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COGNITIVE DEVELOPMENT IN CHILDREN WITH EPILEPSY

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ABSTRACT

Epilepsy is attributed as a disease presenting with seizures altering the structural, cognitive, behavioural and social prospect in a child's development. These altercations between seizure and the brain functions often results in severe deficiency of the fine skills necessary for honing a life. Importantly, functions including memory, speech, learning and others are found reduced in paediatric population. The aforementioned disparities are consequential to a multitude of causative agents ranging from age, type and prolongation of the type. Whilst, the influence individual cause possess over epilepsy ultimately decided the extent of the cognitive disability and the extent of its effects from childhood into adulthood. The confluence of the factors is directly proportional to severity of the comorbidity. On the basis of multiple studies conducted pan world, it was found that more than 1/4th of the children diagnosed with epilepsy scored lesser IQ compared to their peers. Interestingly, more than ½ of the children usually presented with cognitive deficits at varying levels. Hence, it's of common interest to the physician and the researcher to be able to identify these factors and contribute methods to enhance the betterment of life in these population. Children with so-called epilepsy-only, as well as those with community and population-based studies, reports from tertiary care facilities, and other evidence suggest that childhood epilepsy can be linked to impairments in cognition. The objective of the study is to analyse information regarding epilepsy including definition, classification particularly in paediatric population, analyse different forms of DEE's 3 and to understand the different kinds of cognitive impairments in paediatric population.

KEYWORDS: '*Epilepsy', 'cognitive development', 'DEE'*

INTRODUCTION

Epilepsy is known to be one of the common conditions exerting influence over the pediatric generation. According to the clinical definition, "Epilepsy is a disease of the brain defined by any of the following conditions 1. atleast two unprovoked (or reflex) seizures occurring >24h apart and one unprovoked (or reflex) seizure and a probability of further seizures similar to the general recurrence risk. [1]" While this condition persists, seizure is utilized concomitantly with aforementioned condition as seizure in definition is "a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain [2].

It affects an estimated 0.5% to 1% of children [3]. For over many decades many researchers have dedicated their time in understanding working model of epilepsy and its concomitant effects on the human brain and simultaneous changes in patients. Simply put, the process of seizures may be attributed to a tip in the natural course of inhibition and excitation. The associative changes are usually attached to GABA one of the main inhibitory as well as excitatory neurotransmitter in the brain.

Recent papers of ILAE taskforce are set down as in effect of understanding the terminology of epilepsy and set ground rules to better seize the prognostic value of the condition. The predominance of age factor owing to the occurrence of the pediatric patient is crucial in prompting a positive prognosis. Nonetheless. Epileptic syndromes encountered in the childhood period provides a very intriguing symbiosis of diagnostician and the patient itself. As specified earlier, the fragility of the age, the greater disparities, the course and the individuality of the growth period is critical. The implications of the syndrome in the aforementioned age category coherences to adversities in multiple areas of cognition and action. Whilst, remarkable discoveries have been made in the genetics front respecting epilepsy. The preponderance of these discoveries is to depict the innumerable and indefinite etiological variables causative of epilepsy in the childhood period [4]. The archetypes of epileptic syndrome depicted in the neonatal and infantile period are SLE's and DEE's.

Epileptic encephalopathy abbreviated as EE, is a collective term suggestive of normal brain and overall development preceding the seizure occurrence, while unlike its peers EE is notorious to cause increasing brain dysfunction. Developmental encephalopathy exhibits a slightly divergent character which is a diagnosis of forgoing neurological condition before the onset of epileptic seizures. Nevertheless, they are known to lead to cognitive impairments [5]. One of the prominent syndrome in this category is Ohtahara syndrome, one of the serious forms in DEE [6]. The clinical presentation of this type is reduced to as young as 10 days after birth while most cases are reported around 30 days after birth. These seizures in comparison to the category of self-limited epilepsies occur either clustered or not [7]. Another differentiating character are in the form of onset while SLE are predominantly focal, DEE may present as either focal, generalized. Apart from these differences, suppression burst is a characteristic feature visible in the EEG finding.

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These findings are coherent with sleep-wake timings of the patient [8]

PURPOSE

To understand the cognitive development in pediatric population with different form of epilepsies.

OBJECTIVE

To analyse information regarding epilepsy including definition, classification particularly in paediatric population, analyse different forms of DEE's 3 and to understand the different kinds of cognitive impairments in paediatric population.

METHODOLOGY

The thesis was performed at the Department of Paediatrics during the year 2021-2023. The research design included. The data were extracted from scientific platforms such as Hinari, PubMed, Medscape, Research Gate, the NCBI, and Google Scholar, among others. Various publications, including scientific investigations, cross-sectional and cohort studies, and some longitudinal studies, were analysed.

DISCUSSIONS

The time frame of seizures are attributed to prolonged deficits visualized in the patients and also, increases the risk of disrupting normal development of the brain in the formative years of the children. In simple words, onset at neonate stage may exhibit severe and abrupt cognitive impairment in comparison to the slower progression visible in prolonged disease course. Increasing data suggests that these seizure lead to an interference between neural networks. The epidemiological data required in understanding the cognitive deficits are dime. Amongst the prevalent form the reduced ability to learn was analyzed. This trend was noticed in a study group form a population study occupying children under 16 years from the time span of 45 years living in the region of turkey. In the study conducted over the span of 45 years, 242 patients were selected and were reviewed utilizing multiple tools including questionnaires and health checks at regular intervals. The results attested to the aforementioned assumption that is about 76% of the patients exhibited learning 25 disability to a certain extent. Theoretically, reducing the cognitive dysfunction maybe attributed to the expeditious identification and management of the etiology. However, thus far endeavors targeted towards hindering the progression of epilepsy in patient located in the high-risk categories have seen little promising results. This has prompted researchers to concentrate on creating new therapies to inhibit the progression as well assure a good overall outcome for patients. According to seizure focus, specific cognitive deficits may start in focal epilepsies. Attention difficulties and a decline in executive function are common symptoms of frontal lobe epilepsy. Both a structural lesion and an epileptogenic zone in the frontal lobe can affect several executive processes, including planning, organizing, paying attention, and problem-solving, which results in cognitive impairment. Many epileptic encephalopathies with neonatal to childhood onset are usually accompanied by severe cognitive impairment and drug-resistant seizures. In addition to the common and paroxysmal electroclinical seizures, metabolic or genetic factors may also play a significant role. Childhood, the most sensitive time for brain development, is when neurologic disorders like electroclinical seizures can affect brain maturation and cognitive performance. Depending on the 31 intensity of the seizure, transitory cognitive impairment may happen during the interictal or postictal period, directly interfering with daily tasks. Moreover, repeated or protracted seizures that cause anoxia, lactic acidosis, or excessive excitatory neurotransmitters may irreversibly harm the cerebral substrate and impair cognitive function.

CONCLUSIONS

One of the common conditions affecting the younger age is considered to be epilepsy. While the definition still adheres to its original meaning, it has been updated to include the occurrence of two unprovoked seizures occurring within a 24-hour period and/or one provoked seizure with a significant risk of recurrence. Almost of generalised epilepsy syndromes with childhood onset are caused by hereditary factors. They are thought to have complicated inheritance, which implies that they have a polygenic basis, with or without input from the environment. 2. Generalized epilepsy syndromes, self-limited focal epilepsies, and developmental and epileptic encephalopathies—which frequently feature both focal and generalised seizures—can be used to classify the juvenile onset syndromes. 3. Childhood-onset focal epilepsies are frequently self-limited and typically have an unknown origin. The greater occurrence of a positive family history of epilepsy and age-dependent, focused EEG abnormalities suggest that genetic factors play a significant etiological role in epilepsy. Self-limited epilepsy syndrome is characterized by focal tonic or clonic activity of the throat, tongue, and one side of the dorsal surface, which may progress to a focal to bilateral tonic-clonic seizure. These episodes are frequently brief. Developmentally normal kids can develop childhood occipital visual epilepsy, which manifests as frequent, brief awake seizures with visual disturbances but unaltered awareness that are frequently followed by headaches with migrainous symptoms. Two different syndromes, epilepsy with myoclonic absence and epilepsy with myoclonia of the eyelids, are among the other children hereditary generalised epilepsy syndromes.

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Conflict of Interest Statement
The authors report no conflicts of interest.

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