play an important role in sensory perception of the environment. Many representatives of this subclass have significant plasticity in the choice of food resources and adapt to various environmental conditions.

All this indicates that the insects' ability to survive difficult climatic conditions is the result of their long-term evolutionary adaptation, which allowed them to master and successfully survive even in such hostile conditions as northwestern Kyzylkum.

The ecological importance of Hemimetabola is difficult to overestimate. They occupy a wide range of ecological niches, ranging from herbivorous species that influence plant communities to predators that control the numbers of other small invertebrates. In addition, some species, such as aphids, can be vectors of plant diseases, which emphasizes their importance in nature and agriculture.

The life cycles and behavior of these insects are the subject of extensive research aimed at understanding their evolutionary adaptations and roles in ecosystems. Given the diversity and importance of Hemimetabola, further research could provide valuable data for biology, ecology, and even agricultural technology.

Thus, Hemimetabola represent a unique group among insects, distinguished by their biological features and adaptations. Research into their life cycle, morphology and ecological interactions continues, revealing more aspects of their role in natural systems and their importance to humans.

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HEART RATE VARIABILITY IN FOOTBALL PLAYERS AND TRACK AND FIELD ATHLETES

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ABSTRACT

Objective of the study: To investigate the state of the autonomic nervous system in athletes based on heart rate variability indicators. **Materials and methods:** The study was conducted on 142 male athletes (67 football players and 75 track and field athletes) aged 17-20 years, with an average age of 18.5 ± 1.5 years. Depending on the type of higher nervous activity, athletes were divided into 4 groups: sanguine (41.55%), choleric (28.87%), phlegmatic (19.01%), and melancholic (10.56%). Heart rate variability (HRV) was studied using the "BioMouse" system. A t-test for independent samples (Welch's t-test) was used to analyze the significance of differences between the groups. **Results of the study:** It was found that the highest adaptive capabilities were observed in phlegmatic athletes, who demonstrated high SDNN and HF values, as well as a low tension index (IN). Their calm temperament allows for better adaptation to physical exertion and maintaining a balance between sympathetic and parasympathetic activity. The lowest adaptive capabilities were observed in melancholics, who showed high IN and LF values, as well as low SDNN and HF, indicating an imbalance in the autonomic nervous system and lower resilience to physical stress. Overall, beginner athletes tended to have slightly higher heart rates and lower HRV indicators (SDNN), LF, and HF compared to more experienced athletes of the 2nd-3rd ranks. This is due to the fact that first-year athletes have not yet fully adapted to physical loads, leading to more pronounced dominance of the sympathetic nervous system and less parasympathetic activity.

KEYWORDS: variability, heart rate, athletes, football players, track and field athletes, autonomic nervous system, physical exertion.

INTRODUCTION

The regulation of the cardiovascular system plays a crucial role in the adaptation of athletes to physical exertion and the achievement of high performance, which directly depends on the type of higher nervous activity (HNA) and the autonomic nervous system (ANS) [1,5,8,9,10]. During intense training, athletes often experience changes in the functioning of the cardiovascular system, which may be related to the characteristics of nervous activity [2,4,6,12,21].

Heart rate variability (HRV) indicators serve as an important tool for assessing the functional state of athletes and identifying deviations in autonomic regulation [2,7,11,14,18,20]. Football players and track and field athletes are exposed to significant physical and psycho-emotional stress, making the study of the influence of different types of HNA and ANS on HRV indicators relevant [3,15,17,19]. Determining the relationship between them and the body's ability to adapt to intense training and competition will help develop more effective individualized training programs [4,16,22]. Since a decrease in heart rate variability often indicates disturbances in regulatory processes, this study aims to examine HRV indicators in football players and track and field athletes. This will allow for a deeper understanding of the mechanisms of athletes' adaptation to physical exertion and identify potential factors that contribute to improved athletic performance.

OBJECTIVE OF THE STUDY

To investigate the state of the autonomic nervous system in athletes based on heart rate variability indicators.

MATERIALS AND METHODS

Informed consent was obtained from all athletes before the start of the study. A total of 142 male athletes were examined (67 football players and 75 track and field athletes) aged 17-20 years (mean age 18.5 ± 1.5 years). The psychological characteristics of the athletes were assessed using the Eysenck Personality Questionnaire (EPQ) with the "Psychotest" computer program. Heart rate variability (HRV) was evaluated using the "BioMouse" system from the company "NeuroLab" (Russia, 2001), which allows for the recording of heart rate (HR), standard deviation of normal RR intervals (SDNN), tension index (IN), low-frequency power (LF), and high-



frequency power (HF). The t-test for two independent samples with unequal variances (Student's method) was used to calculate the significance of differences between the groups of football players and track and field athletes. Mean values and standard deviations for each group were used to calculate the t-statistics. Welch's t-test was applied due to differences in sample sizes and variances between the groups. P-values were calculated for each group pair (football players vs. track and field athletes), and the difference was considered statistically significant at $p < 0.05$.

RESULTS AND DISCUSSION

It was found that among the examined athletes, sanguine individuals predominated (41.55%), including 21.13% of football players and 20.42% of track and field athletes. Choleric athletes made up 28.87% of the sample. The choleric temperament in 15.49% of football players was characterized by high activity, decisiveness, and a strong drive for leadership. In track and field, choleric (13.38%) excelled in disciplines such as sprinting and throwing, where high motivation and aggressiveness in achieving goals are essential. Phlegmatic individuals were somewhat less common, comprising 19.01%. Among them, 7.04% of phlegmatic football players, with their stable, calm, and balanced character, played a key role in stable and predictable defense. In contrast, 11.97% of phlegmatic track and field athletes demonstrated high endurance and stability. Melancholics (10.56%) included 3.52% of football players and 7.04% of track and field athletes. Melancholics are more prone to stress and anxiety, which may limit their ability to perform effectively in team sports. In track and field, melancholics may succeed in disciplines requiring precision and concentration, such as jumping or technical events, as their melancholic temperament often shows greater sensitivity to psycho-emotional stress (Figure 1).

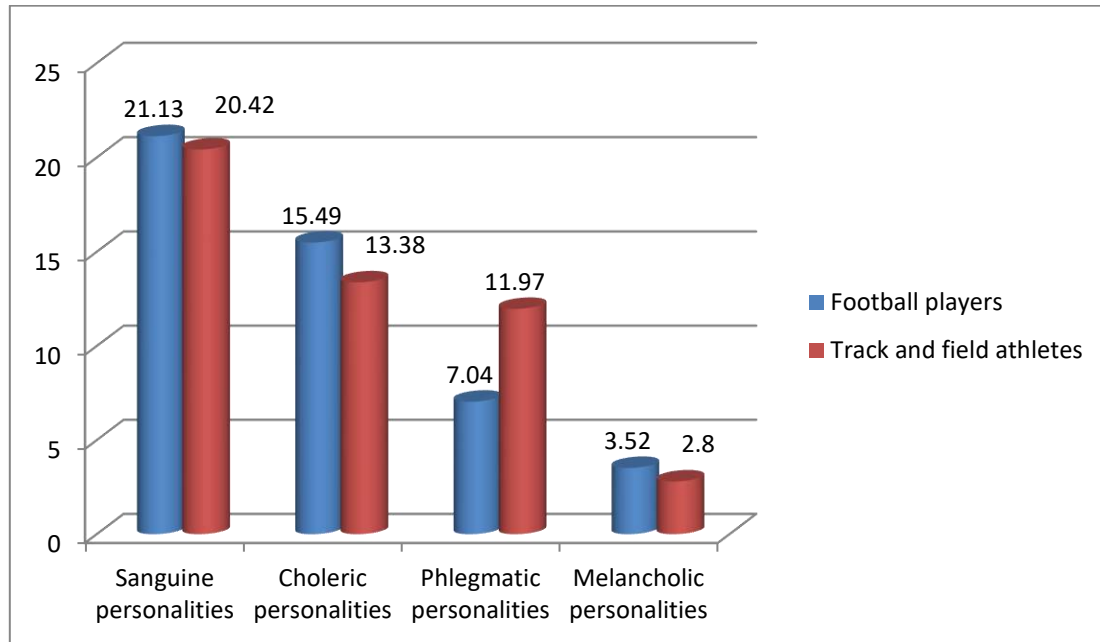


Figure 1. Distribution of athletes by types of higher nervous activity

Further analysis of heart rate variability indicators for first-year athletes and 2nd-3rd rank athletes revealed several key differences depending on the type of higher nervous activity (HNA) and the level of training (Table 1).

Table 1

HRV indicators depending on HNA types and sports (football players and track and field athletes) in the first year of training

HNA Type	Sport	HR (bpm)	SDNN (ms)	IN (units)	LF (ms ²)	LF (ms ²)
Sanguine	Football players(n=10)	68.0±2.0	125.0±4.0	60.0±5.0	650.0±40.0	580.0±40.0
Choleric	Football players (n=9)	77.0±2.2	105.0±5.5	90.0±5.0	850.0±5.0	380.0±45.0
Phlegmatic	Football players(n=5)	62.0±3.0	135.0±6.0	48.0±6.0	580.0±60.0	680.0±60.0
Melancholic	Football players (n=2)	77.0±3.0	98.0±6.0	100.0±12.0	930.0±95.0	300.0±95.0
Sanguine	Track athletes (n=19)	63.0±2.0	137.0±4.0	50.0±6.0	580.0±40.0	680.0±40.0
Choleric	Track athletes (n=9)	72.0±2.5	115.0±5.0	78.0±5.0	760.0±45.0	480.0±45.0
Phlegmatic	Track athletes (n=7)	58.0±2.5	145.0±6.0	40.0±5.0	480.0±50.0	760.0±50.0
Melancholic	Track athletes (n=4)	71.0±3.0	105.0±5.0	84.0±6.0	840.0±60.0	380.0±60.0



As seen in Table 1, the comparative analysis of HRV indicators for first-year athletes (ages 17-20) and 2nd-3rd rank athletes reveals several key differences.

For football players with a sanguine temperament, the heart rate (HR) of beginner athletes (68.0 ± 2.0 bpm) was slightly higher than that of 2nd-3rd rank athletes (65.0 ± 1.8 bpm), which can be attributed to lower adaptation to physical exertion. The SDNN level in beginners was slightly lower (125.0 ± 4.0 ms) compared to more experienced athletes (130.0 ± 3.7 ms), indicating lower heart rate variability and, consequently, less adaptation to training. The LF (650.0 ± 40.0 ms²) and HF (580.0 ± 40.0 ms²) values were also lower in beginner athletes than in experienced ones, which suggests underdeveloped autonomic nervous system regulation.

Among beginner choleric athletes (77.0 ± 2.2 bpm), there was an increase in heart rate compared to more experienced athletes (75.0 ± 2.1 bpm), which may be explained by a higher level of excitability in less trained athletes. The SDNN indicator was significantly lower in beginners (105.0 ± 5.5 ms) compared to experienced athletes (110.5 ± 5.3 ms), indicating less resilience to physical exertion. At the same time, the LF level in beginners was higher (850.0 ± 45.0 ms²), and HF was lower (380.0 ± 45.0 ms²), which indicates a dominance of sympathetic activity at the beginning of the training process.

When determining heart rate (HR) in beginner phlegmatics (62.0 ± 3.0 bpm), there was a slight increase in HR compared to experienced athletes (60.0 ± 3.2 bpm). The SDNN level in beginner athletes was slightly lower (135.0 ± 6.0 ms) compared to experienced ones (140.0 ± 6.3 ms), indicating lower adaptation to physical loads. LF and HF levels in beginners (580.0 ± 60.0 ms² and 680.0 ± 60.0 ms², respectively) were lower than those in 2nd-3rd rank athletes, suggesting less balanced autonomic regulation.

In beginner melancholic athletes, HR was 77.0 ± 3.0 bpm, slightly higher than in experienced athletes (75.0 ± 2.7 bpm). SDNN values in beginners were lower (98.0 ± 6.0 ms) compared to more experienced athletes (102.0 ± 5.4 ms). Additionally, beginner melancholics showed higher LF levels (930.0 ± 95.0 ms²) and lower HF levels (300.0 ± 95.0 ms²), indicating dominant sympathetic activity.

Different data were obtained in the group of track and field athletes. HR in beginner sanguine athletes (63.0 ± 2.0 bpm) was slightly higher than in experienced athletes (60.0 ± 1.9 bpm). On the other hand, SDNN levels in beginners were slightly lower (137.0 ± 4.0 ms) compared to experienced athletes (142.5 ± 3.9 ms), indicating less developed adaptation mechanisms. Similar data were observed when evaluating LF (580.0 ± 40.0 ms²) and HF (680.0 ± 40.0 ms²), which were lower in beginners than in experienced athletes.

In beginner choleric athletes, HR was 72.0 ± 2.5 bpm, differing slightly from experienced athletes (70.0 ± 2.3 bpm). More significant differences were found in the interpretation of SDNN, which was lower in beginners (115.0 ± 5.0 ms) compared to experienced athletes (120.0 ± 4.6 ms). The less stable autonomic regulation in beginner track and field athletes was evidenced by lower LF (760.0 ± 45.0 ms²) and HF (480.0 ± 45.0 ms²) compared to experienced athletes.

As for the HR in beginner phlegmatics, it reached 58.0 ± 2.5 bpm, higher than in 2nd-3rd rank athletes (55.0 ± 2.4 bpm). The SDNN level in beginner athletes (145.0 ± 6.0 ms), as well as LF (480.0 ± 50.0 ms²) and HF (760.0 ± 50.0 ms²), were lower than in more experienced athletes. For example, SDNN in the group of experienced athletes was 150.0 ± 5.8 ms.

For novice melancholic athletes, a higher heart rate (71.0 ± 3.0 beats/min) was observed compared to more experienced track-and-field athletes (69.0 ± 3.8 beats/min). The SDNN value for novices was lower (105.0 ± 5.0 ms) compared to more experienced athletes (109.5 ± 4.7 ms), indicating reduced heart rate variability and, consequently, less developed regulatory mechanisms. Lower LF (840.0 ± 60.0 ms²) and HF (380.0 ± 60.0 ms²) values also pointed to a less developed autonomic regulation in novice athletes.

In the comparative analysis of heart rate variability (HRV) among football players and track-and-field athletes, significant differences were identified depending on the type of higher nervous activity (HNA).

In the group of football players:

- HR (Heart Rate): Highest HR values: in choleric athletes (77.0 ± 2.2 beats/min), explained by their high excitability and activity. Lowest HR values: in phlegmatic athletes (62.0 ± 3.0 beats/min), consistent with their calm and balanced temperament.

- SDNN (Standard Deviation of Normal-to-Normal Intervals): Highest SDNN values: in phlegmatic athletes (135.0 ± 6.0 ms), indicating higher heart rate variability and better adaptation to physical loads. Lowest SDNN values: in melancholic athletes (98.0 ± 6.0 ms), reflecting lower variability.

- IN (stress index): The highest IN values were observed in melancholics (100.0 ± 12.0 units), indicating a high level of stress and tension in the autonomic nervous system. The lowest IN values were found in phlegmatics (48.0 ± 6.0 units), suggesting a lower level of tension and better resistance to stress.



- LF (low-frequency components): The highest LF values were found in melancholics ($930.0 \pm 95.0 \text{ ms}^2$), which indicates a dominance of sympathetic activity and poor adaptive capacity. The lowest LF values were observed in phlegmatics ($580.0 \pm 60.0 \text{ ms}^2$), suggesting a more balanced autonomic regulation.

- HF (high-frequency components): The highest HF values were recorded in phlegmatics ($680.0 \pm 60.0 \text{ ms}^2$), indicating high parasympathetic activity and better heart rate regulation. The lowest HF values were seen in melancholics ($300.0 \pm 95.0 \text{ ms}^2$), reflecting suppressed parasympathetic activity and weaker adaptive capabilities.

For track and field athletes, the following HRV parameters were characteristic depending on the type of nervous system:

- HR (heart rate): The highest HR values were seen in choleric ($72.0 \pm 2.5 \text{ bpm}$), while the lowest HR values were observed in phlegmatics ($58.0 \pm 2.5 \text{ bpm}$).

- SDNN (standard deviation of NN intervals): The highest SDNN values were recorded in phlegmatics ($145.0 \pm 6.0 \text{ ms}$), reflecting their better adaptive capabilities. The lowest SDNN values were found in melancholics ($105.0 \pm 5.0 \text{ ms}$), indicating lower heart rate variability and reduced adaptive capacity.

- IN (stress index): The highest IN values were recorded in melancholics ($84.0 \pm 6.0 \text{ units}$), indicating a high level of tension. The lowest IN values were found in phlegmatics ($40.0 \pm 5.0 \text{ units}$), suggesting the lowest stress level and better adaptive capacity.

- LF: The highest LF values were found in melancholics ($840.0 \pm 60.0 \text{ ms}^2$), indicating strong sympathetic activity. The lowest LF values were observed in phlegmatics ($480.0 \pm 50.0 \text{ ms}^2$), which suggests more balanced autonomic regulation.

- HF: The highest HF values were seen in phlegmatics ($760.0 \pm 50.0 \text{ ms}^2$), indicating high parasympathetic system activity. The lowest HF values were in melancholics ($380.0 \pm 60.0 \text{ ms}^2$), which reflects suppressed parasympathetic activity.

Thus, the highest adaptive capacities are seen in phlegmatics, who demonstrate high SDNN and HF values along with low IN levels. Their calm temperament allows them to adapt better to physical loads and maintain a balance between sympathetic and parasympathetic activity. The lowest adaptive capacities are observed in melancholics, who show high IN and LF values, low SDNN and HF, indicating an imbalance in the autonomic nervous system and lower resistance to stress.

It was found that, in general, novice athletes tended to have slightly higher heart rates and lower heart rate variability (SDNN), LF, and HF compared to experienced 2nd-3rd rank athletes. This is due to the fact that first-year athletes have not fully adapted to the loads, leading to a more pronounced dominance of the sympathetic nervous system and lower parasympathetic activity.

To calculate the correlation between types of higher nervous activity and the type of sport (footballers and track and field athletes), Pearson's correlation coefficient was used. The results of the correlation between higher nervous activity (HNA) types and the type of sport showed a correlation coefficient close to zero (0.0000000000047), indicating no linear relationship between these two variables. The p-value of 1.0 also suggests that the relationship is not statistically significant.

Thus, it can be concluded that the types of HNA (sanguine, choleric, phlegmatic, melancholic) and the choice of sport (football or track and field) do not have a significant correlation.

However, the calculated correlation coefficients between heart rate variability (HRV) indices and the types of higher nervous activity (HNA) and sport type (footballers and track and field athletes) revealed the following key results:

Heart rate (HR) shows a weak correlation with the type of HNA ($r=0.22$) and a moderate correlation with the type of sport ($r=0.38$). SDNN shows a positive correlation with the type of sport ($r=0.30$) and a negative correlation with the type of HNA ($r=0.42$), indicating that SDNN depends on the emotional and physiological stability of athletes;

LF and HF components also show moderate correlations with HNA types, highlighting the role of autonomic regulation in adaptation to physical load. These data indicate that certain HRV parameters, such as SDNN and HF, have significant correlations with both HNA types and sport type.

Therefore, it can be concluded that HRV parameters are closely related to HNA type and sport type, which should be considered when developing individualized training programs for athletes. Specific characteristics of cardiac regulation and the autonomic nervous system should be taken into account to increase training process efficiency and improve recovery after physical loads.

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23. *Начало формы*
24. *Конец формы*



ROLE OF WOMEN IN ENVIRONMENTAL PROTECTION

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ABSTRACT

Women played a crucial role in protection of environment in India ,In the Chipko Movement, which is concerned with preservation offorests and maintenance of the ecological balance in the sub-Himalayan region, is a social movement, -an important role has been played by women of Garhwal region and this paper seeks to explore their contribution to the movement. The Chipko Movement, a grassroots environmental movement in India, is well-known for its success in saving trees and promoting sustainable development. Woman's involvement in the movement challenged traditional gender roles and empowered them to assert their rights and interests. The paper argues that a more inclusive and gender-sensitive approach to environmental activism is necessary to address the complex challenges of sustainable development

KEYWORDS: Women, environment, surrounding, movement, nature, development

INTRODUCTION

A woman role into the protection of environment is has been noticed very remarkable since Ancient times.. Women are always closely connected with the surrounding nature; they are the manager of the resources in all the families of the communities and directly collect resources for the household from the nature. Such as water, firewood and several items etc. Women were playing key role in protection of environment from the time unmemorable. Women are more active in the field of environment protection than men because they are do household and societal work more connectively with the environment. They maintain and deal with the entire family and its various issues when men are busy in acquiring bread for the family. Women in national or international level working for the betterment of environment by different movements, strikes, protest etc. Women were led Chipko movement, Bishnoi movement, Green Belt movement and many more. Women environmentalist activist like Greta Thunberg, Jane Goodall, Medha Patkar, Kinkari Devi, Vandhana Shiva and many more are working for the protection of environment. Throughout the above discussion it has found that women were working whole heartedly for protect and improves the environment, this will be become more active and fruitful when other parts of the society stand with the women by holding hand in han

The word Environment derived from French word 'Environ' which means surround. Environment is the nature and surrounding in which all plants, animals, humans and other living beings live and operate. It is the interrelationships of land, water and air among themselves and with all living and non-living. Our human society and environment or nature has an inseparable bonding. Society emerged as per the prevailing environment therefore the living styles, dressing, food culture, language and festivities occasion of people are distinct different accordingly various environment. Environment can be divides into two category i.e. Natural environment and Men made environment. With the explosion of human population environment had started degraded very harshly due to which today entire world suffering from Global Warming, frequent Earthquake, explosion of Volcanoes, Tsunami, Flood, Acid rains and Drought etc. Now peoples were awake and understand the important of environment for the existing of human life therefore started to work for save environment. Societies were involved themselves into the work regarding the safeguard of environment. Being the better half part of the society Women's role into the protection of environment found deep rooted. Greek and Hindu Goddesses were animal as their 'bahana' which showed that woman playing great role in the protection of environment.

CHIPKO ANDOLAN (MOVEMENT)

The Chipko Movement is a famous environmental movement in India that emerged in the 1970s to protest against deforestation and to conserve forests. The Chipko Movement, which is also identified chiefly as a women's movement, originated in the Garhwal Himalayan mountain region of the present Uttarakhand state. The region is known for its fragile ecology, often prone to earthquakes, erosive rivers and steep valleys that are least conducive to agricultural growth. Its vast forest cover and reserves enables the local communities to pick



the fodder, fuel and fibers that contribute to their daily sustenance. With no opportunities for viable income, the men folk search for income outside the region while the women are left in the villages often leaving them as the real custodians of the available resource

The movement was led by a group of rural women from the village of Mandal in the Indian state of Uttarakhand. These women, who were mostly illiterate, realized the importance of preserving the forests that sustained their lives and livelihoods. The Chipko Movement became a catalyst for environmental activism in India and inspired similar movements in other parts of the world.

The term 'Chipko' means 'to hug' in Hindi. The movement was named after the practice of hugging trees to prevent them from being cut down. The Chipko Movement originated in the Himalayan region of Uttarakhand, which was then a part of the state of Uttar Pradesh. The region was known for its dense forests and rich biodiversity, which were threatened by commercial logging and deforestation.

The Chipko Movement was started by a group of women from the village of Mandal, who were inspired by the teachings of environmentalist Sunderlal Bahuguna. Bahuguna was a prominent environmentalist and social activist who had been working for the preservation of the Himalayan forests for many years. He had been promoting the idea of 'ecology is permanent economy', which emphasized the need to conserve forests for sustainable development.

In 1973, a logging contractor arrived in the village of Mandal to cut down a large number of trees. The women of the village, led by Gaura Devi, decided to resist the contractor and save the trees. They formed a human chain around the trees and hugged them to prevent the loggers from cutting them down. The loggers were forced to retreat without cutting a single tree, and the women emerged victorious. The success of the Chipko Movement in Mandal inspired similar protests in other parts of Uttarakhand and other states in India. The movement became a symbol of people's resistance against commercial exploitation of natural resources. The Chipko Movement also raised awareness about the importance of preserving forests for ecological balance and sustainable development.

The Chipko Movement had a significant impact on environmental policies in India. The government of India enacted the Forest Conservation Act in 1980, which restricted the felling of trees in forests. The government also launched the National Afforestation Programme in 1985 to promote afforestation and reforestation in degraded forest areas.

The Chipko Movement also inspired similar movements in other parts of the world. In Kenya, the Green Belt Movement, led by Nobel Peace Prize laureate Wangari Maathai, promoted afforestation and community-based conservation. In Brazil, the Chico Mendes Extractive Reserve was established to protect the Amazon rainforest and the rights of traditional forest dwellers.

In conclusion, the Chipko Movement was a significant event in the history of environmental activism in India and the world. It was a grassroots movement that mobilized rural women to protect their natural resources and livelihoods. The movement inspired similar movements in other parts of the world and raised awareness about the importance of ecological conservation for sustainable development. The Chipko Movement remains a symbol of people's power and resistance against environmental degradation and exploitation.

CHIPKO AS AN ECO-FEMINIST MOVEMENT

There have been arguments-both for and against the Chipko Movement's label as a women's movement. While the contribution of the local communities consisting of both men and women is not ruled out, the extraordinary role played by women, who with firm determination pledged to restore the nature to its pristine, attracted worldwide attention. Undoubtedly, the movement has been a complete non-violent achievement, and can be likened to Satyagraha in the environmental arena. Since by nature women are known as nurturers of creatures- living and non-living- 'ecofeminism takes the woman-nature connection a step further' (Turner, 2003, p.4. see URL). Most of the interpretations are heavily drawn from the arguments of Dr. Vandana Shiva with special references to her works, 'Staying Alive- Women, Ecology and Development in India' and her joint work with Maria Mies, 'Ecofeminism'.

Firstly, the nature is viewed in terms of feminine principle. Since the ancient ages, women in general and India in particular are considered as an inseparable part of nature. At one level, nature is symbolised as the embodiment of the feminine principle, and at another, she is nurtured by the feminine to produce life and provide sustenance (Shiva, 1988, p.38). This is a manifestation of shakti or energy, from which all existence arises. This energy is called nature (Prakriti). Nature, both animate and inanimate is thus an expression of shakti, the feminine and creative principle of the cosmos; in conjunction with the masculine principle (purusha), Prakriti creates the world. Further, nature is inherently active, a powerful, productive force in the dialect of creation, renewal and sustenance of all life (Ibid). From this, the world derives its activity and diversity manifest in the form of life on earth-mountains, trees, rivers, animals etc. The human being, so much a part of this world of creation, ideally is to live in consonance with nature. Regrettably, man's attitude



towards nature has turned into that of a dominant force, who can subjugate nature to the maximum extent. This, in a way, symbolises man's eternal urge to demonstrate domination over woman

The large number of women participating, even defying their men, demonstrates their innate power or shakti. In India, in spite of women's suppression, there is a universal agreement, even if grudgingly, that women are nurturers of nature. The ancient civilisation and texts have often put women on a higher pedestal in the context of ecological/ environmental concerns. This view finds a wide spread critique among the Western scholars, thus bringing to the fore the cultural differences and the perception of nature as a sacred force to be restored and not exploited.

Another criticism that faces the ecofeminist perspective is that it failed to end the marginalisation of women. Though the movement has brought forth the issues of forest management and concern for ecological conservation, it failed to mitigate the woes of women who continue to move far and wide in search of resources necessary for subsistence. Further the non-participation of women in the official roles like joint forest management bodies further deprives them of playing a direct, constructive and authoritative role. Thus, the discrepancies in representation are obvious rendering the constructive role of women in the whole debate obsolete. The movement otherwise has brought in few policy changes related to the protection of environment and natural resources.

Whether the Chipko movement was led by women or witnessed a participation of large number of women due to which it was called an eco-feminist movement leads to several debates. What concerns the most in this context is the preservation of ecological resources. Even if an economic motive is attributed to the women's participation, it should be remembered that the resources needed for subsistence is far less than the massive tree felling efforts of the commercial contractors. Thus comparing women's subsistence needs to contractor's greed would be totally unwarranted. Even if a short-term economic motive is attributed to women's resistance, the scenario of long-term benefits of forest conservation cannot be underestimated

Lastly, the Chipko struggle is essentially an effort to save the natural resources and forests for the benefit of all. In the words of Shiva, 'the Chipko struggle is a struggle to recover the hidden and invisible productivity of vital resources, and the invisible productivity of women, to recover their entitlements and rights to have and provide nourishment for sustained survival, and to create ecological insights and political spaces that do not destroy fundamental rights to survival. Chipko women provide a non-violent alternative in forestry to the violence of reductionist forestry with its inherent logic of indispensability. They have taken the first step towards recovering their status as the other silviculturists and forest managers, who participate in nature's processes instead of working against them, and share nature's wealth for basic needs instead of privatising it for profit'(Shiva, 1988, p.95,

EXPERIENCES OF WOMEN IN THE CHIPKO MOVEMENT

The Chipko movement, also known as the Chipko Andolan, was a non-violent environmental movement that originated in the state of Uttarakhand in India in the 1970s. One of the unique features of this movement was the active participation of women. Women played a crucial role in the success of this movement, and their experiences offer valuable insights into the challenges faced by women who fight for environmental justice.

One of the primary experiences of women in the Chipko movement was the challenge of balancing their traditional roles as caretakers of the family and the forest with their new roles as activists. Women in the region were responsible for collecting firewood, fodder, and other forest produce, and they also had to take care of their families. However, they recognized the importance of protecting the forest and saw the Chipko movement as an opportunity to safeguard their livelihood and way of life. Women had to balance their responsibilities and find time to participate in the movement. This often meant waking up early in the morning and working late into the night.

Another experience of women in the Chipko movement was the challenge of overcoming gender discrimination. Women in the region were often seen as second-class citizens and were not allowed to participate in decision-making processes. However, the Chipko movement provided an opportunity for women to assert their rights and challenge patriarchal norms. Women actively participated in the movement and played a crucial role in educating the local communities about the need to protect the forests.

The Chipko movement also provided an opportunity for women to gain leadership skills and develop self-confidence. Women who participated in the movement became empowered and realized that they had the power to effect change. They also became role models for other women in the region and inspired a new generation of women to take up the cause of environmental protection. The participation



of women in the Chipko movement was crucial to its success, and their legacy continues to inspire women around the world to fight for environmental justice.

IMPACT OF WOMEN'S PARTICIPATION IN CHIPKO MOVEMENT

Here are some of the ways in which women's participation in the Chipko movement made a difference:

(a) Increased participation: Women played a vital role in the Chipko movement and their participation increased the number of people involved in the movement. Women brought their unique perspectives and experiences to the movement, which helped to broaden its goals and strategies. Women's participation increased the number of people involved in the movement. Women brought their unique perspectives and experiences to the movement, which helped to broaden its goals and strategies. Women were able to mobilize other women in their communities and encourage them to participate in the movement. Women's involvement in the Chipko movement also helped to challenge traditional gender roles and to promote gender equality.

(b) Empowerment of women: The Chipko movement empowered women by giving them a platform to voice their concerns and to actively participate in the decision-making process. Women's involvement in the movement helped to challenge traditional gender roles and to promote gender equality. The Chipko movement empowered women by giving them a platform to voice their concerns and to actively participate in the decision-making process. Women were able to understand the importance of protecting forests and ecology and the impact of deforestation on their lives. They were able to share their experiences and knowledge with other members of the community and make a significant contribution to the movement. Women's involvement in the Chipko movement helped to challenge patriarchal structures and create a more equitable society.

(c) Increased awareness: The participation of women in the Chipko movement helped to raise awareness about the importance of protecting forests and ecology. Women were able to reach out to other women in their communities, which helped to mobilize a wider section of society. The participation of women in the Chipko movement helped to raise awareness about the importance of protecting forests and ecology. Women were able to reach out to other women in their communities, which helped to mobilize a wider section of society. Women's involvement in the movement helped to make it more inclusive and accessible to everyone. The Chipko movement also emphasized the importance of sustainable development, which was a key message that resonated with women. Women were able to understand the long-term impact of deforestation and the need to protect forests for future generations.

(d) Sustainable development: The Chipko movement emphasized the importance of sustainable development, which was a key message that resonated with women. Women were able to understand the long-term impact of deforestation and the need to protect forests for future generations. The Chipko movement had a significant impact on policy changes related to forest conservation in India. Women's participation in the movement helped to ensure that their voices were heard and that their concerns were taken into account when making policy decisions. The Chipko movement led to the creation of the Forest Conservation Act in India, which helped to regulate the use of forests and ensure their sustainable use. The Act also recognized the rights of forest-dwelling communities and their role in forest conservation.

(e) Policy changes: The Chipko movement had a significant impact on policy changes related to forest conservation in India. Women's participation in the movement helped to ensure that their voices were heard and that their concerns were taken into account when making policy decisions.

Women were raised movement for the protection of environment by themselves and along with the men of the society. They were: -

Bishnoi Movement (1700): The movement took place in Khejarli, Marwar region of Rajasthan when the Maharaj of that area ordered his soldier to cut down the trees of the region which were believed as sacred by the villager. Amrita Devi along with the other Bishnoi villager hugged the trees to protect and encourage others to protect the trees. 363 Bishnoi villagers were killed in this movement. Later the Bishnoi state was declared as a protected area.

Silent Valley Movement (1978): Silent valley is an evergreen tropical forest in the Palakkad district of Kerala. In the leadership of Sugutha Kumari along with others in order to protect the Silent valley from being destroyed by Hydroelectric power project of the Kerala State Electricity Board.

Jungle Bachao Andolon, (1982): This movement took place in Singbhum district of Bihar by the Tribal's started protest when the government decided to replace Sal forest with Teak. This protest also known as Greed Game Political Populism.

Appiko Movement, (1983): Appiko movement is the southern version of the Chipko movement. The Appikomovement was locally known as Appiko Chaluvali. The local people embraced the trees against the contractors. Narmada Bachao Andolon, 1985: This is organized by the farmers, environmentalists and human right activists protest against the Sardar Sarovar Dam in Gujrat across the



Narmada river which flows thorough the Gujrat, Madhya Pradesh and Maharashtra. To provides irrigations and electricity of above mentioned states in the cause of environment degradation. Medha Patkar and Babu Amte were the main leaders of the movement.

Green Belt Movement, (1977): The movement was initiated to stop Kenya's rapidly diminishing forest resources. It was the one of the biggest women movement for the protection of environment to bring environmental restoration along with society's economic growth and to empower rural women through environmental preservation. The movement led by Noble Prize Winner Wangari Maathai on the day of world environment day on 5th June 1977 when very few women planted seven trees in Wangari Maathai's backyard, till 2005 there are 30 million trees had been planted by its participants in private lands.

CONCLUSION

In conclusion, the participation of women in the Chipko movement was a critical factor in its success. Women played a crucial role in the movement, both as leaders and as participants. They brought a unique perspective to environmental issues and highlighted the importance of protecting the forests and the ecology of the Himalayan region for future generations.

The involvement of women in the Chipko movement challenged traditional gender roles and empowered women to become leaders and activists. It also helped to raise awareness about the importance of women's participation in social and environmental movements.

The Chipko movement and the participation of women in it were a significant milestone in the history of environmental activism in India. It not only protected the forests and ecology of the Himalayan region but also inspired a new generation of activists and social reformers to fight for environmental justice and social equality. The legacy of the Chipko movement and the participation of women in it continues to inspire environmental and social justice movements worldwide. It is a testament to the power of collective action and the importance of grassroots movements in bringing about social and environmental change

The participation of women in the Chipko movement serves as a reminder that environmental activism is not just a matter of protecting nature but also about social justice, gender equality, and human rights. Women have a unique role to play in environmental activism, and their voices and perspectives must be heard and respected

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SUITABLE INSECTICIDE FOR INTEGRATED PEST MANAGEMENT

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ABSTRACT

The article presents the results of testing the oxadiazine insecticide Avaunt with the active substance indoxacarb against the cotton bollworm on cotton and the mulberry moth on mulberries. In all experiments, high efficiency against caterpillars of all ages was obtained, which greatly distinguishes it from other preparations - larvicides. Depending on the objects, the consumption rates of the preparation can be in the range from 0.3 to 0.45 l / ha. The preparation is practically non-toxic for entomophages - trichogramma, bracon and lacewing, which is especially valuable in integrated plant protection programs.

KEYWORDS: Cotton, tomato, insecticide, avaunt, cotton bollworm, mulberry moth, entomophages, efficiency.

INTRODUCTION

Applied entomology has received an excellent preparation – the insecticide Avaunt, intended to combat the caterpillars of harmful butterflies. The preparation was synthesized and offered to the market by DuPont several years ago. By decision of the State Chemical Commission of the Republic of Uzbekistan, the insecticide Avaunt in the form of 15% k.s. underwent a comprehensive agrotoxicological assessment at the Uzbek Research Institute of Plant Protection (URIPP) after 2000.

Avaunt is a new generation insecticide: it is from a new class of chemical compounds - oxadiazines, has no analogues, has a unique mechanism of action on the insect organism. This provides it with high biological efficiency at low consumption rates and prevents (in the near future) the selection of group or cross-resistance of insects to this preparation.

Avaunt is an insecticide with contact and intestinal action. It does not have a systemic effect, but can penetrate deep into the tissue (deep or translaminar action). This property is especially evident when destroying cutworm eggs - the preparation is able to penetrate the egg shell and destroy the caterpillar embryo. Already formed caterpillars hatch, but after leaving the egg, they usually eat the shell. And this already causes intestinal poisoning of the young organism. So, Avaunt is an ovicide and larvicide, effective against all ages of caterpillars. Avaunt has been studied as a possible insecticide against the most dangerous pest of cotton in Uzbekistan - the cotton bollworm - *Helicoverpa armigera* Hbn. (Fig. 1) and a pest that has spread relatively recently in our country - the mulberry moth - *Diaphania pyloalus* Walker. (Fig. 2) on mulberries (*Morus alba* L.).

MATERIALS AND METHODS

The research was conducted in the Tashkent, Khorezm, Namangan, Andijan and Fergana regions. Agrotoxicological studies were carried out according to the "Methodological guidelines" ... (2004) and Sh.T. Khodjaev (2020). Biological effectiveness was derived using the Abbott formula (1925), which provides for a correction for control. The study of the danger of Avaunt and other insecticides on entomophages was carried out using the improved method of M. Golyshin et al. (1984), when experimental insects are offered leaves from treated plants every 24 hours.

RESULTS AND DISCUSSION

Based on the results of experiments conducted in various regions, a conclusion was made about the high biological efficiency of the insecticide Avaunt against cotton bollworm at a level of 75-100% at consumption rates of 0.4-0.45 l/ha, which is 17-30% higher than the standards: cypermethrin, esfenvalerate, betacyfluthrin. Based on these results, the State Chemical Commission of the Republic of Uzbekistan included the drug Avaunt in the List of pesticides recommended for use in Uzbekistan.

In the following 2013-2014 years, zonal demonstration tests of the insecticide Avaunt were conducted. In one of them, conducted in the Khorezm region, the treatment was carried out using a tractor sprayer OVH-28 (300 l / ha) on June 26. The results showed



that within 20 days after treatment, Avaunt at a consumption rate of 0.45 l / ha showed high biological efficiency at the level of 79-100%. In the reference version - betacifluthrin (0.8 l / ha), the efficiency was lower (61-76%). The same results were obtained in experiments conducted in 2016-2018 in the Baghdad district of the Fergana region, the Pap district of the Namangan and the Balikchi district of the Andijan regions. Thus, it is a fact that Avaunt at a consumption rate of 0.4-0.45 l/ha is currently one of the best insecticides recommended against this pest.

As is known, the spread of a relatively new pest – the mulberry moth – is of particular concern to plant protection specialists and silkworm breeders in the republic (Fig. 2).



Figure 1. Cotton bollworm as a pest of agricultural crops.

Damage caused by bollworm caterpillars: 1 – to cotton bolls; 2 – to corn kernels; 3 – tomato fruits; 4 – to wheat ears; 5 – to sunflower heads; 6 – the process of treating cotton fields with the drug Avaunt; 7 – all ages of bollworm caterpillars die.

The pest turned out to be a monophage and, fortunately, does not damage anything except mulberry. High ecological plasticity and great life potential of the species allow it to spread quickly throughout the republic. Due to the lack of significant biological resistance in the new area, the reproduction potential of the species is very high and so far it can only be contained by chemical treatments. The caterpillars of the mulberry moth have a specific way of protecting themselves from enemies by folding the edges of the leaf where it feeds. This in turn complicates the fight against it. Insecticides with deep or intraplant action are required. Preparations with ovicidal action should be tested. Avaunt meets these requirements. Indeed, testing of this preparation in vegetation in 2013-2017 showed that Avaunt has unique capabilities to combat this pest to protect mulberries. The guarantee of success is the selection of optimal scientifically substantiated terms of treatments - during the period of mass egg-laying and hatching of caterpillars. Treatment of mulberry in these conditions allows to achieve efficiency of up to 99% at the rate of 0.3 l/ha. In conditions of violation of these requirements - in the presence of older caterpillars, the effect of Avaunt is achieved at an increased rate of consumption - 0.4 l/ha. Thus, Avaunt has found successful application here too. It is possible that Avaunt can be used against other objects, for example, against leaf rollers (Tortricidae) in pome orchards, or against apricot thick-legged moth (*Eurytoma samsonovi* Vass.) on stone fruits, etc. It is important to establish scientifically substantiated terms of treatments.



Figure 2. Mulberry moth and effective protection against them:

1 – pest moths in pheromone traps, 2 – older caterpillars, scaling and mining of leaves, 3 – wrapping the edges of infected leaves, 4 – tractor treatment of infected trees using special attachments (200-300 l/ha of working fluid), 5 – manual treatment using motor sprayers (250-350 l/ha), 6 – all ages of pest caterpillars may die.

A great advantage of the insecticide Avaunt is its low toxicity for most entomophages. The reason for this property of the preparation is probably hidden in the specificity of its mechanism of action, which has a distinctive (selective) effect on butterfly caterpillars. To study this issue, we conducted laboratory and field experiments in 2001 and 2005. Using a special technique, we studied the acute and residual toxicity of Avaunt in the maximum recommended consumption rates on the imago of *Trichogramma pintoi*, *Bracon hebetor* and *Scolothrips acarifagus*; on the imago and pupae of *Encarsia formosa*; and the imago, eggs and larvae of lacewings (Chrysopidae).

The main objects widely used in Uzbekistan to combat cotton bollworm and developed in biolaboratories and biofactories are: trichogramma (12 species in total) and bracon. Therefore, it is very important to know the acute and residual toxicity of preparations for these objects. From the results of our studies, it was clear that Avaunt in all tested concentrations has some acute toxicity for trichogramma imago (see table). But already 2 days after treatment, even at the highest consumption rate (0.45 l/ha), it becomes safe for this entomophage. In the standards: cypermethrin and zetamethrin, this occurs only on the 15th day.

Table

Acute and residual toxicity of the insecticide Avaunt for entomophages and safe periods of their release after application of the preparation

№	The most widespread entomophages	At the rate of 0.4 l/ha, toxicity for:		Acceptable release dates (days after return)
		imago	other phases	
1.	<i>Trichogramma pintoi</i>	toxic for 1 day	non-toxic	2
2.	<i>Bracon hebetor</i>	1 day	non-toxic	2
3.	<i>Scolothrips acarifagus</i>	non-toxic	non-toxic	without restrictions
4.	<i>Encarsia formosa</i>	1 day	non-toxic	2
5.	<i>Chrysopa carnea</i>	non-toxic	non-toxic	without restrictions

For the imago of the bracon, Avaunt also turned out to be toxic in the first day after spraying (mortality 55-84%), but this activity passed 2 days after treatment, unlike the reference preparations, the activity of which lasted more than 8 and 6 days, respectively.

During cotton treatments, there may be various entomophages on the site, including an effective acariphage - a predatory mite-eating thrips (*Scolothrips acariphagus*). A study of this effect showed that the insecticide Avaunt is completely harmless to this insect.

On the day of treatment (after 1 hour), Avaunt turned out to be toxic for the imago of encarsia (*Encarsia formosa*) - an active endoparasite of whiteflies. But on the 2nd day, their toxicity dropped sharply to a safe level. For the “pupae” (mummified whitefly



larvae), Avaunt turned out to be absolutely safe, just like the specific aleurocid admiral (pyriproxyfen) and better than cymbusch-cypermethrin (42% mortality).

There are more than 13 species of lacewings in Uzbekistan, but the most common is *Chrysopa carnea*. A study of the toxicity of Avaunt for the imago, larvae and eggs of this predator showed that the drug is completely safe for individual phases of this insect, unlike cypermethrin and zetamethrin.

CONCLUSION

The insecticide Avaunt is an effective means of combating the cotton bollworm (0.4-0.45 l/ha) on cotton and the mulberry moth (0.3-0.4 l/ha) on mulberry.

Possessing unique capabilities of a gentle effect on the main types of entomophages of agrobiocenoses, Avaunt has taken a worthy place in integrated systems for protecting various crops from harmful organisms and continues to amaze with its capabilities.

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A TECHNIQUE TO SECURE DATA TRANSMISSION IN WIRELESS BODY AREA NETWORKS

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ABSTRACT

The wireless body area networks have contributed to the changes in healthcare sector by enabling continuous monitoring of biomedical parameters remotely on the patient body and offering real time data transmission. Upon collection of the vital signs, they are transmitted to the gateway node which then forwards them to the remote hospital medical servers. Here, these physiological data items are analyzed and necessary action is taken. Such physiological data include electrocardiograms (ECGs), blood pressure, body temperature, blood oxygen levels, respiratory rate, Electroencephalogram (EEG), Electromyogram (EMG), glucose levels, physical activity and Electrodermal Activity (EDA). In this paper, we develop a technique for securely transmitting this sensitive data from the body sensor unit (BSU) to the remote hospital medical server (HMS).

KEYWORDS: Sensors, BSU, WBAN, security, privacy

1. INTRODUCTION

Wireless body area network (WBANs) comprised of smart medical sensors that are placed inside the patient's body or located in the vicinity of the patient. The main components of a typical WBAN include the medical staff, sensors, and gateway nodes [1]. These sensors offer real-time monitoring and healthcare support to the patients. They may also be utilized to monitor the elderly people who need some permanent care devoid of being hospitalized. In such a scenario, the monitoring is done at home using sensors that then send the collected data to the hospital using some wireless transmission channels. In case of emergencies such as heart attack, the medical staff can initiate some immediate actions without further delays.

As explained in [2], WBANs collect patient medical data and forward the same to medical staff for monitoring the patient's health remotely. Thus, patients diagnosis can be done remotely using some remote clinical nano-sensors [3]. The collected data may include body temperature, ECG, sugar level and blood pressure among others [4]. WBAN presents an emerging domain that employs ubiquitous technologies such as smart sensors, cloud computing, embedded systems and wireless network technologies to boost the electronic-health care system [5]. As explained in [6] and [7], WBAN based systems represent one of the most critical technologies in the biomedical field. Basically, important patient and elderly health parameters and movements are received and forwarded to the healthcare service provider for analysis and appropriate action [2], [8]. As a result of the effectiveness and demand for WBAN, a new international communication standard IEEE 802.15.6 [9] has been developed.

In spite of the numerous merits accompanying this technology, its open nature in regard to wireless communication channels coupled with cloud computing introduce a number of security threats and vulnerabilities. As such, the privacy and integrity of the exchanged data may be compromised. For instance, an attacker can eavesdrop, intercept, modify, or replay the exchanged messages. In addition, the data stored in the utilized mobile devices and sensors can be retrieved. As explained in [10], attacks such as offline password guessing, privileged insider, user tracking, session key disclosure, forgery and impersonations are possible in WBANs. Since the exchanged data directly impacts on patient health and life, its confidentiality should be upheld [11]. The resource-constrained nature [12] of the sensors deployed in WBAN presents some challenges with regard to execution, storage and communication complexities. Cloud computing can potentially solve these issues but it introduces its own threats and vulnerabilities [13]. According to [14] and [15], data encryption is another solution to these issues. However, some of the encryption algorithms are resource-intensive hence not suitable for the sensors. This paper makes the following contributions:

- A review of the current security techniques for WBAN is provided, including the shortcomings of these techniques.
- We develop an efficient technique to protect the data exchanged in WBANs.



- We show that it is computationally infeasible to extract the sensory data transmitted over the public channels. The rest of this article is structured as follows: Part 2 describes the related works while Part 3 presents the adopted methodology. However, Part 4 presents the obtained results while Part 5 concludes this paper.

2. RELATED WORKS

Many security solutions have been put forward by researchers in industry as well as academia to protecting WBAN communication process. For example, the authentication protocols in [16] are lightweight and incur less communication overheads but are never evaluated from the privacy and security perspectives. On the other hand, the two-factor authentication scheme in [17] cannot uphold user anonymity [12]. These issues can be addressed by the secure and efficient approaches in [18] and [19]. Using offline signatures, a remote authentication scheme is developed in [20]. Using the physical unclonable functions (PUFs), lightweight protocols are developed in [21] and [22]. Unfortunately, the security analysis of the scheme in [21] is missing. In addition, PUF-based schemes have stability challenges. On the other hand, an energy-efficient authentication and key agreement protocol is developed [23]. Although the technique incurs less communication, memory and computation overheads, it cannot withstand many security attacks [24]. To address this challenge, many schemes have been put forward in [25], [26] and [27]. However, most of these schemes are not lightweight and cannot offer forward secrecy, untrace ability as well as resilience against key compromise impersonation attack [10]. For instance, the scheme [26] incurs extremely high communication costs. To reduce the computation and communication overheads, a secure anonymous user authentication scheme is developed in [28]. Similarly, an efficient and privacy preserving smart card-based authentication protocol is presented in [29]. However, this approach is vulnerable to offline password guessing, replay, smart card loss and forgery attacks. Similarly, the scheme in [30] is susceptible to key compromise, replay, privacy leakages and impersonation attacks [5].

3. METHODOLOGY

The major communicating entities in the proposed algorithm include the Gateway Node (GWN), Hospital Medical Server (HMS) and the Body Sensor Unit (BSU) as shown in Figure 1 below.

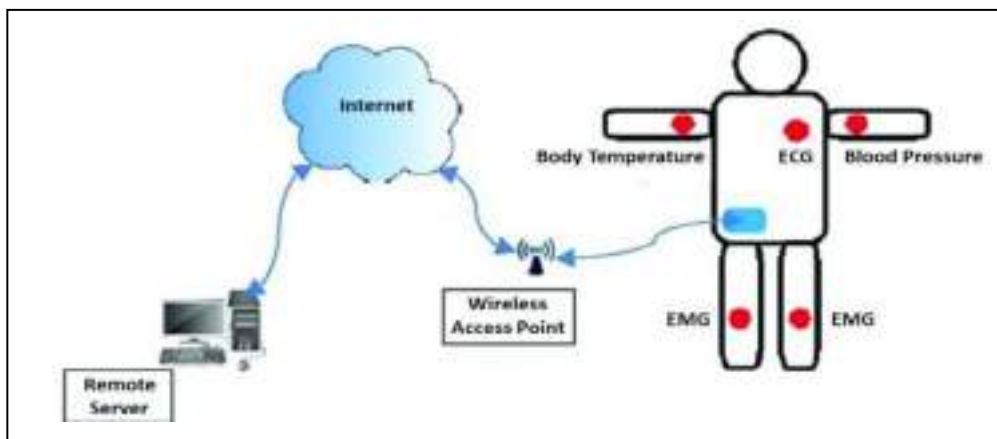


Figure 1: WBAN environment

In this environment, the BSU collects data such as body temperature, glucose levels, PR, QT, ST, QRS and RR. The PR, QT, and RR intervals represent the duration of conduction through the AV node, the duration of ventricular depolarization to repolarization, and the duration between each cardiac cycle, respectively. Basically, PR and ST segments represent the isoelectric interval between depolarization and repolarization of the atria and ventricles. On the other hand, QRS complex is a crucial part of an electrocardiogram (ECG or EKG) which represent the electrical activity associated with the depolarization of the ventricles, which are the two lower chambers of the heart. Table 1 gives a summary of these physiological data collected at the BSU.



Table 1: Physiological parameters

Physiological parameter	Description
QRS complex	Represents ventricular depolarization and consists of three main components: <i>Q Wave</i> - This is the initial downward deflection following the P wave which represents the initial depolarization of the interventricular septum. <i>R Wave</i> - This is the first upward deflection after the Q wave and it represents the depolarization of the main mass of the ventricles, primarily the left ventricle. <i>S Wave</i> - This is the downward deflection following the R wave which represents the final phase of ventricular depolarization at the base of the heart.
PR Interval	Is the time from the onset of the P wave (the start of atrial depolarization) to the beginning of the QRS complex (the start of ventricular depolarization). <i>Clinical Importance:</i> a prolonged PR interval can indicate first-degree heart block, while a shortened PR interval may suggest a pre-excitation syndrome such as Wolff-Parkinson-White (WPW) syndrome.
QT Interval	Is the time from the beginning of the QRS complex (start of ventricular depolarization) to the end of the T wave (end of ventricular repolarization). <i>Clinical Importance:</i> a prolonged QT interval can increase the risk of ventricular arrhythmias, such as Torsades de Pointes, and may indicate conditions like Long QT Syndrome. On the other hand, a shortened QT interval can be associated with hypercalcemia or Short QT Syndrome.
ST Segment	Is the flat, isoelectric section of the ECG between the end of the S wave and the beginning of the T wave. <i>Clinical Importance:</i> Elevation of the ST segment can indicate myocardial infarction (STEMI) or pericarditis. On the other hand, depression of the ST segment can suggest ischemia or non-ST elevation myocardial infarction (NSTEMI).
RR Interval	Is the time between two successive R waves, which represent consecutive ventricular depolarizations. <i>Clinical Importance:</i> Regular RR intervals indicate a regular heart rhythm while irregular RR intervals can indicate arrhythmias such as atrial fibrillation.

In a nutshell, in the context of the cardiac conduction system and electrocardiography (ECG or EKG), PR, QT, ST, QRS and RR intervals are critical measurements that provide valuable information about the heart's electrical activity and overall function. Table 2 presents the permissible ranges of these physiological data items.

Table 2: Physiological parameters ranges

Physiological parameter	Range
Body temperature	97°F (36.1°C) to 99°F (37.2°C).
Glucose level	70 to 99 mg/dL (3.9 and 5.5 mmol/L)
RR Interval	0.6-1.2 seconds
PR Interval	120-200 milliseconds
PR segment	50-120 milliseconds
ST Segment	80-120 milliseconds
QRS complex	80-100 milliseconds

To protect the transmitted physiological data transmitted between the BSU and HMS, a session key is setup. This session key consist of random number R_i , the gateway node master key M_{GW} , and the entities of both the BSU and HMS (ID_{BSU} , ID_{HMS}), which are then hashed. That is,

$$\text{Session key, } SK = h(M_{GW} || ID_{BSU} || ID_{HMS} || R_i)$$



The collected data is then encapsulated as shown in Table 3.

Table 3: Transmitted data format

Physiological parameter	Encapsulated data
Body temperature, <i>body_temp</i>	$Trans_body_temp = SK \oplus body_temp$
Glucose level, <i>Gluc_lev</i>	$Trans_Gluc_lev = SK \oplus Gluc_lev$
RR Interval, <i>RR_int</i>	$Trans_RR_int = SK \oplus RR_int$
PR Interval, <i>PR_int</i>	$Trans_PR_int = SK \oplus PR_int$
PR segment, <i>PR_seg</i>	$Trans_PR_seg = SK \oplus PR_seg$
ST Segment, <i>ST_seg</i>	$Trans_ST_seg = SK \oplus ST_seg$
QRS complex, <i>QRS_com</i>	$Trans_QRS_com = SK \oplus QRS_com$

The transmitted data is therefore a concatenation of the above seven physiological data items. At the receiver end, the plaintext physiological data is recovered as shown in Table 4.

Table 4: Data recovery at HMS

Physiological parameter	Recovered data
Body temperature, <i>body_temp</i>	$SK \oplus Trans_body_temp$
Glucose level, <i>Gluc_lev</i>	$SK \oplus Trans_Gluc_lev$
RR Interval, <i>RR_int</i>	$SK \oplus Trans_RR_int$
PR Interval, <i>PR_int</i>	$SK \oplus Trans_PR_int$
PR segment, <i>PR_seg</i>	$SK \oplus Trans_PR_seg$
ST Segment, <i>ST_seg</i>	$SK \oplus Trans_ST_seg$
QRS complex, <i>QRS_com</i>	$SK \oplus Trans_QRS_com$

The obtained plaintext data in Table 4 is then read and interpreted by the medical experts. Thereafter, appropriate action and medication can be recommended.

4. RESULTS AND DISCUSSION

In this sub-section, the security characteristics offered by the developed algorithm are demonstrated. After every successful mutual authentication, session key *Session key*, $SK = h(M_{GW} || ID_{BSU} || ID_{HMS} || R_i)$ is setup to encipher all exchanged messages. Consider the plaintext data generated at the BSU shown in Figure 2.



Figure 2: Generated BSU data

Prior to sending the above physiological data over the open wireless channels, each data item is XORed with the session key (as detailed in Table 3 above) to produce the output shown in Figure 3. Basically,

$$Transmitted\ data = session\ key \oplus plaintext\ data$$



Figure 3: Data in transit over the communication channel

Suppose that an adversary acting as man-in-the-middle (MitM) between the BSU and the HM launches an eavesdropping attack. However, due to the one-way hashing operations, the adversary is unable to recover identities ID_{BSU} and ID_{HMS} . As such, anonymity is preserved. In addition, we include random number R_i in each communication session. Therefore, the derived session key is different for each session, mitigating against tracking attacks. At the HMS, the plaintext data is recovered as follows in Figure 4. Basically, $Plaintext\ data = session\ key \oplus transmitted\ data$

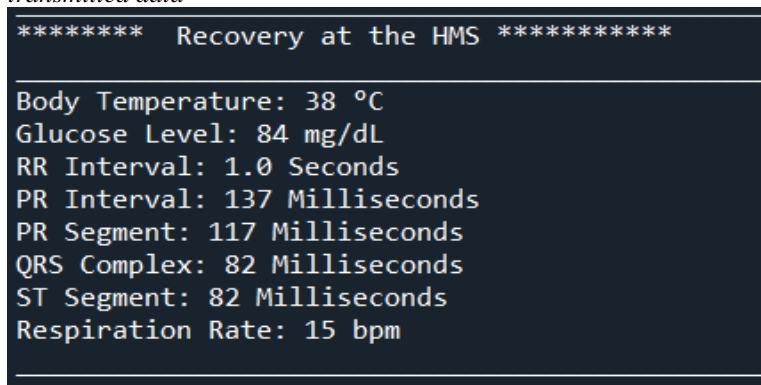


Figure 4: Data at the HMS

As shown in Figure 4, the obtained values at the HMS have been successfully recovered. Basically, they are equivalent to the values appearing at the BSU in Figure 2 presented earlier on.

5. CONCLUSION

The ever-increasing utilization of mobile devices, wireless networks, Internet of Things (IoT) and sensors has seen the healthcare sector adopting numerous mobile devices to collect data, monitor patients and communicate the data over WBANs. These sensors offer real-time monitoring and healthcare support to the patients. They may also be utilized to monitor the elderly people who need some permanent care devoid of being hospitalized. In such a scenario, the monitoring is done at home using sensors that then send the collected data to the hospital using some wireless transmission channels. In case of emergencies such as heart attack, the medical staff can initiate some immediate actions without further delays. In spite of the numerous merits accompanying this technology, its open nature in regard to wireless communication channels coupled with cloud computing introduce a number of security threats and vulnerabilities. As such, the privacy and integrity of the exchanged data may be compromised. In this paper, we have presented a technique that can potentially help address these security and privacy issues.

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BEST PRACTICES FOR IMPLEMENTING HYPERCONVERGED INFRASTRUCTURE (HCI) IN MODERN DATA CENTERS

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1. INTRODUCTION

Data centers have evolved from mainframe systems to advanced hyperconverged infrastructures (HCI) that integrate compute, storage, networking, and virtualization into a single system. This document outlines best practices for adopting HCI to address common data center challenges, streamline operations, and improve resource utilization.

2. KEY PRINCIPLES OF HCI IMPLEMENTATION

2.1 Simplified Management and Operations

- **Consolidate Resources:** HCI combines compute, storage, networking, and virtualization into a single package, reducing the need for multiple management tools.
- **Centralized Management:** Utilize software-defined infrastructure (SDI) for unified management of resources to streamline operations and reduce complexity.
- **Automate with AI and ML:** Integrate AI-driven operations to handle routine tasks like monitoring, maintenance, and resource allocation for proactive management.

2.2 Efficient Resource Utilization

- **Dynamic Scaling:** Implement horizontal scaling to add compute or storage nodes seamlessly as demand increases without disrupting operations.
- **Optimize Storage:** Employ techniques like data deduplication, compression, and tiered storage for maximum storage efficiency.
- **Leverage Advanced Algorithms:** Use intelligent algorithms to dynamically balance workloads across the cluster, ensuring efficient compute and storage utilization.

3. HIGH AVAILABILITY AND FAULT TOLERANCE

3.1 Ensuring System Resilience

- **Data Replication:** Ensure high availability by distributing data across multiple nodes using replication to mitigate data loss during hardware failure.
- **Self-Healing Infrastructure:** Leverage automated fault tolerance mechanisms that redistribute workloads across healthy nodes when a component fails, ensuring minimal impact on performance.

3.2 Disaster Recovery

- **Integrated Backup Solutions:** HCI platforms often come with built-in data protection and disaster recovery features. Ensure these are configured for seamless failover and recovery during outages.

4. ADVANCED SECURITY PRACTICES

4.1 Secure by Design

- **Encryption and Compliance:** Implement encryption for data at rest and in transit. Utilize role-based access controls (RBAC) to ensure only authorized personnel access sensitive systems.
- **Automated Security Audits:** Use HCI's AI-driven tools to continuously monitor and enforce security policies, ensuring compliance with industry standards.



4.2 Edge Security

- **Edge Computing Integration:** In edge deployments, ensure data integrity and performance by using lightweight HCI nodes optimized for low latency and real-time processing. Secure edge environments with encrypted data channels and real-time threat detection systems.

5. AI AND AUTOMATION IN HCI

5.1 Workload Optimization

- **AI-Driven Load Balancing:** Use AI to optimize workload distribution across on-premises and cloud environments, improving resource efficiency and reducing operational costs.
- **Predictive Analytics:** Integrate machine learning algorithms to predict hardware failures and performance bottlenecks, enabling proactive maintenance and minimizing downtime.

6. CLOUD INTEGRATION AND HYBRID DEPLOYMENTS

6.1 Cloud-Native Applications

- **Seamless Cloud Integration:** Enable hybrid cloud deployments by integrating HCI with public cloud services (IaaS, PaaS). Use this to run cloud-native applications and scale resources efficiently between on-premises and cloud environments.

6.2 Cost Efficiency

- **Cloud Bursting for Peak Demand:** Implement policies to dynamically shift workloads to the cloud during peak usage periods to avoid over-provisioning on-premises resources.

7. PERFORMANCE OPTIMIZATION TECHNIQUES

7.1 Leveraging SSD and NVMe

- **High-Speed Storage:** Utilize SSDs and NVMe storage for faster data access. Employ caching algorithms to further enhance performance and reduce latency.
- **Low Latency Networking:** Implement high-throughput network adapters (10G/25G/40G/100G) to maximize application performance.

8. BEST PRACTICES SUMMARY

- **Consolidate Infrastructure:** Adopt a unified HCI solution that integrates compute, storage, and networking.
- **Automate with AI and ML:** Leverage AI for intelligent workload distribution, predictive analytics, and resource optimization.
- **Ensure High Availability:** Use data replication and self-healing mechanisms to minimize downtime.
- **Secure the Infrastructure:** Implement encryption, access controls, and automated security checks across both data center and edge deployments.
- **Optimize for Cloud:** Integrate HCI with public clouds for hybrid and multi-cloud environments, ensuring flexibility and scalability.

9. CONCLUSION

By following these best practices, businesses can leverage hyperconverged infrastructure to solve traditional data center challenges, improve operational efficiency, and ensure that their infrastructure is future-ready, scalable, and resilient.



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PERINATAL PATHOLOGY AS A RISK FACTOR FOR THE DEVELOPMENT OF BRONCHIAL ASTHMA IN CHILDREN

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ABSTRACT

The aim of the study: to study the perinatal history of children with bronchial asthma depending on the concomitant neurological symptoms.

Material and methods of the study: A total of 103 children with moderate bronchial asthma in remission were examined, with an average age of 7.2 ± 1.2 years. The children were divided into 2 groups: the main group, which included 72 children with bronchial asthma and late consequences of perinatal CNS damage, and a comparison group consisting of 31 children with bronchial asthma without concomitant neurological disorders.

Results: Based on the data obtained, it was found that perinatal lesions of the central nervous system significantly affect the further development and course of bronchial asthma in children. A burdened heredity for allergic diseases in patients with bronchial asthma against the background of late consequences of perinatal lesions of the central nervous system (the main group) was significantly less common (30.6%; $n=22$) than in the comparison group - in 67.7% ($n=21$) of cases. In the main group, the mothers' pregnancies proceeded with some complications (100% of cases), while in the comparison group, only a quarter of the observations revealed a pathological course of pregnancy in mothers, which is undoubtedly a predisposing factor in the formation of perinatal damage to the central nervous system in the main group.

KEY WORDS: bronchial asthma, consequences, perinatal damage, central nervous system, neurological symptoms, perinatal history, risk factors, Apgar scale

Bronchial asthma is one of the urgent problems of pediatrics, since in the last decade both in our country and abroad, there has been an increase in the prevalence of this disease in children, a shift in the onset to an earlier age and a worsening of the course. Studies by a number of authors have shown that perinatal hypoxic damage to the central nervous system (CNS) increases the risk of developing bronchial asthma (BA) in preschool children by 3.4 times, while BA is characterized by an early onset, a more severe persistent course, polyvalent sensitization and low efficiency of traditional methods of therapy [4,6].

It has been found that most children with bronchial asthma have a history of perinatal CNS damage [2,4,6]. Perinatal CNS damage increases the risk of developing bronchial asthma in preschool children by 3.4 times. It is the disturbances in the mechanisms of neurovegetative regulation of the cardiorespiratory system that arise as a result of unfavorable nonspecific influences in perinatal ontogenesis, along with hereditary and constitutional predisposition to atopy, that have a significant impact on the development of bronchial asthma in preschool children [5,6,8,11].

In this regard, it is necessary to further develop new diagnostic and prognostic criteria for the implementation and course of bronchial asthma in children with the consequences of perinatal hypoxic damage to the central nervous system, based on a comprehensive study of the pathogenetic features of allergic inflammation in the bronchopulmonary system, as well as the process of cerebral hemodynamics, taking into account a set of neuropsychological, psychosomatic, immunological and functional parameters, which was the basis for this work.

THE AIM OF THE STUDY

To study the perinatal history of children with bronchial asthma depending on the accompanying neurological symptoms.



MATERIAL AND METHODS OF THE STUDY

A total of 103 children with moderate bronchial asthma in the period of disease remission were examined, the average age of which was 7.2±1.2 years. The children were divided into 2 groups: the main group, which included 72 children with bronchial asthma with the presence of remote consequences of perinatal CNS damage, and a comparison group consisting of 31 children with bronchial asthma without concomitant neurological disorders. The diagnosis of bronchial asthma was verified on the basis of anamnesis data, complaints, clinical symptoms, study of functional respiratory parameters, allergological examination in accordance with the National Program for Bronchial Asthma in Children.

An optimized questionnaire was developed, where the obtained anamnestic data and the results of the conducted studies (28 parameters) were recorded. Particular attention was paid to information from the child's developmental histories (form 112), in particular, the data of the hereditary anamnesis, especially the somatic status of the parents, where the presence of allergic diseases and/or bronchial asthma was indicated. Attention was also paid to the age and place of residence of the child, the age of the mother at the time of the child's birth, the number of pregnancies she had, the characteristics of the course of pregnancy and childbirth; the course of the adaptation period of newborns, the type of feeding, the somatic pathology suffered by children in the first and subsequent years of life.

RESULTS AND DISCUSSION

The conducted analysis of the anamnesis to identify the factors influencing the development and course of bronchial asthma in children, in most cases showed a hereditary burden of atopic /allergic diseases - 69.9% (n=72) of observations, which was detected in 100% of cases (31 patients) in the comparison group. Whereas 30.1% (n=31) of children did not have an burdened heredity and these were children with bronchial asthma against the background of remote consequences of perinatal CNS damage. Allergic diseases were present in both parents of the examined children (34.0%; n=35) and other close relatives (grandmothers, grandfathers, aunts, uncles) (14.6%; n=15). In 21.4% (n=22) of children, a hereditary burden of the group of diseases was noted on both lines at once (Table 1). Moreover, hereditary burden in children with bronchial asthma on the mother's side (22.3%) was found almost 2 times more often than on the father's side (11.7%).

Table 1
Hereditary burden of allergic diseases in children in observation groups

Hereditary burden	Main group (n=72)			Comparison group (n=31)			r
	n	% of all children (103)	% in group (72)	n	% of all children (103)	% in group (31)	
Hereditary burden of allergy pathology	41	39.8	56.9	31	30.1	100,0	0.753
Including on the father's side	6	5.8	8.3	6	5.8	19.4	0.832
Including on the mother's side	13	12.6	18.1*	10	9.7	32.3*	0.552
On both lines	14	13.6	19.4	8	7.8	25.8	0.909
Other immediate relatives	8	7.8	11.1	7	6.8	22.6	

Note: * - p ≤0.005 between paternal and maternal lines (Chi-square test)

When assessing the health status of the patients' parents, it was found that both fathers and mothers of the children had various allergopathologies (Table 2), more often found on the maternal side. Thus, mothers suffered from hay fever and drug allergies (4.8% and 5.8%, respectively) significantly more often than the fathers of the examined children, in whom this pathology was not found in any case (p≤0.05). Allergic dermatitis/urticaria was found in the anamnesis among mothers of patients with bronchial asthma almost 7.7 times more often - 14.6%, against 1.9% on the paternal side.

Table 2
Allergic diseases of parents of examined children

Allergic diseases	Fathers		Mothers		Both parents	
	n	%	n	%	n	%
Hay fever	0	0*	5	4.8	0	0
Bronchial asthma	5	4.8	6	5.8	0	0
Quincke's edema	0	0	2	1.9	0	0
Allergic rhinitis	5	4.8	8	7.7	0	0
Drug allergy	0	0*	6	5.8	0	0
Cold allergy	4	3.9	2	1.9	2	1.9
Allergic dermatitis/urticaria	2	1.9*	15	14.6	0	0

Note: * - p ≤0.005 between paternal and maternal lines (Chi-square test)



When analyzing the incidence of allergic diseases in children in the observation groups, a burdened heredity for allergic diseases in patients with bronchial asthma against the background of remote consequences of perinatal CNS damage (main group) was significantly less common (30.6%; n=22) than in the comparison group – in 67.7% (n=21) of cases.

The study of the perinatal history showed that the majority of the examined children in the study group were born from the first birth (68.9%); 26.2% - from the second; 2.9% - from the third and 1.9% - from the fourth. The analysis of somatic pathology in mothers revealed that the most common pathology in them was chronic pyelonephritis and tonsillitis, noted in 21.3% (n=22) and 15.5% (n=16) of mothers. At the same time, 8.3% were diagnosed with an exacerbation of pyelonephritis during this pregnancy. Somatic pathology among mothers of children with bronchial asthma was found in the main group 2.8 times more often than in patients of the comparison group (p≤0.05) (Table 3).

Table 3
Analysis of somatic pathology of mothers of examined children

Nosological Form	Main Group		Comparison Group		Total	
	n=72	%	n=31	%	n=103	%
Chronic pyelonephritis	19	26.4*	3	9.7	22	21.3
Chronic gastritis	3	4.2	1	3.2	4	3.9
Nodular goiter/hypothyroidism	5	6.9	1	3.2	6	5.8
Chronic tonsillitis	15	20.8*	1	3.2	16	15.5
Chronic bronchitis	4	5.6	1	3.2	5	4.8

Note: * - p ≤0.05 – reliability of data between the main and comparison groups

Other somatic diseases (chronic gastritis, chronic bronchitis, thyroid disease) were quite rare, and their frequency did not differ significantly between the groups of children examined.

When analyzing the unfavorable factors of the perinatal history of mothers of children in the examined groups, it was found that the most common causes were medical abortions preceding the given pregnancy, which were noted in 33.3% (n=24) of mothers of children in the main group and in 19.4% (n=6) in the comparison group (Table 4). In 31.9% and 16.1% of mothers of children in the main and comparison groups, respectively, there were complaints of cervical erosion in the anamnesis. Chronic adnexitis in mothers of children in the main group was noted 1.7 times more often than in the comparison group (22.2% and 12.9%, respectively), but the differences were not statistically significant.

Table 4
Adverse factors in the gynecological anamnesis of mothers of the examined children

Factors and nosological forms	Main group (n=72)		Comparison group (n=31)		r
	n	%	n	%	
History of miscarriages, frozen pregnancy	8	11.1	2	6.5	0.464
History of medical abortions	24	33.3*	6	19.4	0.915
Long-term history of infertility	1	1.4	1	3.2	0.535
Chronic adnexitis	16	22.2	4	12.9	0.273
Cervical erosion	23	31.9*	5	16.1	0.533
Bicornuate uterus	3	4.2	-	-	0.249
History of ectopic pregnancy	1	1.4	-	-	0.51
History of termination of pregnancy for medical reasons	2	2.8	-	-	0.349
Total number of pathologies	64	88.8*	13	41.9	

Note: * - p ≤0.05 – reliability of data between the main and comparison groups

Other unfavorable factors of gynecological history, such as miscarriages, history of frozen pregnancy, termination of pregnancy for medical reasons, long-term infertility, bicornuate uterus, history of ectopic pregnancy, were observed in isolated cases with the same frequency in both groups. At the same time, in mothers of children of the main group, an aggravated gynecological history was observed in 88.8% of cases, which is 2.1 times more often than in the comparison group. Since the course of pregnancy largely determines the health of future children, special attention is paid to its characteristics. The conducted studies allowed us to establish that in mothers of children of the main group, the threat of termination of pregnancy at different stages was noted significantly more often than in mothers of patients of the comparison group (52.8% and 22.6%, respectively; p=0.05), which, most likely, was the main etiologic factor of intrauterine hypoxia of the fetus. The next most significant factors leading to the development of perinatal CNS damage were maternal anemia (54.2%), colpitis (40.3%), gestosis in the second half of pregnancy (30.6%) and umbilical cord entanglement around the fetus's neck (22.2%). Gestational diabetes mellitus occurred with the same frequency in both groups (4.2% and 3.2%, respectively). An important perinatal risk factor was intrauterine infections, observed 4.1 times more often in the main



observation group. In general, in all observations in the main group, the pregnancy of mothers proceeded with some complications (100% of cases), and in the comparison group, only a quarter of observations revealed pathological pregnancy in mothers (Table 5).

Table 5
Peculiarities of the course of pregnancy in mothers of the examined children

Factors and nosological forms	Main group (n=72)		Comparison group (n=31)		r
	n	%	n	%	
Threat of termination of pregnancy	38	52.8*	7	22.6	0.05
Cord entanglement	16	22.2	3	9.7	0.489
Gestational diabetes mellitus	3	4.2	1	3.2	0.535
Gestosis of the first half	11	15.3	6	19.4	0.829
Gestosis 2nd half	22	30.6	3	9.7	0.05
Colpitis	29	40.3	3	9.7	0.446
Anemia	39	54.2	2	6.5	0.745
Intrauterine infection	19	26.4	2	6.5	0.927

Note: * - $p \leq 0.05$ – reliability of data between the main and comparison groups

When analyzing the condition of newborn children after birth, it was found that the majority of children in the comparison group (93.5%) received a score of 8-10 points in the first minute after birth, while in the main group all children were born in a state of asphyxia (Fig. 1).

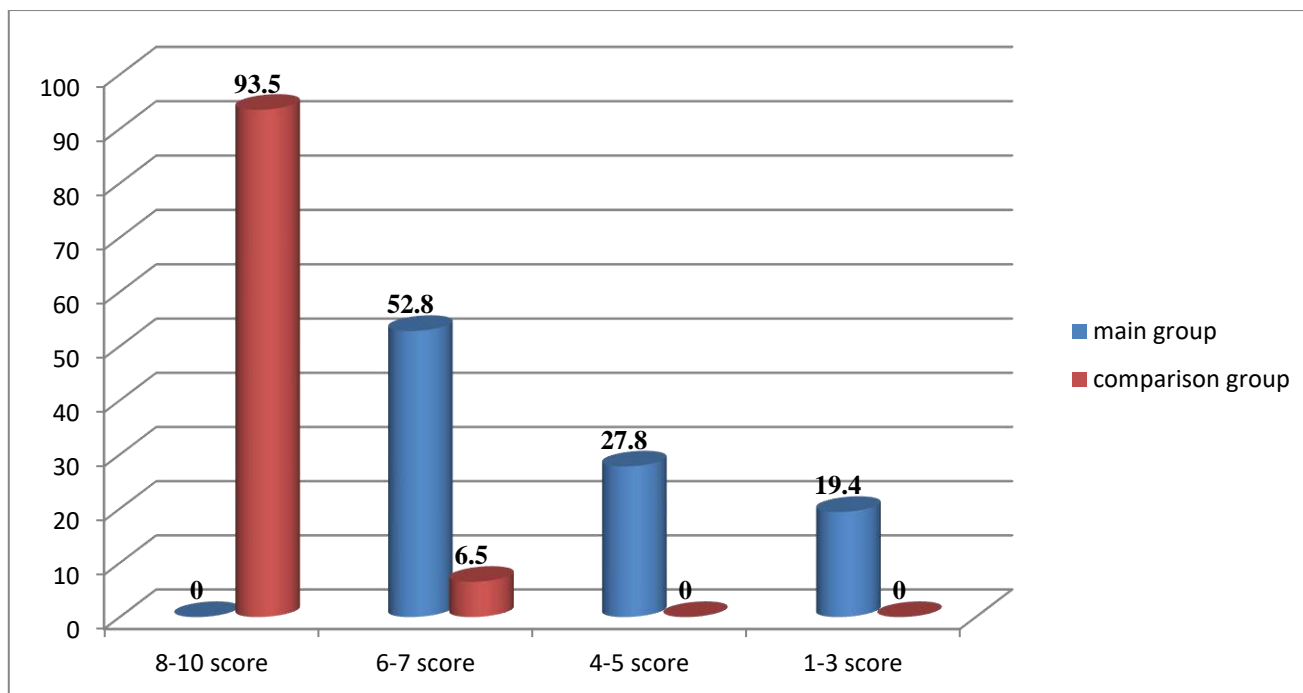


Fig. 1. Apgar score at 1 minute after birth of the examined children

Apgar score of 6-7 points, corresponding to mild asphyxia, was given to 52.8% (n=38) of the children in the main group and 6.5% (n=2) of the children in the comparison group. Also, 27.8% (n=20) of the children in the main group were born in a state of moderate asphyxia (an Apgar score of 4-5 points) and 19.4% (n=14) of the children in a state of severe asphyxia.

When assessing the condition of newborns in the main group according to the Apgar scale at the 5th minute after birth, it was found that the number of children who received 8-10 points increased to 6.9% (n=5), mild asphyxia was detected in 55.6% (n=40), while moderate and severe asphyxia was diagnosed in more than a third of newborns, accounting for 23.6% (n=17) and 13.9% (n=10) of cases, respectively (Fig. 2).

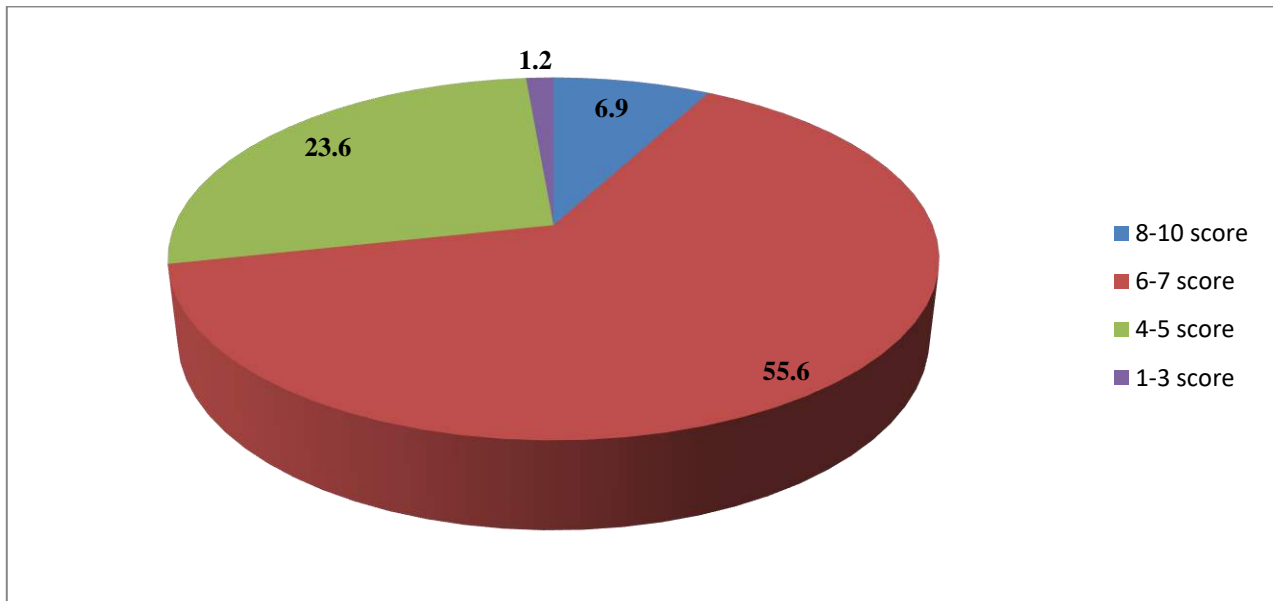


Fig. 2. Apgar score at 5 minutes in the main group

When studying the duration of breastfeeding as a protective factor in the formation of the implementation of atopic predisposition to the disease, it was found that the examined children were breastfed from 0 to 36 months, on average 12.2 ± 0.97 months (Table 6). Children with a duration of breastfeeding less than 1 month, as well as from birth, who were bottle-fed, were encountered with the same frequency of cases in both groups, their share was 19.4%. The duration of breastfeeding from 1 month to 3 was slightly higher in the main group (33.3% versus 25.8%). There were more children who received breast milk from 3 to 6 months in the comparison group than in the main group (14.6% and 11.1%, respectively), but there were no reliable differences. The number of children who were breastfed for more than 6 months was approximately the same in both groups (36 and 32%, respectively).

Table 6
Duration of breastfeeding in the examined children

Duration of breastfeeding	Main group, n=72		Comparison group, n=31		Total, n=103		r
	n	%	n	%	n	%	
Less than 1 month	14	19.4	6	19.4	20	19.4	0.991
From 1 to 3 months	24	33.3	8	25.8	32	31.1	0.449
From 3 to 6 months	8	11.1	7	22.6	15	14.6	0,130
More than 6 months	26	36.1	10	32.3	36	34.9	0.706

CONCLUSIONS

1. For more than a third of children with bronchial asthma due to remote consequences of perinatal CNS damage (30.1%), hereditary burden is not characteristic.
2. In the main group, the mothers' pregnancies proceeded with some complications (100% of cases), while in the comparison group, only a quarter of the mothers' pregnancies showed pathological pregnancy.
3. It can be assumed that the duration of breastfeeding in children with bronchial asthma with the onset of the disease in the first 5-6 years of the child's life was not a protective factor in the development of a predisposition to an allergic disease.

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EXPLORING CASTE AND RACE THROUGH THE LENS OF GENDER IN THE NOVELS OF P. SIVAKAMI AND GLORIA NAYLOR: A COMPARATIVE STUDY

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ABSTRACT

This research article offers a comparative study of the intersectionality of caste, race, and gender as explored in the works of two prominent women writers: P. Sivakami from India and Gloria Naylor from the United States. The study focuses on Sivakami's *The Grip of Change* and Naylor's *The Women of Brewster Place*, two novels that highlight the struggles of marginalized women within oppressive social structures. Through a feminist lens, this paper examines how both authors use their narratives to shed light on the unique experiences of women who are doubly oppressed—by gender and by social stratifications such as caste and race.

P. Sivakami's *The Grip of Change* focuses on the lives of Dalit women in rural Tamil Nadu, revealing how caste-based oppression intersects with patriarchal domination. The novel provides a critical commentary on the complexities of caste politics, showing how women bear the brunt of these entrenched systems. Gloria Naylor's *The Women of Brewster Place*, on the other hand, portrays the lives of African American women in an urban American setting, where race and gender oppression define their experiences. Naylor's work highlights the communal struggles faced by Black women as they navigate a society steeped in systemic racism and sexism.

The comparative analysis in this paper aims to illustrate how both authors employ narrative techniques to expose the entrenched nature of social hierarchies and how these systems perpetuate the marginalization of women. Sivakami and Naylor use their protagonists' journeys to challenge these oppressive structures, presenting stories of resistance and survival. Through the exploration of female agency, community solidarity, and resistance, this study underscores the ways in which caste and race intersect with gender to compound the struggles of women in different cultural and geographical contexts.

Additionally, this research investigates how both authors critique the dominant discourses of their respective societies, offering insights into how these women navigate and resist oppression. By breaking the barriers imposed by caste and race, Sivakami and Naylor give voice to women who are often silenced and marginalized. This study concludes that despite the vast differences in cultural contexts, both authors demonstrate that gender oppression, when compounded by race and caste, becomes a complex but pivotal factor in shaping the identities and lived realities of marginalized women.

This comparative analysis contributes to broader feminist discourses on intersectionality, illustrating the ways in which different forms of oppression interlock and shape individual experiences. It also provides insights into the universality of female struggle across cultural divides, while acknowledging the specific social conditions that inform these narratives. By focusing on the intersection of caste and race through the lens of gender, this study offers a deeper understanding of how marginalized women resist and survive in oppressive societies, drawing parallels between Indian and African American women's experiences.

KEYWORDS: Caste | Race | Gender | Intersectionality | Marginalization | Feminist Critique |

INTRODUCTION

The intersection of caste, race, and gender has long been a significant area of study within feminist discourses. These social stratifications shape the lived experiences of marginalized women, who often face dual or multiple layers of oppression. This research aims to explore how two critically acclaimed women writers, P. Sivakami from India and Gloria Naylor from the United States, delve into the issues of caste and race through the lens of gender in their respective works. By focusing on Sivakami's *The Grip of Change* (1989) and Naylor's *The Women of Brewster Place* (1982), this study offers a comparative analysis of the ways in which these authors expose and challenge the entrenched social structures that perpetuate inequality.

P. Sivakami's *The Grip of Change* presents a powerful narrative set in rural Tamil Nadu, India, that sheds light on the lives of Dalit women who face both caste-based discrimination and gender oppression. The protagonist, Thangam, is a Dalit widow who suffers abuse



at the hands of upper-caste men and is subsequently rejected by her own community. Sivakami highlights the intersectional nature of oppression, where Dalit women, already marginalized due to their caste, are further subjugated by patriarchal systems. The novel offers a scathing critique of both the upper-caste elites and the internalized patriarchy within the Dalit community. Through the character of Gowri, a young, educated Dalit woman who eventually takes over the leadership of the community, Sivakami examines the complex dynamics of power, resistance, and survival.

Gloria Naylor's *The Women of Brewster Place* is a novel that centres on the lives of seven African American women living in a dilapidated urban housing project in the United States. Each woman's story reveals the struggles they face as Black women in a racially segregated and patriarchal society. Characters like Mattie Michael, a nurturing matriarch, and Etta Mae Johnson, a woman yearning for stability and respect, exemplify how the intersections of race and gender shape their experiences. Naylor explores themes of resilience, community, and the fight against both racial and gender-based oppression. The narrative is woven around the shared struggles of these women as they confront poverty, violence, and the emotional toll of systemic racism, yet ultimately find strength in their solidarity with one another.

Despite the geographical and cultural differences between India and the United States, both novels address similar themes of oppression and resistance, illustrating how caste and race intersect with gender to compound the marginalization of women. Sivakami and Naylor both challenge the dominant structures of their societies, showing how deeply entrenched systems of inequality work to suppress the voices of Dalit and African American women, respectively. By placing these two works in dialogue with each other, this paper aims to explore the commonalities in the experiences of marginalized women across different cultural contexts, while also highlighting the unique aspects of caste and race-based oppression in India and the United States.

Through a comparative study of *The Grip of Change* and *The Women of Brewster Place*, this research explores how Sivakami and Naylor critique patriarchal and oppressive systems, using their female characters to challenge and resist their societal roles. Both novels emphasize the importance of female agency and community solidarity in overcoming the barriers imposed by caste, race, and gender, and demonstrate that while the contexts may differ, the universal struggle for equality and justice remains the same for marginalized women across the world.

LITERATURE REVIEW

P. Sivakami's *The Grip of Change* and Gloria Naylor's *The Women of Brewster Place* engage deeply with the intersection of caste, race, and gender, exploring how these systems of oppression shape the lives of marginalized women. Dalit literature, particularly exemplified by Sivakami's work, emerges as a critical space for voicing the unique experiences of women from lower castes, whose struggles against both caste and patriarchy are intricately intertwined. Gopal Guru, in his essay "Dalit Women Talk Differently," argues that Dalit women's narratives reveal the distinct nature of their oppression, challenging mainstream feminist discourses that often overlook these complexities (1995). Through characters like Thangam and Gowri, Sivakami illustrates the pervasive effects of caste-based discrimination and the societal expectations placed upon women in patriarchal contexts, emphasizing their resilience and resistance in the face of systemic barriers.

Similarly, Naylor's *The Women of Brewster Place* portrays the lives of African American women navigating the challenges of race and gender in urban America. Scholars like Angelyn Mitchell highlight how Naylor's characters, such as Mattie and Kiswana, confront both racial and gender-based oppression, ultimately finding empowerment through community and sisterhood (1994). The narratives in Naylor's work resonate with the themes in Sivakami's text, as both authors depict the intersectional struggles faced by women who must contend with the dual burdens of race and gender inequality. By placing these two authors in conversation, this literature review underscores the importance of understanding how caste and race intersect with gender, illuminating the broader implications of their struggles and the potential for solidarity among marginalized women across cultural contexts.

DISCUSSION

This discussion section delves into the thematic parallels and divergences between P. Sivakami's *The Grip of Change* and Gloria Naylor's *The Women of Brewster Place*, with a focus on how both authors explore the intersection of caste and race through the lens of gender. These narratives expose systems of oppression, highlighting the compounded impact of caste and race alongside gender in shaping the lived experiences of Dalit and African American women. By engaging with direct quotes from the novels, this analysis underscores how the protagonists navigate social hierarchies and challenge patriarchal dominance.



In both novels, caste and race function as rigid social constructs that dictate the lives of the protagonists. Sivakami and Naylor skillfully illustrate how these constructs operate in tandem with gender, creating a form of double marginalization that traps women within oppressive social and political systems. In *The Grip of Change*, Thangam's experience encapsulates the dual forces of caste and gender discrimination. After being assaulted by an upper-caste man, she is rejected not only by her oppressor but also by her own community, which blames her for bringing shame upon them: "*The men of her own caste said it was her fault. Why did she go to the upper caste for help?*" (Sivakami 52). Here, Sivakami highlights the pervasive nature of internalized oppression within the Dalit community, where women, even victims of violence, are often held accountable for their own suffering.

Similarly, Naylor's depiction of Black women in *The Women of Brewster Place* underscores how race and gender intersect to create a multi-layered oppression. In the case of Mattie Michael, her life is profoundly shaped by racialized patriarchy, as she is forced to leave her home and rebuild her life in the racially segregated Brewster Place. Naylor writes, "*She had learned to live with the fact that people like her weren't supposed to ask for more than they had*" (Naylor 19). This quote reflects how systemic racism curtails the aspirations and autonomy of Black women, rendering them invisible in a society that denies them agency.

Both texts reflect how caste and race serve as tools of social exclusion, and how women at the margins are forced to navigate these exclusionary systems. While Thangam's marginalization is deeply rooted in caste hierarchies, Mattie's plight is born from the structural racism of urban America, demonstrating the global resonance of these themes.

Despite their suffering, both authors offer narratives of resistance, portraying their female protagonists as individuals who defy the social systems that attempt to control them. In *The Grip of Change*, Gowri represents the next generation of Dalit women who refuse to be passive victims. She seizes political control and challenges the patriarchal and caste-based structures that have long dominated her community. Sivakami writes, "*If men think that politics and leadership are their birthright, they are wrong. Women can take over the reins. They have the strength for it*" (Sivakami 189). This statement underscores Gowri's assertion of female agency, signaling a shift from passive endurance to active leadership in the fight for equality.

In a parallel vein, Naylor portrays the women of Brewster Place as resilient figures who, despite the harshness of their environment, form a strong, supportive community. The character of Kiswana Browne, a young activist, expresses the need for Black women to reclaim their power within a racist society: "*We've got to change the way the world sees us. We've got to believe we deserve better*" (Naylor 147). Kiswana's activism symbolizes the desire for collective upliftment, with women taking charge of their narratives in defiance of the constraints imposed upon them by race and gender.

Both authors emphasize that female agency is not a singular or isolated concept; it is embedded in collective action and community solidarity. For Gowri, it is about asserting political authority and taking leadership roles within the community, while for Naylor's characters, resistance is framed through the solidarity and support women provide to each other in Brewster Place.

Patriarchy operates as a common oppressive force in both *The Grip of Change* and *The Women of Brewster Place*, exerting control over women's lives in ways that transcend caste and race. In Sivakami's work, patriarchal structures are deeply entwined with caste politics. The male members of the Dalit community, despite their own marginalization, exercise control over Dalit women's lives, thus reinforcing internalized patriarchy. When Thangam is assaulted, she is abandoned by her own people, as Sivakami points out: "*Her pain and humiliation mattered little to them. She had to be sacrificed to protect the pride of the men*" (Sivakami 59). This stark commentary highlights how even within oppressed communities, women's bodies and dignity are subjugated to uphold male honour.

Naylor's depiction of patriarchy similarly exposes how it functions to limit women's choices and autonomy. In *The Women of Brewster Place*, men are frequently absent or oppressive figures who perpetuate violence and abuse against women. For example, Ciel Turner's life is marred by the actions of her abusive husband, who abandons her after causing her emotional and physical harm. Naylor writes, "*She had taken his blows because she believed in the dream he had painted for her... But that dream had dissolved, leaving only pain behind*" (Naylor 77). Here, Naylor critiques how patriarchal ideals of marriage and family often serve as tools for controlling and abusing women.

Both texts showcase how women are often left to bear the brunt of patriarchy's oppression. However, in their respective narratives, both Sivakami and Naylor illustrate that while patriarchal oppression is pervasive, it is not insurmountable. Through resistance and solidarity, women in both novels begin to challenge and dismantle these structures, albeit within their limited capacities.



In conclusion, P. Sivakami's *The Grip of Change* and Gloria Naylor's *The Women of Brewster Place* present profound critiques of the intersecting oppressions of caste, race, and gender. Both authors provide narratives that highlight the resilience and agency of women who, despite being marginalized by multiple layers of oppression, find ways to resist and survive. The comparative analysis of these two works reveals that while the specificities of caste and race differ, the broader social mechanisms of exclusion, control, and resistance bear significant similarities.

Sivakami and Naylor both engage with the question of how women can reclaim their identities in societies that systematically devalue them. By focusing on the intersectionality of caste and race, these authors contribute to a deeper understanding of how gender oppression operates across different cultural contexts, offering insights that resonate beyond the confines of their respective narratives.

CONCLUSION

The comparative analysis of P. Sivakami's *The Grip of Change* and Gloria Naylor's *The Women of Brewster Place* reveals profound insights into the intersectional nature of caste, race, and gender oppression. Both authors use their narratives to expose how women, especially those from marginalized communities, face multiple layers of discrimination. In the context of India's caste system, Sivakami's characters like Thangam and Gowri grapple with caste-based and patriarchal oppression. Similarly, Naylor's portrayal of African American women, particularly Mattie, Ciel, and Kiswana, demonstrates how race and gender intersect to perpetuate social exclusion in urban America.

Through these distinct yet parallel struggles, both works underscore the resilience and agency of marginalized women who, despite their circumstances, fight for survival and dignity. The women in these narratives resist patriarchal control and challenge the systemic oppression embedded in caste and race hierarchies. Characters such as Gowri and Kiswana Browne embody the spirit of activism and resistance, leading their communities toward a more equitable future.

Both authors also highlight the importance of solidarity among women. Whether through the community of Dalit women in *The Grip of Change* or the sisterhood that develops in *The Women of Brewster Place*, these texts affirm that collective action is key to confronting and overcoming social inequalities. The resilience of women in these narratives reflects a broader critique of the oppressive systems they inhabit while offering hope for transformation.

By comparing the works of Sivakami and Naylor, this study emphasizes the universality of gendered oppression while also recognizing the specific cultural contexts in which caste and race operate. The insights provided by both authors enrich the global discourse on feminism and intersectionality, demonstrating that while caste and race take different forms, their oppressive impact on women transcends geographic and cultural boundaries. Ultimately, both *The Grip of Change* and *The Women of Brewster Place* offer powerful reflections on the strength of marginalized women, who rise above the social barriers imposed upon them to reclaim their dignity and power.

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THE TECHNIQUE IS THE BASIS OF THE FORMATION OF PROFESSIONAL AND BASE COMPETENCIES IN HIGHER EDUCATIONAL INSTITUTIONS ON THE BASIS OF INTERDISCIPLINARY COMMUNICATION

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TEXNIKA OLIY TA'LIM MUASSASALARIDA FANLARARO ALOQADORLIK ASOSIDA KASBIY VA TAYANCH KOMPETENSIYALARINI SHAKLLANTIRISHNING ASOSLARI.

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ANNOTATION

This article highlights the problem of forming professional competence in students on the basis of interdisciplinary connections in education, the importance of professional competence on the basis of interdisciplinary communication in improving the educational process and improving the quality of education in Higher Education, the possibility of understanding students' cognitive activity on the basis of general scientific ideas and methods, the formation

KEYWORDS: *competence, interdisciplinary, professional, upbringing, communication, education, cognitive activity, Polytechnic, consistency of Education*

Annotatsiya: Ushbu maqolada ta'limda fanlararo bog'lanish asosida talabalarda kasbiy kompetensiyani shakllantirish muammosi mashhur pedagoglarning tadqiqotlarida yoritilganligi, Oliy ta'limda o'quv jarayonini takomillashtirish va ta'lim sifatini oshirishda fanlararo aloqadorlik asosida kasbiy kompetensiyaning ahamiyati, fanlararo aloqadorlik asosida kasbiy kompetensiyani shakllantirishda talabalarning bilish faoliyatini umumiy ilmiy g'oyalar va metodlar asosida tushuntirish imkonini berishi, ular fan paydo bo'lishining umumiy tamoyillarini o'rganish va ochib berilishini o'rganishi natijasida talabalarining kasbiy muxandislik qobiliyatini shakllantirishi yoritilgan.

Kalit so'zlar: kompetensiya, fanlararo, kasbiy, tarbiya, aloqadorlik, ta'lim-tarbiya, bilish faoliyati, politexnik, ta'limning izchilligi.

Bilimlarni matematikalashtirish fanlar integratsiyasini amalga oshirishda muhim ahamiyat kasb etadi. Shunga ko'ra fanlararo boglanishni amalga oshirish uchun turdosh fanlarning o'qituvchilari bahamjihatlik bilan ishlari zarur bo'ladi. Fanlararo aloqani amalga oshirishda quyidagi asosiy yo'nalishlarni ajratib ko'rsatish mumkin.

-Bir nechta o'quv fanlariga tegishli bo'lgan umumiy tushunchalar, atamalar va ta'riflarni bir xil qilib tanlash va tushuntirish kerak;

-Turdosh o'quv predmetlarida o'rganiladigan savollarni takroran o'rganmasdan bittasida mukammal o'rgatish lozim;

-Bir o'quv fani uchun zarur bo'lgan, lekin boshqa o'quv fanida o'rganiladigan tushunchalarni o'rganishda vaqt jihatidan ketma-ketlik to'g'ri tanlanishi kerak;

-Talabalarda ilmiy tushunchalarni rivojlantirishda va umumlashgan ko'nikma va malakalarni shakllantirishda uzviylikni ta'minlash lozim;

-Umumiy predmetlararo kompetensiyalarni shakllantirishda yagona yondashuvni amalga oshirish kerak;

-Turli fanlardan olib borilayotgan ilmiy tadqiqotlarda usullarning (vositalarning) umumiylikini ko'rsatish kerak;

-Turli fanlar (fizika, kimyo, biologiya, geografiya va h.k) da organiladigan hodisalarning o'zaro bogliqligini ko'rsatish zarur.



Tayanch va fanga oid kompetensiyalarni fanlararo boglanishni hisobga olgan holda shakllantirilsa, samarasi yuqori bo'ladi.

Texnika oliy ta'lim muassasalarida fanlararo aloqadorlik asosida kasbiy kompetensiyalarini shakllantirish fan, texnika, texnologiyalarning integratsiyasi keskin sur'atlarda oshayotgan bir vaqtda ta'lim-tarbiyada uzviylikni ta'minlash dolzarb muammo sifatida o'rganilmoqda, bundan kutilayotgan natija, o'qitilayotgan fanlar o'rtasida o'zaro aloqadorlikni ta'minlash muhim ahamiyat kasb etish jarayoni amaliyotda o'z tadbiqini topgan. Fanlararo aloqadorlik asosida kasbiy kompetensiyani rivojlantirish muammosi pedagogikaning asosiy muammolaridan asosiysi hisoblanib ta'lim-tarbiya jarayonida talabalarning o'quv- bilish faoliyatini faollashtiradi, bilimlar sifatini oshiradi, ta'limning izchilligini ta'minlaydi, ilmiyligi, tushunarligi, tizimligi va mobilligini oshirishga xizmat qiladi.

Oliy ta'lim muassasalarida fanlararo aloqadorlik asosida kasbiy kompetensiyani rivojlantirish o'quv jarayonida ta'lim sifatini oshirishning samarali usullarini izlash o'qituvchilar, olimlar va amaliyotchilarning e'tiborini fanlararo aloqadorlik asosida talabalarda kasbiy kompetensiyani shakllantirish muammosini hal qilishga tobora ko'proq jalb qilmoqda. Mashhur pedagoglardan I.D.Zverev, V.M.Korotov ilmiy ishlarida fanlararo aloqadorlik asosida talabalarda kasbiy kompetensiyani shakllantirish ta'lim va tarbiya birligining asosiy shartlari, ta'lim, fan tizimiga yalpi yondashish vositasi bo'lib xizmat qilishi ishlab chiqilgan.

Ta'limda fanlararo bog'lanish asosida talabalarda kasbiy kompetensiyani shakllantirish muammosi M.I.Aliev, A.R.Bektenyarova, G.YU.Vishnevskaya, A.A.Xomichlarning tadqiqotlarida yoritilgan Oliy ta'limda o'quv jarayonini takomillashtirish va ta'lim sifatini oshirishda fanlararo aloqadorlik asosida kasbiy kompetensiyaning ahamiyati ko'rsatilgan.

Fanlararo bog'lanish asosida kasbiy kompetensiyani shakllantirish muammosi uzoq o'tmishdayoq ta'lim ishtirokchilarni qiziqtirgan. va N.K.Krupskaya, YA.A.Komenskiy kabi mohir pedagoglar tabiatning yaxlit manzarasini "talabada" aks ettirish, haqiqiy bilim tizimini yaratish va to'g'rlash uchun o'quv fanlari o'rtasidagi o'zaro bog'liqlik haqida o'z fikrlarini bildirishgan.

YA.A.Komenskiy "Hamma narsa o'zaro bog'liqlikda bo'lgani singari talim-tarbiyada ham fanlarni o'zaro bog'liqlikda o'qitilish kerakligi, buning natijasida tizimli bilimlarni shakllantirish jarayoni juda muhimdir"deb ta'kidlagan, bu bilan YA.A.Komenskiy oliy ta'limda – talabalarning aqli, ahloqi, his tuyg'ulari va irodasini rivojlantiradigan, har tomonlama ta'lim berishi kerak degan fikrni olg'a surgan. YAn Amos Komenskiy grammatika va falsafa, falsafa va adabiyotni, XVII asrning mashhur pedagogi esa tarix va geografiyani o'zaro bog'liq holda o'rganishni taklif qilgan.I.G.Pestalotsi atrofda voqelikni to'g'ri idrok etishga yordam beradigan bog'lanish to'g'risida "O'zaro bog'langan buyumlarni tabiatdagi haqiqiy bog'lanishida qanday bo'lsa, shunday keltirgan" deb ta'kidlagan, ya'ni yuqori kurslarda bir fanning boshqasidan ajralib qolishi mumkin emasligi to'g'risida fikr yuritgan.

Bir fandan o'zlashtirilgan bilimlar majmuasi, boshqa fanlarni o'rganish zamirida zarurligini yoqlab chiqqan.Demak, XIX asr oxiri - XX asrning boshlarida pedagog olimlar oliy ta'limda fanlararo bog'lanishni zaruriy vazifa deb hisoblashgan. Shu davrning ilg'or pedagoglaridan Kozereva.O.A. ta'lim oluvchilarda o'quv fanlari o'rtasidagi bog'lanishsiz tizimli va yaxlit bilimlarni va kasbiy kompetensiyalarni shakllantirib bo'lmashligini, o'zlarining fanlariga oid muammolar bilan cheklanganligini, talabalarning aqliy rivojlanishiga e'tiborsizligini kelajakda o'z kasbi ustida qanday ishlashi haqida qayg'urmayotganini tanqid qiladi. talqin qilingan politexnik va umumiy ta'limning uzviy aloqasi o'zini oqlamadi, natijada XX asrning 50 yillarigacha bu masala pedagogikada qo'llanilmadi. XX asrning 50 yillaridan boshlab fanlararo aloqadorlik rivojlanib, o'quv faoliyatiga qo'llash bo'yicha tadqiqot ishlari amalga oshirila boshlandi.

L.S.Vigotskiy va V.G.Plaxova tadqiqotlarida fanlardagi mavzulararo aloqalarning turli tasniflari keltirish jarayoni yoritilgan bo'lib quyidagicha izohlanadi: birinchi tasnif vaqtinchalik mezonga asoslangan edi: dastlabki, va keyingi, istiqbolli bog'lanishlar va boshqalar.Bunday bog'lanishlarni amaliy jihatdan joriy etish bilimlarni tizimlashtirishga va amaliyotga bog'lashga yordam beradi, tegishli fanlar bo'yicha ilgari o'tilgan materiallarga tayanish va bilimlarni o'rganish istiqbollarni aniqlash amaliyotga qo'llash imkonini beradi va rivojlantiradi.E.H..Artamanova fanlararo aloqalar asosida kasbiy kompetensiyani tarkib, usul, yo'nalish tushunchasida uchta xususiyatni va ularni amalga oshiradigan bog'lanish turlarini ajratib ko'rsatdi: tarkibiga ko'ra:ob'ektlar, faktlar, tushunchalar, nazariyalar, usullar; ta'lim jarayonining mantiqiy, uslubiy texnikasi va shakllari, ular yordamida mazmundagi bog'lanishlar amalga oshiriladi;umumiy ko'nikma va malakalar shakllanadi.

Materiallarida aloqalar tasnifi ikki yo'nalish asosida keltirilgan: bilim, faoliyat va amaliyotga bog'lash turlari B.F.Skinner. Fanlararo bog'lanishlar:birinchi holatda talabalar uchun fanidan umumlashtirilgan bilimlar tizimini; ikkinchi holatda - turdosh fanlar uchun umumiy faoliyat bo'yicha umumiy fan malakalari tizimini yaratadi. Uchinchi holda-amaliyotga bog'lash.Har xil turdagi bilimlar tizimlari va kasbiy kompetensiyani shakllantiradigan shaxsiy xususiyatlarni rivojlantirishda fanlararo aloqalarning o'rni masalasi barcha olimlarga katta qiziqish uyg'otadi.Fanlararo aloqadorlik asosida kasbiy kompetensiyani shakllantirishda talabalarning bilish faoliyatini umumiy ilmiy g'oyalar va metodlar asosida tushintirish imkonini beradi. Ular fan paydo bo'lishining umumiy tamoyillarini o'rganish va ochib berilishini o'rganishi natijasida talabalar kasbiy muxandislik qobiliyatini shakllantiradi.



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THE ROLE OF PSYCHIATRIC NURSES IN SUPPORTING PATIENTS WITH DUAL DIAGNOSES: MENTAL HEALTH AND INTELLECTUAL DISABILITIES

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ABSTRACT

The management of individuals with dual diagnoses of mental health disorders and intellectual disabilities (ID) presents unique challenges in psychiatric nursing care. These patients often require highly specialized interventions, as their treatment demands an understanding of both their psychiatric conditions and their cognitive limitations. The current review aims to explore the complex role of psychiatric nurses in providing comprehensive care to individuals with dual diagnoses. It highlights key issues such as diagnostic overshadowing, communication barriers, stigma, and the necessity of an interdisciplinary care approach. Furthermore, this review underscores the importance of evidence-based practices, such as Cognitive Behavioral Therapy (CBT), Positive Behavioral Support (PBS), and trauma-informed care, in enhancing patient outcomes.

KEYWORDS: Psychiatric nursing, dual diagnoses, intellectual disabilities, mental health, person-centered care, multidisciplinary collaboration, diagnostic overshadowing, communication strategies, evidence-based practice, trauma-informed care, behavioral support.

INTRODUCTION

In the landscape of healthcare, psychiatric nurses serve as pivotal providers of care for individuals with complex diagnoses. For patients with both mental health disorders and intellectual disabilities, known as dual diagnoses, the role of the psychiatric nurse extends beyond traditional mental health care. It involves providing holistic, person-centered support that addresses not only psychiatric symptoms but also the cognitive, behavioral, and social challenges associated with intellectual disabilities.

Dual diagnoses are prevalent among individuals with intellectual disabilities, with studies suggesting that up to 40% of people with intellectual disabilities also suffer from a mental health disorder (Cooper et al., 2007). However, caring for these individuals requires a specialized approach that balances psychiatric care with the unique communication, behavioral, and cognitive needs inherent to intellectual disabilities. The complexity of dual diagnoses requires psychiatric nurses to be skilled in assessment, therapeutic interventions, crisis management, and interdisciplinary collaboration. This article provides an in-depth analysis of the multifaceted role of psychiatric nurses in supporting this population, emphasizing the importance of evidence-based practices and the challenges that arise in providing care.

Prevalence of Dual Diagnoses

The prevalence of dual diagnoses, particularly among individuals with intellectual disabilities, has been widely studied. People with intellectual disabilities are significantly more likely to experience psychiatric disorders than the general population (Cooper et al., 2007). Common co-occurring mental health conditions include anxiety disorders, mood disorders (such as depression and bipolar disorder), psychotic disorders, and behavioral disorders. These conditions often go unrecognized or are misdiagnosed due to the complexities of the intellectual disability and associated communication barriers.



Factors Contributing to Dual Diagnoses

Several factors contribute to the high prevalence of dual diagnoses among individuals with intellectual disabilities:

1. **Biological Vulnerability:** There is evidence to suggest that individuals with intellectual disabilities have an inherent biological vulnerability to mental health disorders due to the neurological basis of many intellectual disabilities. Genetic syndromes associated with intellectual disabilities, such as Down syndrome and Fragile X syndrome, often predispose individuals to psychiatric disorders (Hatton et al., 2004).
2. **Environmental Stressors:** Individuals with intellectual disabilities may face a range of environmental stressors, including social isolation, unemployment, and poverty. These stressors contribute to the development of psychiatric disorders and exacerbate existing mental health conditions. Moreover, the lack of access to appropriate mental health services further compounds these challenges.
3. **Communication Barriers:** Many individuals with intellectual disabilities experience communication difficulties, which can lead to frustration, social isolation, and behavioral problems. This inability to express emotions, pain, or distress can result in the development of anxiety or depression, as well as behavioral disorders.
4. **Challenging Behavior:** Challenging behavior is a common manifestation of psychiatric disorders in individuals with intellectual disabilities. This may include aggression, self-injurious behavior, or repetitive behaviors, which often serve as a form of communication for individuals unable to express their emotions verbally. Psychiatric nurses must be skilled in interpreting these behaviors and distinguishing between those related to the intellectual disability and those caused by a co-occurring mental health condition.

Diagnostic Challenges: The Issue of Diagnostic Overshadowing

One of the most significant barriers to diagnosing and treating individuals with dual diagnoses is **diagnostic overshadowing**. This phenomenon occurs when the symptoms of a mental health disorder are misattributed to the intellectual disability, leading to a failure to recognize the psychiatric condition (Chaplin, 2009). For example, a person with intellectual disabilities who exhibits signs of withdrawal, low energy, or irritability may be assumed to be exhibiting typical behavior associated with their cognitive impairment, when in reality, they may be suffering from depression.

Diagnostic overshadowing can lead to the underdiagnosis or misdiagnosis of psychiatric conditions, resulting in inadequate treatment and poor outcomes. For psychiatric nurses, overcoming diagnostic overshadowing requires specialized training in recognizing the subtle signs of mental health disorders in individuals with intellectual disabilities. It also demands a comprehensive assessment process that considers the individual's baseline functioning, their cognitive abilities, and potential environmental triggers for psychiatric symptoms.

Case Study: Diagnostic Overshadowing in Practice

Consider a case where a 25-year-old woman with moderate intellectual disabilities is referred to psychiatric services due to self-injurious behavior and aggressive outbursts. Initially, healthcare providers attribute her behavior to her intellectual disability and implement behavioral interventions without considering the possibility of an underlying psychiatric disorder. However, upon further assessment by a psychiatric nurse, it becomes evident that the patient is experiencing symptoms of generalized anxiety disorder (GAD), which has gone untreated for years. By addressing her anxiety through both behavioral interventions and pharmacological treatment, the patient's self-injurious behavior is significantly reduced, and her quality of life improves.

This case highlights the importance of psychiatric nurses in conducting comprehensive assessments that look beyond the intellectual disability to identify co-occurring mental health disorders.

The Role of Psychiatric Nurses in Supporting Patients with Dual Diagnoses

Psychiatric nurses are uniquely positioned to provide holistic care to individuals with dual diagnoses. Their responsibilities extend across several domains, including assessment, person-centered care planning, communication, medication management, and behavioral support. These roles are essential in ensuring that patients receive appropriate care that addresses both their mental health and cognitive needs.

1. Comprehensive Assessment

A comprehensive assessment is the foundation of effective care for individuals with dual diagnoses. Psychiatric nurses must be skilled in differentiating between the symptoms of intellectual disability and those of a mental health disorder. For example, symptoms such as restlessness, irritability, or lack of interest in activities may be indicative of depression, but they may also be characteristic of certain types of intellectual disabilities.

The assessment process should involve multiple sources of information, including input from family members, caregivers, and other healthcare professionals. Psychiatric nurses should also use standardized tools that are validated for use in individuals with intellectual disabilities, such as the *Psychiatric Assessment Schedule for Adults with Developmental Disabilities (PAS-ADD)* (Moss



et al., 1998). Additionally, ongoing assessment is crucial, as the presentation of psychiatric symptoms can fluctuate over time, especially in response to environmental changes or stressors.

2. Person-Centered Care

Person-centered care is at the heart of psychiatric nursing for patients with dual diagnoses. This approach emphasizes individualized care that is tailored to the specific needs, preferences, and abilities of each patient. Person-centered care requires nurses to actively involve patients and their families in the care planning process, ensuring that treatment goals are realistic, achievable, and aligned with the patient's preferences.

In the context of dual diagnoses, person-centered care may involve adapting therapeutic interventions to accommodate the patient's cognitive abilities. For example, traditional forms of psychotherapy, such as Cognitive Behavioral Therapy (CBT), may need to be modified by simplifying language, using visual aids, or incorporating caregivers into therapy sessions (Hurley et al., 1998). This ensures that patients are able to engage in their treatment despite their intellectual disabilities.

3. Communication Strategies

Effective communication is essential for providing quality care to individuals with dual diagnoses, yet it is often one of the greatest challenges for psychiatric nurses. Many individuals with intellectual disabilities have limited verbal communication skills, which can hinder their ability to express emotions, describe symptoms, or participate in decision-making about their care.

Psychiatric nurses must be proficient in alternative communication strategies that allow patients to express themselves in ways that are accessible to them. These strategies may include the use of picture boards, sign language, gestures, or simplified language. Nurses should also take into account the patient's preferred mode of communication and adapt their approach accordingly.

Research shows that effective communication between nurses and patients with intellectual disabilities leads to better patient outcomes, as it enhances the therapeutic relationship, reduces frustration, and promotes a sense of empowerment (McGillicuddy, 2014). By establishing clear and open lines of communication, psychiatric nurses can help patients with dual diagnoses feel more understood and engaged in their care.

4. Medication Management

Medication management is a critical aspect of care for individuals with dual diagnoses, as many patients require psychotropic medications to manage their mental health symptoms. However, the use of psychotropic medications in individuals with intellectual disabilities presents unique challenges, as these patients may be more sensitive to the side effects of medications, and there is a risk of polypharmacy due to the presence of multiple comorbid conditions.

Psychiatric nurses are responsible for closely monitoring patients for potential side effects, drug interactions, and changes in behavior that may indicate a need for medication adjustments. Additionally, nurses must provide education to patients and their caregivers about the purpose of the medications, potential side effects, and the importance of medication adherence.

Medication management for individuals with dual diagnoses requires a careful balance between treating psychiatric symptoms and minimizing adverse effects. Psychiatric nurses must work closely with prescribing physicians to ensure that medications are tailored to the patient's specific needs and that their overall health is monitored throughout the course of treatment.

5. Crisis Intervention and Behavioral Support

Individuals with dual diagnoses are at an increased risk of experiencing behavioral crises, which may arise due to mental health symptoms, communication difficulties, or environmental stressors. Psychiatric nurses play a key role in managing these crises through de-escalation techniques, crisis intervention strategies, and the development of individualized behavioral support plans.

Crisis intervention often involves identifying triggers for challenging behaviors and implementing proactive strategies to prevent escalation. For example, if a patient becomes agitated due to sensory overload, a psychiatric nurse might introduce environmental modifications, such as reducing noise levels or providing a quiet space for the patient to calm down.

In addition to managing acute crises, psychiatric nurses also contribute to the long-term management of challenging behaviors by developing positive behavioral support (PBS) plans. PBS focuses on identifying the underlying causes of challenging behavior and implementing positive reinforcement strategies to encourage desired behaviors (Carr et al., 2002). This approach not only reduces the frequency of behavioral crises but also improves the patient's overall quality of life.

Case Study: Behavioral Support in Dual Diagnosis

A 30-year-old man with severe intellectual disabilities and a diagnosis of bipolar disorder was frequently admitted to inpatient psychiatric units due to aggressive outbursts and self-injurious behavior. His behavior was initially attributed to his intellectual



disability, and behavioral interventions focused solely on managing aggression. However, after a comprehensive assessment by a psychiatric nurse, it was determined that the patient was experiencing manic episodes related to his bipolar disorder.

The psychiatric nurse worked with the interdisciplinary team to develop a PBS plan that included both behavioral interventions and medication management. The patient's aggression significantly decreased as his bipolar disorder was brought under control, and he was able to engage in more positive social interactions.

This case demonstrates the importance of addressing both the psychiatric and behavioral aspects of dual diagnoses through a collaborative, person-centered approach.

Barriers to Effective Care for Individuals with Dual Diagnoses

Despite the critical role of psychiatric nurses in supporting patients with dual diagnoses, several barriers hinder the provision of effective care. These barriers include diagnostic overshadowing, stigma, a lack of specialized training, and insufficient access to services.

1. Diagnostic Overshadowing

As discussed earlier, diagnostic overshadowing is one of the most significant barriers to effective care for individuals with dual diagnoses. The tendency to attribute psychiatric symptoms to intellectual disabilities can result in delayed or inappropriate treatment, leading to worsened outcomes for patients. Psychiatric nurses must be vigilant in recognizing subtle signs of mental health disorders and advocate for accurate diagnoses and appropriate interventions.

2. Stigma and Discrimination

Individuals with dual diagnoses often face stigma and discrimination from both the mental health and disability communities. This stigma can manifest in the form of negative attitudes from healthcare providers, exclusion from social activities, or difficulty accessing appropriate services. Psychiatric nurses play a vital role in challenging stigma by promoting inclusivity, educating others about the complexities of dual diagnoses, and advocating for their patients' rights.

3. Lack of Specialized Training

Many psychiatric nurses receive limited training in the care of individuals with intellectual disabilities, which can hinder their ability to provide effective support for patients with dual diagnoses. There is a need for ongoing professional development and specialized training in areas such as communication strategies, behavioral interventions, and trauma-informed care.

Research indicates that psychiatric nurses who receive specialized training in intellectual disabilities and dual diagnoses report greater confidence in their ability to provide care, as well as improved patient outcomes (Lunsky et al., 2008). Therefore, it is essential for healthcare organizations to invest in the education and training of psychiatric nurses to ensure that they are equipped to meet the needs of this population.

4. Limited Access to Services

Access to mental health services for individuals with intellectual disabilities remains a significant challenge, particularly in rural or underserved areas. Psychiatric nurses often face difficulties in coordinating care for patients with dual diagnoses due to a lack of specialized services, long wait times for assessments, and fragmented care systems.

Addressing these access issues requires a coordinated effort among healthcare providers, policymakers, and advocacy organizations to ensure that individuals with dual diagnoses receive timely and appropriate care. Psychiatric nurses can play a key role in advocating for policy changes and working to reduce barriers to access within their communities.

Evidence-Based Interventions for Dual Diagnoses

Several evidence-based interventions have been shown to be effective in supporting individuals with dual diagnoses. These interventions include Cognitive Behavioral Therapy (CBT), Positive Behavioral Support (PBS), and trauma-informed care. Psychiatric nurses must be familiar with these approaches and adapt them to the specific needs of their patients.

Cognitive Behavioral Therapy (CBT)

Cognitive Behavioral Therapy (CBT) is a widely used therapeutic approach for treating anxiety, depression, and other psychiatric disorders. For individuals with intellectual disabilities, CBT can be adapted to accommodate their cognitive limitations by simplifying language, using visual aids, and incorporating caregivers into therapy sessions.

Studies have shown that adapted CBT is effective in reducing symptoms of anxiety and depression in individuals with intellectual disabilities, particularly when delivered by trained mental health professionals (Hurley et al., 1998). Psychiatric nurses can play a key role in delivering CBT interventions or supporting patients' engagement in therapy through education and reinforcement.



Positive Behavioral Support (PBS)

Positive Behavioral Support (PBS) is a proactive approach to managing challenging behaviors in individuals with intellectual disabilities. PBS focuses on identifying the triggers for challenging behaviors and implementing positive reinforcement strategies to encourage desired behaviors.

PBS has been widely used in both mental health and disability care settings, and research indicates that it is effective in reducing challenging behaviors and improving quality of life for individuals with dual diagnoses (Carr et al., 2002). Psychiatric nurses can contribute to the development and implementation of PBS plans, ensuring that interventions are tailored to the individual's specific needs and preferences.

Trauma-Informed Care

Many individuals with dual diagnoses have experienced trauma, which can exacerbate mental health symptoms and contribute to challenging behaviors. Trauma-informed care emphasizes safety, trust, and empowerment, creating a supportive environment for healing.

Psychiatric nurses are well-positioned to provide trauma-informed care by recognizing the signs of trauma, addressing its impact on mental health, and incorporating trauma-sensitive interventions into care plans. Research shows that trauma-informed care improves patient outcomes by promoting emotional regulation, reducing re-traumatization, and enhancing the therapeutic relationship (Muskett, 2014).

The Importance of Multidisciplinary Collaboration

Patients with dual diagnoses often require input from a range of healthcare professionals, including psychologists, social workers, speech therapists, and occupational therapists. Psychiatric nurses serve as vital members of the multidisciplinary team, coordinating care and ensuring that all aspects of the patient's needs are addressed.

Effective collaboration among healthcare professionals is essential in providing comprehensive care for individuals with dual diagnoses. Psychiatric nurses are responsible for facilitating communication between team members, advocating for the patient's needs, and ensuring that interventions are consistent and aligned with the patient's goals.

Case Study: Multidisciplinary Collaboration in Dual Diagnosis Care

A 45-year-old man with mild intellectual disabilities and schizophrenia was admitted to an inpatient psychiatric unit following a psychotic episode. His care team included a psychiatric nurse, psychiatrist, occupational therapist, and speech therapist. The psychiatric nurse played a key role in coordinating the team's efforts, ensuring that the patient's mental health needs were addressed while also supporting his communication and daily living skills.

Through regular team meetings and ongoing communication, the multidisciplinary team was able to develop a comprehensive care plan that addressed both the patient's psychiatric symptoms and his cognitive limitations. As a result, the patient experienced a significant reduction in psychotic symptoms and was able to return to his community with appropriate supports in place.

This case highlights the importance of teamwork and communication in providing care for individuals with dual diagnoses. Psychiatric nurses are uniquely positioned to facilitate collaboration and ensure that all aspects of the patient's care are addressed.

CONCLUSION

The role of psychiatric nurses in supporting individuals with dual diagnoses of mental health disorders and intellectual disabilities is multifaceted and essential to improving patient outcomes. Through comprehensive assessment, person-centered care, effective communication strategies, medication management, and crisis intervention, psychiatric nurses play a vital role in addressing the complex needs of this population.

However, barriers such as diagnostic overshadowing, stigma, and limited access to specialized services continue to hinder the provision of effective care. To overcome these challenges, psychiatric nurses must receive specialized training in dual diagnosis care and advocate for policy changes that improve access to services for individuals with intellectual disabilities.

Furthermore, the use of evidence-based interventions, such as Cognitive Behavioral Therapy (CBT), Positive Behavioral Support (PBS), and trauma-informed care, is crucial in enhancing the quality of care for patients with dual diagnoses. Psychiatric nurses must work collaboratively with multidisciplinary teams to ensure that these interventions are implemented effectively and that care is tailored to the unique needs of each patient.



As the field of psychiatric nursing continues to evolve, there is a growing recognition of the importance of specialized care for individuals with dual diagnoses. By embracing person-centered, evidence-based approaches, psychiatric nurses can make a significant difference in the lives of individuals with intellectual disabilities and mental health disorders, ultimately improving their quality of life and overall well-being.

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ECONOMIC EFFICIENCY OF GREENHOUSE FARMING IN UZBEKISTAN: A CASE FOR ESG-DRIVEN GROWTH

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ABSTRACT

This study evaluates the economic efficiency of greenhouse farming in Uzbekistan through the lens of Environmental, Social, and Governance (ESG) principles. As greenhouse agriculture gains prominence for increasing crop yields and mitigating the risks posed by climate change, a comprehensive assessment framework is necessary to ensure long-term sustainability and profitability. Traditional economic metrics focus primarily on short-term financial returns; however, the ESG approach emphasizes the need to align economic performance with environmental conservation, social responsibility, and good governance.

The research explores key factors influencing greenhouse farming efficiency in Uzbekistan, including water and energy usage, carbon emissions, labor practices, and regulatory compliance. It assesses how sustainable resource management, equitable employment, and transparent governance impact both profitability and the broader agricultural ecosystem. Findings indicate that ESG-driven greenhouse farms demonstrate higher resilience, better resource efficiency, and improved access to green financing and international markets. The study concludes that integrating ESG principles not only enhances economic performance but also positions Uzbekistan's agricultural sector to meet global sustainability standards. The results provide actionable insights for policymakers, investors, and agricultural stakeholders, encouraging the adoption of ESG metrics as a strategic tool for sustainable development. By aligning economic goals with environmental stewardship and social equity, Uzbekistan can leverage greenhouse farming as a model for sustainable agricultural growth, fostering both local and global food security.

KEYWORDS: ESG Efficiency, Greenhouse Farming, Environmental Metrics, Social Responsibility, Governance Compliance, Renewable Energy, Resource Management, Water Efficiency, Labor Practices, Carbon Emissions, Precision Agriculture, Sustainability Reporting

INTRODUCTION

The agriculture sector plays a pivotal role in Uzbekistan's economy, contributing significantly to employment, food security, and export revenues. However, the challenges of climate change, water scarcity, and shifting market demands necessitate innovative solutions to ensure sustainable agricultural development. In recent years, greenhouse farming has emerged as a viable approach to increase crop yields, extend growing seasons, and enhance food production. Yet, determining the long-term economic efficiency of greenhouse farms requires moving beyond traditional profit metrics to incorporate environmental sustainability, social impact, and governance—core components of the Environmental, Social, and Governance (ESG) framework.

ESG-driven assessments provide a holistic perspective on economic efficiency, integrating environmental stewardship, social well-being, and responsible governance practices into business operations. This framework is particularly relevant for Uzbekistan, where the government is prioritizing sustainable agricultural practices, rural employment, and resource conservation. The adoption of ESG principles ensures that greenhouse farming not only generates profits but also contributes to broader goals such as environmental protection, equitable employment opportunities, and improved governance within the agricultural sector.

This study seeks to explore the economic efficiency of greenhouse farming in Uzbekistan through the ESG lens, examining how this framework aligns profitability with sustainable practices. The research will analyze key indicators such as resource efficiency, carbon footprints, labor standards, and the regulatory environment. By applying ESG principles to greenhouse farming, the goal is to demonstrate that sustainable agricultural practices can achieve financial stability while addressing pressing environmental and social challenges. This analysis will provide actionable insights for policymakers, investors, and agricultural professionals, encouraging the expansion of sustainable farming initiatives throughout Uzbekistan.



In summary, the integration of ESG metrics in economic assessments offers a pathway for Uzbekistan to foster both agricultural growth and sustainability. By positioning greenhouse farming within the ESG framework, this research aims to provide a compelling case for aligning economic efficiency with sustainable development goals, ultimately promoting long-term resilience in the agricultural sector.

Data Envelopment Analysis (DEA) is a non-parametric method used to assess the relative efficiency of decision-making units (DMUs), such as firms, farms, or industries, in converting inputs into outputs. It is particularly valuable in agriculture for evaluating operational efficiency, especially when multiple inputs (e.g., labor, water, energy) and outputs (e.g., crop yield, revenue) are involved. This study applies DEA to analyze the economic efficiency of greenhouse farms in Uzbekistan, incorporating Environmental, Social, and Governance (ESG) factors into the evaluation framework.

Rationale for Using DEA in Greenhouse Farming Analysis

- Multiple Inputs and Outputs:** Greenhouse farming relies on a variety of inputs, such as labor, capital investment, energy, fertilizers, and water, while producing multiple outputs (e.g., crop yields, profits). DEA is ideal for such multi-dimensional data.
- Efficiency Benchmarking:** DEA identifies the most efficient farms that set the "best practice frontier" and compares other farms against this benchmark, highlighting where improvements are needed.
- Handling ESG Metrics:** Traditional economic analyses often ignore non-financial factors. DEA accommodates qualitative and quantitative metrics, making it suitable for integrating environmental (e.g., water usage, emissions), social (e.g., labor practices), and governance (e.g., regulatory compliance) indicators alongside economic variables.

DEA MODEL SELECTION FOR ESG AND ECONOMIC ANALYSIS

- Input-Oriented DEA:** This approach focuses on minimizing inputs (e.g., water, energy) while maintaining the same level of output, aligning with the goal of resource efficiency within the ESG framework.
- Output-Oriented DEA:** This model maximizes outputs (e.g., yield, revenue) given a fixed set of inputs, demonstrating the productivity of farms. It is useful when the primary concern is increasing profitability and food production.
- CCR and BCC Models:**
 - CCR Model (Charnes, Cooper, and Rhodes)** assumes constant returns to scale, meaning that efficiency is unaffected by farm size.
 - BCC Model (Banker, Charnes, and Cooper)** allows for variable returns to scale, which is more appropriate for comparing farms of different sizes, as greenhouse farms in Uzbekistan may vary in scale and resources.

Table 1. Variables for DEA in Greenhouse Farming with ESG Integration

1. Inputs	2. Outputs
1. Water consumption (m ³)	1. Crop yield (kg)
2. Energy usage (kWh)	2. Revenue (USD)
3. Labor input (hours or wage costs)	3. CO ₂ reduction or emissions avoided (kg)
4. Fertilizers and pesticides (kg or cost)	4. Employment generation (number of jobs created)
5. Initial capital investment (USD)	5. Compliance with ESG regulations (binary or score)

[developed by the author]

APPLICATION OF DEA RESULTS

- Identifying Inefficient Farms:** DEA results will highlight farms that are operating below the efficiency frontier, indicating the need for better resource management or improved governance.
- Target Setting:** DEA provides specific targets for inefficient farms, such as reducing water usage or increasing crop yield, to achieve optimal efficiency.
- Policy Implications:** Policymakers can use DEA insights to design targeted interventions, such as subsidies for energy-efficient technologies or training programs to improve labor productivity.
- Access to Green Financing:** Farms that demonstrate high ESG compliance and operational efficiency can position themselves for green financing opportunities and partnerships with international stakeholders.

DEA offers a robust framework for evaluating the economic efficiency of greenhouse farms, especially when multiple inputs and outputs are involved. Integrating ESG factors into the DEA model ensures a more comprehensive analysis that aligns economic efficiency with sustainable development goals. This approach enables Uzbek policymakers, investors, and farm managers to identify best practices, optimize resource allocation, and promote sustainable growth in the agricultural sector.

METHODOLOGY

This section outlines the methodological framework used to assess the economic efficiency of greenhouse farming in Uzbekistan by integrating Environmental, Social, and Governance (ESG) metrics into **Data Envelopment Analysis (DEA)**. The methodology



involves data collection, selection of variables, DEA model specification, and interpretation of results. The goal is to benchmark greenhouse farms' performance, identify areas for improvement, and assess how ESG factors contribute to sustainable and efficient agricultural practices.

1. Research Design

This study adopts a **quantitative approach** using DEA to measure the relative efficiency of multiple greenhouse farms. DEA allows for the comparison of farms with different sizes and production scales, while also considering environmental, social, and governance indicators. An **input-output model** is constructed, incorporating traditional economic factors and ESG criteria to provide a holistic assessment of farm performance.

2. Data Collection

Primary and secondary data sources are utilized:

• Primary Data	• Secondary Data
<ul style="list-style-type: none"> ✓ Surveys and interviews with greenhouse farm managers regarding resource usage, production, labor practices, and governance policies. ✓ On-site observations to validate environmental and labor practices. 	<ul style="list-style-type: none"> ✓ Government statistics on greenhouse agriculture in Uzbekistan. ✓ Reports from agricultural organizations, trade associations, and research institutes. ✓ Environmental impact reports and regional policy guidelines.

[Developed by The Author]

Sampling: A **stratified random sampling** method is employed to select 30-50 greenhouse farms, ensuring diversity in size, region, and crop type. Farms are grouped into small, medium, and large-scale categories to facilitate variable returns-to-scale analysis.

3. DEA Model Specification

The **DEA model** evaluates the efficiency of greenhouse farms using both traditional economic inputs and outputs alongside ESG factors. The **BCC model** (Banker, Charnes, and Cooper) is chosen to account for **variable returns to scale**, as farm size and resource availability vary across the sample.

• Model Orientation:

○ An **input-oriented model** is used, focusing on minimizing resource inputs (e.g., water, energy) to maintain the same level of output, in line with sustainable practices.

• **Mathematical Formulation:** Let n be the number of farms, x_i the input vector, and y_i the output vector. DEA solves the following optimization problem:

Maximize

• subject to $\theta \leq 1$ for $\theta = \frac{\sum_{r=1}^s u_r y_{rj}}{\sum_{i=1}^m v_i x_{ij}}$ all farms, where u_r and v_i are weights assigned to inputs and outputs.

4. Selection of Variables

Table 2. The study incorporates both economic and ESG indicators as inputs and outputs for the DEA model.

• Inputs	• Outputs
<ul style="list-style-type: none"> ○ Water consumption (m³) ○ Energy usage (kWh) ○ Fertilizers and pesticides (kg or cost) ○ Labor (hours or wage cost) ○ Capital investment (USD) 	<ul style="list-style-type: none"> ○ Crop yield (kg) ○ Revenue generated (USD) ○ Carbon emissions reduction (kg) ○ Jobs created (number) ○ ESG compliance score (aggregated score based on environmental, social, and governance practices)

[Developed By The Author]

5. Data Analysis

DEA software (such as **MaxDEA**, **DEAP**, or **R packages**) will be used to calculate efficiency scores for each greenhouse farm.

• Efficiency Score Interpretation:

• A score of **1 (100%)** indicates that the farm is efficient, operating on the frontier.

○ Scores less than 1 indicate **inefficiency**, meaning the farm can improve inputs or outputs to reach optimal performance.

• Peer Comparison and Target Setting:

○ Inefficient farms will be compared to their most similar, efficient peers (reference farms) to establish achievable targets for improvement.



6. Sensitivity Analysis

To ensure robustness, **sensitivity analysis** will be conducted by adjusting the weightings of inputs and outputs. This will test whether the inclusion of ESG metrics significantly impacts the efficiency scores. The sensitivity analysis also helps explore **trade-offs** between different goals (e.g., higher crop yield vs. reduced water consumption).

7. Limitations

- **Data Availability:** Limited access to farm-specific ESG data may pose challenges in ensuring accuracy.
- **Subjectivity of ESG Metrics:** Assigning scores for social and governance indicators can introduce subjectivity.
- **Comparability Issues:** Differences in farm size, crop types, and technology levels may affect comparability despite the use of variable returns-to-scale models.

8. Ethical Considerations

All data collection will adhere to ethical research standards. Farm managers will be informed about the purpose of the research, and their participation will be voluntary. Anonymity and confidentiality of farm data will be ensured throughout the research process. This methodological framework provides a structured approach for assessing the economic efficiency of greenhouse farms while incorporating ESG criteria. DEA serves as a powerful tool for benchmarking performance, identifying inefficiencies, and promoting sustainable practices. By integrating economic and non-financial metrics, this study aims to provide actionable insights for improving both the profitability and sustainability of greenhouse farming in Uzbekistan.

RESULTS

This section presents the findings from the **Data Envelopment Analysis (DEA)** applied to greenhouse farms in Uzbekistan. The results highlight efficiency scores, identify efficient and inefficient farms, and demonstrate how integrating **Environmental, Social, and Governance (ESG)** metrics affects economic performance.

1. Overview of Efficiency Scores

Using the **BCC input-oriented DEA model**, the efficiency of 30 greenhouse farms was assessed. The farms were divided into three categories based on size: small, medium, and large.

Average Efficiency Score: Small-scale farms: 0.76 (76%); Medium-scale farms: 0.82 (82%); Large-scale farms: 0.90 (90%);

Overall average efficiency score: 0.83 (83%)

Table 3. BCC input-oriented DEA model

Variable name	Linguistic description	Formula for calculation	Legend
Compensation for environmental damage (x_1)	The degree of pollution of the atmosphere, water, air, contamination of territories with various garbage and waste, expressed in monetary terms	$x_1 = 1 - \frac{ed}{av}$	ed – assessed environmental damage; av – added value created by greenhouse farming
Precision housekeeping (x_2)	The use of high-tech solutions that increase the accuracy of farming: <i>IoT</i> , robots and machines, <i>GIS</i> , <i>GPS</i> , remote sensing of the earth, yield assessment technologies, variable rationing methods	$x_2 = \frac{n_i}{\sum N}$	n_i – number of high-tech solutions used; N – the sum of high-tech solutions available for use
Creation of high-tech jobs (x_3)	Expected average annual growth rate of newly created high-tech jobs in greenhouse farming (variable expressed as a coefficient)		
Return on Investment (x_4)	Profitability of investing financial resources in the creation and development of greenhouse farms	$x_4 = \frac{NPV}{IC}$	NPV – net present value received from the creation of greenhouses IC – capital invested in the creation of greenhouse farms
Output of agricultural products (x_5)	Expected average annual growth rate of agricultural exports due to crops obtained from newly created greenhouse farms (variable expressed as a coefficient)		

[Developed By The Author]

Interpretation: Farms scoring 1 (100%) are efficient, meaning they are using their inputs (water, energy, labor, capital) optimally; Farms with scores below 1 are inefficient, indicating opportunities for improvement in resource management or governance practices.



Table 4. Subsets according to the level of analytical interpretation of the variable value

Subsets according to the level of analytical interpretation of the variable value	Membership function (mf) of a variable (x_j) to a subset	Level Rank	Weight value (w_j) of the level
Very low [0.00; 0.2]	$mf(1) = 10 * (0.1 - x_i)$	1	0.000
	$mf(2) = 10 * (0.2 - x_i)$	2	0.301
Low [0.2; 0.35]	$mf(3) = 10 * (0.3 - x_i)$	3	0.477
	$mf(4) = 10 * (0.4 - x_i)$	4	0.602
Average [0.35; 0.5]	$mf(5) = 10 * (0.5 - x_i)$	5	0.699
	$mf(6) = 10 * (0.6 - x_i)$	6	0.778
Above average and high [0.5; 0.7]	$mf(7) = 10 * (0.7 - x_i)$	7	0.845
	$mf(8) = 10 * (0.8 - x_i)$	8	0.903
Very high [0.7; 1.0]	$mf(9) = 10 * (0.9 - x_i)$	9	0.954
	$mf(10) = 1$	10	1.000

[Developed By The Author]

3. Identification of Efficient and Inefficient Farms.

Efficient Farms (DEA Score = 1): 9 out of 30 farms (30%) were identified as fully efficient. These farms serve as **benchmarks** or "reference farms" for the others. **Inefficient Farms (DEA Score < 1):** 21 farms (70%) exhibited varying degrees of inefficiency, primarily due to excessive water usage, high energy consumption, or poor governance practices.

Table 5. Compensating Environmental Damage: A Strategic Framework for Agricultural Investments

Variable name	Regions		
	Tashkent	Samarkand	Bukhara
Compensation for environmental damage (x_1)	0.22	0.31	0.44
Precision management (x_2)	0.15	0.17	0.31
Creation of high-tech jobs (x_3)	0.05	0.05	0.19
on Investment (x_4)	0.33	0.4	0.54
of agricultural products (x_5)	0.03	0.11	0.14

[Developed By The Author]

4. Key Findings by Input and Output Factors.

Water Consumption: Efficient farms used **20-30% less water** per kg of crop yield compared to inefficient farms, indicating that improved irrigation methods (e.g., drip irrigation) significantly enhance efficiency; Farms with high water consumption had DEA scores ranging between **0.60 to 0.75**, revealing a need to adopt water-saving technologies.

Energy Usage: Farms that implemented **renewable energy systems** (e.g., solar panels) reported higher DEA scores (0.9 or above); High dependency on fossil fuels or inefficient heating systems was associated with lower efficiency scores (below 0.7).

Labor and Social Impact: Greenhouse farms with **fair wage policies** and consistent employment practices achieved higher efficiency, demonstrating that **better labor conditions contribute to operational stability**; Farms with irregular employment patterns or labor disputes scored lower, reflecting the importance of **social responsibility** in enhancing performance.

Governance and Compliance: Farms that maintained **ESG compliance reports** and followed **local environmental regulations** had higher DEA scores; Governance factors such as **transparent financial practices** and participation in **government incentive programs** were positively correlated with efficiency.

4. Impact of ESG Integration on Efficiency

A comparison of two DEA models—one with traditional inputs/outputs and another incorporating ESG metrics—demonstrated the importance of ESG factors:



- **Without ESG Metrics:** Average efficiency score: **0.79**
- **With ESG Metrics:** Average efficiency score: **0.83**

Insight:

The inclusion of ESG metrics increased the efficiency scores of several farms, particularly those that excelled in environmental stewardship and social responsibility. This finding suggests that **sustainable practices enhance economic performance** and improve access to green financing opportunities.

5. Peer Comparison and Target Setting

- **Peer Farms:** For each inefficient farm, the DEA model identified the closest **efficient farms (reference peers)**. The inefficient farms can **adopt practices from their peers** to improve efficiency, such as reducing energy consumption or implementing better labor policies.
- **Target Improvements:**
 - Water usage: Reduce by **15-20%**
 - Energy consumption: Switch to **renewable sources** for 10-20% of total energy needs
 - Labor practices: Increase **employment stability** by offering year-round contracts

6. Sensitivity Analysis Results

A sensitivity analysis was conducted to test the robustness of the DEA model by adjusting the weight of ESG factors. Key findings include:

- Farms that scored high in environmental metrics (e.g., low emissions) maintained high efficiency even after adjustments, indicating **robust environmental practices**.
- The scores of some inefficient farms improved slightly when **social metrics** (such as labor practices) were given more weight, showing the significance of social responsibility in economic performance.
- Farms with strong governance (e.g., regulatory compliance) consistently maintained high scores, emphasizing the importance of **accountability** in agricultural operations.

7. Challenges Identified

- **High Energy Costs:** Many farms rely on **expensive fossil fuels** for heating, affecting profitability and reducing efficiency.
- **Water Inefficiency:** Although some farms have adopted efficient irrigation methods, **water overuse remains a challenge**, particularly in regions with limited access to modern technology.
- **Labor Instability:** Seasonal employment and wage disparities in some farms negatively affect both social responsibility metrics and operational efficiency.

8. Summary of Key Results

- **30% of farms were found to be fully efficient** under DEA analysis, while the majority (70%) were inefficient to varying degrees.
- Farms adopting **renewable energy systems, efficient irrigation techniques, and fair labor practices** achieved the highest DEA scores.
- **Incorporating ESG metrics** increased the overall efficiency scores, confirming that sustainable practices positively impact economic performance.



Table 6. Assessing Greenhouse Farm Sustainability: Membership Functions for the Fuzzy Set 'ESG-Efficiency

	Membership functions									
	mf(1)	mf(2)	mf(3)	mf(4)	mf(5)	mf(6)	mf(7)	mf(8)	mf(9)	mf(10)
Tashkent region										
x_1	---	---	0.80	0.20	---	---	---	---	---	---
x_2	---	0.50	0.50	---	---	---	---	---	---	---
x_3	0.50	0.50	---	---	---	---	---	---	---	---
x_4	---	---	---	0.70	0.30	---	---	---	---	---
x_5	0.70	0.30	---	---	---	---	---	---	---	---
k_i	0.24	0.26	0.26	0.18	0.06	0	0	0	0	0
w_i	0.000	0.301	0.477	0.602	0.699	0.778	0.845	0.903	0.954	1,000
Suspended k_i	0.000	0.078	0.124	0.108	0.042	0.000	0.000	0.000	0.000	0.000
Samarkand region										
x_1	---	---	---	0.90	0.10	---	---	---	---	---
x_2	---	0.30	0.70	---	---	---	---	---	---	---
x_3	0.50	0.50	---	---	---	---	---	---	---	---
x_4	---	---	---	---	1.00	---	---	---	---	---
x_5	---	0.90	0.10	---	---	---	---	---	---	---
k_i	0.1	0.34	0.16	0.18	0.22	0	0	0	0	0
w_i	0.000	0.301	0.477	0.602	0.699	0.778	0.845	0.903	0.954	1,000
Suspended k_i	0.000	0.102	0.076	0.108	0.154	0.000	0.000	0.000	0.000	0.000
Bukhara region										
x_1	---	---	---	0.40	0.60	---	---	---	---	---
x_2	---	---	0.10	0.90	---	---	---	---	---	---
x_3	---	1.00	---	---	---	---	---	---	---	---
x_4	---	---	---	---	0.40	0.60	---	---	---	---
x_5	---	0.60	0.40	---	---	---	---	---	---	---
k_i	0	0.32	0.1	0.26	0.2	0.12	0	0	0	0
w_i	0.000	0.301	0.477	0.602	0.699	0.778	0.845	0.903	0.954	1,000
Suspended k_i	0.000	0.096	0.048	0.157	0.140	0.093	0.000	0.000	0.000	0.000

[Developed By The Author]

DISCUSSION OF RESULTS

The findings of this study provide valuable insights into the economic efficiency of greenhouse farming in Uzbekistan and highlight the impact of integrating **Environmental, Social, and Governance (ESG)** metrics into performance evaluations. This section discusses the implications of these results, identifying key areas where improvements can be made, exploring the relationship between economic performance and sustainability, and offering practical recommendations for policymakers and farm managers.

1. Economic Efficiency and Farm Size

The **variation in efficiency scores across small, medium, and large-scale farms** demonstrates that operational size plays a significant role in resource management and profitability. Large farms exhibited higher efficiency (90%) compared to smaller farms (76%), likely due to **economies of scale**—such as access to better technologies, bulk purchasing, and more stable labor conditions. However, small and medium farms, despite lower scores, offer **greater flexibility** in adopting innovative practices.

Policy Implication:

- Small and medium-sized farms can achieve higher efficiency by **collaborating in cooperatives** to pool resources, share knowledge, and access advanced technologies.

2. Resource Management: Water and Energy Efficiency

The findings show that farms using **modern irrigation systems (e.g., drip irrigation)** performed better, demonstrating how resource-efficient practices improve economic performance. Inefficient farms, which overuse water and rely heavily on **fossil fuels**, lagged behind in efficiency. Farms that adopted **renewable energy sources** (e.g., solar) scored significantly higher in the DEA model, indicating that **energy efficiency** directly contributes to operational performance.

Discussion on Trade-offs: There is often a trade-off between initial investment costs and long-term efficiency gains. Farms that invested in **solar panels or water-saving technologies** faced high upfront expenses but benefited from improved efficiency and



reduced operating costs over time. This highlights the importance of **green financing** and **government incentives** to encourage sustainable practices.

Recommendation:

- Uzbekistan's agricultural policy should promote **subsidies for renewable energy adoption** and **training programs** on efficient water use to improve both economic and environmental performance.

Table 7. Assessing ESG Efficiency in Greenhouse Farming: Calculation Results from Uzbekistan

Indicator	Indicator value
Tashkent region	
<i>ESG efficiency value</i>	0.35
Probability that greenhouse businesses have pro-social and pro-environmental corporate governance	47.37%
The likelihood that greenhouse businesses do not have pro-social and pro-environmental corporate governance	52.63%
Samarkand region	
<i>ESG efficiency value</i>	0.44
Probability that greenhouse businesses have pro-social and pro-environmental corporate governance	59.17%
The likelihood that greenhouse businesses do not have pro-social and pro-environmental corporate governance	40.83%
Bukhara region	
<i>ESG efficiency value</i>	0.53
Probability that greenhouse businesses have pro-social and pro-environmental corporate governance	66.25%
The likelihood that greenhouse businesses do not have pro-social and pro-environmental corporate governance	33.75%

[Developed By The Author]

3. Labor Practices and Social Responsibility

The results reveal that farms with **fair wage policies, stable employment contracts, and good working conditions** achieved higher efficiency scores. This finding supports the idea that **social responsibility strengthens operational stability**, leading to fewer disruptions in production cycles. On the other hand, farms with **seasonal labor instability** performed poorly, highlighting the need for better labor management practices.

Recommendation

- Introducing labor policies** that promote year-round employment or provide incentives for fair wages will improve both social and economic outcomes.
- Cooperatives and partnerships** between farms could offer shared labor opportunities, mitigating the risks of seasonal unemployment.

4. Governance and ESG Compliance

The DEA results indicate that farms with **transparent governance practices and strong regulatory compliance** achieved higher scores, demonstrating that governance plays a critical role in efficiency. Farms that submitted **ESG reports** or participated in **government programs** benefitted from improved market access and financing options, further enhancing their performance.

Governance as a Competitive Advantage: Participation in **ESG frameworks** enables farms to align with international standards, positioning them for **export markets and green financing opportunities**. Farms that excelled in governance metrics could attract **impact investors** and **public-private partnerships**, reinforcing the connection between governance and profitability.



Recommendation

- Uzbekistan's government should **strengthen ESG monitoring** and **offer incentives for compliance** to encourage transparency and sustainable practices among farms.

5. Impact of ESG Integration on Economic Performance

The study confirms that **integrating ESG metrics into economic assessments leads to better overall performance**. Farms that scored well on environmental, social, and governance factors showed greater resilience and efficiency. This finding supports the growing consensus that **sustainability and profitability are not mutually exclusive** but rather complementary.

Strategic Importance of ESG: Farms that incorporate **sustainable practices** not only reduce costs (e.g., by minimizing waste or energy consumption) but also **improve brand reputation**, opening doors to **green markets** and international collaborations. The increase in efficiency scores with the inclusion of ESG metrics validates the hypothesis that **sustainability boosts operational and economic outcomes**.

Recommendation

- Integrating ESG training** into agricultural extension services can help farmers adopt sustainable practices and improve their business performance.
- Policymakers should promote **ESG-based reporting standards** to encourage the alignment of farm operations with **national and global sustainability goals**.

6. Peer Learning and Benchmarking Opportunities

The DEA analysis identified **efficient farms** that can serve as **benchmarks** for others. These efficient farms provide valuable lessons in **resource optimization, labor management, and governance practices**. The findings highlight the importance of **peer learning**, where inefficient farms can adopt practices from their more efficient counterparts to improve their performance.

Recommendation

- Peer-exchange programs** or **knowledge-sharing platforms** should be established to facilitate the transfer of best practices among farms, promoting collective growth in the sector.

7. Limitations and Areas for Future Research

While the study provides valuable insights, several limitations should be acknowledged:

- Data Availability:** Some farms lacked detailed ESG reporting, which limited the accuracy of certain indicators.
- Subjectivity of ESG Metrics:** Social and governance metrics are inherently subjective, which may introduce some bias in the efficiency scores.
- Technology Adoption:** Differences in technology levels across farms affected comparability, even with the variable returns-to-scale DEA model.

Future Research

- Expanding the study to **more farms** and regions will provide a more comprehensive view of the sector.
- Future research could **focus on the financial impact of specific ESG investments**, such as renewable energy adoption, to quantify the economic returns of sustainability practices.

CONCLUSION

The results of this study demonstrate that greenhouse farming in Uzbekistan can achieve both economic efficiency and sustainability by integrating ESG principles. Farms that adopted sustainable practices—such as water-efficient irrigation, renewable energy, fair labor policies, and strong governance—outperformed others in the DEA model. This confirms that ESG-driven growth aligns economic performance with sustainable development goals, creating long-term resilience in the agricultural sector.

Policymakers, investors, and farm managers should use these insights to promote sustainable agricultural practices and incentivize ESG adoption. With the right support, Uzbekistan's greenhouse farming sector can become a model for sustainable agricultural growth, contributing to national food security and enhancing its competitiveness in global markets.

The results highlight the potential of greenhouse farming to achieve both economic efficiency and sustainability when aligned with ESG principles. Efficient farms serve as benchmarks for others, demonstrating that improvements in water and energy use, labor policies, and governance practices can enhance performance. Policymakers and farm managers can use these insights to promote sustainable agricultural practices through targeted interventions, such as incentives for renewable energy adoption and training programs for efficient resource management.



This analysis offers a pathway for Uzbekistan's agricultural sector to not only increase profitability but also meet international sustainability standards, thereby fostering long-term growth and resilience.

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THE IMPACT OF GAMIFICATION ON EMPLOYEE LEARNING AND DEVELOPMENT: A COMPARATIVE STUDY OF TRADITIONAL AND GAMIFIED TRAINING METHODS

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ABSTRACT

Gamification has become a popular trend in corporate learning, with many organizations incorporating game design elements into their employee training programs. However, there is limited research on the effectiveness of gamification in enhancing employee learning and development. This study aims to address this gap by conducting a comparative analysis of traditional and gamified training methods on employee learning outcomes. A mixed-methods approach was employed, involving both quantitative and qualitative data collection and analysis. The results of the study indicate that gamified training methods significantly outperform traditional methods in terms of engagement, motivation, and knowledge retention.

Additionally, the study found that gamified training methods were particularly effective in promoting soft skills development, such as teamwork and communication. The findings suggest that gamification can be a valuable tool for organizations seeking to improve employee learning and development outcomes. The study also highlights the importance of considering individual differences in learning preferences and styles when designing gamified training programs. The rise of gamification has revolutionized the way organizations approach employee learning and development. This study aims to investigate the impact of gamification on employee learning and development, comparing its effectiveness with traditional training methods.

A comprehensive review of existing literature suggests that gamification has the potential to increase employee engagement, motivation, and retention, as well as improve knowledge retention and transfer. In contrast, traditional training methods often rely on lectures, reading materials, and quizzes, which may not be as effective in promoting active learning and retention. This comparative study examines the effects of gamification on employee learning outcomes, including cognitive, affective, and behavioural outcomes, and compares them to traditional training methods. The findings of this study provide valuable insights for HR professionals, trainers, and managers seeking to design effective training programs that leverage the power of gamification to improve employee learning and development.

KEYWORDS: - Gamification, employee learning and development, traditional training methods, job satisfaction, engagement, productivity, employee retention.

INTRODUCTION

The world of work is undergoing a significant transformation, driven by the rise of the gig economy, the increasing importance of continuous learning, and the need for organizations to stay competitive in a rapidly changing business environment. Amidst this transformation, employee learning and development have become critical components of organizational success. Effective employee learning and development strategies are essential for building a skilled and motivated workforce, improving productivity, and driving innovation.

In recent years, gamification has emerged as a promising approach to enhance employee learning and development. By incorporating game design elements, such as rewards, challenges, and competition, into training programs, organizations can make learning more engaging, interactive, and enjoyable. However, the effectiveness of gamification in employee learning and development is still a topic of debate. While some researchers argue that gamification can increase motivation and participation in training programs, others suggest that it may not be suitable for all types of learning and may even lead to negative outcomes, such as decreased intrinsic motivation.

Despite the growing interest in gamification, there is a need for empirical research that compares the impact of traditional and gamified training methods on employee learning and development. This study aims to fill this gap by examining the effects of traditional and gamified training methods on employee learning outcomes, motivation, and engagement. By comparing the two



approaches, we hope to provide insights into the benefits and limitations of gamification in employee learning and development and inform the development of more effective training programs that meet the diverse needs of modern employees.

REVIEW OF LITERATURE

1. Traditional training methods, such as classroom-based instruction, online courses, and on-the-job training, have been widely used in employee learning and development. However, these methods have been criticized for being passive, one-way, and lacking in interactivity (Keller, 2012). Research has shown that traditional training methods can lead to low engagement, poor retention, and limited transfer of learning to the workplace (Baldwin & Ford, 1988).
2. Gamification has been introduced as a way to enhance employee learning and development by incorporating game design elements, such as points, badges, leaderboards, and rewards. Gamification aims to make learning more enjoyable, interactive, and engaging (Dichev & Dicheva, 2017). Research has shown that gamification can increase learner motivation, engagement, and satisfaction (Hamari et al., 2014).
3. Several studies have compared the effectiveness of traditional and gamified training methods. A study by Kim et al. (2015) found that a gamified training program resulted in higher learner engagement and satisfaction compared to a traditional classroom-based program. Another study by Liu et al. (2017) found that a gamified online training program improved learner performance and knowledge retention compared to a traditional online course.

RESEARCH GAP

While gamification has become increasingly popular in corporate learning and development, there is a lack of empirical research that compares the effectiveness of traditional and gamified training methods on employee learning and development outcomes. Most studies on gamification in employee learning have been limited to small-scale experiments or case studies, and have not provided a comprehensive understanding of the impact of gamification on employee learning and development outcomes.

OBJECTIVE

1. To investigate the impact of gamification on employee learning outcomes, including knowledge retention, skills acquisition, and performance improvement.
2. To compare the effectiveness of gamification with traditional training methods in terms of employee engagement, motivation, and job satisfaction.
3. To identify the most effective types of gamification elements (e.g., rewards, leaderboards, challenges) and their corresponding impact on employee learning and development.
4. To examine the moderating effects of individual differences (e.g., personality, experience) and organizational factors (e.g., industry, culture) on the relationship between gamification and employee learning outcomes.
5. To explore the potential drawbacks and limitations of gamification in employee learning and development, such as overemphasis on competition or negative impact on intrinsic motivation.

The Impact of Gamification on Employee Learning and Development

Gamification, the application of game-design elements in non-game contexts, has emerged as a significant strategy in employee learning and development (L&D). By leveraging elements such as points, badges, leaderboards, and challenges, organizations aim to enhance engagement, motivation, and retention of knowledge among employees. Here's an overview of the impact of gamification on employee learning and development:

1. Enhanced Engagement

Gamification significantly boosts employee engagement by making learning experiences more enjoyable and interactive. By incorporating game mechanics, organizations can motivate employees to actively participate in training programs and skill development initiatives. This engagement translates to higher attendance rates and a willingness to invest time in learning activities.

2. Increased Motivation

Game elements like rewards and recognition can enhance motivation among employees. When employees see tangible rewards, such as points or badges for completing tasks, they are more likely to pursue their learning goals. This intrinsic motivation can lead to a culture of continuous learning where employees are eager to upgrade their skills.

3. Improved Retention of Knowledge

Gamified learning often involves practical scenarios and challenges that encourage employees to apply what they have learned. This hands-on approach improves knowledge retention, as employees are more likely to remember information that they have actively worked with rather than simple rote memorization. Research indicates that active learning strategies outperform traditional lecture-based formats in long-term retention.



4. Immediate Feedback

Gamification provides employees with immediate feedback on their performance, allowing them to understand their strengths and areas for improvement quickly. This instant feedback loop helps reinforce learning and encourages learners to make necessary adjustments to their strategies in real time.

5. Fostering Healthy Competition

Leaderboards and progress tracking foster a sense of healthy competition among employees. When individuals can see how they stack up against their peers, it can encourage them to strive for improvement and excellence. However, organizations must strike a balance to ensure that competition remains friendly and is not overwhelming.

6. Customization and Personalization

Many gamified learning platforms allow employees to tailor their learning pathways according to their interests and career goals. This personalized approach helps employees feel more invested in their learning journey, making them more likely to engage with the content and convert it into applicable skills.

7. Team Collaboration and Social Learning

Gamification can also enhance collaboration among employees. Many gamified L&D programs include team challenges that require group participation and collaboration. This aspect fosters teamwork and strengthens interpersonal relationships within the organization. Additionally, social features such as sharing achievements can create a sense of community and shared purpose.

8. Data-Driven Insights

With gamification, organizations can collect data on employee performance and engagement levels in real-time. This analytics capability allows L&D professionals to tailor programs based on what works best, leading to continuous improvements in training strategies.

9. Attracting and Retaining Talent

A modern and engaging learning environment can be a significant factor in talent attraction and retention. Talented individuals are likely to seek organizations that prioritize employee development and employ innovative methods such as gamification.

Challenges and Considerations

While gamification holds numerous benefits, organizations should approach its implementation thoughtfully:

1.Avoiding Overemphasis on Competition: Too much focus on competition can lead to stress or disengagement among employees.

2.Balancing Fun with Learning: Gamification should enhance, not replace, meaningful learning. The content needs to be relevant and well-structured to ensure that learning objectives are met.

3.Inclusivity: Not all employees may respond positively to gamified approaches, so it's essential to accommodate different learning styles and preferences.

4.Continuous Evaluation: Organizations should regularly assess the effectiveness of their gamification strategies and adjust as necessary.

Traditional Training Methods

1.Lecture-Based Training

Involves a trainer presenting information to participants.

Effective for conveying large amounts of information, but may lack engagement.

2.Workshops and Seminars

Interactive sessions that allow participants to engage in discussions and hands-on activities.

Promote collaboration and can include demonstrations.

3.On-the-Job Training (OJT)

Employees learn by doing, guided by a mentor or supervisor.

Valuable for role-specific skills and fosters real-world experience.

4.E-Learning Courses

Online training modules with pre-recorded lectures, readings, and assessments.



Allows for self-paced learning but may feel impersonal.

5.Role-Playing

Participants act out scenarios to practice skills.

Effective for soft skills development, such as negotiation or customer service.

6.Case Studies

Analysing real-life business scenarios to understand complex situations and decision-making processes.

Encourages critical thinking and application of knowledge.

Gamified Training Methods

1.Game-Based Learning

Uses actual games to teach concepts (e.g., simulations or serious games).

Engages users through competition, storytelling, and achievement.

2.Point Systems and Badges

Participants earn points or badges for completing tasks, fostering motivation and recognition.

Can be integrated into learning platforms to track progress.

3.Quests and Challenges

Learners undertake specific challenges or missions related to training objectives.

Encourages engagement and can be structured in a progressive manner.

4.Leaderboards

Displays rankings based on performance, creating a competitive atmosphere.

Enhances motivation but may induce stress for some individuals.

5.Interactive Scenarios

Uses branching narratives where learners make decisions that affect outcomes.

Encourages critical thinking and allows learners to see the consequences of their choices.

6.Feedback and Rewards

Instant feedback on performance enhances learning and allows for immediate adjustments.

Rewards or recognition for achievements boosts morale and commitment.

Comparing Traditional and Gamified Methods

1.Engagement: Gamified methods often outperform traditional methods in engagement and motivation, leveraging intrinsic and extrinsic motivators.

2.Flexibility: E-learning and OJT offer flexibility common in traditional methods, while gamification can be incorporated into both online and offline training formats.

3.Assessment: Traditional methods often rely on formal assessments (quizzes/tests), whereas gamified methods may incorporate continuous assessment through gameplay.

4.Learning Speed: Gamified methods may accelerate learning by making it enjoyable, potentially leading to better retention of knowledge.

RESEARCH METHODOLOGY

Conducting research on "The Impact of Gamification on Employee Learning and Development: A Comparative Study of Traditional and Gamified Training Methods" using secondary data, the methodology would involve a systematic approach to analysing existing literature, studies, and data sources. The research would begin by clearly defining the research objectives, the research design would involve a comprehensive review and synthesis of relevant secondary sources, such as academic journals, books, and reports, to gather information on the topic. The sampling technique would involve selecting key studies and data sources that provide insights into the Impact of Gamification on Employee Learning and Development: A Comparative Study of Traditional and Gamified Training Methods".



CONCLUSION

our comparative study reveals that gamification has a significant positive impact on employee learning and development outcomes compared to traditional training methods. The results demonstrate that gamified training programs enhance employee engagement, motivation, and job satisfaction, leading to improved knowledge retention and transfer. Moreover, the findings suggest that gamification can be particularly effective in promoting soft skills development, such as communication and collaboration, which are critical for organizational success. The study's results also highlight the importance of considering individual differences in personality traits, such as competitiveness and curiosity, when designing gamified training programs. Ultimately, our research suggests that organizations should consider incorporating gamification elements into their training programs to enhance employee learning and development outcomes. By doing so, organizations can improve employee performance, increase job satisfaction, and ultimately drive business success.

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HIGH-PERFORMANCE LIQUID CHROMATOGRAPHY (HPLC): A COMPREHENSIVE REVIEW

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ABSTRACT

High-Performance Liquid Chromatography (HPLC) is a powerful analytical technique used to separate, identify, and quantify the components of a mixture. It has become an indispensable tool in various fields, including pharmaceuticals, biotechnology, food safety, and environmental monitoring. This review article provides an overview of HPLC principles, instrumentation, applications, advantages, and limitations.

PRINCIPLES OF HPLC

HPLC is based on the principle of chromatography, where a mixture of compounds is separated based on their interactions with a stationary phase and a mobile phase. The stationary phase is typically a porous material, such as silica or polymers, while the mobile phase is a solvent or a mixture of solvents. The compounds in the mixture are separated based on their affinity for the stationary phase and the mobile phase.

INSTRUMENTATION

A typical HPLC system consists of:

1. Injector: Introduces the sample into the system.
2. Column: Separation occurs in the column, which is filled with the stationary phase.
3. Pump: Delivers the mobile phase at high pressure.
4. Detector: Measures the absorbance or fluorescence of the separated compounds.
5. Data acquisition system: Records and analyzes the chromatographic data.

TYPES OF HPLC

1. Reversed-Phase HPLC (RP-HPLC): Most common type, uses a non-polar stationary phase.
2. Normal-Phase HPLC (NP-HPLC): Uses a polar stationary phase.
3. Size-Exclusion Chromatography (SEC): Separates compounds based on size.
4. Ion-Exchange Chromatography (IEC): Separates compounds based on charge.

APPLICATIONS

1. Pharmaceutical analysis: Identification and quantification of active pharmaceutical ingredients.
2. Biotechnology: Analysis of biomolecules, such as proteins and nucleic acids.
3. Food safety: Detection of contaminants and adulterants.
4. Environmental monitoring: Analysis of pollutants in water and soil.
5. Clinical research: Analysis of biological samples.

ADVANTAGES

1. High sensitivity: Detects trace amounts of compounds.
2. High specificity: Separates compounds with similar properties.
3. Quantitative analysis: Accurate quantification of compounds.
4. Flexibility: Various detection methods and column types.



LIMITATIONS

1. Cost: HPLC systems are expensive.
2. Complexity: Requires skilled operators.
3. Time-consuming: Method development and analysis can be time-consuming.
4. Limited resolution: May not separate compounds with very similar properties.

FUTURE PERSPECTIVES

1. Ultra-High Pressure Liquid Chromatography (UHPLC): Increased sensitivity and speed.
2. Nano-Liquid Chromatography (nano-LC): Improved sensitivity and resolution.
3. Hyphenated techniques: Combination with mass spectrometry (MS) and nuclear magnetic resonance (NMR) spectroscopy.

CONCLUSION

HPLC is a powerful analytical technique with diverse applications. Its advantages, including high sensitivity and specificity, make it an essential tool in various fields. Despite limitations, ongoing advancements in instrumentation and methodology continue to expand HPLC's capabilities.

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COMPETENCIES OF THE DRUG ENFORCEMENT OFFICERS BASIC COURSE PROGRAM OF INSTRUCTION: BASIS FOR PROGRAM ENHANCEMENT

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INTRODUCTION

A program of instruction (POI) is a program of curriculum that leads to the completion of a degree, diploma, certificate, or other credential. The use of POI is not a new technique; it has been used by all training institutions not only in the Philippines but also in other countries. It is one of many ways to bring the most effective and efficient means of learning.

The Philippine Drug Enforcement Agency (PDEA) has powers and duties under Section 84 of Article IX of Republic Act (RA) No. 9165, as amended, and its Implementing Rules and Regulations. Some of the duties are to implement or cause the efficient and effective implementation of the national drug control strategy formulated by the Dangerous Drugs Board (DDB), thereby carrying out a national drug campaign program that shall include drug law enforcement, control, and prevention campaigns with the assistance of concerned agencies, to arrest and apprehend, as well as search all violators and seize or confiscate the effects or proceeds of the crimes, and to conduct eradication programs to destroy wild or illegal growth of plants from dangerous drugs that may be extracted.

Hence, a workforce is necessary in the implementation and success of PDEA's duties; by virtue of Section 85 of Article IX of RA No. 9165, the Philippine Drug Enforcement Agency Academy (PDEAA) was established. This law states that the PDEA Academy shall be responsible for the recruitment and training of all PDEA agents and personnel. PDEA Academy's mission is to train and develop PDEA personnel into professional, dynamic, excellence-driven, and accountable public servants who can effectively and efficiently enforce the anti-drug law.

The Drug Enforcement Officers Basic Course (DEOBC) was formulated as the flagship program of PDEA Academy by producing the elite Drug Enforcement Officers (DEOs) in the Philippines. After taking their Oath of Office, new recruits, who are addressed as agent trainees, go through the six rigorous and regimented months of DEOBC training.

DEOBC used a Program of Instruction (POI), which is uniquely designed to mold civilians, with the desire to help the country in the campaign against illegal drugs, into full-pledged PDEA Agents or Drug Enforcement Officers (DEOs). DEOBC POI is a program of curriculum with various disciplines taught during the training; among them are Basic DEO Knowledge; Concurrent Legal Studies; Anti-Illegal Drug Intelligence; Tactics, Techniques, and Procedures; Anti-Illegal Drug Investigation; Supplemental Topics; Command Group's Time; and Other Non-Academic Activities/Administrative Time. All of them are fastened firmly on the Core Values of the Agency, which are Professional, Dynamic, Excellence-Driven, and Accountable.

Even before PDEA Academy was ISO certified, pre-test and post-test, pre-assessment and post-assessment, and course evaluation were already used as tools in evaluating the competencies of Drug Enforcement Officers Basic Course (DEOBC) training. However, the researcher seeks to assess the competencies of the training by evaluating the successful application of what the agent trainees learned when they were deployed to regional offices and/or national services. This is also known as the evaluation of learning transfer. Because the researcher believes that if the learner doesn't apply the knowledge in real life, the learner is not going to achieve what he/she sets out to learn in the first place.

Generally, the researcher aims to assess the impact of the DEOBC POI on the success rates of graduates in their job performance once they are deployed. It is expected that the result of this study will show a positive correlation between the completion of the training and improved job performance. This study may also identify areas for improvement in the training program of instruction and provide recommendations for future iterations of the program.



In the field of drug enforcement, effective basic training for officers is crucial for the success of any program. It not only equips officers with the necessary skills and knowledge to combat drug-related crimes but also ensures their safety and the safety of the communities they serve. However, as times change and new challenges arise, it becomes essential to continuously enhance and improve the training programs to stay ahead. This study aims to provide recommendations for program enhancement, offering valuable insights on how to make basic training for drug enforcement officers more effective, efficient, and impactful.

Through this thesis study, it would possibly influence PDEA Academy to strive more to become a world-class drug law education institution that produces competent and finest drug enforcement officers. As the concurrent PDEA Academy Superintendent stated in the DEOB Rules and Regulations (4th Edition) Handbook, *"Nothing is more humbling and rewarding than seeing PDEA Academy alumni return to their alma mater with recognitions and stories of triumphs. As they look back on their training days with pride, the words perennially engraved on the sacred wall of the academy shine even brighter: "From this ground shall emerge the professionals in drug law enforcement."*

RELATED LITERATURE

Design and Development of Military Training

According to the Institute for Defense Analyses by Fletcher, the rapid changes in technology, tactics, and missions that are characteristic of today's military operations require matching agility in the design and development of training and education programs. These changes must be made quickly and efficiently. The U.S. defense community recognized this need early and began to apply the techniques and processes of systems engineering to the design and development of training. Systems engineering had served the DoD well in a host of other applications, and it provided a foundation for R&D that produced Instructional Systems Development (ISD) (Logan, 1979) and, more recently, Systems Approach to Training (SAT) (Guptil, Ross, & Sorenson, 1995). ISD/SAT approaches apply standard systems engineering to the development of instructional programs. They extend the generic systems components of analysis, design, production, implementation, and evaluation to training and education. ISD/SAT combines these engineering components with theories of learning and instruction to produce systematically designed and effective training programs.

- Training analysis is based on a systematic study of the job and the task(s) to be performed. It identifies training inputs and establishes training objectives to be accomplished in the form of student flow and in the knowledge, skill, and attitude outcomes to be produced by the training.
- Training design devises the instructional interactions needed to accomplish the training objectives identified by training analysis. It also selects the instructional approaches and media used to present these interactions.
- Training production concerns the development and preparation of instructional materials. These materials can include hardware (e.g., III-9 simulators), software (e.g., computer programs and audiovisual productions), and databases for holding information (e.g., subject matter content and the performance capabilities of military systems ranging from tanks and airplanes to radios and parachutes).

SUMMARY OF FINDINGS

Overall, the evaluation of the DEOBC POI indicates that the DEOs regularly utilize the topics from the program in their day-to-day jobs. The respondents displayed mastery in various topics under Module 1, including Occupational Safety and Health Orientation, Personal/Group Hygiene and Sanitation, PDEA Code of Conduct and Disciplinary Procedures, Cultural Sensitivity, Property Accountability and Responsibility, Gender Development and Sensitivity, PDEA Protocol and Precedence, and The Philippine Drug Enforcement Agency. Nevertheless, the remaining modules are also regularly utilized by the respondents in their jobs. Certain topics from different modules also displayed high median scores, such as Introduction to Philippine Drug Law, Introduction to Intelligence, Intelligence Cycle, Interview, Casing, Firearms Safety Handling, Pistol Marksmanship, Rifle Marksmanship, and Rifle/Pistol Marksmanship.

The evaluation also revealed that there is no significant difference in the competencies of the program between tactical officers and DEOs. This suggests that both groups utilize the program at a similar level. This similarity can be attributed to both parties undergoing the same training program.

Additionally, the survey indicated positive feedback from the respondents regarding the benefits they gained from the program. The topics within the program helped mold the agent trainees from novices into knowledgeable and skilled drug enforcement officers who now regularly utilize their training in their jobs.



However, tactical officers faced challenges in implementing the program of instruction. These challenges primarily revolved around resource allocation, including a lack of training venues, inadequate training materials, and internet connection issues.

Furthermore, respondents provided suggestions for enhancing the POI. Some suggested focusing more on the Intelligence and Investigation Module. Others proposed incorporating more practical exercises to enhance understanding and provide real-world experience that could be beneficial when deployed in the field.

CONCLUSIONS

The lack of effective learning transfer evaluation has been identified as a significant issue in learning institutions. Without proper evaluation, it is difficult to determine if learners can apply what they have learned in real-world situations.

As mentioned in the introduction, although PDEA Academy utilizes Pre-Test and Post-Test, Pre-assessment and Post-Assessment, and Course Evaluation as the tool in evaluating the competencies of Drug Enforcement Officers Basic Course (DEOBC) training. However, the researcher seeks to assess the competencies of the training by evaluating the successful application of what the agent trainees learned when they were deployed to regional offices and/or national services.

In conclusion, the evaluation of the DEOBC POI revealed that DEOs regularly utilize the topics from the program in their day-to-day job. Both DEOs and tactical officers utilize the program at a similar level, indicating the program's competency is not significantly different between groups. The program has been beneficial for agent trainees, transforming them into knowledgeable and skilled drug enforcement officers. However, tactical officers faced challenges in implementing the POI due to resource allocation issues. Additionally, feedback from respondents suggests that the POI could be enhanced by focusing more on the Intelligence and Investigation Module and incorporating more practical exercises.

Enhancing the DEOBC POI would better prepare future Drug Enforcement Officers to combat evolving drug trends and trafficking techniques. This would ensure that officers are equipped to effectively respond to new challenges in drug enforcement. Officers would be more effective in identifying and countering new methods used by drug trafficking organizations. The enhancement would ultimately result in a more efficient and successful approach to drug enforcement, ultimately leading to a safer community for all (Campbell, Griffiths, & Hinkle, 2021).

RECOMMENDATIONS

PDEA Academy may also face challenges in creating a program of instruction that is relevant and effective for the specific needs and challenges faced by Drug Enforcement Officers in their daily work. Understanding the unique demands of the job and tailoring the training program to address these challenges is crucial for meeting the objectives of the program. The recommendations below were anchored in qualitative results and not in quantitative results. In addition, although most of the results of the quantitative result are regularly used, the program of instruction still has room for improvement.

1. Implement a system for regular performance evaluation and feedback to assess Drug Enforcement Officers' progress and identify areas for improvement of the DEOBC POI using *"Training Competencies Evaluation for DEOBC"* after a year of deployment.
2. Based on the result of the evaluation, PDEA Academy shall use the feedback to adjust the training program and ensure it remains effective and
3. relevant.
4. To add more lecture hours solely related to financial investigation since money laundering has emerged as a concerning trend in today's society due to various factors. The advancements in technology have made financial
5. transactions more accessible and convenient, facilitating the movement of illegal funds across borders.
6. Include a wide range of topics, including drug identification, pharmacology, investigative techniques, legal procedures, cultural awareness, and ethics, to keep abreast of the ever-changing trends of illegal drug trades and transactions.
7. Incorporate updated and/or new realistic scenarios and the latest jurisprudence for case studies to enhance practical application.
8. Recruit experienced and knowledgeable instructors and/or tactical officers with backgrounds in drug enforcement, law enforcement, forensics, and related fields and encourage instructors to share real-world experiences and best practices. Match experienced officers with recruits to provide guidance and support.
9. Provide opportunities for hands-on training, such as mock raids, undercover operations, and evidence collection. Utilize training facilities equipped with state-of-the-art technology and resources.



10. Conduct a deeper study on the new drug trends in the Philippines through close coordination of PDEA Plans and Operations Service, Intelligence Service, and Investigation Service.
11. The Academy may conduct a separate study, which would assess the effectiveness and applicability of the existing Drug Enforcement Officers Basic Course Program of Instruction.

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A GLIMPSE ON PHARMACEUTICO-ANALYTICAL STUDY OF SWETA PARPATI

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ABSTRACT

The Parpati kalpana is a thin flake form of mercurial preparation which is unique in the field of Rasashastra. It is one among the Chaturvidha Rasayana and Agnisthayi Murchhita Parada Bandha i.e., Pota Bandha of Parada. Sweta parpati is an Ayurvedic medicine that comes under Parpati kalpana, used in the treatment of difficulty in urination, urinary calculi, etc. There are two different references of Sweta Parpati where the ingredients and method of preparation are different. In the present work an attempt has been made to prepare Sweta parpati along with its analytical study. It is mainly indicated in Mutrakricchra (Dysuria) and other diseases like Mutraghata, Ashmari, etc.

KEYWORDS: Parpati kalpana, Chaturvidha Rasayana, Sweta Parpati, Mutrakricchra (Dysuria)

INTRODUCTION

In Ayurveda system of medicine, the Rasashastra branch which deals with the herbal, mineral and herbo-mineral formulations with the different method of preparation like Kharaliya, Parpati, Pottali and Kuppipakwa Rasayana. As Rasaushadhi is gaining importance in this modern era due to the low dose form, potent in action and easily absorbed in the body due to its minute form. Here the Parpati which has the different method of preparation based on the amount of Agni given during the preparation and based on the number of ingredients used.

Parpati is a kind of Murchhana of Parada. It is the Agnisthayi Murchhita Avastha of the Parada Bandha, as Kajjali is the base for the preparation of the Parpati by the application of the proper quantum of Agni it makes the preparation Laghu in nature. Hence the name indicates Parpati means Lightness.

Parpati Rasayanas have the high therapeutic Value, potency, less toxicity and cost-effective preparations. Here the materials required for the preparation are easily available & cost effective. The Parpati Prepared is having the longer shelf life as explained in the classics, the Rasaushadhi older the better in the context of the Saviryata Avadhi.

“Parpati kalpana” are unique formulation categorized under the murchhita parada yoga. The formulation is named as parpati as the end product resembles the shape, consistency of the “parpata” –papad shape (wafer). First reference of parpati is mentioned in Grahani chikitsa of Chakradatta written by Acharya Chakrapanidutta of 11th century.

Mainly two types of parpati are explained, which includes Sagandha parpati and Nirganda parpati. Sagandha parpati are formulations which includes Gandhaka (Sulphur) as an ingredient. Nirganda parpati are the formulations which do not contain Gandhaka (Sulphur) as an ingredient.

Parpati Kalpana (Flakes) is a well-known and successfully used preparation for the management of Grahani (Malabsorption/sprue syndrome). Before the invention of Parpati, Grahani was considered difficult to cure but after the invention of Parpati it became easily curable. The use of Parpati was found beneficial for alleviating associated symptoms of Grahani as well as various other diseases like Rajayakshma, Kustha, Gulma etc. Later various scholars derived different types of Parpatis by adding one or the other ingredients like Gold, Silver, Iron, Copper, Mica, Pearl and other precious stones. Some of them are Tamra Parpati (Rasa Prakasasudhakar), Panchamruta Parpati (Rasendra Sara sangraha), Swarna Parpati (Rasapaddhati), Loha Parpati (Rasa paddhati), Vijaya Parpati (Bhaisajya Ratnavali), etc. Sweta parpati is an Ayurvedic medicine coming in Parpati kalpana, used in the treatment of difficulty in urination, urinary calculi, dysuria etc. This is also known as Ksharaparpati, Seetala parpati. Sweta



Parpati is different from other *Parpati kalpanas* since it does not contain *Parada* and *Gandhaka* as its ingredient. It contains *Suryakshara*, *Sphatika* and *Navasagara* as main ingredients as per AFI and Sidhha yoga sangraha.

The present study includes mainly the preparation of Sweta parpati with its detailed pharmaceutical processing. All the required drugs were collected from local market and traders. They were identified as genuine samples by the expert faculties of department of Dravyaguna & Rasashastra, Gopabandhu Ayurveda Mahavidyalaya, Puri, Odisha. All the practicals were done in the Mini pharmacy attached to the P.G Deptt. of Rasashastra & Bhasajya kalpana, Gopabandhu Ayurveda Mahavidyalaya, Puri.

PREPARATION OF SWETA PARPATI

According to Siddha Yog Sangraha (SYS): Sweta parpati is named as Kshara Parpati.

Materials and Methods

Gas stove, Loha Darvi (Iron pan), Spoon, Khalwa yantra

Ingredients:

- Suryakshara- 16 parts (300 grams)
- Kankshi- 2 parts (40 grams)
- Navsadar- 1 part (20 grams)

Method of preparation

- All ingredients were taken as per in khalwa yantra and powdered to form a homogeneous mixture.
- After it turned into homogenous mixture, about 1 TSF from it was taken in darvi.
- Then heated on madhyamagni with continuous stirring by spoon till it turned liquid.
- On heating, it started melting from the bottom.
- When the complete mixture was melted, it was then Spread on the steel tray and left to solidify.
- It formed into a thin flake soon after pouring, which was allowed to cool.
- Then it was collected and powdered & kept it to air tight container for further use.

Observations

- It gives yellow-coloured flames while melting, which are mildly irritative.
- On pouring over the Steel tray, the flakes cool down with crackling sound and sometimes even break.
- Colour of the parpati was White.
- Flakes of parpati had a smooth surface.
- Hardness - Breaks easily with a sound. It was brittle on breaking.
- A cooling sensation was felt.

Table 1: Observations on Sweta Parpati Nirmana

Total quantity taken	360 gm
Total quantity obtained	356.25 gm
Loss	3.75 gm
Total time duration	25 minutes

Precautions

- The preparation if made in louha patra becomes brown in colour as iron particles get mixed with the parpati, hence Properly cleaned vessel should be used.
- The most important precaution is to control the intensity of the fire, which was done very carefully and thus the trial drug should not get burnt at any stage.
- During boiling, ammonia and sulphur gases pass out in the form of yellow fog which should be avoided to inhale or use mask.
- During the boiling, pot gets very hot so should not touch directly.

Packaging and Labelling

- Aim: For protection, convenience and information transmission for use, transport, dispose etc. of the package or product. The final product is stored in a clean, dry, airtight glass container and dried completely before packing and kept in a dry & cool place with a view to protect the product from the invasion of microorganism.

The finished product was filled in glass container and sealed. The container was labelled with required details of Sweta parpati and kept ready for Analytical study.

Dosage: 6-12 ratti

Anupana: Seetala jala (cold water)

Indication: Mutrakruhhra, Mutrarodha, Mutraghata, Mutradaha, Ashmari



ANALYTICAL STUDY

In this chapter the Physico-chemical characters had been evaluated out in “ALN Rao memorial ayurvedic medical college & PG Centre, Koppa, Karnataka”.

All the modern parameters were adopted for quality assessment of the trial drug as per the guidelines framed for quality assessment of Ayurveda and Siddha drugs by CCRAS, Ministry of AYUSH, Govt. India, New Delhi.

EVALUATION

It can be done on following parameters

- Organoleptic Evaluation
- Physico-chemical
- Quantitative Estimation
- Biological

GENERAL /ORGANOLEPTIC EXAMINATION

1. Colour
2. Odour
3. Touch
4. Taste

PHYSICO-CHEMICAL EVALUATION

It includes the following parameters

1. pH Value
2. Loss on drying at 105°C / Moisture content
3. Total Ash
4. Water soluble Ash
5. Acid insoluble Ash
6. Water soluble extractive
7. Alcohol soluble extractive

BIOLOGICAL EVALUATION - It includes

1. Microbial limit test

RESULTS

A. Organoleptic Characters

Sl. No.	Parameters	Appearance of Specimen Sample
1.	Colour	White
2.	Odour	Characteristic
3.	Taste	Kashaya (Astringent)
4.	Texture	Crystalline Amorphous Powder

B. Physico-chemical parameters

Sl. No.	Test Parameters	Results
1.	Loss on Drying at 105°C	1.31 %
2.	Total ash	96.96%
3.	Acid insoluble ash	1.63%
4.	Water soluble ash	4.12%
5.	Alcohol soluble extractives	12.37%
6.	Water soluble extractives	5.97%
7.	pH (5% aqueous solution)	4.10 ± 0.10

C. Quantitative Estimation

Sl. No.	Test Parameters	Results
1.	Potassium	38.25%
2.	Chloride	3.14%
3.	Sulphate	4.08%
4.	Sodium	0.21%

**D. Microbial contamination**

Sl. No.	Test Parameters	Results
1.	Total aerobic count	Nil
2.	Total fungal count	Nil

DISCUSSION

Parpati kalpana is one among the four murcchita parada yogas that are unique and highly evolved pharmaceutical preparations with a wide range in therapeutics. Parpati is sagandha/ nirgandha, sagni, pota bandha. Agni samskara plays an important role in Parpati preparation. It helps in altering the physico- chemical properties. Parpati is a popular and successfully used preparation for the management of Grahani, Mutraghata, Mutrakrichra, Rajayakshma, Gulma, Kusta, etc. diseases.

Preparation of Sweta parpati follows slightly different pattern of making than usual Parpati preparations. It does not contain Parada and Gandhaka as its ingredient. And in therapeutic use it is mainly used in Mutrakrichra, Mutraghta etc when compared with other Parpati preparations like Rasa parpati which is used mainly in Grahani. The melting point of the ingredients used in Sweta parpati is high when compared with other Sagandha-parpatis which has Parada (38.820c) and Gandhaka (115.20c) as main ingredient. There is no need of smearing ghee in the vessel since Kshareeya ingredients will not stick on the pot or vessel.

In organoleptic examination, it is found the Colour of Sweta Parpati is White, Odour is Characteristic, Taste is Salty & Texture is Crystalline amorphous Powder.

In Physico-chemical tests, the result of loss on drying at 105 °C is 1.31%, total ash is 96.96%, Acid insoluble ash is 1.63%, Water soluble ash is 4.12%, Alcohol Soluble extractives is 12.37%, Water soluble extractives is 5.97% & pH value is 4.10 ± 0.10.

In Quantitative Estimation of Sweta parpati, it is found the Quantity of Potassium is 38.25%, Chloride is 3.14%, Sulphate is 4.08% & Sodium is 0.21%.

In Microbial contamination Test, Result of Total aerobic count is Nil & Total fungal count is Nil.

CONCLUSION

Sweta parpati is one of the unique parpati yoga, which does not contain parada in it. The method of preparation of Sweta parpati is different than the other parpati kalpanas. Among three references, the method of preparation mentioned in SYS was felt easier. Usually most of the parapti kalpanas are indicated in grahani and related rogas. But this is specially indicated in mutrakricchra and mutravarodha. Since suryakshara is atiushna, tikshna, dahaka, shoshaka, vatanashaka, pittakaraka one should not use in large dose and for long time.

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INGREDIENTS



PHARMACUTICAL PROCEDURE



FINAL PRODUCT



THE ROLE OF *MARMA* POINTS IN MUSCULOSKELETAL HEALTH: AN ANATOMICAL PERSPECTIVE

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ABSTRACT

Marma points are vital energy centers in the body that are important in the musculoskeletal system because they connect muscles, ligaments, bones, veins, and joints. There are 107 Marma points in the body. They are also associated with different organs and nerves, and are related to Nadis and Chakras. Marma therapy is a self-care and self-healing practice that involves massaging Marma points to relieve stiff muscles and boost circulation.

A musculoskeletal disorder is an injury that affects the human body's movement or musculoskeletal system, including muscles, tendons, ligaments, nerves etc. Ayurveda understands the ailment in detail like etiological factors, Marma-chikitsa, a traditional therapy for managing vital points and specific Panchakarma to manage ailments effectively. Marma is a special concept described by Sushruta. Mamsa Marma's are 11, they are Talahridaya- 4, Indrabasti- 4, Guda- 1, Stanarohita- 2. Asthi Marma's- are 8, they are Kateekataruni- 2, Nitamba- 2, Amsaphalaka- 2, Shankha- 2. Snayu is a vital structure that helps maintain joints stability during movement, and all joints are bind together by snayu. There is 27 Snayu Marma. The musculoskeletal system is a system that provides our body with movement, stability, shape, and support. Besides its main function to provide the body with stability and mobility, the musculoskeletal system has many functions; the skeletal part plays an important role in other homeostatic functions such as storage of minerals and hematopoiesis, while the muscular system stores the majority of the body's carbohydrates in the form of glycogen. Hence playing important perspective in present study to know detail about the importance of Marma points in musculoskeletal health.

KEY WORDS: Marma, Mamsa Marma, Musculoskeletal system.

INTRODUCTION

As we all know the marma points are the important and vital structures of the body. Classification of marma is done based on its structure, composition, location, etc. here an attempt is made to see the importance of marma points in Musculo-skeletal health. Marma is explained as the anatomical area were the five– principle anatomical structures Mamsa, Sira, Snayu, Asthi, and Sandhi are collectively present. It is the intense point of Prana, which gives its vitality. It is a site where pulsation is felt and generates pain when pressure exists.^[1]

Marma classification according to their composition:

- Mamsa Marma: These are mainly composed of muscles and related structures like fascia. 11 in number. Talhridaya, indrabasti, guda and stanrohita.
- Sira Marma: These are mainly composed of blood vessels. 41 in number. Nila, manya, matrika and shringataka.
- Snayu Marma: Snayu marma are composed of ligaments, tendons, and muscle aponeurosis. 27 in number. Ani, vitapa, kakshadhar, vasti etc.
- Asthi Marma: Asthi marmas are composed of bones and bony structures. 08 in number. Krikatika, nitamba, amsaphalak, and shankhaka.
- Sandhi Marma: Sandhi marma are made up of joints. 20 in number. Janu, kurpara, simant, gulpha etc.



MAMSA MARMAS

There are 4 Mamsa Marmas (by names) and 11 Mamsa Marmas (by number). They are-

Sl. No.	Name	Type/Number	Location	Anatomical correlation
1.	Talahridaya	Kaalaantara Praanahara/4	Located at the middle of palm, Middle of sole/palm	In adhah shakhagat- Medial plantar artery, Lateral plantar artery, plantar nerve, plantar aponeurosis, Abductor hallucis muscles. ^[2] In Urdhwa Shakhagata- talhridaya marma- Flexor retinaculum, Palmar aponeurosis, Palmaris brevis muscle, interossei palmar muscle. ^[3]
2.	Indravasti	Kaalaantara Praanahara/4	Located at the middle of forearm on front side, Middle of leg in line with medial	pronator teres, Flexor carpi radialis, Palmaris longus, Flexor carpi ulnaris, Flexor digitorum superficialis, Radial artery and ulnar artery, Median nerve and ulnar nerve. ^[4]
3.	Guda marma	Sadhyo Praanahara/1	Located in the region of anus, attached with colon	rectum / anus, Bulks of levator ani muscle, Transverse peronei muscle, the sphincter ani muscle.
4.	Stanarohita	Kaalantara Praanahara/2	Located above the nipples on both sides of the chest	The areolar space is referred for the stanrohit marma, pectoralis minor muscle, Intercostal muscle, intercostal nerves, Internal thoracic artery. ^[5]

SNAYU MARMAS

There are 27 Snayu Marmas covered under 10 names and scattered all over the body. They are -

Sl. No.	Name	Type/Number	Location ^[8]	Anatomical correlation
1.	Aani	Vaikalyakara/4	Three angula (6cm) above the kurpar (elbow joint) and janu (knee)	Upper extremities- The brachial artery, median nerve, radial nerve, and ulnar nerve. Musculocutaneous nerve, coracobrachialis muscle, biceps brachii and triceps brachii muscles. ^[6] Lower extremities- Five relative structures are seen a. mamsa- the lower end of rectus femoris, vastus intermedius, vastus medialis, b. sira- femoral vessels, c. snayu- tendon of quadriceps femoris, d. asthi- the lower end of the femur and patella, e. sandhi- the joint between patella and femur. ^[7]
2.	Vitap	Vaikalyakar/2	Between the rushan (testis) and vankshan (inguinal/groin region).	Males- External oblique aponeurosis, Internal spermatic fasciae, Cremasteric fascia, External spermatic fascia, Ilio-inguinal nerve, Spermatic cord, Inguinal ligaments. ^[9] Fmales- External oblique aponeurosis, Internal oblique muscle of abdomen, ilio-inguinal nerve
3.	Kakshadhar	Vaikalyakar /2	in between the vaksha (thorax) and kaksha (axilla)	the brachial plexus, lateral Cord, median cord, posterior cord, axillary artery, axillary vein, and tendon of pectoralis minor. ^[10]
4.	Kurcha	Vaikalyakar/4	Upper limb- proximal to the junction b/w thumb & forefinger. Lower limb- proximal to junction b/w big toe & 1st toe	Upper limb- Carpo-metacarpal and intermetacarpal ligaments, Tendons of Extensor pollicis longus, Extensor digitorum, Extensor indicis, Flexor carpi radialis brevis muscles, Radial artery and its Dorsal metacarpal branches, Interosseous muscles, Carpo-metacarpal and inter metacarpal articulations. Lower limb- Tarsometatarsal and inter-tarsal ligaments, Extensor digitorum brevis, Dorsalis pedis and Dorsal intertarsal arteries, Tendons of Extensor digitorum longus, Extensor hallucis longus, Peroneus tertius muscles, Branches of deep Peroneal nerve ^[11]



5.	Kurchashira	Rujakar/4	Upper limb – distal to the wrist joint. Lower limb- distal to the ankle joint	Upperlimb- Ulnar Collateral ligaments, Radial collateral ligaments, Inter-carpal ligaments, Transverse carpal ligaments, Ulnar artery, Median nerve, Superficial branches of ulnar nerve, Inter-carpal articulations. Lowerlimb- Deltoid ligaments, Talocalcaneal ligaments, Calcaneofibular ligaments, Annular ligaments, Tendon of Tibialis anterior muscle
6.	Basti	Sadya pranhar/1	Mutrashaya (urinary bladder)	the tissues involved in Basti Marma are the urinary bladder, terminal part of the ureter, prostate & prostatic urethra, puboprostatic/pubo-vesical ligaments and other ligaments, vesical branches of the internal iliac artery, the internal iliac veins and its tributaries from bladder, sympathetic and parasympathetic nerves from inferior hypogastric plexus etc. ^[12]
7.	Kshipra	Kalantar pranhar/4	In hand- in between the index finger and thumb In foot- in between big and 2nd toe	Upper limb- Dorsal metacarpal Artery, Flexor Pollicis Brevis, Oblique and transverse head of adductor pollicis, Branches of the median nerve, Superficial and deep palmar arch supplying blood to the finger. Lower limb- Dorsal Pedis Artery, Branch of deep peroneal nerve going to big toe, Adductor hallucis Brevis, Lumbricalis muscles, Plantar arch, Medial plantar artery, Posterior tibial nerve, Meta tarso- phalangeal joint. ^[13]
8.	Amsa	Vaikalyakar/2	in between the arms, head and neck	Coraco-clavicular ligaments, Conoid ligaments, Trapezoid ligaments, Acromio-clavicular ligaments, Coraco-clavicular ligaments. ^[14]
9.	Vidhur	Vaikalyakar /2	at the back (or behind) the ear and below it	- Stylomastoid artery, and the facial nerve is especially found at the site of Marma passing through the stylomastoid foramen. ^[15]
10.	Utkshap	Vishalyaghana/2	It is located at the level of the scalp's hairline, above the temple	superficial and deep fascia of the temporal region, i.e. up to the meninges, super facial temporal artery, deep temporal artery and vein zygomatic temporal nerve. The pterion is a small circular area within the temporal fossa which contains the junction of the frontal, sphenoid, parietal and temporal sutures. ^[16]

ASTHI MARMA:

There are 8 Asthi Marmas covered under 4 names and scattered all over the body. They are -2 in number

Sl. No.	Name	Number	Location	Anatomical Correlation ^[17]
1.	Kateeka taruna	2	Low back, one on either side of the back bone, on the pelvic bones	Ilium near sacroiliac joint, common iliac vessels
2.	Nitamba	2	Above the pelvic region covering the viscera and between the 2 lateral parts	Iliac crest, lumbar plexus
3.	Amsaphalaka	2	Upper part of the back, on both lateral sides of vertebral column and at the place of union of 3 bones (scapula, humerus and clavicle)	Scapula, supraspinatus, subscapularis, chords of brachial plexus
4.	Shankha	4	Between ear and forehead on either side, in the temples	Squamous part of temporal bone, middle meningeal artery



SANDHI MARMA

There are 20 Sandhi Marmas covered under 09 names and scattered all over the body.^[18] They are -

Sl. No.	Name	Type	Location	Anatomical Correlation ^[19]
1.	Janu	2	At the region where jhanga and uru unites	knee joint
2.	Koorpara	2	Region where arm and forearm joins	Elbow joint
3.	Seemanta	5	5 sandhi present in shirah	Frontal, sagittal, occipital sutures
4.	Adhipati	1	Within the cranial cavity, in its upper part	confluence of sinuses
5.	Gulpha	2	Region where pada and jhanga unites	ankle joint
6.	Manibandha	2	Region where forearm and arm joins	wrist joint
7.	Kukundara	2	On either side of vertebral column in the jaghana bahirbhaga	Sacro-iliac joint, sciatic nerve
8.	Aavarta	2	Depressed area above bhru	Orbicularis oculi muscle, levator palpebrae superioris.
9.	Krukaatika	2	Joint between shira and greeva	Atlanto-occipital joint

MUSCULOSKELETAL SYSTEM

The musculoskeletal system / locomotor system is a human body system that provides our body with movement, stability, shape, and support. It is subdivided into two broad systems:

1. Muscular system, which includes all types of muscles in the body. Skeletal muscles, in particular, are the ones that act on the body joints to produce movements. Besides muscles, the muscular system contains the tendons which attach the muscles to the bones.
2. Skeletal system, whose main component is the bone. Bones articulate with each other and form the joints, providing our bodies with a hard-core, yet mobile, skeleton. The integrity and function of the bones and joints is supported by the accessory structures of the skeletal system i.e., articular cartilage, ligaments, and bursae.

Besides its main function to provide the body with stability and mobility, the musculoskeletal system has many other functions; the skeletal part plays an important role in other homeostatic functions such as storage of minerals (e.g., calcium) and hematopoiesis, while the muscular system stores the majority of the body's carbohydrates in the form of glycogen.

Parts of the Musculoskeletal System

- Skeleton — this is the framework of the body. The adult human skeleton is made up of 206 bones.
- Joints — an area where 2 bones work together.
- Cartilage — is a cushioning that covers the ends of 2 bones.
- Ligaments — tough bands of tissue that join bones to other bones to strengthen joints.
- Muscles — there are more than 600 skeletal muscles in the human body. They help the body move.
- Tendons — these are made of strong fibrous connective tissue and they attach muscles to bones.

1. **Muscular system** - The muscular system is an organ system composed of specialized contractile tissue called the muscle tissue. There are three types of muscle tissue, based on which all the muscles are classified into three groups:

- Cardiac muscle- which forms the muscular layer of the heart (myocardium)
- Smooth muscle- which comprises the walls of blood vessels and hollow organs
- Skeletal muscle- which attaches to the bones and provides voluntary movement.

Based on their histological appearance, these types are classified into striated and non-striated muscles; with the skeletal and cardiac muscles being grouped as striated, while the smooth muscle is non-striated. The skeletal muscles are the only ones that we can control by the power of our will, as they are innervated by the somatic part of the nervous system. Skeletal muscles- The skeletal muscles are the main functional units of the muscular system. There are more than 600 muscles in the human body. They vary greatly in shape in size, with the smallest one being the stapedius muscle in the inner ear, and the largest one being the quadriceps femoris muscle in the thigh.



Anatomical Structure

Structurally, the skeletal muscles are composed of the skeletal muscle cells which are called the myocytes (muscle fibres, or myofibrils). Muscle fibers are specialized cells whose main feature is the ability to contract. They are elongated, cylindrical, multinucleated cells bounded by a cell membrane called sarcolemma. The cytoplasm of skeletal muscle fibers, contains contractile proteins called actin and myosin. These proteins are arranged into patterns, forming the units of contractile micro-apparatus called sarcomeres.

Each muscle fiber is enclosed with a loose connective tissue sheath called **endomysium**. Multiple muscle fibers are grouped into muscle fascicles or muscle bundles, which are encompassed by their own connective tissue sheath called the **perimysium**. Ultimately, a group of muscle fascicles comprises a whole muscle belly which is externally enclosed by another connective tissue layer called the **epimysium**. This layer is continuous with yet another layer of connective tissue called the deep fascia of skeletal muscle, that separates the muscles from other tissues and organs.

This structure gives the skeletal muscle tissue four main physiological properties:

- Excitability - the ability to detect the neural stimuli.
- Contractibility - the ability to contract in response to a neural stimulus.
- Extensibility - the ability of a muscle to be stretched without tearing.
- Elasticity - the ability to return to its normal shape after being extended.

Tendons - A tendon is a tough, flexible band of dense connective tissue that serves to attach skeletal muscles to bones. Tendons are found at the distal and proximal ends of muscles, binding them to the periosteum of bones at their proximal (origin) and distal attachment (insertion) on the bone. As muscles contract, the tendons transmit the mechanical force to the bones, pulling them and causing movement.

Being made of dense regular connective tissue, the tendons have an abundance of parallel collagen fibers, which provide them with high tensile strength (resistance to longitudinal force). The collagen fibers within a tendon are organized into fascicles, and individual fascicles are ensheathed by a thin layer of dense connective tissue called endotenon. In turn, groups of fascicles are ensheathed by a layer of dense irregular connective tissue called epitenon. Finally, the epitenon is encircled with a synovial sheath and attached to it by a delicate connective tissue band called mesotenon.

Functions of the muscular system - The main function of the muscular system is to produce movement of the body. Depending on the axis and plane, there are several different types of movements that can be performed by the musculoskeletal system. Some of the most important ones include- Flexion and extension, Adduction and abduction, Rotation, Supination and pronation .

Both during movement and stationary positions, muscles contribute to the overall support and stability of joints. Many muscles and their tendons pass over joints and thereby stabilize the articulating bones and hold them in position. In addition, the muscles also play an important role in maintaining posture. While the movements occur mainly due to muscles intermittently contracting and relaxing, the posture is maintained by a sustained tonic contraction of postural muscles. These muscles act against gravity and stabilize the body during standing or walking. The postural muscles include the muscles of the back and abdominal muscles. Another important function of muscles is heat production. Muscle tissue is one of the most metabolically active tissues in the body, in which approximately 85 percent of the heat produced in the body is the result of muscle contraction. This makes the muscles essential for maintaining normal body temperature.

2. Skeletal system

The adult human skeleton is composed of 206 bones and their associated cartilages. The bones are supported by ligaments, tendons, bursae, and muscles. The bones of the body are grouped within the two distinct divisions:

- Axial skeleton, that includes the bones along the long axis of the body. The axial skeleton consists of the vertebral column, bones of the head and bones of the thoracic cage.
- Appendicular skeleton, that involves the bones of the shoulder and pelvic girdle, as well as the bones of the upper and lower extremities.

Bones- Bones are rigid structures made of calcified dense connective tissue. Bone tissue is composed of a mineralized bone matrix that consists of type 1 collagen fibers dispersed throughout the ground substance. The cellular component of the bones is represented by three types of specialized bone cells called osteocytes, osteoblasts and osteoclasts.^[20]

Types of bones- Long bones, Short bones, Flat bones, Sesamoid bones, Irregular bones.

Cartilage - Cartilage is a flexible connective tissue found in multiple organ systems of the body. Cartilage is composed of specialized cells called chondrocytes, collagen fibers and abundant ground substance rich in proteoglycan and elastin fibers.

Cartilage is classified into the following types based on its composition:



- Hyaline cartilage is composed of type II collagen and an abundance of ground substance, which gives it a glossy appearance. It is the most abundant type of cartilage found in joints (articular cartilage), as well as the nose, larynx, trachea and ribs.
- Elastic cartilage is similar to hyaline cartilage but contains more elastic fibers. It is found in structures such as the pinna of the ear, auditory tube and epiglottis.
- Fibrocartilage is composed of plenty of collagen fibers type I and a smaller amount of ground substance. Examples of fibrocartilage include intervertebral discs, pubic and other symphyses.

The musculoskeletal system specifically contains articular cartilage, a type of cartilage that lines the articulating surfaces of bones. The articular cartilage provides congruence to the articulating bones and allows them to bear weight and glide over each other with very little friction.

Joints - Each bone of the musculoskeletal system is connected to one or more bones via a joint. Joints provide a fulcrum to the bones, on which they pivot and thereby allow movements of body parts. However, movement is not a necessary attribute of a joint as some joints do not move, such as joints between the bones of the skull. The integrity or stability of a joint is provided by several factors including the bony congruence and structures that cross the joint, such as tendons and ligaments. According to the movements they allow and/or the shape of their articulating surface, the synovial joints can be further subdivided into 6 major types- Ball and socket joints, Condylod joints, Hinge joints, Pivot joints, Saddle joints, Plane joints

Ligaments -Ligaments are fibrous bands made of dense regular connective tissue which are similar in structure to tendons. Unlike the tendons that connect muscles to bone, the ligaments connect bone to bone. Besides the musculoskeletal system, the ligaments are also found in many other parts of the body, where they usually stabilize and hold internal organs in place and transmit neurovascular structures. In the musculoskeletal system, ligaments stabilize the articulating bones and reinforce the joints. Depending on their anatomic position relative to the joint capsule, ligaments are classified into:

- Capsular ligaments are essentially thickenings of the joint capsule that form either elongated bands or triangular structures. These ligaments serve to reinforce the integrity of the joint capsule.
- Intracapsular ligaments are the ligaments that lie internal to the joint capsule. These ligaments reinforce the connection of the articulating surfaces of the joint, but allow a far wider range of motion than other ligaments.
- Extracapsular ligaments are ligaments that lie outside the joint capsule. These ligaments provide the most stability to the articulating bones, and are important for preventing dislocations. ^[21]

DISCUSSION

Marma therapy works by restoring balance in prana and doshas. By stimulating specific marma points, practitioners aim to- Rebalance prana flow throughout the body, promoting optimal function and healing, reduce inflammation and promote tissue repair, easing pain and discomfort, improve circulation by stimulating blood flow to affected areas, aiding in healing and reducing pain.

Acharya Susruta has defined Marma as the anatomical site where Mamsa, Sira, Snayu, Asthi and Sandhi meet together. Prana dwells at these sites and so they are important.

Marma is not only anatomical structure but also a part of applied anatomy, it is physio-anatomical concept described in ayurveda. Marma is the part of surface anatomy where we get knowledge of internal structures and pathological conditions due to trauma. With the help of skin surface of particular marma and region of the marma we understand the area, internal structure and severity of the trauma.

So the detail of marma and importance of mamsa, asthi, sandhi, snayu marma with its anatomical importance is explained which help in forming Musculo-skeletal system. By having the knowledge all the above structures one can maintain the normalcy of functioning of all the systems of our body.

CONCLUSION

All the above descriptions show the importance and vitality of the marma point. Marma is the confluence of muscles, veins, ligaments, bones, and joints. In these places, prana (life) resides specifically by nature; hence when fatal spots are injured, producing their respective effects. Mamsa, Snayu, Asthi, Sandhi plays an important role in the posture of the human body. Snayu marma, better known as the vital point in ayurvedic anatomy, is a specific location in the human body characterized by the predominance of the ligament. The injury to the nerve, muscles or ligaments may lead to a decrease in length, strength movement and emaciation of limb. Therefore, knowledge of marma, especially, mamsa, asthi marma, is essential for physicians and surgeons for preventive and curative aspects. Therefore, we need



to protect these by knowing its structure. As they play important role in forming muscular and skeletal system. Hence an attempt is made to see the importance of marma in maintaining the Musculo-skeletal health.

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LEGISLATIVE FRAMEWORK FOR WOMEN EMPOWERMENT IN INDIA

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“We don't Women Empowerment doesn't mean that a woman becomes more and more like a man, Women Empowerment means that you become more and more of the women.” — Rajneesh Osho

ABSTRACT

Women's empowerment is a global issue that has received attention in recent decades, since women's social and economic well-being is vital to the success of any community or nation. Women's empowerment is about establishing an environment in which women have the authority to make their own decisions. Women's Empowerment ensures that women have equal rights and gives them the courage to assert them. It also ensures that women may live their lives freely, with dignity and respect. Women's empowerment guarantees women equal access to education and employment possibilities, free of gender bias. It also entails providing a safe and comfortable workplace for women. The first step towards women's empowerment is to educate them. Education will increase women's self-confidence and help them find jobs. Education, in particular, empowers women to make health-promoting choices for themselves and their children. Education will also increase women's awareness of their human rights, as well as their confidence and ability to exercise them. Despite significant progress in recent years, literacy is not universally accessible, and gender inequities remain. Women account for half of the Indian population. In modern India, in addition to the correction of international treaties, provisions in the Constitution and various legislative Acts have been developed to ensure women's empowerment. Women's responsibilities have altered in various ways, such as engagement in the development process and the emergence of self-help groups, which is vital for sustainable growth in which women play a direct and distinctive role.

KEY WORDS; Women, Women Empowerment, Inequality, Justice, Legislations, Feminism

INTRODUCTIONS

Women's empowerment in India is the most powerful instrument for growth, as women across the country are now effectively leading by example and outperforming men in all aspects of life. While the entire world holds its breath and begs for an incredible respite via the corona virus pandemic every day, it is the women who are leading representatives, and the nations led by these incredible individuals, who are taking charge and leading the way in the fight wherever it is needed.

Women's empowerment in India is largely determined by several factors, including the country's geography (metropolitan or rural), social position (class and rank), educational achievement, and age. There are programs to empower women at the state, local (Panchayat), and municipal levels. However, women confront exclusion in a variety of categories, including education, economic possibilities, health and medical support, and political partnership, revealing that there are significant gaps between policy advances and real localized action.

The rapid development in the legal world over the last few years is neither an accident or an anomaly. According to all accounts, it is the outcome of certain, discernible patterns. In any case, more people are aware of the humiliation that women have faced in the past. Third, the legal attitude to women's concerns has often been moderate and liberal. Furthermore, the Law Commission of India, whose commitments on the subject are exceedingly long-lasting, has made a considerable contribution to women's freedoms and positions in certain of their aspects. India has not achieved perfect progress in terms of women's opportunities, even if the framework that the country has accepted for growth may not be entirely different from the framework that it has been expecting elsewhere. Indeed, societal shifts have occurred here as well, requiring alterations to our beliefs and customs.

The Indian Constitution affirms women's right to equality and empowers the state to implement policies that support the establishment of a foundation of equality for women and children. Following the adoption of the Constitution, various laws were enacted to outlaw gender discrimination both at home and in public. True empowerment for women will not occur until sex-based discrimination is eliminated and they are given the same opportunities and rights as men.

LEGISLATIVE EFFORTS FOR WOMEN EMPOWEMENT

It can be divided into two spheres i.e. prior to independence and after independence.



The exceptionally earliest instances of guidelines for ladies were Guideline No. III of 1804 and Suggestion No. XXI of 1795, which pronounced baby murder to be unlawful.

In this way, the "Bengal Sati Guideline XVII of 1829" pronounced that widows' demonstrations of sati, or self-immolation, were unlawful and ought to be arraigned in culprit courts as chargeable manslaughter.

Sati, the demonstration of a women self-immolating or showing good cause by setting her soul mate's carcass ablaze, was the clearest unfair custom predominant in India during the English rule. To try not to irritate Hindu subjects, the English East India Association allowed sati despite the fact that they believed it to be a disrupting and thorough discipline. The discussion over sati started in 1813 when the East English India structure, after strain from intense gatherings in Britain, authorized the training in light of the fact that the widow had acted unshakably. This regulation ignited serious discussion on the two sides of sati in the two India and Britain. English evangelists, alongside sati's Indian partners and rivals, scanned Hindu standard sections for help for their contradicting perspectives. Impacted by the utilitarian way of thinking, which tried to expand benefits for the best number of individuals through guideline, and energized by help from Indians like Crush Mohan Roy, in 1829, Expert William Bentinck, who filled in as the Association's main delegate general in India from 1828 until 1835, gave a declaration reviling sati. The 1830s saw a ton of discussion due to the sati occasions that proceeded. It was hard to uphold the boycott in a setting where most of passings were brought about by consuming inside the primary hour of their demises and English specialists were scattered far.

PRE INDEPENDENCE-EFFORTS FOR WOMEN EMPOWERMENT

1. WIDOW REMARRIAGE ACT, 1856

The English system witnessed the enactment of the Widowed Remarriage Act of 1856, a measure pushed by women. Ishwar Chandra Vidyasagar dedicated his life to alleviating the lives of Hindu widows and encouraging remarriage. In contemporary India, progressives and activists staged large-scale rallies against widows' harsh living circumstances and the legalization of remarriage for widows. In modern India, there is a rising awareness of widows' suffering and the deplorable conditions under which they live. A lot of stern and social reformers urged for widow remarriage to be permitted and cried out that their circumstances will improve. They then proceeded to request that regulations be passed by the English enabling Hindu widows to get married again. Ishwar Chandra obtained slightly over 1,000 points to support this interest and submitted this petition to the Indian Administration Committee. The Gathering received a lot of feedback both in favor of and against this move, but in the end, the participants decided to support the "illuminated minority". In 1856, the Hindu Widow Remarriage Act was enacted.

Laxmi Devi conducted a sample assessment of 805 Hindu women between 1945 and 1947. 111 of these were widows, and their average age was 22. Only two had moved on. Again, 51 widowed with a mean age of 26 years were included in the most recent case study of middle-class women conducted in 1965–1966. One got married again¹.

Thus, British liberal socio-religious reform was postponed for more than three decades. During this time, the East India Company's Hindu Widow's Remarrying Act of 1856 and the crown's modest Age of Permission Act of 1891 were both in force. The Act merely increased the age at which "agreeing" Indian brides might be raped from 10 to 12 years old.

2. THE AGE OF CONSENT ACT, 1891

The Age of Consent Act of 1891 extended the ten-year assent term for culmination to twelve years in English India. Although the issue of such a legislation was resurrected in 1880 by the young lady of the time, Rukhmabai, in a Bombay high court, the death of eleven-year-old Phulomnee in 1889 as a result of sexual assault by her child spouse prompted British involvement. The Act passed in 1891. Hindu nationalists like as Bal Gangadhar Tilak opposed it, whilst progressives such as Behramji Malabari and women's social clubs backed it. It is argued that the actual impact of the legislation was the reassertion of Hindu man-centered authority over family matters for nationalistic reasons, even if it was rarely truly implemented.

Remarrying a Hindu widow was often forbidden in earlier Indian society. Hindu widows' remarriage and legacy became lawful with the passage of the Hindu Widow Remarriage Act in 1856.

3. MARRIED WOMEN'S PROPERTY ACT 1874

The Married Women's Property Act was enacted in 1874, in part to protect economic independence. It said that a married woman's salaries and earnings, as well as any property she may have acquired independently through the use of her abilities or talents, savings, and investments, were all considered her independent property. The Act also permits a married woman to sue for her own property

¹ Laxmi Devi, *Crime Atrocities and Violence against women and related laws and justice* 45 (Anmol Publications Pvt. Ltd., New Delhi, 1st edn., 1998).



in her own name. When we consider how common it was for families to own joint property back then, we can fully understand the significance of this Act. If the husband was insured, it created a natural trust for the assureds' wife and children.

4. THE CHILD MARRIAGE RESTRAINT ACT, 1929

Social reformers and women alike showed strong resistance to underage marriage. The Child Marriage Restriction Act was passed in 1929 and amended in 1938 in response to public demand. It was known as the Sarda Act to some. The first fallacy about this Act circulated was that it exclusively pertained to Hindus. However, it holds true for all communities. This minor deed comes at a cost, yet the marriage suffers permanent damage. Child marriage has long been a prevalent occurrence. However, the Act was never put into action in India during the British colonial period.²

POST INDEPENDENCE EFFORTS FOR WOMEN EMPOWERMENT

Proposals for laws intended at enabling women to resist crimes and gender-based massacres after independence:

The term "crime against women" refers to crimes that especially target women, even if any act, such as "murder," "robbery," "cheating," and so on, can happen to them. Numerous laws protect women. While various laws exist to protect women from different sorts of specialized offenses, the Bharatiya Nyaya Sanhita, 2023 offers the maximum protection against crimes against women. BNS outlines a variety of offenses against women, as well as the consequences for each. Some notable laws that effect women include the Immoral Traffic (Prevention) Act, BNS, and the Juvenile Act.

1. Bharatiya Nyaya Sanhita, 2023

The Indian Criminal Code is a reformatory statute that includes numerous notable clauses addressing offenses against women and their right to privacy. These arrangements are governed by Sections 296 (obscene acts and songs), 80 (dowry death), 88-94 (induction of unsuccessful labors, injuries to unborn children, and the disclosure of newborn children during birth concealment), and 127 (2) (illegitimate confinement). such as stealing from legitimate guardianship, getting a juvenile female, transporting a young woman into another nation, selling a child with the goal of converting them into a prostitute, and buying a minor with the intention of turning them into a prostitute. Offenses include living together after a man deceitfully induces a conviction of a lawful marriage, remarrying while the spouse or wife is still alive, deceitfully performing a wedding ceremony without a lawful marriage, adultery, and luring or removing a married woman with unlawful intent. Finally, and maybe most crucially, section 85 discusses the husband's family members' or spouse's lack of regret. We are pleased with human development and our legacy. However, the sheer volume of examples leads us to recognize that we are a country of brutes.

Section 354 of ancient legislation specifies how to assault or use criminal authority on a lady in order to scare her into being less obtrusive. The individual who does so with the goal of stunning the woman, knowing full well that he would most likely shock her humility as a consequence, may face penalty that could include up to two years in jail, a fine, or both, according to Roopan. Bajaj Deol Vs. KPS Gill³. Rape (Segment 63), with a life penalty, is the most heinous violation against women specified in the Sanhita. There are five ways in which a sexual encounter might turn violent. Initially, we assumed that the woman had not agreed to the sexual activity. Second, in if it was done without her permission. Third, in the uncommon situation that the woman's permission was secured by instilling fear that she would die or be harmed. Fourth, even though she admits he isn't her genuine love, she still accepts him since she sees him as her more loving half. Fifth, whether or not the girl grants consent, when she is under sixteen.

On the other hand, with the 1986 change to the Settlement Act, another arrangement, such as share passing, was added to the IPC as Area 304B. According to Kaliya Perumal v. Province of Tamilnadu, Part 304 B states that: If a woman dies from a major illness or injury, or if, under normal circumstances, within roughly seven years of her marriage, and it can be demonstrated that, just prior to her death, she was subjected to remorse or provocation by her spouse or any relative of her spouse for, or about, any interest for settlement, such a death will be classified as a "share demise" and such a spouse or relative.⁴

Furthermore, dowry death convictions can result in a maximum sentence of seven years in jail or life in prison.

Abduction, slavery, and abduction are some of the activities that target women. According to the BNS, a person is judged to have abducted a minor (a person less than sixteen or a girl under 18) or a mentally unstable from their lawful guardian if they do so without the guardian's agreement.⁵

² Forbes, H Geraldin., *Women in Modern India* (Cambridge University Press, Cambridge, 1st Edn., 1998).

³ 1995 (6) SCC 194.

⁴ AIR 2003 SC 3828.

⁵ Bharatiya Nyaya Sanhita, s. 137(1)(b).



2. Bharatiya Nagarik Suraksha Sanhita 2023

The Bharatiya Nagarik Suraksha Sanhita also makes various safeguards for women's protection. Section 180 protects women from unnecessary police harassment. A police officer may summon a guy to the station to interrogate him or acquire information while conducting an investigation. A woman or man under the age of fifteen is not necessary to visit the police station. The police officer must go to the girl's or boy's residence. Another female without much regard when picking decency shall execute the search" when a lady passes through by a police officer."⁶

A court chaired by a woman will examine any case pertaining to any of the following sections of the BNS 2023: 64, 65(1), 65(2), 66, 67, 68, 69, 70, 70(1), 70(2).⁷

Police must obtain the magistrate's prior consent before executing an arrest of a woman after dusk and before dawn, and a female police officer should be notified.⁸

3. Bharatiya Sakshya Adhiniyam, 2023

According to Section 120 of the BSA 2023, in circumstances of institutional rape, rape by a group, and rape of a pregnant woman, the burden of proof shifts to the accused if the victim argues in court that she did not agree. This was a big change in the law.

Furthermore, in 1986, the Dowry Act was incorporated into the amendment of Sections 113A and 113B of the Indian Evidence Act, which address dowry death.

SUGESSTIONS FOR EMPOWERIING WOMEN

Government takes a lot of efforts for empowering women at all sphere of life, but at the ground level we should Suo moto take more efforts. If we do not take the effort to empower women in our own families, how can we empower women at the national level? we discuss here some points for empowering women;

First and first, in order to empower women, we must give them with basic knowledge so that they are aware of their rights. Because education is the only weapon, we can use to make her aware of her fundamental rights. Dr Bhim Rao Ambedkar once said, "Shiksha hi Adhikaro ki Jananni hai," and our Indian constitution, under Article 21A, mentions the right to education. Every human being has the right to receive a basic education and stand on their own feet in order to strengthen themselves. So, provide them basic education first and then they will shine like a star in open sky.

Second, in order to empower women, they must be aware of any laws that may protect them against harsh actions or experiences in society. If they feel protected from this side, they will develop like a bamboo tree and reach her objective or ambition in life. Everyone wants to feel protected, so that they freely strive for their own growth.

Thirdly, Most Indian households are medium or lower class. If women are given authority, they are more likely to assist their families improve their level of living. Educated women can earn greater earnings, and fiscally empowered women can better educate their children, ending the poverty cycle. India is becoming the world's fastest expanding economy. However, it still has a long way to go. Women's empowerment has the potential to significantly enhance the national economy. According to study, boosting the proportion of women finishing secondary education by only 1 percent may boost a country's economic development by 0.3 percent.

CONCLUSION

Women's empowerment is more than simply a notion or a national goal; it is essential to the nation, just as humans require air to exist. My goal in writing this paper is to show that while women's positions in society were not favourable at the time, people today consider their daughters' future. So, we should constantly respect our mother, sister, and daughter for their presence in our lives, as well as the job they perform for us. Women's empowerment not only benefits nations, but also improves our family situations.

This document seeks the attention of the government to implement more policies for women's empowerment, to boost national pride, and to provide more opportunities for women to live the way they wish to live.

"A woman is like a tea bag — you can't tell how strong she is until you put her in hot water." — Eleanor Roosevelt

⁶ Bharatiya Nagarik Suraksha Sanhita 2023. s. 53

⁷ Bharatiya Nagarik Suraksha Sanhita 2023. s. 32

⁸ Bharatiya Nagarik Suraksha Sanhita 2023. s. 49



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PROJECT WRITE ON: A REMEDIAL INSTRUCTION TO ADDRESS WRITING SKILL DIFFICULTIES ON ENGLISH LANGUAGE COMPOSITION

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ABSTRACT

This action research sought to determine the students' writing skills before and after using the Project Write On. This exploration also measured the effect of PWO on students' knowledge in writing. Additionally, the study investigated the challenges encountered by the research participants and their coping mechanisms in addressing the problems they experienced. The study used sequential explanatory research. The research participants consisted of thirty (30) students from the Humanities and Social Sciences (HUMSS) strand of Zamboanga del Sur National High School – Senior High during the school year 2023-2024. The students obtained below-normal scores before the utilization of PWO, but the performance of the students in writing tests significantly improved after the intervention. The drastic shift in students' writing skills proved the effectiveness of the Project Write On to the students. The participants experienced four (4) major problems or challenges: (1) Insufficient Knowledge on English Grammar (2) Lack of English Vocabulary, (3) Difficulty on Sentence Structure, and (4) Struggle with Spelling. Furthermore, the research participants articulated their four (4) coping mechanisms in handling the challenges encountered in the implementation of Project Write On: (1) Critical Thinking on Grammar Usage (2) Practicing the Language (3) Following the Basic Structure in Writing, and (4) Seeking Assistance from Classmates & Teachers. The findings of this research support the conduct of a learning program to capacitate the students in their writing skills and enhance the pedagogical skills of the Peer Tutors of the school.

KEYWORDS: *Project Write On, self-made learning activities and worksheets*

CONTEXT AND RATIONALE

Ensuring compliance with the standards and requirements set by the Department of Education (DepEd) for K–12 graduates require a thorough examination of K–12 pupils. The Early Language, Literacy, and Numeracy Program should be implemented to help every child develop writing abilities. This was stressed by Education Secretary Leonor Briones and DepEd Order No. 18 series 2017 (Department of Education 2017, 1). While a large body of research has been done on literacy programs, relatively little of it has concentrated on literacy-writing. Writing is seen as a necessary ability for effective language development. Unlike when we speak, writing is an activity that is typically done in both a private and public capacity. It is public because most writing is meant for an audience—often one that is very hard to define—but it is private since composing is by its very nature a solitary process. Writing is an act distinct from speaking. It is less spontaneous and more permanent, and the resources which are available for communication are fewer because we cannot - as we do in conversation - interact with the listeners and adapt as we go along (Ahn, 2012). Hence, English writing has a great impact on the entire system of education, because it is the primary source of world knowledge. According to Deane (2018), writing is the most significant development in human history. It is a way of exchanging knowledge, information, thoughts and opinions with other countries of the world from one generation to another.

The Department of Education is aware that remedial courses are already being used by many schools to correct any learning gaps in their student body. Schools are advised to frame programs and interventions with the constraints provided in the guiding principles for resolving learning gaps in order to expedite the process and guarantee a more scientific approach to closing learning gaps. Fast interventions for correcting gaps must be implemented, according to DepEd Order No. 39 series 2012, since students will find it difficult to catch up if their comprehension gaps are allowed to grow (Department of Education, 2012).

One of the biggest issues affecting hundreds of students learning English as a second or foreign language is writing difficulties. Owing to the pressures placed on students by academic writing, such as English composition in senior high school, ZSNHS-SHS pupils only received a 43% in the Reading and Writing course, according to MPS data collected during the 2022–2023 academic year. Magsambol (2020), who said that senior high school pupils find it difficult to write in English, concurs with this. Conducting a study is crucial to determine whether students experienced significant challenges while writing reports, essays, and summaries, as well as what abilities they are able to employ when requested to compose in English.



For the practicing user, writing is usually a relatively easy and fluent task, but for foreign learners, fluency frequently comes at the sacrifice of accuracy. However, because writing rules are more stringent than speech conventions and we are less tolerant of deviation, it is imperative that writers maintain accuracy (Yunus et al., 2013). Thus, in order for students to create better compositions, they should have access to sufficient language resources; nevertheless, some students in today's classrooms are not as proficient in this area. Writing is more than merely scribbling words down on a paper or computer screen. It also involves composition, or the creation of texts that have the ability to speak even when the creator is not there. It is therefore more difficult to learn because it is a more intricate and demanding process than reading. Teachers have a crucial responsibility to help pupils develop their writing skills, which calls for extensive planning.

The researchers' submissions of English-language works demonstrate that, as English teachers of grade XI, they truly have a problem with writing skill problems in the language. It is concerning to learn that even though they are in their senior year of high school, they are still unable to compose well.

In keeping with the aforementioned realities, solving the issue will need action. In order to create an intervention program based on the identified needs, this study aims to ascertain how the Project Write On program has affected students' writing challenges in English language composition in Humanities and Social Sciences XI of Zamboanga del Sur National High School—Senior High School—during the school year 2023–2024.

Innovation, Intervention, and Strategy

Project Write on is a remedial instruction that aims to help improve students' writing skill specifically those who are struggling writers. It is designed with 5 phases which are arranged logically from the basic to the complex one. This initiative has been realized due to the low MPS Results of the students in Reading & Writing subject last school year.

In the realm of education, the acquisition of proficient writing skills in the English language stands as a cornerstone for academic success and effective communication. However, a growing concern permeates classrooms as educators grapple with the challenges presented by students experiencing difficulties in mastering the art of composition. Recognizing the pivotal role that writing plays in both scholastic and real-world contexts, this research embarks on a journey to initiate remedial instruction tailored to address the nuanced complexities of English language composition.

The initiation of remedial instruction represents a proactive response to the pressing need to bridge the gap of students grappling with writing skill difficulties. By delving into the intricacies of these challenges, we seek to unravel the root causes, identify effective intervention strategies, and lay the groundwork for a comprehensive remedial program. This research aspires to contribute not only to the academic understanding of writing difficulties but also to the practical implementation of targeted instructional methodologies that empower students to navigate and excel in the realm of written expression.

This study proposed a self-made learning activities and worksheets to address the writing skill difficulties of students on English Language Composition. The intervention program has five parts which are stated below:

The Part 1 is Writing a Short Composition About Oneself where students will have to fill out words or phrases on the blank portions of the given composition. This activity will help the learners understand how to connect ideas in compositions and develop their vocabulary and word choice. According to Vygotsky's ZPD(1978), effective learning occurs when students engage in tasks that are just beyond their current level of competence but achievable with support. Writing about oneself allows students to draw upon their personal experiences, making the task more accessible and providing a supportive foundation for further writing development.

The Part 2 is Composition Writing Based on Given Pictures wherein the students will say something about the given pictures by writing it on the space provided for them. According to Lynell Burmark (2002) of *Visual Literacy: Learn to See, See to Learn*, and Neil Cohn (2014) *Visual Language: Perspectives for Both Makers and Users* that Visual literacy is the ability to interpret and create visual messages. Writing compositions based on given pictures integrates visual elements into the writing process. The theory emphasizes the importance of understanding and effectively communicating through visual forms. This theory collectively contribute to the understanding of how incorporating visual elements, such as pictures, into writing activities can enhance learning and cognitive processes.

The Part 3 is Fragments and Run – on Sentences Identification where students will find out whether the given phrase is a fragment or a run-on sentence. They will then correct the fragments and run-on sentences. The identification and correction of fragments and run-



on sentences align with principles from various linguistic and writing theories. According to the books of *Teach Writing as a Process, Not a Product* by Donald M. Murray (1972), and *The Composing Processes of Twelfth Graders* by Janet Emig (1971) that writing process model emphasizes the importance of revision and editing. Identifying and correcting sentence errors, such as fragments and run-ons, are integral steps in the writing process. This linguistic and writing theory collectively contributes to the understanding of why identifying and correcting fragments and run-on sentences is crucial for effective communication and writing proficiency. They provide a foundation for teaching and practicing grammatical conventions within the broader context of language and writing theories.

The **Part 4 is Guided Story Writing** wherein the teacher will state a short introduction and then the students will continue the story. Here they could broaden their thinking and imagination while completing the story. The practice of guided story writing aligns with principles from various educational theories and instructional approaches that emphasize creativity, narrative development, and collaborative learning. One of these theories is the Vygotsky's Zone of Proximal Development (ZPD) of Lev Vygotsky. It suggests that effective learning occurs when students engage in tasks just beyond their current level of competence but achievable with support. Guided story writing offers guidance and support, allowing students to develop their narrative skills within their zone of proximal development.

The **Part 5 is Journal Writing** where students will write journal about their learnings from part 1 to part 5 of the intervention. According to Donald Schön (1983) of *The Reflective Practitioner: How Professionals Think in Action* that reflective practice involves self-awareness and critical reflection on experiences. Journal writing provides a structured avenue for individuals, including students, to reflect on their thoughts, experiences, and learning processes.

This intervention was designed to meet the students' need of addressing their writing difficulties on English language compositions and the activities were designed in ascending order of difficulty. The teachers checked religiously the students' output using a rubric with complete indicators for the students to be acquainted with their mistakes and progress.

Teaching-writing was done actively and explicitly in a developmental sequence. It used multi-sensory teaching to incorporate all the senses in a fun and engaging way, ensuring that all children learn regardless of learning style or background (Smith, 2015).

ACTION RESEARCH QUESTIONS

The principal objective of this action research is to ascertain the effect of Project Write On on the writing difficulties in English language composition faced by students in Humanities and Social Science XI at Zamboanga del Sur National High School – Senior High School (ZSNHS-SHS) during the school year 2023-2024. The anticipated outcome of this study is to share the research findings and best practices to other educators and stakeholders, contributing to the field of English language composition.

Specifically, this action research seeks answers to the following queries:

1. What is the students' level of writing skill difficulties on English language composition before the Project Write On?
2. What is the students' level of writing skill difficulties on English language composition after the Project Write On?
3. Is there a significant difference of the level of students' Mastery on English language composition before and after the Project Write On?
4. What problems did the students encounter during the Project Write On?
5. What coping mechanisms did the students employ after they encountered the problems?
6. What remedial instruction can be employed to develop students' mastery on English Language composition?

ACTION RESEARCH METHODS

Research Design

This study utilized a mixed methods sequential explanatory design, wherein quantitative and qualitative data are analyzed sequentially. After employing the Project Write On and completing the self-made learning activities and worksheets, research participants answered the researcher-made questionnaire to redetermine the students' mastery level in writing compositions. Pre-test and Post-test results were compared to find out any differences after employing the innovation.

This design is appropriate for this study which started with a quantitative description and comparison of students' writing skills before and after applying the Project Write On self-made learning activities. This exploration was followed by a subsequent qualitative phase on the problems and coping strategies to the challenges encountered by the students-respondents.



Participants and Other Sources of Data and Information

The study involved a total of thirty (30) Grade 11 students from Zamboanga del Sur National High School- Senior High School, specifically from the Humanities and Social Sciences Strand (HUMSS).

Students who had an equivalent achievement level of utmost average down to absolutely no mastery during the Pre-test were delegated into the learning program. In addition, purposive sampling method is used, which means that the participants were selected based on the lowest score got during the Pre-test. Non-probability sampling was used in choosing samples for the qualitative investigation in this action research. Data saturation was also utilized to determine the number of students who will supply information about the problems/challenges encountered during the project write on and the coping mechanisms that they have employed after they encountered the problems.

Research Instruments

The first research instrument used in the study is the validated teacher-made essay test on Students' Writing Skills. This instrument underwent content validation by the expert validators. The writing skills test captured four (4) criteria as reflected in the Scoring Rubric for Composition Writing Activity which was adopted from Generalitat de Catalunya and was modified by the researchers (Appendix B).

The second instrument used in the conduct of research is the interview guide which identifies the problems and coping mechanisms for the challenges encountered by the students on writing English language composition. This interview guide was validated by content experts to ensure the validity of the data collection.

Data Gathering Procedure

In order to uphold the integrity of the research procedure, the researchers received permission from the Office of the Principal to carry out the study at the school level. Before deciding to participate as research subjects, the chosen students were asked for their informed consent.

As part of the initial stages of the data collection procedure, participants were informed of the privacy of any information obtained. The data collected is only utilized for the study. The study's relevance and significance, the explanation of risks and benefits, the required degree of commitment, and confidentiality protection were all brought up in the researcher's reminders to the research participants.

In this action research, both quantitative and qualitative data were progressively examined using the Sequential Explanation Design. Participants in the study responded to a validated researcher-made post-test to reassess the degree of their writing skills after using the Project Write On self-made activities and finishing the learning program. Results from the pre-test and post-test were compared to see if the innovation had made any difference.

The interview method through a questionnaire was used to solicit qualitative data on the problems/challenges identified by the students regarding students' problems encountered and their coping mechanisms to address those problems/ challenges.

This intervention was done in a span of almost 2 months from the 1st stage to the last stage considering the 5 phases students must undergo.

DATA ANALYSIS

Descriptive and inferential statistics were employed to analyze this study's quantitative data. Specifically, mean, standard deviation and Mean Percentage Score (MPS) were utilized to summarize the level of students' writing skills before and after using Project Write On. From DepEd Memorandum No. 160, s. 2012, the degree of learners' writing abilities, the scaling of their score, and its descriptive equivalent are displayed here and have been modified to fit.



Table 1. Mastery/Achievement Level

MPS	Descriptive Equivalent
96 – 100%	Mastered
86 – 95%	Closely Approximating Mastery
66 – 85%	Moving Towards Mastery
35 – 65%	Average
15 – 34%	Low
5 – 14%	Very Low
0 – 4%	Absolutely No Mastery

Inferential statistics such as the paired-sample t-test was employed to determine the significant difference in the students' writing skills before and after using Project Write On. Moreover, thematic analysis was also utilized in inducing the themes of the qualitative data on students' difficulties in writing English language composition and their coping mechanisms to address those challenges.

RESULTS AND DISCUSSION

Level of Students' Writing Skills. Students took two (2) sets of writing tests. The first was before the application of the Project Write On, and the next test was after the application of Project Write On.

Table 2. Level of Students' Writing Skills Before Project Write On

Test	Mean Score	SD	MPS	Descriptive Equivalent
Writing Test	17.37	4.13	43.42%	Average

Total Items: 40

Scale: 96 – 100% = Mastered; 86 – 95% = Closely Approximating Mastery; 66 – 85% = Moving Towards Mastery; 35 – 65% = Average; 15 – 34% = Low; 5 – 14% = Very Low; 0 – 4% = Absolutely No Mastery

Table 2 shows that the level of students' writing skills before Project Write On disclosed as Average (*Mean = 17.37; SD = 4.13; MPS = 43.42%*). The mean indicated that the students would typically get below 50% of the total items in every writing test conducted. The standard deviation proved that most students who took the test did not score more than 54%. Considering the years spent at school, the students obtained below-standard scores on the writing test. Moreover, the students demonstrated unsatisfactory performance in writing English language composition. The school had some students with a low level of writing skills.

Among the four (4) criteria used in the writing test which was reflected in the Scoring Rubric for Composition Writing Activity (*See Appendix B*) The main idea is clearly stated but not well organized in terms of unity, coherence, & cohesion. These results indicated the need to capacitate and enhance the student's skills in writing English language composition. Writing appears to be as a medium for conveying ideas, information, and thoughts. The elements of clarity, organization, unity, coherence, and cohesion contribute to the effectiveness of communication in writing. When the main idea is clearly stated but lacks organization and coherence, it diminishes the impact of the message and underscores the importance of developing these writing skills for effective communication. However, some teaching strategies that try to utilize is the writer's workshop approach which involves students working independently and collaboratively in a workshop setting. It emphasizes choice, feedback, and revision. Teachers confer with students individually to provide targeted feedback and support (Calkins, 1983).

Table 3 confirms the effectiveness of the Project Write On as the interpretation change to Moving Towards Mastery (*Mean = 32.87; SD = 4.93; MPS = 82.17%*). On average, the students got 82% of the given rubric to the total items in the writing test. The standard deviation substantiated that more students could score up to 95% of the total items. The student's performance in writing tests significantly improved after Project Write On. The results inferred that the students could carry out good results with the help of the self-made learning activities and worksheets, and their teachers. A notable increase in MPS is conspicuous after Project Write On.

Table 3. Level of Students' Writing Skills After Project Write On

Test	Mean Score	SD	MPS	Descriptive Equivalent
Writing Test	32.87	4.93	82.17%	Moving Towards Mastery

Total Items: 40

Scale: 96 – 100% = Mastered; 86 – 95% = Closely Approximating Mastery; 66 – 85% = Moving Towards Mastery; 35 – 65% = Average; 15 – 34% = Low; 5 – 14% = Very Low; 0 – 4% = Absolutely No Mastery



Among the four (4) criteria used in the writing test which was reflected in the Scoring Rubric for Composition Writing Activity, Vocabulary reported low levels of writing skills. This result convincingly shows the benefits of the Project Write On to the students. Positive evaluations praised the researchers' inclusive communication style and clarity. Although research cannot verify that attending workshops was the single factor in improving performance, it does indicate the benefit of early interventions to promote writing skills (Choudhary and Malthus 2017, 1-22).

Table 4. Test of difference before and after Project Write On

Variables	t-value	df	p-value	Interpretation
Before and After Project Write On	-19.09	29	.001	With Significant Difference

Test of difference of students' writing skills before and after the Project Write On. In this action research, the researchers used a paired-sample t-test to ascertain whether there was a significant difference between the students' writing abilities before and after Project Write On. The mean results of the students' writing examinations are shown in Table 4. (T-value = -19.09; p-value = .001). It showed that there is a substantial difference in the students' writing abilities before and after Project Write On. The fact that the students' performances significantly improved suggested that the five (5) Parts of the self-made learning activities and worksheets of the Project Write On were effective in developing their writing skills on English language composition.

The outcome revealed that using Project Write On significantly improved students' writing abilities. Prior to Project Write On, the students' writing abilities were not very strong. However, with the aid of the five (5) Parts of the self-made learning activities and worksheets after Project Write On, the students increased their knowledge and ability levels in writing English language composition. Developing writing skills is a valuable investment that can positively impact various aspects of personal and professional life. It is a skill that can be applied across disciplines and is essential in many different contexts. Like numeracy, literacy is a skill that every person should be able to use (Steen 1999, 8-13).

One of the key benefits of the Project Write On is that it promotes active learning and engagement among students. By encouraging students to write, ask questions and participate in the learning process, they become more invested in their education and take ownership of their learning. This method leads to more excellent retention of information, as students are more likely to remember and apply concepts they have actively engaged. Project Write On also encourages students' interaction and discussion, which is a bonus. Students learn cooperation and communication skills, which are crucial for success in both academic and professional settings when they are encouraged to collaborate.

Project Write On also encourages students to have a growth mindset, which encourages them to see barriers as opportunities for learning and development rather than things to fear. In general, the Project Write On is a cutting-edge method of instruction that can greatly enhance students' writing abilities. Teaching students to develop writing skills can provide them with a wide range of benefits that extend beyond the academic setting. By emphasizing and encouraging critical thinking, active learning, teamwork, and a growth mindset, this method aids students in acquiring the skills necessary to thrive in school and preparing them for success in various aspects of their lives. As a result, educators ought to think about incorporating it into their teaching methods.

Problems/Challenges Encountered by the Respondents in doing the activities

A particular section was identified for the research. From a class of 57 students, 30 was then chosen to be the respondents of the Project Write On. These students were identified based from the scores they got after given a topic to write about. Following the rubrics, their papers were corrected and scored. The 30 students who got the lowest scores were then identified to be the respondents who will undergo a massive tutoring from the researchers.

Using textual analysis of the qualitative responses, the respondents experienced four (4) major problems or challenges: (1) *Insufficient knowledge on English Grammar* (2) *Lack of English Vocabulary*, (3) *Difficulty on Sentence Structure*, and (4) *Struggle with Spelling*.

Theme 1: Insufficient Knowledge on English Grammar Several respondents expressed that they find it hard to identify if their grammar is correct when they are writing. This had been the major problem of most of them. The research participants (RP) disclosed the following:



"I did not master the grammar that's why I find it difficult to compose a sentence". – RP 5

"I encountered a lot of problems especially in grammar. When I'm writing, I am not sure if my grammar is correct". - RP 15

"My problem is that I don't know much about grammar. I want to correct some of my mistakes but I also lack knowledge about it".
-RP 7

"When I'm writing, I am not sure if my grammar is correct. This is the most difficult part I always encounter when writing" -RP 1

"The problem that I encountered during writing was my grammar. I'm still trying to improve my grammar in many ways, and sometimes my brain would just stop and I've nothing to say". – RP 9

Theme 2: Lack of English Vocabulary. English vocabulary plays a crucial role in effective communication and language proficiency. A lack of vocabulary can hinder one's ability to express thoughts. This is one of the problems encountered as they disclosed:

"Ang problema ko kapag ako ay nagsusulat ay ang paggamit ng englis dahil hindi ko kabisado ang mga ibang salita sa englis at paggamit ng wastong wika." RP 26

"I have encountered difficulties in finding the right words to use in writing."
RP 16

"Nahirarapan po talaga ako sa pagsusulat gamit ang wikang englis." RP 18

"Marami akong mga na-encounter na problema during the activities. Isa na rito ay hindi ako bihasa sa paggamit ng wikang englis kaya nahihirapan talaga ako sa pag-compose ng mga salita." RP 17

"For me, writing is not easy. I keep on asking my classmate and teacher about the english terms of the words I am using". RP 13

Theme 3: Difficulty on Sentence Structure Sentence structure can indeed pose challenges for many students. It is important to construct sentences that are clear, concise, and grammatically correct. According to Harris (1989) "Mastering sentence structure is like building a strong foundation for a house. It requires attention to detail, understanding of grammar rules, and practice to create sentences that effectively convey meaning and engage readers."

This quote highlights the importance of understanding sentence structure as a fundamental aspect of writing. By paying attention to sentence construction and practicing different sentence types, students can enhance the clarity and impact of their writing. Thus, they emphasized their difficulties as they revealed:

"For me, there are many techniques in writing. I have difficulties in putting my sentences together to make a paragraph." -RP 20

"Ito ay napakahirap sa akin sapagkat susubukin ka nito kung gaano ka katalino, gaano ka kagaling sumulat at mag-compose ng sentence." -RP 11

"I literally had a hard time when it comes to constructing a sentence, nahihirapan talaga ako sa pagbuo ng words." -RP 8

Theme 4: Struggle with Spelling. Struggling with spelling can be a common challenge that many students face. Spelling difficulties can arise from various factors, such as language differences, learning disabilities, or lack of exposure to proper spelling conventions. It can be frustrating and impact one's confidence in written communication. However, it's important to remember that spelling is a skill that can be improved with practice and targeted strategies. The research participants (RP) expressed the following:

"I encountered a lot of struggles especially in spelling. However, I kept coping up with it through checking the spelling of the words from the internet or asking my classmates or teachers." -RP 15

"I have encountered difficulties in finding for the correct spelling of the words I am using in writing." -RP 16



“The problem that I encountered is finding for the correct spelling of the difficult words.” -RP 3

“Hindi naman sobrang laki ng problema ko sa pagsusulat. Minsan kasi hindi ko alam ang spelling ng mga words kaya nahihirapan ako, ‘yun lang naman.”-RP 10

Writing is a complex task that requires various skills such as organization, vocabulary, grammar, punctuation, and creativity. While some individuals excel in this area and find writing to be effortless, others struggle with the process and face various difficulties. One of the most difficult problems identified is the insufficient knowledge on English Grammar. Grammar is an essential component of language that governs the structure and usage of words and sentences. It provides a set of rules and guidelines that enable effective communication. A good understanding of grammar is crucial for expressing thoughts and ideas accurately, as well as for comprehending written and spoken language. Grammar, perfectly understood, enables us not only to express our meaning fully and clearly, but so to express it as to enable us to defy the ingenuity of man to give to our words any other meaning than that which we ourselves intend them to convey (Whately 1853).

Moreover, the Lack of English Vocabulary has also become a struggle to most of the respondents. They tend to pause or even stop writing due to lack of words to use or they simply do not know the English term of the word they want to use. As said by Jonson (1759), "Language is the dress of thought." One cannot express his/her thought if he/she lacks knowledge of the language.

Added more, the participants also experienced difficulty on sentence structure. Sentence structure is an essential aspect of writing. It refers to the arrangement of words in a sentence, including their order, formation, and punctuation. The way sentences are structured plays a crucial role in conveying meaning and maintaining clarity in written communication. Furthermore, understanding sentence structure allows one to create varied and sophisticated sentences that effectively convey his/her intended message. Good writing is built on solid sentence structure; it is the foundation upon which all other elements of the written word are built (Zinsler 1976).

Aside from these, struggle with spelling has also been identified a problem. This is a challenging and frustrating experience. Correct spelling is important as it ensures that our written messages are clear, coherent, and easily understood by the reader. It is a small part of good writing, but a crucial one (Truss 2003). Thus, incorrect spelling can lead to confusion, misinterpretation, and even hinder effective communication.

Coping Mechanisms for the Challenges Encountered by the Research Participants while participating in the project Write On.

Based on the coping mechanisms for the challenges encountered by the research participants, they had articulated four (4) major categories: (1) *Critical Thinking on Grammar Usage* (2) *Practicing the Language* (3) *Following the Basic Structure in Writing*, and (4) *Seeking Assistance from Classmates & Teachers*.

Theme 1: Critical Thinking on Grammar Usage Critical thinking on grammar usage involves evaluating and analyzing the way grammar rules are applied in writing or speech. It requires examining the clarity, coherence, and effectiveness of grammar usage in conveying ideas. Applying critical thinking in checking for the grammar usage in writing means trying to figure out the mistakes, making it grammatically correct. This is what the research participants tried to do as they expressed:

“The coping mechanism that I employed was thinking thoroughly. I used simple words first and tried my best in constructing a sentence, and then a paragraph.” – RP 28

“After joining Project Write On, I had learned a lot. I now know some basic rules in writing, and I usually do critical thinking.” – RP 29

“I was able to cope up because my brain was functioning well. I was able to write through critical thinking.” – RP 2

“Nalampasan ko po ang mga challenges na na-encounter ko sa pamamagitan ng pag-iisip at pag-iintindi ng mga salita.” – RP 26

“ Even though I was having a hard time, I tried my best to construct a sentence. Pinipilit kong intindihin ang mga panuto at tanong upang makakapagsulat ako.” – RP 23



Theme 2: Practicing the Language. Practice makes perfect. Practice extends beyond specific skills and contributes to personal development. It fosters perseverance, resilience, and the ability to overcome obstacles. Regular practice in writing helps to enhance overall writing skills. By consistently engaging in writing exercises, individuals become more proficient in grammar, vocabulary, sentence structure, and overall coherence. This is how some of the RP did as they revealed:

:

“I keep learning. I think you need to know yourself, know your weakness and try to develop it. Practice speaking & writing using the English language so that you will learn many words.” – RP 15

“ Sometimes I struggle in writing especially using the English language. So what I did, nagbabasa ako ng dictionary sa aking free time para naman madagdagan ang aking kaalaman. -RP 24

“ Binibigay ko ang aking makakaya at ginagawan ko ito ng paraan para ma-develop pa sa pamamagitan ng pagbabasa ng mga aklat upang madagdagan ang aking kaalaman sa wikang englis.” – RP 7

“I usually challenge myself. I just keep on writing and writing so that I could practice it. I know that time will come that I won't anymore struggle writing.” – RP 30

Theme 3: Following the Basic Structure in Writing. Effective writing is essential for clear communication and conveying ideas accurately. To achieve this, it is crucial to follow basic rules in writing. A well-organized and structured piece of writing is easier to comprehend and follow. This is evident to some of the RP as they shared:

“I cope up with my problem through following the basic structure. I start with the introduction, body, then conclusion.” – RP 18

“I choose simple words in writing and follow the basic structure in writing. What's important is I was able to write through following basic structure in writing.” – 17

“The first thing I did was use a simple tense to emphasize my thoughts and ideas, and to cope up with my problem in writing.” – 9

“I applied what my teacher taught us like how to write following the basic structure.” – RP 23

“Ang ginawa ko upang malampasan ang binigay na activities ni ma'am ay sinunod ko ang mga itinuro n'ya sa amin.” – RP 21

Theme 4: Seeking Assistance from Classmates & Teachers. It is beneficial to seek assistance from people around you. Collaborating with others can bring fresh perspectives and insights to your writing process. They can provide constructive criticism, identify areas for improvement, and offer suggestions to enhance your work.

This is why few of the RP seeks assistance from the people around them as they stressed:

“I coped up with the problems encountered especially on spelling through asking my classmates about the spelling of some difficult words. Sometimes, I also ask my teachers or check it from the internet.” – RP 16

“Ang aking ginawang diskarte ay nagtatanong po ako sa aking kaklase lalo na sa spelling ng mga mahihirap na salita.” – RP 22

“Nagtatanong-tanong po ako sa aking mga katabi lalo na sa spelling po kasi nahihirapan ako dito. Minsan, tinatanong ko rin po ang guro namin at humihingi po ng permiso na tingnan sa dictionary ang spelling ng mga words na di ko sigurado ang spelling.” – RP 4

“I usually ask my seatmate of the spelling of some words. I'll let him/her see my work to check if it's correct especially my spelling.” – RP 1

Improving writing skills requires patience, practice, and the implementation of effective coping mechanisms. By thinking critically, constant practice, following the basic structure, and seeking assistance from others, individuals can enhance their writing abilities and overcome common challenges. Remember, writing is a skill that can be developed and refined over time, and with consistent effort, you



can become a more confident and proficient writer. After all, according to Doctorow (2000), writing is an exploration. You start from nothing and learn as you go.

Initiating Remedial Instruction to Address Writing Skill Difficulties on English Language Composition

Based on the study's findings, the researchers had created an initiative to boost students' writing skills. Select HUMSS students of Zamboanga del Sur National High School were being engaged on Project Write On to improve their writing skills. This initiative supports the directive of the Department of Education to produce prepared and high-quality graduates of the K-12 Basic Education Program.

CONCLUSION AND RECOMMENDATIONS

This study, which aims to determine the impact of Project Write On on students' writing skills, concluded that the use of Project Write On significantly improved students' writing skills as revealed by the pretest and post test comparison of results. The remarkable increase in students' performance after the tutorial session warrants the claim that Project Write On is efficient in improving writing skills. Thus, Project Write On provides opportunities for learners to strengthen critical thinking, questioning, and dialogue to stimulate learning. Moreover, the thematic analysis induced four (4) major problems or challenges encountered by the peer tutors in handling their peers such as (1) Insufficient knowledge on English Grammar (2) Lack of English Vocabulary, (3) Difficulty on Sentence Structure, and (4) Struggle with Spelling. Furthermore, the research participants articulated their four (4) coping mechanisms in handling the challenges encountered in the implementation of Project Write On: (1) Critical Thinking on Grammar Usage (2) Practicing the Language (3) Following the Basic Structure in Writing, and (4) Seeking Assistance from Classmates & Teachers. The findings of this research also recommend further exploration of the phenomenon, such as examining case studies or anecdotal evidence of the Project Write On being used in teaching contexts. While these may not deliver immediate quantitative evidence of effectiveness, they can offer valuable insights and practical examples. Further research on the effectiveness of the Project Write On is also recommended since the context in which the initiative is taking place, and the specific goals through which Project Write On is implemented may vary depending on the subject, grade level, and individual learners.

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The researchers guaranteed that this study's findings would help the school to produce quality graduates, capacitate the students in their writing skills, and convey the problems/challenges encountered in the implementation of the project write on.

To the Almighty Father, who is constantly patient, loving, provider, and merciful to the researcher, the researchers always glorify His name!



Action Plan



Republic of the Philippines
 Department of Education
 Region IX, Zamboanga Peninsula
 Division of Pagadian City
 Zamboanga del Sur National High School – Senior High
Pagadian City



Capacity-Building Intervention for the Students Project Write On

School Year 2023 – 2024

Subject Focus	Program Description	Objectives	Strategies/ Activities	Time Frame	Persons Involved	Sources of Fund	Expected Outcome
ENGLISH	School Training to English Teachers.	Equip and train the selected English Teachers about the Project Write On (PWO).	Seminar-Workshop in Capacitating the selected English Teachers regarding the Project Write On (PWO).	October 2, 2023	Proponent/ Select Experts/ Teachers	None	*Equipped and trained Teachers on the Project Write On. *Streamlined the workshop process.
ENGLISH	Workshop Sessions employing the Project Write On.	Enhance the students' writing skills through the Project Write On.	Workshop sessions for the identified students having low writing skills based on the writing test. Conduct the Five (5) Parts of self-made learning activities and worksheets	October 3- November 30, 2023	Proponent/ Teachers/ Students	None	Enhanced students' writing skills.



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Financial Report

The table below shows the cost estimates expended before, during, and after conducting this action research.

General Descriptions	Quantity	Unit	Unit Price	Total Estimated Costs
Short Bond paper sub. 20	3	reams	275.00	825.00
Ink for printer	4	bottles	271.25	1,085.00
Internet Costs			1,000.00	1,000.00
Printing and Binding	5	copies	60.00	300.00
Ballpen	2	pcs	20.00	40.00
Snacks (50 participants)	50	pax	35.00	1,750.00
Total				5,000.00



Appendix A



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 Division of Pagadian City
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Appendix B
Scoring Rubric for Composition Writing Activity

Scoring criteria	Beginning 3	Developing 5	Approaching 8	Exemplary 10	Score
1- Main Idea/ Topic	The main idea or topic is difficult to understand. There is no organization of ideas, unity, coherence & cohesion.	The main idea or topic is misleading. Tried to apply some properties of well-written text but not properly organized.	The main idea is clearly stated but not well organized in terms of unity, coherence, & cohesion.	The main idea is clear & well organized. It is evident that the writer has a vast knowledge on the properties of well-written text.	
2 - Vocabulary	The vocabulary is poor. There are 6-8 words being repeated.	The vocabulary needs improvement. There are 3-5 repeated words used.	The vocabulary is better. There are only 1-2 repeated words used.	There is a wide range of vocabulary. There is no word being repeated.	
3 - Grammar	There is a poor grammar structure. Found 8-10 mistakes in grammar.	The grammar structure needs improvement. There are 4-7 grammar mistakes found.	The grammar structure is good. Found only 1-3 grammar mistakes.	The grammar structure is exceptional. There is no grammar mistake found.	
4-Spelling /Punctuation	Found 8-10 total mistakes in spelling and punctuation.	There are 4-7 total mistakes in spelling & punctuation.	There are only 1-3 total spelling & punctuation mistakes.	Found no mistake in spelling & punctuation.	



MODERN POSSIBILITIES OF EARLY DIAGNOSTICS LARYNX NEOPLASMS

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СОВРЕМЕННЫЕ ВОЗМОЖНОСТИ РАННЕЙ ДИАГНОСТИКИ НОВООБРАЗОВАНИЙ ГОРТАНИ

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Резюме. В статье описывается значение и эффективность видеоэндоскопии в ранней дифференциальной диагностике различных опухолевых заболеваний гортани, позволяющей выявить участки патологических изменений слизистой оболочки и определить специфический сосудистый рисунок, характерный для новообразований. На основании исследований, проведенных на кафедре оториноларингологии АГМИ, и анализа литературных данных, Оториноларингология обозначены возможности и перспективы внедрения видеоэндоскопии в практику отоларингологов.

Ключевые слова: видеоэндоскопия, рак гортани, нарушение голоса, гортань, голос, опухоли гортани, злокачественные новообразования.

Актуальность. Ранняя диагностика доброкачественных и злокачественных новообразований верхних дыхательных путей, в частности гортани, – одна из приоритетных задач, стоящих перед оториноларингологами в настоящее время. Успешное решение этой задачи позволяет достичь оптимальных терапевтических результатов, увеличить продолжительность и улучшить качество жизни пациентов. Усовершенствование методов визуализации позволяет повысить точность диагностики и результативность лечения опухолевых заболеваний гортани, а следовательно, улучшить восстановление и сохранение функций гортани [1].

По данным А. И. Пачеса, лишь у 30–40% вновь выявленных больных рак гортани диагностируется в I–II стадии заболевания, когда возможно применение органосохраняющего лечения и достижение 5-летней выживаемости без рецидивов и метастазов 70–80% пациентов [2]. Среди злокачественных новообразований на долю плоскоклеточного рака приходится до 98% случаев, в 0,5–2% случаев встречаются злокачественные неэпителиальные опухоли [2, 3]. Практически незаменимыми для решения вопросов ранней диагностики остаются эндоскопические технологии.

Современная диагностика заболеваний гортани основывается на эндоскопическом методе исследования, позволяющем оценить состояние органа на качественно новом уровне.

Наибольшее количество пациентов с заболеваниями гортани и нарушениями голосовой функции (дисфониями) составляют лица голосоречевых профессий. Поэтому диагностика заболеваний гортани остается актуальным разделом оториноларингологии.

Видеоларингостробоскопия позволяет количественно и качественно оценить показатели вибраторного цикла голосовых складок. Раннее выявление малигнизации считается самым трудным в процессе диагностики опухоли гортани и является в настоящее время почти единственным путем повышения эффективности лечения больных. В связи с этим трудно переоце-



нить значение эндоскопии гортани, которую широко применяют для осмотра гортани и глотки, а также при хирургических эндофарингеальных и эндоларингеальных вмешательствах.

Показания к проведению видеоларингостробоскопии:

- острые и хронические ларингиты,
- доброкачественные и злокачественные новообразования гортани,
- функциональные нарушения голоса,
- парезы и параличи гортани,
- стенозы гортани.

Наличие современного оборудования позволяет провести точную дифференциальную диагностику как функциональных, так и органических нарушений гортани и выработать правильную лечебную тактику.

Цель исследования. Провести точную дифференциальную диагностику как функциональных, так и органических нарушений гортани и выработать правильную лечебную тактику.

Материалы и методы: На основании анализа литературных данных и собственных наблюдений изучить возможности и эффективность НВИэндоскопии в дифференциальной диагностике хронической патологии гортани.

Существуют различные эндоскопические методы исследования, которые используются в современной медицине. Например, фиброларингология, видеоларингоскопия, высокоскоростная съемка гортани, аутофлуоресцентная эндоскопия и другие. Они позволяют расширить возможности врачей-специалистов. С помощью видео и фотофиксации ларингоскопической картины, специалисты могут получить доступ к доказательной базе, а также понять особенности заболевания и подобрать наиболее эффективную тактику лечения.

В течение 2020-24 гг. под наблюдением и обследованием в отделении отоларингологии клиники находилось 29 больных с хроническим гипертрофическим ларингитом в возрасте от 28 до 63 лет. Длительность заболевания составляла от года до 3 лет.

Периодически проводимое консервативное лечение этим больным давало только временное улучшение фонаторной функции. Шесть пациентов отмечали ухудшение фонаторной функции на фоне проводимой терапии. Всем пациентам было проведено исследование функции гортани ларингостробом.

По результатам обследования у больных была выявлена следующая патология. У 8 пациентов были выявлены ранние признаки формирования рака гортани, что потребовало в дальнейшем проведения этим пациентам радикального органосохраняющего хирургического лечения. Во всех случаях диагноз был подтвержден гистологически. У 16 больных диагностированы формирующиеся доброкачественные новообразования: в 12 случаях фиброма, в 4-х случаях – папиллома. Этим пациентам было проведено эндоларингеальное хирургическое вмешательство. Голосовая функция восстановлена в полном объеме во всех случаях. У 5-х пациентов был установлен диагноз функциональной дисфонии, что потребовало коррекции лечения и консультации фонопеда. Восстановление голосовой функции после коррекции лечения наблюдалось у всех пациентов этой группы.

Вывод. Сведения, полученные в ходе исследования, свидетельствуют о том, что видеозэндоскопия дает возможность получить информацию о морфологических изменениях слизистой оболочки гортани. С помощью данной технологии можно получить представление о том, как работает система в целом. Она является эффективным дополнением к стандартным методам визуализации, позволяющим оценить эффективность хирургического вмешательства, лечения при помощи лекарств или лучевой терапии, а также провести качественный динамический контроль за пациентами с целью раннего выявления рецидива, облигатного предрака.



Метод видеоларингоскопии доказал свою полезность в педиатрическом скрининге. Возможности получения изображения. Использование сверхтонких эндоскопов делает обследование понятным, неинвазивным и относительно простым. Использование сверхтонких эндоскопов. Эндоскопия является передовой технологией, и ее активное внедрение в практику отоларингологов позволяет решить ряд сложнейших проблем в дифференциальной диагностике. Проблемы дифференциальной диагностики патологии гортани. Применение видеэндостробоскопии гортани в комплексном обследовании пациентов позволяет повысить качество ранней диагностики новообразований гортани и помогает в выработке правильной лечебной тактики.

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SUSTAINABLE DEVELOPMENT GOALS IN KARNATAKA: A STUDY OF 'NO POVERTY' GOAL WITH SPECIAL REFERENCE TO HAVERI DISTRICT

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ABSTRACT

The Sustainable Development Goals (SDGs), also known as the Global Goals, were adopted by the United Nations in 2015 as a universal call to action to end poverty, protect the planet, and ensure that by 2030 all people enjoy peace and prosperity. Sustainable development aims to bring a balance between meeting the requirement of what the present demand while not overlooking the needs of future generations. Eradicating poverty in all its forms remains one of the greatest challenges facing humanity. While the number of people living in extreme poverty dropped by more than half between 1990 and 2015, too many are still struggling for the most basic human needs.

Achieving 'No Poverty' is one the SDGs and it is the main theme of the present study. In this direction, the current study focused and examined the status and performance of Karnataka state in eradicating poverty which is the first goal of SDGs. Hence, this paper highlighted on various programmes and policies initiated by Government of Karnataka to eradicating poverty. Further, this paper tried to highlight on the status of poverty in Haveri District of Karnataka State. This paper is purely based on secondary source of data and appropriate statistical tools have used for the data interpretation. At the end, some of policy suggestions are presented.

KEYWORDS: Sustainable Development Goals, No Poverty, Human Development,

I. INTRODUCTION

United nations 2030 agenda for sustainable development that includes 17 goals, 169 targets and 232 indicators to be achieved by 2030. The goals are interdependent and cover social, environmental and economic issues. These goals aim at ending poverty, protecting the planet and ensuring prosperity through equitable development and environmental sustainability. A new approach to sustainable development – threading together economic, social and environmental dimensions across the generations, acknowledging that decisions and approaches are related and have both synergies and trade-offs.

In India, Karnataka is among the top 5 states with 3rd position contributing Rs. 17.31 lack crore economy and 8.8% to national GDP. Maharashtra is in the first position and second position stands for Tamilnadu. The economy of Karnataka has reached 3rd position in India because of its contribution in sector wise income level, 14.3% of its GVA comes from agriculture while 19.4% from industry and remaining 66.3% from service sector. Compared to India's average per capita income (₹1, 45,680) Karnataka has higher average per capita income (₹2, 59,803). Because of the rise in Karnataka's average per capita income poverty ratio is decreasing.

The main reason for an increase in per capita income is due to “outcome based planning & budgeting” in Karnataka. Innovative approaches and strategies of the state are enhancing the development effectiveness of various programs and projects. This kind of innovative planning and strategy has enabled Karnataka to be in the top most States in India.

II. POVERTY IN KARNATAKA: AN ANALYSIS

Poverty is one of the most critical issues being faced by Karnataka Economy it has been defined variously by the scholars “poverty is conservatively measured by the expenditure or income level that can continue an exposed minimum standard of living”. . The planning commission has updated the poverty lines and poverty ratios for 2011-2012 based on the recommendations of Rangarajan committee using a household consumer expenditure survey. According to the data of the National Sample Survey Organizations (NSSO) 68th round, the poverty line at Karnataka level at monthly per capita expenditure (MPCE) of ₹ 975 for rural areas and ₹ 1373 for urban areas in 2011-12 the poverty ratio in the Karnataka has declined from 23.6% in 2009-10 to 20.91% in 2011-12 in absolute terms, the number of



poor declined from 14230 (no of persons thousand) in 2009-10 to 12976(no of persons thousand) in 2011-12 with an average annual decline of 1.12 percentage points during 2009-10 to 2011-12. Karnataka recorded 13.02% of poverty in 2020-21 against the India average of 17.9%.Karnataka aims to eradicate poverty completely in the state by 2030.

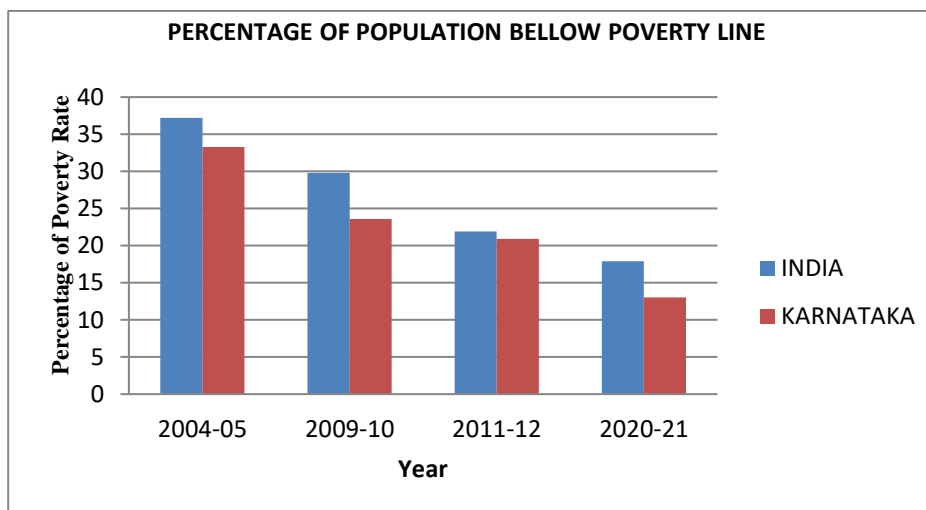
TABLE NO: 1. PERCENTAGE OF POPULATION BELLOW POVERTY LINE

Based on MRP Consumption	India	Karnataka
2004-05	37.2	33.3
2009-10	29.8	23.6
2011-12	21.92	20.91
2020-21	17.9	13.02

Note: Computed as Per Tendulkar MethodMRP (Mixed Recall Period)

Source: <https://www.rbi.org.in/scripts/PublicationsView.aspx?id=16603>

Karnataka's poverty line is continuously decreasing compared to the Indian poverty line. The poverty ratio has declined from 33.3% in 2004-05 to 23.6% in 2009-10 in Karnataka. The decline was thus a uniform 9.7% point's decrease over two year. Then 23.6% in 2009-10 to 20.91% in 2011-12 in Karnataka. The decline was thus a uniform 2.69% point's decrease over the two year. Then 20.91% in 2011-12 to 13.02% in 2020-21 in Karnataka. The decline was thus a uniform 7.89% point's decrease over the two year.



III. SUSTAINABLE DEVELOPMENT GOALS IN KARNATAKA

Karnataka is being one of the progressive states in the country compared to other states like Madhya Pradesh, Uttar Pradesh, Bihar, Telangana, Odisha, and West Bengal etc. Karnataka has goal wise committees identified around 605 total indicators which encompass national indicator (305) and additional state indicators (300), which is the highest number of indicators developed by any state in the country. Karnataka is being highly sensitive to universal development by organizing various programmes initiated by international institutions such as United Nations Development Programme (UNDP), World Bank, UN, and other organizations. The state has taken up the implementation and monitoring of SDGs and targets on priority basis. The planning, programme monitoring and statistics department is formulating strategies for attainment of sustainable development goals in Karnataka by 2030.

Karnataka State Level Action Plans for SDGs

2030 agenda needs to be supported & strengthened by the strategies & action plans at the state level. Karnataka state has developed AVALOKONA (New Decision Support System) platform that enable citizens to access data on budget & expenditures incurred.

1. State Level Steering Committee: - Effective & efficient action plan for SDGs
2. Separate Technical Cell: - Monitor the progress of various SDGs
3. Goal Wise Committee: - Every SDG identified indicators & additional state indicators
4. Nodal Officers: - Contribute to the goal as a member
5. Monitoring & Coordination Committee: - Budget requirements of SDGs



District Level Action Plan for SDGs

2030 agenda needs to be supported & strengthened by strategies & action plans at district level in Karnataka. The following are the action plans of Haveri district:- District Planning Committee (DPC):-This committee collects data for district with district specific targets to ensure the effective and efficient implementation of SDGs and evaluation of the development programmes.Public Affairs Centre (PAC).International Institute of Information Technology .

Sustainable Development Goals Coordination Centre (SDGCC)

As part of the Planning Department in partnership with United Nation Development Programme (UNDP). This center’s main intention is to achieve innovative action of the SDGs. This center’s motive is to attain the Vision of 2030: Strategies & Action Plan, Community Broadcast Programs: community radios are connecting to government schemes & programs, SDG Centre for youth engagement, SDGs for Youth, NGOs for SDGs, and Media for SDGs.

TABLE:2. Number of SDG Indicator Developed by Karnataka Based on National Indicator Framework

Goal Number	Goal	National Indicator	State Indicator	Total
1	No poverty	19	4	23
2	Zero hunger	19	38	57
3	Good health & well being	41	43	84
4	Quality education	20	10	30
5	Gender equality	29	21	50
6	Clean water and sanitation	19	20	39
7	Affordable and clean energy	5	12	17
8	Decent work and economic growth	40	26	66
9	Industry innovation and infrastructure	17	25	42
10	Reduced inequalities	6	37	43
11	Sustainable cities and communities	16	6	22
12	Sustainable consumption and production	17	8	25
13	Climate action	4	27	31
14	Life below water	13	11	24
15	Life on land	21	1	22
16	Peace, justice and strong institution	19	11	30
Total		305	300	605

(Source: Karnataka economic survey 2021-22)

According to the Karnataka economic survey 2021-22 information is already published by this paper, so we are going to conduct a study on national and state indicators regarding no poverty which is the first goal of sustainable development. Karnataka has adopted the national indicator (19), and state indicator (04), and total indicator (23) for no poverty, which is the first target of sustainable development. The goal of no poverty is included in the category of human development needs and services. Karnataka has already achieved 52nd rank in 2018, 49th rank in 2019 and 68th rank in 2020, in poverty eradication, the first goal of SDGs.

TABLE:3. SDGs measures is divided into four categories

S.NO	SCORE	CATEGORY	KARNATAKA
1	100 scorer	Achievers	First goal of ‘No Poverty’ performance score 68 this goal move to front runner category. Karnataka 10th ranks of no poverty performance. (Source: Karnataka economic survey 2021-22)
2	65 to 99 scorer	Front Runner	
3	50 to 64 scorer	Performer	
4	00 to 49 scorer	Aspirant	

IV.PROFILE OF HAVERI DISTRICT

Haveri district came into existence on 24th August 1997, in the state Karnataka with an allotted district code of 564. The district has the boundary of 4,823 sq km and occupies 21st rank in the State and 231st rank in India. It lies at 14°79’N latitude, 75°40’ longitude and 605m E altitude. In the year 2019, the district covered 7.12% forest area of total geographical area. Haveri district is divided into 7 talks,



10 towns and 696 villages. The district is exactly in the center of Karnataka with equal distance from Bidar in the far north and till Kollegal in the far south. It has two sub-divisions namely Haveri and Savanur with seven taluks namely Hanagal, Shiggaon, Savanur, Haveri, Byadgi, Hirekerur and Ranebennur.

PICTURE:1. KARNATAKA MAP



PICTURE:2. HAVERI DISTRICT MAP



HAVERI DISTRICT ECONOMY

According to 2011 census, the district has 3,25,456 total number of households with total population of 15,97,668 including 8,19,128 males and 7,78,540 females causing it to 18th rank in the state and 313th rank in India(2021 data projected total population is 18,38,540 including 9,51,476 males and 8,86,991 females).The districts total rural population is 12,42,167 including 6,38,450 males and 6,03,717 females causing it to 14th rank in the state and 275th in India. The district urban total population is 3,55,501 including 1,80,678 males and 1,74,823 females and causing it to 19th rank in the state and 269th in India. The density of population of the district is 331 persons per sq km. The sex ratio is pegged at 950 (females per 1000 males) while the child ratio stands at 946 (females per 1000 males). The population growth rate during the period 2001 to 2011 was 11.02% including 10.62% males and 11.44% females. In the year 2019 the number of live births in the district was 20,907 out of which 10,743 were males and 10,164 were females. In the same year the number of deaths in the district was 11,414 out of which 6,708 were males and 4,706 were females. The district has a total number of 7, 30,066 workers, with 4, 90,731 males and 2, 39,335 females. Labor Force Participation Rate is (2017-2018) 55.68% (Rural), 54.51% (Urban). Looking at the above data we know that the majority of people in this district are living in rural areas and the proportion of employees is less than 50% of the total population of this district.

Agriculture is the major source of income in haveri district because the majority of people live in rural areas in the district and their primary occupation is agriculture. The district 2018-19 data Gross District Domestic Product ₹17,53,328 in lakh at Current Prices and ₹13,34,890 in lakh at Constant (2011-2012) Prices. Then Net District Domestic ₹16,15,630 in lakh at Current Prices and ₹12,16,448 in lakh at Constant (2011-2012) Prices. The district 2019-2020 data Gross District Domestic Product ₹22,84,893 in lakh at Current Prices and ₹16,11,772 in lakh at Constant (2011-2012) Prices. Then Net District Domestic ₹20,01,436 in lakh at Current Prices and ₹13,81,729 in lakh at Constant (2011-2012) Prices When looking at the revenue of this district, it is seen that haveri district is very backward compared to the district of south Karnataka but this district year to year increasing the income level.

The district Per Capita Income (NDDP, at Factor Cost) 2018-19 data ₹ 95,196 at Current Prices and ₹71,675 at Constant (2011-2012) Prices and 2019-2020 data ₹115780 at Current Prices and ₹79,931 at Constant (2011-2012) Prices. 2021-2022 economic survey report per capita income (GDDP) ₹ 1, 32,178. Looking at the per capita income information of this district, it can be seen that the personal income of the people of the district is increasing year by year and consumption, production, investment, is also increasing. By observing the above collected data of Haveri district the average per capita income of the people is increasing day by day, due to the changes in income level consumption level, production investment and standard of living the overall development has taken place.



V. MULTIDIMENSIONAL POVERTY INDEX (MPI)

The Multidimensional Poverty Index was launched by the United Nations Development Programme (UNDP) and the Oxford Poverty & Human Development Initiative (OPHI) in 2010. MPI is based on the idea that poverty is not unidimensional (not just depends on income and one individual may lack several basic needs like education, health etc.), rather it is Multidimensional.

Dimensions Used by MPI:

MPI uses three dimension and ten indicators which are Health, Education, and Standard of Living.

1. Health: child mortality and nutrition (1/6 weightage each, total 2/6)
2. Education: years of schooling and child enrollment (1/6 weightage each, total 2/6)
3. Standard of Living: Electricity, Flooring, Drinking Water, Sanitation, Cooking Fuel and Assets (1/18 weightage each, total 2/6)

Who is poor as per MPI?

A person is multidimensional poor if she/he is deprived in one third or more (means 33% or more) of the weighed indicators (out of the ten indicators). Those who are deprived in one half or more of the weighted indicators are considered living in extreme multidimensional poverty. MPI is significant as it recognizes poverty from different dimensions compared to the conventional methodology that measures poverty only from the income or monetary terms.

Equation of MPI (MO)

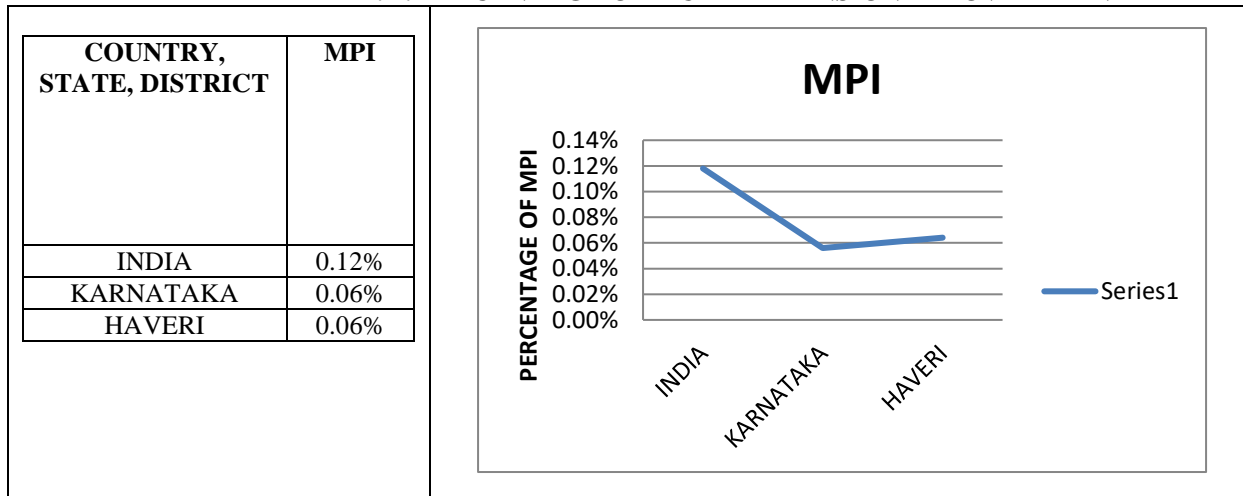
The Multidimensional Poverty Index reflects both the incidence and the intensity of multidimensional poverty. The index (denoted by M0) is the product of the two partial indices, the Headcount Ratio (H) and Intensity of poverty (A) of multidimensional poverty.

$$\text{Equation of MPI: } M_0 = H \times A$$

1. Headcount Ratio (H): The identification of multidimensionally poor individuals, the next step is to determine the proportion of multidimensionally poor individuals in the total population. This is known as the headcount ratio of multidimensional poverty or the incidence of poverty and is the first of two partial indices used to determine the MPI. The headcount ratio (denoted by H) answers the question ‘how many are poor?’

2. Intensity of Poverty (A): The intensity of poverty (denoted by A) is the average proportion of deprivations which is experienced by multidimensionally poor individuals. It is the average deprivation score of all multidimensionally poor individuals. A is the second partial index used in the construction of the MPI and answers the question how poor are the poor?

TABLE: 4. PERCENTAGE OF MULTIDIMENSIONAL POVERTY INDEX



Source: National Multidimensional Poverty Index (NITI Aayog, 2021 Based on the National Family Health Survey-4 (2015-16)

When we look at the above table India’s Multidimensional Poverty Index is 0.12 percent and if we compare it to Karnataka, Karnataka’s Multidimensional Poverty Index is 0.06 percent, which is much lower than India. Similarly, Haveri district in Karnataka state also has the same multidimensional poverty index as Karnataka state. When we look at this Multi-dimensional Poverty Index, we come to know that the poverty rate is decreasing across the state of Karnataka. Also, the poverty rate is decreasing in Haveri district as well.



TABLE: 5. PERCENTAGE OF MPI IN KARNATAKA AND HAVERI (Rural and Urban)

STATE & DISTRICT	MPI
KARNATAKA	0.06%
Rural	0.08%
Urban	0.02%
HAVERI	0.06%
Rural	0.07%
Urban	0.04%

Source: National Multidimensional Poverty Index (NITI Aayog, 2021 Based on the National Family Health Survey-4 (2015-16)

Looking at the above table, the Multidimensional Poverty Index of Karnataka is 0.06 percent, of which 0.08 percent is in rural areas and 0.02 percent in urban areas. When compared to Haveri district, the rural MPI of Karnataka is 0.01 percent higher and haveri urban MPI is 0.02 percent higher than urban MPI of Karnataka

TABLE: 6. PERCENTAGE OF INDICATOR WISE MPI IN KARNATAKA & HAVERI (Rural and Urban)

STATE & DISTRICT	HEALTH			EDUCATION		STANDERD OF LEAVING						
	Nutrition	Child & Adolescent Mortality	Maternal Health	Years of Schooling	School Attendance	Cooking Fuel	Sanitation	Drinking Water	Electricity	Housing	Assets	Bank Account
KARNATAKA	29.88%	1.05%	7.94%	16.15%	6.98%	9.81%	9.35%	2.93%	0.82%	7.99%	4.22%	2.87%
Rural	29.58%	1.00%	7.66%	15.96%	6.34%	10.30%	9.61%	3.10%	0.81%	8.36%	4.39%	2.91%
Urban	31.46%	1.34%	9.39%	17.15%	10.38%	7.22%	8.02%	2.05%	0.92%	6.03%	3.35%	2.70%
HAVERI	30.17%	0.89%	7.87%	14.85%	4.47%	10.51%	8.67%	3.64%	1.38%	10.10%	5.01%	2.43%
Rural	29.48%	1.02%	7.54%	15.30%	4.56%	10.55%	8.77%	4.16%	1.29%	10.30%	4.86%	2.17%
Urban	34.95%	0.00%	10.18%	11.72%	3.78%	10.25%	7.99%	0.00%	2.05%	8.70%	6.10%	4.28%

Source: National Multidimensional Poverty Index (NITI Aayog, 2021 Based on the National Family Health Survey-4 (2015-16)

The above data reveals that the MPI of Karnataka and Haveri district measures the poverty level based on three factors, the most important of which are health education and standard of living. Looking at the above data, overall we know that health education and standard of living are lower in rural areas compared to urban areas of Karnataka. Similarly, the condition of Haveri district is also similar. We came to know that rural areas need to be developed more than urban areas because in rural areas. Poverty can be eradicated only when the basic amenities are provided to the people living in large number.

VI. POVERTY ALLEVIATION PROGRAMMES

Karnataka being the progressive state formulated several policies and programmes in end of poverty. The poverty alleviation programs in Karnataka can be categorized based on whether it is targeted either for rural areas or urban areas in the state. Most of the programs are designed to target rural poverty as the prevalence of poverty is high in rural areas also targeting poverty is a great challenge in rural areas due to various geographic and infrastructure limitation. The programs can be mainly grouped into wage and self employment programs, food security programs, social security programs, urban poverty alleviation programs, skill India programs for employment.



1. National Food Security Mission: (NFSM)

This is a centrally sponsored scheme launched in October 2007 its main goal is to increase food crops and security in the face of increasing population. 60% of the funds are allocated from the center and 40% from the state. This schemes main objectives area expansion and productivity enhancement, creating employment opportunity, restoring productivity and fertility, entitling form level economy. This scheme provides subsidy for sowing seeds kits, chemical fertilizers and agriculture machineries.

Haveri district has been chosen for implementation of national food security mission(NFSM)’s inter-cropping scheme in the state on a pilot basis the project has been designed with an objective of helping formers get better revenue through cultivation of multi-crops has taken special interest in getting the project for Haveri district. Two lack acres in Haveri district if through inter-cropping different crops including pulses & oil seeds are cultivated farmers have a chance of getting guaranteed income to promote inter-cropping with an objective helping farmers already the district has been allocated seed kits of pulses worth ₹ 2.44 crore for distribution among farmers for cultivation in 600 hectares seeds of pulses and oil seeds will be distributed in all the raita samparka Kendra.

2. National Social Assistance Programme (NSAP)

The programme introduced a national policy for social assistance for the poor and aims at ensuring minimum national standard for social assistance in addition to the benefits that states are currently providing or might provide in future. In providing social assistance benefits to poor households for the aged, widows, disabled and the case of death of the breadwinner, the NSAP aims at ensuring minimum national standards in addition to the benefits that the state are currently providing or might provide in future. The intention in providing or might providing 100 percent central assistance is to ensure that social protection to the beneficiaries everywhere in the country is uniformly available without interruption. Accordingly, the central assistance should not displace states on expenditure in this respect and that the state may expand their own coverage of social assistance independently wherever they wish to do so.

At present five schemes introduce in Karnataka government for BPL persons. 1. India Gandhi national old age pension scheme (IGNOAPS), 2.Indira Gandhi national widow pension scheme (IGNWPS), 3.Indira Gandhi national disability pension scheme (IGNWPS), 4.National family benefit scheme (NFBS) and Annapurna.

TABLE:7. Total Number of Beneficiaries (NSAP Schemes)

S.No	Schemes	Karnataka	Haveri
1	IGNOAPS	899424	23884
2	IGNWPS	452027	19205
3	IGNDPS	44825	1827
4	NFBS	6545	2

3. Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA)

This scheme introduced September 2005th a centrally sponsored scheme which provides a legal guarantee for 150 days of work in each year to any adult member of rural household whose adult members are willing to do unskilled manual work. This schemes implemented by the ministry of rural development. The scheme has multiple aims: social and livelihood security, poverty alleviation, increasing rural consumption, creation of durable assets for rural development and environmental protection, social inclusion, and strengthening panchayat raj system. This scheme introduce for overall sustainable goal achievement in the Karnataka state.

The proportion of persons provided with MGNREGAs work to total demanding in Karnataka was 84.26% almost on percentage with national average (84.75%). However only a small proportion of households were able to have 100 days of work which ranged from 0.1% in kalaburagi to 2% in vijayanagar.

TABLE:8. HOUSEHOLDS AVAILED 100 DAYS OF EMPLOYMENT UNDER THE (MGNREGA)

Year	2016-17	2017-18	2018-19	2019-2020	2020-21
Karnataka(in lakhs)	1.96	0.3	2.11	1.87	2.41

Looking at the above table, in the last five years of the MGNREGA scheme, the level of employment in the state of Karnataka is increasing year by year and the poverty level is decreasing.

Haveri district has also adopted the MGNREGA scheme. It can be seen that the rural people of Haveri district are getting employment opportunities from this scheme. It can also be seen that the income level of the rural people is increasing year by year. From these



schemes it can be seen that the rural areas of Haveri district are moving towards development. It can also be seen that the rural poverty rate of Haveri district is decreasing year to year.

S.No	Block	Total Attendance	
		House Hold Employed	Person Days Generated
1	Byadgi	12130	668356
2	Hanagal	24790	1257252
3	Haveri	13935	628429
4	Hirekerur	17572	1128963
5	Ranebennur	14913	683450
6	Rattihalli	12070	624652
7	Savanur	11200	498354
8	Shiggaon	8401	415740
	Total	115011	5905196

Sources: Govt of India, Ministry of Rural Development, Department of Rural Development

4. Women and Child Development Schemes:

1. Stree Shakthi programme: Stree shakthi programme was launched in 2000-01. Stree Shakti has provided poor and marginalized women an opportunity to collectively save and borrow money. This has enabled them to take up various income-generating activities. Karnataka state self help group is a good medium to congregate women. The programme implemented throughout the state to empower women through groups. Under the scheme, each group comprises about 15 to 20 women members who come from below the poverty line families, women belonging to families that are landless or agricultural laborers, and largely SC/ST women. At present, there are 1.65lakh self-help groups, comprising 25.85lakh women members. The groups had ₹ 12638.59 crore since inception. The introduce several programs CDS-National Nutrition Mission, 2.Bhagya Lakshmi Yojana, Integrated Child Protection Scheme, Pradhana Mantri Maatru Vandana Yojana.

CENTRAL GOVERNMENT LATEST POVERTY ALLEVATION PROGRAMMES

1. Banking And Insurance Related Schemes: Pradhan Mantri Jan Dhan Yojana(PMJDY), Pradhan Mantri Sukanya Samriddhi Yojana(PMSSY), Pradhan Mantra Mudra Yojana(PMMY), Pradhan Mantri Jeevan Joythi Bhima Yojana(PMJJBY), Pradhan Mantra Suraksha Bima Yojana(PMSBY), Atal Pension Yojana(APY) and Kisan Vikas Patra.

2. Agriculture and Rural Development Related: Pradhan Mantri Fasal Bhima Yojana(PMFBY) Pradhan Mantra Gram Sinchai Yojana(PMGSY), Sansad Adarsh Gram Yojana(SASY), Deen Dayal Upadhyaya Gram Joythi Yojana(DDUGJY)

3. Housing and Urban Development Related Schemes: Pradhan Mantra Awas Yojana (PMAY), Atal Mission for Rejuvenation and Urban Transformation (AMRUT), National Heritage City Development And Augmentation Yojana (HRIDAY) and Smart City Mission.

4. Technology, Education and Skill Development Related Schemes: Digital India, Skill India, Deen Dayal Upadhyaya Grameen Kaushalya Yojana(DDUGKY), Unnath Bharat Abhiyan, Pradhan Mantri Kaushal Vikas Yojana(PMKVY), Vidyanjali Scheme and Swayam Prabha.

5. Employment and Poverty Alleviation Related Schemes: Den Dayal Antyodaya Yojana, Make in India, Startup India, Pradhan Mantri Garib Kalayan Yojana (PMGKY)

6. Health and Sanitation Releted Schemes: Swachh Bharat Abhiyan, Pradhan Mantri Jan Aushadhi Yojana (PMJAY), Pradhan Mantri Surakshit Matritva Yojana.

7. Electrification Related Schemes: Integrated Power Development Scheme (IPDS), Ujwal Discom Assurance Yojana (UDAY), Pradhan Mantra Ujjwal Yojana.

STATE GOVERNMENT LATEST POVERTY ALLEVATION PROGRAMMES

1. Welfare of SC/CT Scheme: a) Kuteera Joythi: free electricity supply increased to 75 units

2. Farmers, Agriculture and Horticulture:- a) Mukyamantri Raita Vidhyanidhi Programme: ₹438.69 crore worth of scholarships distributed to 9.98 lakh students. **b) Pradhan Mantra Krishi Samman Scheme:** income support extended to ₹ 50.35 lakh farmers in 2021-22₹47.83lakh farmers in 2022-23

3. Welfare of Weavers: Nekar Samman Scheme: income support increased from Rs. 2,000 to 5,000. Amount transferred to 49,544 weavers directly in 2021-22



4. Social Security Schemes: Increase in Old Age Pension, Sandhya Suraksha, Widow Pension, Maitri, Manaswini, monthly pension for differently abled people and acid attack victims. To help 75 lakh beneficiaries

5. Rural Water Supply Schemes: 1. 'Mane Manege Gange' Jalajeevan Mission: new tap connections provided to 22.85 lakh houses. **2. Jalajeevan Mission:** 100% goal achieved.

6. Food Security scheme: Distribution of 1 kg Finger Millet/Sorghum in addition to 5 kg of Rice to every beneficiary holding a priority ration card

7. Sahakara Samruddhi : Distribution of agriculture loans amounting to 20,971.79 crore to 28.42 lakh farmers GO issued to reimplement of Yashaswini Scheme

8. Irrigation: Between July 2021 and June 2022, irrigation capacity was created for 79,731 acres by spending an amount of 17,270.13 crore

SUGGESTIONS OF END OF POVERTY

The generation of employment is important in poverty alleviation because of the following reasons:

- It will increase the income level of the poor household families and will help in reducing the rate of poverty in the state. Hence, there is a significant relationship between unemployment and poverty.
- It will decrease thru rural –urban migration through the generation of employment programs in rural areas.
- An increase in the income level through the generation of employment programs will help the poor in accessing basic facilities including education, health facilities, and sanitation.

If Gandhiji's dream of "village swaraj" is to be realized, the state will be able to develop only when the rural area is developed. If this village swaraj is to be a poverty free state, Karnataka has adopted the principle of no poverty as the first goal of sustainable development to make it a poverty free state in 2030.

VII. CONCLUSION

The Poverty rate and MPI for both Karnataka state and Haveri district is examined in this paper. It is observed that the poverty rate is decreasing year by year. On the other hand, the per capita income, consumption expenditure and living standard of the people have increased over a period both Karnataka and Haveri District Level. The majority of the people in Haveri District are living in rural areas and it is recommended that there is need to create more employment opportunities and strengthen the poverty eradication programme in order to proper development of Haveri District. This paper examined the various schemes undertaken by the central and state governments to make the state of Karnataka as poverty free by 2030, which is one of the sustainable development goals.

Karnataka is one the leading states in India in achieving sustainable development goals through the income generation, creation of employment opportunities, proper implementation of poverty eradication programmes, providing education and health facilities for their needs persons. Karnataka is also very sound technological development and good governance. The state must set a more ambitions, visions and aim to achieve USD 1 trillion GSDP by 2032. Its citizens must unite under focused strategies to meet this goal. This call for a fresh perspective in planning, goal setting, strategic, initiatives and a much focused human development initiative to ensure the higher job creation, increased incomes for its citizens and the highest quality of life for all. The next decade presents a generational opportunity for our state and it is one all our citizens will work together to achieve.

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A STUDY ON CUSTOMERS SATISFACTION ON JIO MOBILE SERVICES: A STUDY ON THE CAPITAL OF ODISHA

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ABSTRACT

The technological changes have made mobile phone services significantly useful throughout the world. At present, varieties of services are offered by mobile phone companies to their users daily. However, the satisfaction of the Investor on mobile phone services measures the success of the service providers. So, it is now one of the prior objectives of the mobile phone service providers to meet the expectations of their customers at the same time meet the current market requirements. Investor compares their perception of the quality of services and how they are satisfied overall with their experiences. Focussing on this fact, the present study has been made to analyse the satisfaction of users of Jio mobile phone services. An attempt has been made in this study in analysing the satisfaction level of customers towards Jio mobile phone services in Bhubaneswar city. The study focuses to identify the satisfaction level of users of the Jio mobile phone service. The primary source of data is collected with a sample size of 200.

KEY WORDS: customers, Satisfaction, Jio, Quality of services, Garrett ranking

1. INTRODUCTION

Mobile phone has become indispensable to everyday life of human beings. Mobile phones are easy to operate by everybody. Mobile services have been seen as an effective communication process in growing and developing the economy. This sector has shown impressive growth during last few years. In other words, mobile service sector is one of the fastest-growing industries in India. The rapid growth of mobile service sector is associated to the various pro-active and positive policy measure that were taken in last few years by the Government, the dynamic, enthusiastic and innovative entrepreneurial spirit of the various telecom service providers both in private as well as public sector.

customers satisfaction is the primary goal of every business organization. In the rapid changing business scenario, almost service sector organizations activities are investor oriented. Hence, it is essential for the mobile service provider to understand the impact of various Demographic variables that influence the perception and satisfaction level of the customers in order to succeed in the market. This study aims to identify the satisfaction of the customers on mobile service in general and Jio mobile service. In view of this, a survey based descriptive research design adopted to conduct this study in Bhubaneswar City.

Understanding the needs of the consumer for the product or service is fundamental to determine the level of consumer satisfaction. It is known that the demographic background always dictates a person's needs and preferences. Moreover, due to the different demographical impact, which always varies from person to person, hence, there exist a different degree of satisfaction on the same product offered by the service provider to the different consumers. Therefore, getting insights into demographical differences among consumers and their impact on consumer choices helps for better understanding of consumers' need and preference and as a result enhances the ability of the service provider for delivering superior services for investor satisfaction. The amount of satisfaction realized by the consumer is highly dependent upon the degree to which their needs and preferences are fulfilled. This research paper attempts to study the influence of various demographic factors on the satisfaction that the consumers derive from Jio mobile services.

2. REVIEW OF LITERATURE

A literature review gives the guidelines and helps to design the present research topic, which is a narrative in nature. Following are some relevant literatures reviewed for the current study which is vital for evaluation. Leisen B, Vance C, (2001), in their research paper "investor satisfaction, Globalization, international Trade, Service Quality, Strategy, Telecommunication Industry" have examined the strategic implications of service quality dimensions in relation to investor satisfaction. The study is in a cross cultural study of telecommunication service provision in Germany and the USA. They concluded that there exists a significant difference between the two countries in terms of the relative importance of service dimensions. Dixit Sanjay, Shukla Harish et. al. (2008), have studied on monophobia in the Indian scenario. In their study on "A Study to Evaluate Mobile Phone Dependence Among Students of a Medical College and Associated Hospital of Central India" it was found that this disorder is equally prevalent among the study group irrespective of gender. There is a tremendous increase in the use of mobile phone users in the past decade in India. However,



there is no statistically significant association was observed in the study in relation to gender, place of stay and academic sessions with nomophobia score. Zahari Ahmad Suffian Mohd, Momani Khaled Al, Nor Azila Mohd (2011), have studied on "The influence of perceived privacy on investor loyalty in mobile phone services: An Empirical Research in Jordan" the study covers some issues of investor loyalty on mobile phone service subscribers. Their study analysed and concluded that privacy was positively significant towards investor loyalty; the mobile service provider must ensure investor privacy in their services to fully satisfy their subscribers. Petzer D. J. and Meyer C. F. De (2011), in their research paper "The perceived service quality, satisfaction and behavioral intent towards cell phone network service providers: A generational perspective" have examined perceived quality of services and the satisfaction levels of different generations on cell phone network service providers along with their behavioural intentions towards the service provider. The findings of the study exhibit a significant correlation between the perceived level of service quality, level of satisfaction and their behavioral intent towards service provider. Rahman Sabbir, Haque Ahasanul, Ahmad Mohd Ismail Sayyed (2011), in their study "Choice Criteria for Mobile Telecom Operator: Empirical Investigation among Malaysian CUSTOMERS, they had attempted to identify the different choice criteria by the CUSTOMERS for mobile phone operator in the Malaysian Mobile Telecom market. The outcome of the research indicates that vibrant relationships among several dimensions of service quality, price, and brand image have existed on the consumers' perception. Rajpurohit Prof. R.C.S., Vasita Dr. M.L. (2011), have studied on the consumer preferences and their satisfaction level towards the mobile phone service providers of Jodhpur city, Rajasthan. The study opined that, consumers prefer prepaid plans for availing mobile services. A major chunk of the consumer treats their mobile phone as a necessity for the daily life transactions. The study reveals that the most preferred service provider among consumers was BSNL at Jodhpur city of Rajasthan State, followed by Airtel and Vodafone service providers. Rahman, Muhammad Sabbir, (2012), in his study on "Service quality, corporate image and investor's satisfaction towards CUSTOMERS perception: An exploratory study on telecom customers in Bangladesh has indicated the determinants that are significantly influencing telecom investor's perception in Bangladesh. The statistical analysis of his study has concluded that, most of the telecom CUSTOMERS are highly concerned about service quality followed by corporate image. Pandit Richa, Upadhyay Devina (2012), studied "Consumer perception towards 3G mobile technology gives some positive and some negative influences Attitude towards Using (ATU) 3G services". The study tries to find out consumer perception towards the usage of 3G mobile technologies and the usage pattern of 3G technologies by the mobile users in Ahmadabad. The study revealed that the speed of 3G mobile technology is higher in comparison to other generations of technologies in India. Smart phones are more suitable for using 3G technologies than other mobile devices in India. There are no differences in the consumers' usage pattern of 3G mobile technologies in Ahmadabad. Consumers' perception towards 3G mobile technologies does not change as per their demographic factors like age, income and occupation in India

3. RELEVANCE OF THE STUDY

Investor satisfaction is the primary goal for almost all business organizations. In this competitive business scenario, every activity begins and ends with the investor need and their satisfaction. Now, the growth and development in the telecommunication industry has made a tremendous change and contributing towards increased GDP, creates employment opportunity and provides a boost for economic growth in general. A stiff competition exists between the private sector service providers of this industry. In spite of a well-established network and infrastructure supporting, certain service providers weren't able to acquire more market share because survival in this industry very much depends on investor service and satisfaction. There exists a marginal difference between the services rendered by the different private service providers, however, the expectation of the consumer and more possibility to switch from one service provider to another, based on their satisfaction. It is very essential for the service provider to understand the influence of various Demographic variables upon the perception and satisfaction level of the customers to remain win situation. This study could assist the service providers with respect to their enhancement of the quality of the services offered.

4. RESEARCH METHODOLOGY

The purpose of this paper is to analyze the relationship between the investor perceptions towards mobile phone services provided by Jio. The study is also aimed at examining the factors influencing investor satisfaction on Jio mobile phone services at four major city/towns of Bhubaneswar City in Odisha.

5. HYPOTHESIS OF THE STUDY

The following are the hypothesis to be tested in this study:

- There exists a relationship between network connectivity and customer level of satisfaction
- There exists a relationship between billing accuracy and customer level of satisfaction
- There is a relationship between clarity of voice transmission and customer level of satisfaction
- There exists a relationship between alternative plans and schemes and customer level of satisfaction

6. RESEARCH METHODOLOGY

The source of Data collection is based on both from primary and secondary sources. the research is survey based on primary data in the Bhubaneswar City of Odisha. The survey based on primary data is obtained through a designed questionnaire. The questionnaire is administered to users of JIO service and the sampling unit classified on the basis of demographic factors like age, gender, income,



occupation, educational qualification and monthly income. Stratified simple random sampling technique is used for the present study, comprising 200 respondents. For the purpose of the study, sample respondents have been asked on a 5-point Likert’s scale to specify their ranging from “strongly agree” to “strongly disagree”. The data have been collected for five months during the calendar year 2020 during COVID-19 pandemic period i.e., from June 2020 to October 2020. The regression analysis is used to study the significance of demographic factors of age, gender, qualification, income, occupation, and marital status towards the satisfaction level of the respondent on the uses of Jio mobile phone services. Further Garrett ranking are used on perceived some variables of the respondents of the Jio users. The statistical package SPSS has been used for the analysis of the collected primary data. In order to find out the reliability on the questionnaire the internal reliability has been considered and it is tested using Cronbach's alpha method.

Table 1. Demographic Characteristics of the Respondents

Variable		Frequency	Percent
Gender	Male	111	55.5
	Female	89	44.5
Age	Below 21 years	27	13.5
	21 years to 40 years	151	75.5
	41 to 60 years	22	11.0
Occupation	Student	135	67.5
	Govt. Employee	13	6.5
	Business	20	10.0
	Pvt. Employee	21	10.5
	Professional	4	2.0
	House wife	7	3.5
Educational Qualification	Upto 10th	9	4.5
	Upto 12th	6	3.0
	Under graduate	44	22.0
	Postgraduate	121	60.5
	Professional	20	10.0
Family Income (Per Month)	Below 15,000	136	68.0
	15,001 to 50,000	42	21.0
	50,001 to 1,00,000	9	4.5
	Above 1,00,000	13	6.5

Source: Primary Data

There are about 55.5 percent male respondents, 44.5 percent are female and 75.5 percent of the respondents are of 21 years to 40 years. It can be seen from the Table 1 that about 67.5 percent of the respondents are student who were using the mobile for online classes during the pandemic period of the study followed by employee of Pvt organisations (10.5 percent). The set of respondents chosen for the study happened to be well educated with more than 60 percent of the respondents being post-graduates and 10 percent were having professional qualification. Most of the respondents (68 percent) falls in the monthly income slab of below Rs.15,000 followed by 21 percent in the Rs.15,001 to Rs.50,000 category (Table 1).

7. DATA ANALYSIS AND INTERPRETATIONS

To analyse the reasons for selecting the mobile service the respondent was asked to rank the factors in the order of their importance. The ranks given by respondents were quantified using the Garrett Ranking Technique (Garrett, 1969).

Table 2. Rank the Following Factors in the order of their importance

Particulars	1 st Rank	2 nd Rank	3 rd Rank	4 th Rank	5 th Rank	Total	Mean Score	Rank
Quick and Easy Contact	132	21	1	15	31	18845	94	5
Official Purpose	81	49	9	22	39	21700	108	2
Prestige	61	49	29	29	32	23445	117	1
Contact Any Where	117	13	28	20	22	20485	102	4
Economy	102	31	21	34	12	21460	107	3

Source: Primary data



The Table 2 depicts that prestige is the prime reason for respondents for choosing mobile services, followed by official purpose. The next reason was economy. The fourth reason was for contact anywhere. Quick and Easy Contact stood at the last reason for choosing the mobile services.

Reliability Test

To find out the consistency and stability of the instruments applied in the survey Reliability test is used. In this study, Reliability test is performed in order to ensure that whether the questionnaire which were used in this study is reliable and whether it satisfies the purpose for which it is intended or not, and can render a fault-free operation. The result is displayed in the table given below:

Reliability Statistics	
Cronbach's Alpha	N of Items
.786	18

Source: Primary data

The above table shows the reliability for 18 items of the questionnaire. The Cronbach’s Alpha for these items is 0.786 which indicates that this questionnaire is reliable for the present study and so there is no need to any modification in the questionnaire.

Measuring the relationship with the level of satisfaction

It is tried to examine the relationship between the level of satisfaction and the different factors of Jio mobile services. The linear regression model is used which indicates the weak/strong relationship between the level of satisfaction and the different factors of Jio mobile services.

In Table 3 and Table 4 the relationship of network connectivity and the level of satisfaction is exhibited and shows that there exists a strong relationship between network connectivity and satisfaction level and supports the Hypothesis One that “There is a relationship between network connectivity and customer level of satisfaction”

Table 3 Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.320 ^a	.102	.098	.415	.102	22.517	1	198	.000

a. Predictors: (Constant), THE_BASIS_OF_NETWORK_CONNECTIVITY

Source: Primary data

Table 4 ANOVA ^b						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3.880	1	3.880	22.517	.000 ^a
	Residual	34.120	198	.172		
	Total	38.000	199			

a. Predictors: (Constant), THE_BASIS_OF_NETWORK_CONNECTIVITY
b. Dependent Variable: Satisfaction in Using Services

Source: Primary data

In Table 5 and Table 6 the relationship of billing accuracy and the level of satisfaction is exhibited and shows that there exists a strong relationship between billing accuracy and satisfaction level and supports the Hypothesis Two that “There is a relationship between billing accuracy and INVESTOR level of satisfaction”.

Table 5 Model Summary									
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.204 ^a	.042	.037	.429	.042	8.609	1	198	.004

a. Predictors: (Constant), THE_BASIS_OF_BILLING_ACCURACY

Source: Primary data



Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.583	1	1.583	8.609	.004 ^a
	Residual	36.417	198	.184		
	Total	38.000	199			

a. Predictors: (Constant), THE_BASIS_OF_BILLING_ACCURACY
b. Dependent Variable: Satisfaction in Using Services

Source: Primary data

In Table 7 and table 8 the relationship of clarity of voice transmission and the level of satisfaction is exhibited and shows that there exists a very weak relationship between clarity of voice transmission and satisfaction level and does not support the Hypothesis Three that “There is a relationship between clarity of voice transmission and customer level of satisfaction” rather the alternative is significant.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.045 ^a	.002	-.003	.438	.002	.396	1	198	.530

a. Predictors: (Constant), THE_BASIS_OF_CLARITY_OF_VOICE

Source: Primary data

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.076	1	.076	.396	.530 ^a
	Residual	37.924	198	.192		
	Total	38.000	199			

a. Predictors: (Constant), THE_BASIS_OF_CLARITY_OF_VOICE
b. Dependent Variable: Satisfaction in Using Services

Source: Primary data

In Table 9 and Table 10 the relationship of alternative plans and schemes and the level of satisfaction is exhibited and shows that there exists a strong relationship between alternative plans and schemes and satisfaction level and supports the Hypothesis Four that “There is a relationship between alternative plans and schemes and customer level of satisfaction”

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Change Statistics				
					R Square Change	F Change	df1	df2	Sig. F Change
1	.250 ^a	.062	.058	.424	.062	13.166	1	198	.000

a. Predictors: (Constant), BASIS_OF_ALTERNATIVE_PLANS_AND_SCHEMES

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	2.369	1	2.369	13.166	.000 ^a
	Residual	35.631	198	.180		
	Total	38.000	199			

a. Predictors: (Constant), BASIS_OF_ALTERNATIVE_PLANS_AND_SCHEMES
b. Dependent Variable: Satisfaction in Using Services

Source: Primary data

8. SUGGESTIONS AND CONCLUSION

The wireless network connection depends on various factors like time, users load in week or year, locations, size or volume of the document transmitted by the users, latency, bandwidth and quality of handset etc. These factors may sometimes delays to the users when they attempt to access or dissemination information via their wireless handheld devices. As a consequence the long delays may then are associated with “increased feelings of lost” and “negative impression” for the end users. (Sears and Jacko, 2000). In a service consumption process the customers always compare and evaluate their experience on the service performance with their prior expectations to exhibit post performance behaviour. In the post performance behaviour, they are likely to be satisfied when



their expectations are fully or greatly met. On the contrary, the behavioural differences are observed in the responses of the satisfied customer and dissatisfied one. A satisfied consumer may not switch over to other rather will re-use the service and will be loyal or make recommend the service to their friends and others. On the other hand, the customers who are less satisfied may behave adversely like will complain on poor service quality, will not be loyal and will not exhibit positive rather negative word-of-mouth, switch over service provider, etc. (Lovelock and Wirtz, 2008).

However, this paper only focuses on the five variables (Quick and Easy Contact, Official Purpose Prestige, Contact Any Where and Economy) upon the selection of services. There are many other variables can also be considered for observation of the users behaviour. Nevertheless, such variables can result in satisfying the mobile users in general. This study was undertaken to examine and understand the consumers' satisfaction in some selected variables while experiencing the use of JIO mobile services. It is noticed that the prestige, official purpose, economy, contact anywhere and Quick and Easy Contact are the order of importance with relation to the overall satisfaction of the users. So, it is suggested that, while any modification in service rendered or tariff plan as well as induction of new service, the service provider must consider for the greater interest of existing as well as the potential users of the mobile service in these aspects for the overall customers' satisfaction.

9. RECOMMENDATION

- i. Introduce different varieties of offer/plans to attract and adopt the non JIO users focusing on the average economic conditions of the non JIO users.
- ii. Strengthen and widens the network coverage of JIO Service for Quick and Easy Contact at anywhere at any time.

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COMPREHENSIVE TREATMENT PROGRAM FOR BRONCHIAL ASTHMA IN CHILDREN WITH A HISTORY OF PERINATAL CENTRAL NERVOUS SYSTEM PATHOLOGY

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ABSTRACT

Bronchial asthma remains a pressing issue in pediatrics, with high prevalence and a continuous increase in morbidity among children. It has been found that most children with bronchial asthma have a history of perinatal central nervous system (CNS) damage. Despite progress in the diagnosis and treatment of bronchial asthma, the mechanisms by which perinatal CNS lesions influence asthma development are varied, and existing treatment regimens for such children are not always highly effective. This highlights the need for improved treatment methods for children with bronchial asthma who also suffer from the consequences of perinatal CNS injury.

KEYWORDS: *bronchial asthma, central nervous system, perinatal injury, neurostimulation, morphofunctional indicators, Semax.*

Bronchial asthma (BA) is one of the most common chronic respiratory diseases in children. Recently, significant progress has been made in studying the etiology, pathogenesis, clinical course, and diagnosis of BA. However, many treatment-related issues remain unresolved. It is known that bronchial asthma typically begins in the first five years of life, often manifesting with pronounced bronchial obstruction (BO), especially in children who have atopic dermatitis. It should be noted that BO is widespread among children in the first 5–6 years of life, with respiratory viral infections being the main trigger for its development. In many pathological conditions, recurrent BO symptoms are observed. Therefore, differentiating BA from other diseases presenting with BO is not straightforward. This is due to the presence of various BO symptoms and the difficulties in functional diagnostics during the early years of life [National Program “Bronchial Asthma in Children: Treatment Strategy and Prevention”, 2017; Heppe N.A. et al., 2018].

It should be noted that the timing of the initiation of BA treatment affects its outcome. Therefore, once a BA diagnosis is confirmed, therapy should commence as early as possible [Selroos O., 2008]. Early administration of low-dose inhaled glucocorticosteroids (ICS) in patients with BA leads to stabilization and improvement in lung function compared to those whose treatment began 2–4 years after diagnosis. Delaying treatment may require higher doses of ICS. The impact of delayed ICS therapy is noticeable even after 5 years of treatment [Selroos O, Löfroos AB, Pietinalho A, Riska H., 2004].

The choice of treatment depends on the severity, degree of control, and period of BA. However, an individualized approach in selecting treatments and methods is essential. Recent studies indicate that most children with BA have a history of perinatal central nervous system (CNS) injury, which increases the risk of BA by 3.4 times in preschool-aged children. It has been proven that perinatal injuries contribute to frequent bronchial obstruction in children in the first years of life [Pavlenko V.A. et al., 2015].

According to recent literature, newborns who experienced hypoxia-ischemia during the perinatal period often have neurological deficits of varying severity in later childhood, such as delays in neuropsychological and motor development, minimal brain dysfunctions, difficulties in social adaptation, cerebral palsy, and epilepsy [Trepilets S.V. et al., 2018; Krasnorutskaya O.N., Ledneva V.S., 2018]. However, the impact of CNS injury sequelae on BA progression in children, depending on psychosomatic status, has not been studied, nor are there data on the specifics of BA progression and treatment in children with different clinical manifestations of CNS pathology.



Thus, all of the above necessitates further development of new diagnostic and prognostic criteria for the progression and course of bronchial asthma in children with perinatal CNS injury consequences.

OBJECTIVE OF THE STUDY

To investigate the causative factors and potential treatment options for bronchial asthma in children with perinatal CNS injury sequelae, considering a range of neuropsychological, psychosomatic, immunological, and functional parameters.

MATERIALS AND METHODS

According to the protocol, the examination of children included a comprehensive set of anamnesis (epidemiological and disease history, questionnaires), clinical, laboratory (IL-4, IL-8, TNF- α , neuron-specific enolase (NSE), insulin-like growth factor-1), and clinical-instrumental research methods.

A clinical and neurological examination was conducted among 72 children aged 5-7 years with moderate BA (51 boys and 21 girls) who had sequelae of perinatal CNS injury. Based on the therapy received, the children were divided into two groups: the main group, which included 38 children (52.8%) who, in addition to standard treatment, received therapy targeting identified neurological impairments, and the comparison group, which included 34 patients (47.2%) who received only standard therapy.

All patients in the main group received the following treatment: a hypoallergenic regimen; a hypoallergenic diet (an elimination diet excluding or limiting allergens depending on sensitization level); baseline anti-inflammatory therapy in the form of combination medications (salmeterol + fluticasone) at a dose of 25/125 mg. During remission periods, respiratory muscle training was prescribed, including therapeutic exercise, chest massage, and breathing exercises with forced exhalation.

In addition to the baseline therapy, main group patients received methionyl-glutamyl-histidyl-phenylalanine-prolyl-glycyl-proline (Semax nasal drops 0.1%) to correct the consequences of perinatal CNS injury. The drops were administered daily in each nostril, 1 drop twice a day (morning and afternoon) at a dose of 5-6 mcg/kg. The average daily dose was 300-400 mcg/day. The treatment course lasted 2 months, split into two 30-day courses with a 3-month break in between.

To enhance neuroplasticity, interhemispheric relationships, and cortical-subcortical interactions, the children in the main group also underwent translanguague neurostimulation using the "Neuroport" device (Figure 1). The procedure lasted 30 minutes, twice a day, with a total of 10 sessions per course. A second neurorehabilitation course was conducted for all patients after 3 months.



Figure 1. Translanguagial Neurostimulation Device

Numerous studies have shown that physical factors significantly contribute to the treatment and rehabilitation of children with BA. This is partly due to their comprehensive effects and physical properties, as well as their alignment with physical processes within the body and their ability to influence regulatory systems. Since the multifactorial nature of allergic inflammation in BA involves many bodily systems, 15 sessions of Nordic walking (NW) were included in the BA therapy program for children in subgroup A, with each session lasting 30 minutes twice a week.



RESULTS AND DISCUSSION

In the main group, the majority of children (84.2%, n=32) achieved disease control within three months of starting the comprehensive therapy. Only 15.8% (n=6) required an increase in baseline anti-inflammatory therapy up to 375 mcg/day. With this dosage, disease control was achieved in all children within four weeks. In the comparison group, fewer than half (44.1%, n=15) achieved disease control within three months (p=0.0078). The remaining 55.9% (n=19) required an increase (step-up) in therapy, raising the baseline dose to 375 mcg/day of fluticasone. Of these, 23.5% (n=8) achieved control, but 32.4% (n=11) (p=0.011) continued to show exercise intolerance over six weeks. For these children, baseline therapy was increased to 500 mcg/day, resulting in disease control. Two children (5.9%) did not achieve control even at 500 mcg/day due to unfavorable living conditions; their BA severity was reclassified as severe, and therapy was adjusted accordingly.

It was also found that among the main group children who needed higher doses of inhaled glucocorticosteroids (ICS) (25 children; 34.7%), 48% (n=12) had autonomic dysfunction, 40% (n=10) had attention deficit hyperactivity disorder (ADHD), and only 12% (n=3) had speech disorders. This indicates that children with ADHD and autonomic dysfunction more frequently required higher doses of ICS.

To evaluate the effectiveness of the proposed BA therapy program, a follow-up assessment of disease control (complete, partial, or absent) was conducted six months later using the ACT test, peak flowmetry, and spirometry with forced expiratory volume (FEV1). Special attention was paid to the frequency of daytime symptoms and nighttime awakenings (Table 1). Spirometry and peak flowmetry parameters analyzed included vital capacity (VC), vital index, peak expiratory flow rate, breath-hold duration on inhalation (Stange test), and chest excursion. Abdominal muscle strength was assessed with the child lying on their back, measuring the time they could hold their legs straight at the knees and bent at a 45° angle at the hips. Back muscle strength was measured in seconds, with the child in a “swallow” position lying on their stomach, noting the duration of torso hold until the child stopped the test. Physical performance was also evaluated using a two-step step test. The Robinson index (double product=heart rate (HR) in bpm x systolic blood pressure in mmHg; normal Robinson index is 70-94 units) and Ruffier index (where RI=Ruffier index, P1=resting pulse rate, P2=pulse rate after the first 15 seconds of the first recovery minute, P3=pulse rate in the last 15 seconds of the first recovery minute) were calculated. If $RI \leq 3$, performance was rated excellent; from 4 to 6, good; from 7 to 9, average; from 10 to 14, satisfactory; and 15 or more, poor.

Table 1
Dynamics of Morphofunctional Indicators After the Therapy Course

Indicator	Patient Group	
	Comparison Group (n=34)	Main Group (n=38)
Chest excursion, cm	3,8±3,9	8,5±5,3*
Vital lung capacity, L	1,3±1,5	3,3±1,8*
Vital index, mL/kg	44,3±2,4	56,2±2,3*
FEV1, % of formed VC	1,3±0,6	3,8±1,8*
Peak expiratory flow rate, L/min	316,1±6,8	393,3±3,3*
Stange test (breath-hold on inhalation), sec	23,8±2,3	37,1±2,7*
Abdominal muscle strength, sec	13,8±6,5	39,4±6,3*
Back muscle strength, sec	12,9±5,8	28,5±8,6*
Ruffier index, units	19,8±6,3	12,1±5,2
Robinson index, units	112,4±3,7	84,8±4,5
General physical performance, kgm/min-kg	41,7±2,2	54,6±2,5*

Note: * – p<0.05, indicating significant differences between the main group and the comparison group

Since there were no significant differences in the evaluated parameters between groups at the beginning of the study, it was reasonable to conduct a comparative analysis after six months of observation. The results showed that in the main group, the comprehensive therapy course significantly improved respiratory function indicators. Chest excursion was 2.2 times greater in the main group compared to the comparison group receiving only baseline therapy (3.8±3.9 cm vs. 8.5±5.3 cm, respectively). The main group also showed increases in vital lung capacity and vital index to 3.3±1.8 L and 56.2±2.3 mL/kg, exceeding the comparison group values by 2.5 and 1.3 times, respectively. Comprehensive therapy led to an increase in forced expiratory volume (3.8±1.8 L) and peak expiratory flow rate (393.3±3.3 L/min) compared to those in the comparison group receiving standard therapy (1.3±0.6 L and 316.1±6.8 L/min, respectively). Breath-hold time on inhalation in the main group was 1.6 times higher than in the comparison group, reaching 37.1±2.7 seconds. Similar improvements were seen in back muscle strength (2.2 times), abdominal muscle strength (2.9 times), and general physical performance (1.3 times).

Significant improvements were also observed in the psychoneurological status of the main group (Figure 2).

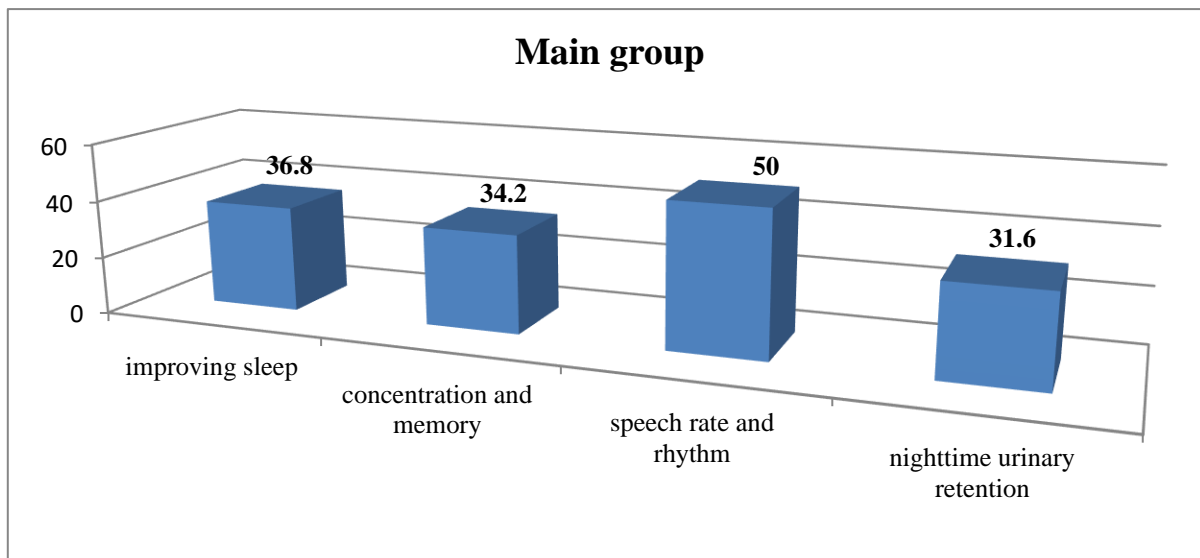


Figure 2. Neurological status of children in the main group under comprehensive therapy

In 36.8% of children (n=14), improvements in sleep and its quality were observed, while attention span and memory were restored in 34.2% (n=14) of cases. The children were more engaged, their attention span increased significantly, and fatigue decreased. Due to the activation of the brain's speech areas, including both expressive (motor) and receptive (sensory) speech, improvements in speech rate and rhythm were noted (n=19; 50%). Additionally, the activation of the Barrington center, responsible for regulating urination, led to the development of circadian rhythms and the habit of bladder control at night in 31.6% (n=14) of children.

Upon enrolling children with BA in the study, it was found that high levels of TNF- α , IL-4, and IL-8 correlated with the extent of CNS damage, as confirmed by elevated NSE levels. This further illustrates the systemic and profound interconnection between immune and neurological processes. Meanwhile, low levels of physical development and its disharmony were associated with decreased serum insulin-like growth factor-1. Overall, the synergistic integration of data on inflammation and neurological conditions may lead to a deeper understanding of the pathogenesis of BA and perinatal CNS injuries in children.

One key aspect of a multimodal therapeutic approach may be combining anti-inflammatory therapy with neuroprotective drugs. For instance, TNF- α antagonists could help reduce systemic inflammation, potentially decreasing tissue damage not only in the respiratory tract but also in the CNS. The use of neuroprotectors (specifically, 0.1% nasal solution of Semax) aims to lower neuron-specific enolase levels (44.7 \pm 4.4 ng/mL at the start of therapy to 26.2 \pm 1.4 ng/mL at the six-month follow-up) and protect neurons, enhancing the therapeutic effect and improving disease prognosis. Nordic walking (NW) contributed to a 1.2-fold increase in insulin-like growth factor-1 levels, rising from 153.2 \pm 2.2 μ g/L before treatment to 183.2 \pm 1.2 μ g/L by the end, which should positively affect the physical development of children with BA against the background of long-term CNS effects (Table 2).

Table 2
Laboratory indicators in children with BA in the main group during therapy

Indicator	Main Group (1 Month of Observation)	Main Group (6 Months of Observation)	Reference Values
IL-4, pg/mL	8,98 \pm 0,33 [^] *	4,9 \pm 0,15*	2,23 \pm 0,08
IL-8, pg/mL	58,13 \pm 1,38 [^] *	29,24 \pm 0,68*	4,43 \pm 0,06
TNF- α , pg/mL	92,6 \pm 4,5 [^] *	58,9 \pm 3,1*	9,87 \pm 1,9
NSE, ng/mL	44,7 \pm 4,4 [^] *	26,2 \pm 1,4	15,9 \pm 1,4
Insulin-like Growth Factor-1, μ g/L	153,2 \pm 2,2 [^] *	183,2 \pm 1,2	213,2 \pm 1,7

**Note: * - significance compared to reference values (p<0.05)*
[^] - differences between the main group's indicators at the start and end of therapy (p<0.05)

Therefore, when developing personalized therapy for BA in children, a comprehensive clinical-neurological examination that includes a range of functional parameters is necessary. The inclusion of the developed comprehensive therapy program for children with BA against the background of long-term CNS damage contributes to improved neurological status, leading to positive dynamics in the functioning of the respiratory and cardiovascular systems.



The proposed comprehensive treatment program for BA in children with long-term CNS damage is a cyclical process and includes patient assessment, therapy adjustment (both pharmacological and non-pharmacological), and monitoring of treatment response with correction of identified neurological syndromes. The primary goal of the presented algorithm and a parameter of therapeutic efficacy is to achieve control with prolonged remission and to prevent exacerbations.

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ANALYSIS OF MARX AND ENGELS' THOUGHTS ON THE INDUSTRIAL REVOLUTION

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ABSTRACT

The Industrial Revolution, which emerged in Britain in the 18th century, was a major event that significantly influenced the course of human history. Lapar, Mantoux, and Ueda Tejiro all mentioned that Marx and Engels used or systematically explained the term "Industrial Revolution". However, these references were brief and lacked in-depth analysis, leaving room for further exploration and elaboration. Based on original works and returning to the texts, Marx and Engels analyzed and elucidated the five key factors that triggered the Industrial Revolution from the perspective of the contradiction between productive forces and relations of production. They presented the relationships between the subjects involved in these factors and, from the standpoint of the proletariat and with human emancipation as the guiding principle, revealed the institutional roots of alienated labor. They also analyzed and clarified the historical mission of the proletariat and the historical value of the Industrial Revolution, providing a valuable intellectual legacy and meaningful historical insights for understanding and grasping the ongoing new wave of the Industrial Revolution.

KEYWORDS: Marxist thoughts on the Industrial Revolution; subject-object factors; class standpoint; value pursuit

1. THE ORIGIN OF THE STUDY

The large-scale industry that emerged in Britain during the 18th century, along with the transformations it triggered, has been a significant focus of academic discourse. Klaus Schwab and Nicholas Davis, in their book, argue that the term "industrial (revolution)" might be too narrow to encompass the scope of this transformation. Instead, they suggest that the term used by 19th-century thinkers such as Thomas Carlyle and John Stuart Mill, namely "industrial revolution," might be more suitable (Schwab & Davis, 2018, p. 5). From the literature, it can be observed that not only 19th-century but also 18th- and 20th-century scholars employed the term "industrial revolution" to explore this momentous event in human social history, and Marx and Engels were no exceptions. Mantoux's work, *The Industrial Revolution in the Eighteenth Century—An Outline of the Beginnings of the Modern Factory System in England*, is acclaimed as a classic in economic history (Mantoux, 1997, p. 7). In the preface of this book, Ashton noted that the term "industrial revolution" was coined by Toynbee in the 18th century, and was subsequently used by Engels, Mill, and Marx (Mantoux, 1997, p. 3). Mantoux summarized the basic characteristics of the industrial revolution as the widespread advent of "machine-based production and the factory system," and he referenced Marx's discussion in *Capital* to clarify the distinctions between factories and craft workshops (Mantoux, 1997, p. 1). From the footnotes that Mantoux provided at the end of his book, it can be seen that Rappard pointed out in *The Industrial Revolution in Switzerland and the Origins of Legal Labor Protection* that Engels had used the term "industrial revolution" in *The Condition of the Working Class in England* on pages 11 and 355 in 1845, while Marx systematically elaborated on it in *Capital* (Mantoux, 1997, p. 390). However, Mantoux and Rappard did not provide detailed explanations of how Marx and Engels used or explained the term.

Tejiro Ueda, in the opening chapter of *The History of the Industrial Revolution*, stated that Marx and Engels not only explained the necessity of the "industrial revolution" from the standpoint of scientific socialism but also frequently used the term (Ueda, 2017, p. 1). While investigating the direct causes of the industrial revolution, he directly cited Engels, stating that the industrial revolution began with the invention of the spinning machine and steam engine (Ueda, 2017, p. 7). However, as Jameson put it, "The 'privilege' of Marxism lies in its intervention and mediation between different theoretical codes, far beyond what these codes can achieve themselves" (Jameson, 1997). In other words, in terms of Marx and Engels' usage and explanation of the term "industrial revolution," Tejiro Ueda provided relatively more commentary compared to Mantoux and Rappard, but it was still far from being a deep and systematic analysis of Marx and Engels' thoughts on the industrial revolution. This paper aims to return to the original works, re-examine the texts, comprehensively



and thoroughly restore and interpret the initial thoughts of Marx and Engels on the industrial revolution, supplement, expand, and deepen the perspectives of the above-mentioned scholars, provide valuable historical insights for understanding and grasping the new wave of industrial revolution, and offer intellectual tools and a practical guide for the breakthroughs in core technologies and industrial upgrading in China.

2. SIX DIMENSIONS OF MARX AND ENGELS' THOUGHTS ON THE INDUSTRIAL REVOLUTION

Engels once humbly stated that most of the guiding ideas he and Marx developed, particularly in the fields of economics and history, belonged to Marx (Marx & Engels, 1995, p. 242). Engels also emphasized that in *The Condition of the Working Class in England*, he described the "youthful phase" of the British Industrial Revolution (Marx & Engels, 1995, p. 422), while Marx, in *Capital*, depicted the period when "the prosperity of British industry had reached its peak". In this work, Marx developed their ideas into a scientific system (Marx & Engels, 1995, p. 423). Therefore, following Marx's logical pathway in *Capital*, this paper examines their thoughts on the industrial revolution through six dimensions to analyze their rich content and profound connotations.

(1) *The Historical Prerequisites of the Industrial Revolution: The Development of Exchange and Division of Labor*

The Industrial Revolution in Britain in the 18th century was not a random event; rather, it was a manifestation of the interconnectedness and mutual influence of exchange and the division of labor, reaching a decisive point through continuous development. Marx linked these facts with the evolution of industrial production methods and expounded on the historical prerequisites of the industrial revolution. Marx divided industrial production since the Middle Ages into three historical periods: household handicrafts, handicraft manufacture, and large-scale industry. These three periods succeeded one another like geological layers. Handicraft manufacture emerged from household handicrafts in two forms—simple cooperation and cooperation based on division of labor. Initially, with the establishment of the colonial system and the development of maritime trade, exchange means and markets expanded, and capital accumulated continuously. In order to conduct large-scale production and reduce unnecessary costs, different production tools and craftsmen were gathered in a large workshop under the control of a single capital. However, they continued laboring according to handicraft production methods, meaning that small master craftsmen worked with a few apprentices and assistants, with each worker manufacturing the entire product, completing each operation sequentially. This was the simplest form of cooperation, in which there was almost no division of labor or only partial division.

As external market demand and exchanges continued to expand, the need arose to provide a large quantity of finished goods within a specific time frame. This necessitated the adjustment and alteration of the original production methods, thereby shifting labor within workshops to a new method. Specifically, the various operations required to produce the entire product were separated and isolated according to the principle of division of labor, with each worker specializing in a single task or partial procedure, all operations occurring simultaneously in collaboration. This kind of division became systematic and institutionalized, leading to the differentiation, specialization, and simplification of production tools. Marx stressed that the accumulation of production tools and the development of division of labor were closely linked and mutually reinforcing. Every significant technological development in machinery spurred further division of labor, and every increase in division of labor, in turn, prompted new inventions in machinery (Marx & Engels, 1972, p. 164). Since machines consisted of numerous simple tools assembled into a single mechanical apparatus, which increasingly developed into sophisticated machine systems, the period of handicraft manufacture laid the technical and material foundation for the advancement and application of machinery.

At the same time, Marx pointed out the production and technological limitations inherent in handicraft manufacture. On the production side, the specific division of labor in handicraft manufacture fixed workers in isolated operations, whereas the production of goods often required a series of interlinked stages and processes. Maintaining the continuity of these interconnected operations inevitably incurred additional, non-productive expenses. Technologically, as different operations required varying time commitments, unequal quantities of intermediate products would be produced in equal periods. To achieve production goals within specific timelines, labor allocation across operations needed to be adjusted proportionally. In Marx's view, compared to household handicrafts, handicraft manufacture had its advantages, but "it could not achieve genuine technical unity based on its own foundation" (Marx & Engels, 1972, p. 386), nor could it overcome "the separation of individual processes resulting from division of labor" (Marx & Engels, 1972, p. 418). True technological unity existed only in mechanized factories, and only in machine-based production could continuous, uninterrupted work occur without dividing processes (Marx & Engels, 1972, p. 418). Additionally, the technological foundation of handicraft manufacture remained within the scope of manual labor. When market demands expanded to the extent that manual labor could no longer satisfy them, it was necessary to surpass its technological limitations and transition to large-scale industry based on machinery. Thus, the contradictions and conflicts between the technological foundation of handicraft manufacture and the production demands it had created led to the historical prerequisites for the British Industrial Revolution.



(2) The Technological Foundation of the Industrial Revolution: Developed Machines Driven by an Automatic Engine

Marx divided developed machinery into three components: the prime mover, which generated power; the transmission mechanism, which transmitted power; and the tool or working machine, which processed and produced. From a functional or division-of-labor perspective, the advanced machinery used in large-scale industry evolved based on technological changes in working machines and prime movers. Marx referred to changes in the working machines as the first revolution and the "use of the steam engine as a machine generating motion" as the second revolution (Marx, 1978, p. 53). Engels went even further by straightforwardly stating that "the invention of the steam engine and cotton-processing machines" spurred the industrial revolution (Marx & Engels, 1957, p. 281). Marx elaborated on the transformation of hand tools into developed machinery, analyzing the technological foundation of the industrial revolution.

The first stage involved changes to the working machines, i.e., the part of the machine that performed the labor, which originated in the tools and implements of household handicraft production and further developed during the heyday of handicraft manufacture (Marx, 1978, p. 53). The sequential invention of the spinning jenny, the water frame, and the spinning mule, all of which were referred to by Engels as "cotton-processing machines," resulted in changes to the working machines. However, these working machines still relied on "human beings themselves" for power and skill, and they did not fundamentally transform the mode of production. Nevertheless, they represented the "origin of the industrial revolution" (Marx, 1978, p. 53), heralding its arrival.

The second stage was the transformation of the prime mover. As the scale of the working machines increased and the number of tools on those machines expanded, the transmission mechanisms grew, necessitating a source of power greater and more consistent than human labor to provide continuous, uninterrupted motion. Consequently, Marx emphasized that "the creation of working machines made the revolution of the steam engine necessary" (Marx & Engels, 1972, pp. 390-391). Importantly, the steam engine being referred to here was James Watt's double-acting steam engine—a prime mover capable of generating its own power through the consumption of coal and water. It was also described as the "universal motive power applicable to all industrial sectors" (Marx, 1978, p. 117). This advancement transformed machinery from a mere hand tool into an elaborate system driven by an automatic engine, thereby enabling the mass production of machines by machines themselves. Large-scale industry established the technological foundation it required, shifting from the handicraft manufacture method to machine-based production, transforming sectors beyond textiles and chemicals, such as mining, metallurgy, metalworking, machinery manufacturing, and transportation, among others—all the "sectors of industrial activity" (Marx & Engels, 1957, p. 219). Especially notable was the advancement of machinery manufacturing, which allowed the machine system to continue to develop into a unified automatic system, fostering interdependence between previously isolated production sectors. Thus, the industrial revolution reached its "most decisive stage" (Mantoux, 1997, p. 269).

(3) Institutional Guarantee of the Industrial Revolution: Establishment and Popularization of the Factory System

From within the large-scale industry, advanced machinery driven by steam engines represented a fundamental technological factor—arguably the most crucial among them. Observing the historical development of industrial production, household handicrafts corresponded to cottage and household industry systems, and handicraft manufacture corresponded to the workshop and craft production systems. Similarly, large-scale industry based on advanced machinery required an organizational and production system aligned with it. Marx noted that the application of advanced machinery relied on factories that implemented a comprehensive division of labor, with machine-based production completing its work within mechanical factories. Factories represented the inherent form of workshops based on machine usage, with mechanical factories being the most advanced form of employing developed machinery, while the factory system represented the corresponding form of advanced labor organization (Marx, 1978, p. 41). The factory system was inextricably linked to the use of advanced machinery, and the two were regarded as basic features of the industrial revolution. The former acted as an institutional guarantee, while the latter served as the technological foundation; together, they promoted the industrial revolution, interacting and reinforcing one another. As mentioned earlier, developed machinery underwent an evolutionary and developmental process, and so did the factory system—it gradually and continuously infiltrated all industrial sectors (Marx & Engels, 1957, p. 495).

Marx quoted Dr. Andrew Ure's view of the factory system as an "order," noting that such order was absent in handicraft manufacture, which was based on scholastic division of labor. The three aforementioned "cotton-processing machines" described by Engels represented different stages of the factory system. The use of the spinning jenny did not require specialized workshops and had little impact on workers, without altering labor organization or destroying household handicrafts, thereby marking the transitional phase between household and factory systems. Arkwright gathered capital to install the water frame in large buildings, signed partnership agreements, and established the largest factory of the time, employing numerous home-based workers—thus "grafting the factory system onto the workshop system," and establishing order. Nevertheless, this did not fundamentally alter the nature of industrial production but only marked the beginning of the factory system. The invention and use of the spinning mule, especially water-powered automatic spinning mules that were used in hundreds of factories, provided the factory system with a solid framework. Marx pointed out that "a



labor organization and labor combination entirely dependent on a system of machinery emerged only in factories driven by an automatic machine" (Marx, 1978, p. 55). With the application of steam-powered advanced machinery in factories, workshops expanded into mechanical factories, manual labor transformed into machine-based production, and the factory system was established. In textile, metalworking, and machinery manufacturing industries where the enterprise conditions allowed, the factory system was widely adopted, achieving "absolute dominance" in large mechanical factories (Marx & Engels, 1957, p. 486). It even dominated large-scale agriculture (Marx, 1978, p. 41), thereby providing a solid institutional foundation for the industrial revolution.

With the establishment and popularization of the factory system, production materials such as machinery and raw materials became increasingly concentrated, and population and capital also concentrated in factories. Marx considered this concentration, based on the factory system, to be "the condition for machine production" (Marx, 1978, p. 43). This was a means for capital to control production materials and achieve capital appreciation, as well as a new condition for labor exploitation and control. In other words, the machine-based production rooted in the factory system fundamentally transformed the modes and nature of production, heralding the beginning of the era of large-scale industry. This organized form of machine-based production became a consciously controlled mode of capitalist domination, characterized by the organized system of large-scale production and factory organization. Hence, industry based on machinery and the factory system was directly interpreted as "an organization, a production system" (Mantoux, 1997, p. 9)—a form of production relationship that typified the nature of capitalism and had the power to influence the entire economic and social system, to the extent that people could consider it as revolutionary.

(4) The Scientific Foundation of the Industrial Revolution: The Development and Application of Scientific Theories and Methods

By the 18th century, a new field of inquiry—technology as a study of production processes—began to emerge. Mechanics, physics, chemistry, and other natural sciences increasingly became connected with industrial production, and scientists were explaining these connections in ways that provided scientific theories and methods for new inventions and production improvements (Marx, 1978, p. 72). Watt's invention of the steam engine exemplified the extensive application of these sciences, with continuity, automation, and the operational speed of machine production all being "solved through the technological application of mechanics and chemistry" (Marx & Engels, 1972, p. 417). In the broader context, the Industrial Revolution was both nurtured during the age of empiricism and emerged during the age of scientific advancement. Marx examined the process of invention, construction, and application of the steam engine through the lens of dynamics and mechanics, thereby elucidating the scientific basis of the industrial revolution.

Technologically, the Industrial Revolution was propelled by successive transformations of working machines and power engines, and the technological shift and union of the power engine and working machines played a decisive role. Marx explained that, during the process of production, the power that drove the tool included human labor, animal power, water power, windmills, watermills, and steam mills. Among these, the first four sources of power did not represent any new principles, whereas the construction of the watermill was the true application of mechanics (Marx, 1978, pp. 58-59). After the Middle Ages, watermills coexisted with handicraft and handicraft manufacture production but did not trigger a fundamental transformation in production methods. It was not until the second half of the 18th century that the steam engine, invented to create steam mills, resulted in an automatic system of machinery. This progress in technology was not solely the result of generations of accumulated experience but also the appearance and application of theories such as friction theory, siphon theory, hydraulics, hydraulic engineering, and turbine theory during the 18th century. Specifically, James Watt's technical improvements to the Newcomen steam engine—including the invention of the double-acting steam engine—were achieved through significant scientific discoveries, including mechanical theory, the theory of latent heat, the principle of the condenser, and the principle of rotary motion, all developed through systematic, long-term experimentation in laboratories. Though building the steam engine still required the collaboration of skilled craftsmen such as clockmakers, tinsmiths, and watermen, its use represented the thorough application of science in production. For example, its application in the textile and paper industries involved alternating mechanical and chemical processes. In machine manufacturing—particularly for the production of specialized precision machines—it was necessary to ensure that the equipment and processes used to manufacture them achieved high levels of accuracy and precision. Manual labor and traditional production processes no longer met these demands, necessitating the introduction of new principles such as the principle of sliding and the principle of pneumatics. Without corresponding scientific theories and methods, high-level machine production would not have been possible (Marx, 1978, p. 123).

Therefore, traditional manual labor and production techniques initially assisted new inventions and large-scale industry. However, with the invention and widespread use of Watt's steam engine, science became an indispensable factor in production processes, transforming production into a scientific application. This transformation not only represented "the concentration of traditional experience, observation, and occupational secrets derived from experimental methods" but also the development of these into scientific theories and methods, which were used to analyze and solve production problems, driving the transformation of production methods and fostering the advancement of the industrial revolution (Marx, 1978, p. 208).



(5) The Capital Logic of the Industrial Revolution: The Relationship Between Science and Large-Scale Machine Production Under Capitalism and Its Consequences

According to Engels, the political revolution in France and the philosophical revolution in Germany were the result of the union between science and philosophy, while the Industrial Revolution in Britain was the result of the combination of science and practice. However, during the 18th century, scientific disciplines such as mathematics, mechanics, and chemistry had already achieved their own forms of scientific knowledge, and in terms of scientific discoveries and technological advancements, "France, Sweden, Germany, and Britain were more or less on the same level" (Marx, 1978, p. 233). Yet why did the Industrial Revolution first occur in Britain? Marx explained this with "four onlies": only under the capitalist mode of production could "the kind of practical problems that required scientific solutions arise for the first time"; only the immediate needs of capitalist production reached a scale that "made the application of science both possible and necessary"; and only in Britain had economic relationships developed to the point where "capital was able to take advantage of scientific advances" (Marx, 1978, pp. 206, 233). In other words, the occurrence of the Industrial Revolution was also rooted in the link between science and large-scale machine production mediated by capital. Marx analyzed this relationship and its consequences by examining the relationship between capital and labor productivity, revealing the underlying logic of capital in the Industrial Revolution. In Marx's analysis, capital is value capable of creating surplus value, while labor is the source of value, and surplus labor is the source of surplus value. In pursuing endless capital accumulation, capitalists also sought to continually increase labor productivity, or as Marx stated, "labor productivity is productivity precisely because it is the productivity of capital; their growth is one and the same" (Marx, 1978, pp. 182-183). The value of a commodity is determined by the socially necessary labor time it embodies. Machinery, being a product of production, has value and represents social labor. In production, machinery transfers its value—determined by the labor required for its creation—to the products, thereby contributing to their appreciation. Machinery's use thus contributes not only to society's labor productivity but also converts natural forces, such as water, wind, steam, and electricity, into components of social labor. While natural forces, resources, and even scientific forces may cost the capitalist nothing, capitalists can only harness these forces by "possessing capital," especially "the form of machinery as capital" (Marx, 1978, p. 190). Through the use of machinery, capital generates surplus value from surplus labor. In this way, capitalism transforms the productive potential of society into the productive force of capital. Capital's goal of increasing labor productivity and extending the scope of production required that all domains of nature submit to production (Marx, 1978, pp. 190-192).

As a result, under capitalist production, large-scale machine production not only subordinated natural forces to direct production processes but also, for the first time on a large scale, created the material means for the advancement of natural science. Capitalism transformed science into a practical tool for production, making it a conscious and systematic element of production. Researchers funded by capitalists were encouraged to continually explore practical applications for science to advance production, thereby "for the first time systematically and extensively developing and applying scientific factors" (Marx, 1978, p. 208). This use of science enabled capitalists to extend their ability to exploit and control nature, and the productivity of capitalist production grew "at an unprecedented pace and on an unprecedented scale" (Marx & Engels, 1995, p. 741), fundamentally transforming production and social life.

However, Marx also emphasized that in mechanical factories, organized under the factory system, surplus value ultimately stemmed from the exploitation of labor power. The capitalist's appropriation of science, and the conversion of science into an applied science for production, was accomplished by "subordinating the worker to capital" (Marx, 1978, pp. 211-212). Thus, under the capitalist mode of production, both science and machinery became forces that opposed labor—forces that obeyed and served capital, executing the "function of a master". To the worker, these forces became "alien, antagonistic, and domineering" (Marx, 1978, p. 207).

Therefore, the result of linking science with production under the capitalist mode of production was inherently dual in nature. While the productive forces of capitalism underwent significant expansion, the relations of production also experienced deep changes, intensifying the degree of exploitation and oppression faced by workers and exacerbating the antagonism between capital and wage labor. This antagonism manifested as a contradiction between capitalists and workers, or the bourgeoisie and the working class, a contradiction that, when intensified to a certain point, would lead to social revolution. Engels thus believed that the result of applying science in production was also social revolution (Marx & Engels, 1972, p. 28), thereby shifting the focus of Marxist industrial thought from capital logic to the logic of human emancipation.

(6) The Historical Value of the Industrial Revolution: Facilitating the Construction of the Association of Free Individuals

Marx believed that, during the Industrial Revolution, science increasingly entered human life through large-scale industry and reshaped it. Even though, under the capitalist mode of production, science had "to fully develop in a form alien to humanity" (Marx, 2016, p. 86), it nonetheless laid the groundwork for human emancipation. Engels pointed out that capitalist large-scale industry had developed "conflicts that made the transformation of production modes absolutely necessary," but it also "developed the means to resolve these conflicts through immense productive forces" (Marx & Engels, 1995, pp. 607-608). Hence, through an examination of the capitalist



production process, Marx and Engels not only revealed the irreconcilable contradiction between the bourgeoisie and the proletariat but also discovered the dynamic of productive forces and production relations and identified the path for human emancipation. They further analyzed this path through the relationship between industry, science, and the generic essence of humanity, clarifying the historical value of the Industrial Revolution.

Marx noted that "the history of industry and the objectively existent products of industry are open books on the essential powers of man" (Marx, 2016, p. 85). However, under the capitalist mode of production, not only machines and science but also labor itself became an alien force, leading to the alienation of human essence and estrangement among people. Regarding the root cause of alienated labor, Engels argued that it "must be sought in the capitalist system itself" (Marx & Engels, 1995, p. 421), while Marx attributed it directly to the capitalist private ownership of production materials, i.e., "modern bourgeois private property" (Marx & Engels, 1995, p. 286). Therefore, eliminating alienated labor requires abolishing this ownership model and establishing a system of ownership based on the social nature of modern production materials—whereby society collectively owns the materials as means for sustaining and expanding production, while individual producers directly own them as living and enjoyment resources (Marx & Engels, 1995, p. 754). This implies that, after the proletariat seizes state power and establishes public authority as the ruling class, they should use this power to transform the bourgeois-controlled social production materials into state property or public property. In doing so, these production materials are liberated from the constraints of the capitalist mode of production, free from their role as capital, allowing their social nature to be fully realized. Thus, the mode of ownership corresponding to the accelerated development of productive forces is established, and through the development of industry and natural sciences, society can "lay the foundation for truly human life" (Marx, 2016, p. 86).

To Marx, conscious and free activity is a human characteristic that is demonstrated by the practical creation of an objective world and the transformation of the natural world. Since industry represents the practical relationship between humans and nature and is also the foundation of human science, the true human mastery over nature could only be achieved through industrial and scientific advances, even though this was initially in an alienated form (Marx, 2016, p. 86). This means that, under conditions of social ownership of production materials, the conscious application of natural sciences to industry and the promotion of a new round of technological revolution and industrial transformation would ensure the development of social production. This development would guarantee not only an abundant material life for all social members but also the full development and utilization of their physical and mental abilities. As production continues to advance, the social ownership of production materials would gradually transform into direct individual ownership, eliminating the existence of class antagonisms. Thus, "the natural laws that have always ruled over people" and "the objective alien forces that have hitherto dominated history" will come under the conscious control of humanity, and humans will become masters of their social relationships and, therefore, the conscious masters of nature and of themselves (Marx & Engels, 1995, pp. 758, 760). Consequently, humanity can form an association of free individuals, where "each individual's free development is a condition for the free development of all" (Marx & Engels, 1995, p. 294). This represents "the historical mission of the modern proletariat" (Marx & Engels, 1995, p. 760) and the most far-reaching historical value of the British Industrial Revolution.

In conclusion, the occurrence of the Industrial Revolution in Britain in the 18th century was not a random event but the manifestation of the interconnected and mutual influence of industrial capitalists, inventors, scientists, and workers, who, based on the development of exchange and division of labor, driven by capital, with science and technology as the foundation, and connected by the factory system, reached a decisive point through continuous development. Marx and Engels, from the standpoint of the proletariat and guided by the value of comprehensive human freedom, connected these subjective and objective factors, demonstrating the process of the British Industrial Revolution's occurrence and development, revealing the institutional roots of alienated labor, clarifying the future trend of human social development, and explaining the historical mission of the proletariat and the actions they must take. They highlighted the historical significance and the value of the Industrial Revolution, providing intellectual tools and historical insights for seizing the historical opportunities of the new round of the industrial revolution and promoting the modernization of socialism with Chinese characteristics.

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