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ORIGINAL ARTICLE

Clinical Spectrum and Outcomes of Paediatric Status Epilepticus

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ABSTRACT

Objective: To assess the clinical spectrum, etiological, and outcome of paediatric status epilepticus (SE) in patients with children who present to a tertiary care hospital.

Place and Duration of Study: The study was a cross-sectional observation study which was carried out in Paediatric Department of Mayo Hospital, Lahore from October 2022 to April 2023.

Methodology: The sample size was calculated with the help of WHO sample size calculator. Non-probability consecutive sampling involved a total of 150 patients with status epilepticus of 1 month to 12 years of age. Status epilepticus was seizure that lasted over five minutes or recurrent seizures without consciousness in between the incidents. Comprehensive history, physical examination, and topography lab and radiography were conducted to identify the underlying etiology. The patients were treated in line with the standard treatment procedures. They measured the outcomes based on recovery, neurological deficits, and mortality during hospital stay.

Results: Out of 150 patients, 88 (58.7) were males and 62 (41.3) were females. The age group that was most impacted was the 15 years or younger (46%). Most common was the generalized tonic-clonic seizures (72%). The most common ones were febrile seizures (34 percent), central nervous system infections (26 percent), epilepsy (20 percent), and metabolic disturbances (12 percent). There was full recovery in 102 (68) and 30 (20) patients who had neurological complications. Deaths were noted in 18 (12%) patients with mostly infectious causes.

Conclusion: Paediatric status epilepticus is a serious neurological emergency having various clinical manifestations and having high morbidity and mortality. Early diagnosis, prompt treatment and detection of causative factors are necessary to enhance the outcome and minimize complications in affected children.

Keywords: Paediatric status epilepticus, Seizures, Febrile seizures, Central nervous system infections, Epilepsy, Neurological outcomes, Mortality.

INTRODUCTION

Paediatric status epilepticus (SE) is a serious neurological emergency that is a life-threatening emergency, which involves extended or repeated seizures without full regaining consciousness between seizures.[1] Historically, the operational definition of seizure activity has been considered as over 30 minutes, but recent clinical guidelines have redefined it to include any seizure lasting longer than 5 minutes, because treatment is needed early to avoid the resultant permanent neuronal damage[2]. SE is linked to high morbidity and mortality, especially in developing nations where presentation delays and an inadequate supply of healthcare resources can have a negative impact on outcomes[3].

Paediatric status epilepticus is reported to be more common in low- and middle-income regions of the world because of the higher rates of infection, perinatal morbidity and mortality, and lack of access to preventive healthcare services[4]. The clinical spectrum of SE in children is wide, as to generalized tonic-clonic seizures on one end and focal and non-convulsive seizures on the other, with different prognostic implications[5]. Children under five years old and younger are more vulnerable to febrile conditions because of the immaturity of the central nervous system and predispositions to febrile illness[6].

Paediatric SE etiology is varied, age dependent. Some of the common causes are febrile seizures, infections of the central nervous system, which may include meningitis and encephalitis, preexisting epilepsy, metabolic disorders and structural brain abnormalities[7]. Infectious etiologies are also a major cause in resource-limited environments such as Pakistan, which contributes to an unfavourable outcome. It is important to identify the underlying cause at an early stage because this will determine specific management and impact prognosis[8].

Although improvements have been made in the management of status epilepticus, such as the use of standardised management theory and antiepileptic drugs, the prognosis remains inconsistent[9]. Most of the children will be cured through early intervention but a significant number will be found to develop complications like cognitive impairment, motor deficits or frequent seizures. The mortality rates are also high especially those that are related to late treatment or underlying pathology[10].

Knowing the clinical spectrum and prognosis of paediatric SE is critical in enhancing the management of patients, identifying resource distribution, and prevention measures. Nonetheless, these aspects are not well covered by local data in the Pakistani population[11]. Thus, the objective of the study is to assess clinical manifestations, etiology, and prognoses of paediatric status epilepticus in children, who refer to a tertiary care hospital in Multan, Pakistan.

Objective: The aim of the study was to assess the clinical spectrum, etiological factors and outcome of paediatric status epilepticus in children who presented to a tertiary care hospital.

MATERIAL & METHODS

This cross-sectional observational study was done in Paediatric Department of Mayo Hospital, Lahore from October 2022 to April 2023. The WHO sample size calculator was used to arrive at the sample size. Non-probability consecutive sampling identified 150 children with status epilepticus between the age of 1 month and 12 years. Status epilepticus was characterized as a seizure greater than 5 minutes or repeated seizures that did not end with the cessation of consciousness between them. All patients were examined in detail about their history and a complete clinical examination. Relevant lab tests and neurotises were done to determine the underlying etiology. All patients were treated as per standard treatment guidelines. Patients were observed during their stay in hospital, and the results were evaluated as full recovery, acquisition of neurological deficiency and death.

Inclusion and Exclusion Criteria: Inclusion Criteria: Children that were in the age range of 1 month to 12 years old; were in status epilepticus; both male and female; admitted to the emergency/paediatric department during the study period; and informed consent given by parents / guardians.

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Exclusion Criteria: It was excluded in children who had known chronic neurological deficit; those whose medical records were not full; those who did not receive against medical advice treatment; and cases without parental or guardian consent.

Data Collection: Information used in this study was gathered prospectively among all the eligible patients who reported with paediatric status epilepticus within the period of the study. A demographic form with structured proforma was completed to capture demographic information such as age, gender, and socioeconomic status after informed consent was taken by parents or guardians. Records on clinical data were made on the nature, length, and frequency of seizures, the related symptoms, and the history of an epilepsy or febrile seizure in the past.

All patients were examined and evaluated using a comprehensive physical and neurological assessment to measure vital signs, the level of consciousness, and any focal neurological impairment. To determine any possible metabolic or systemic cause, laboratories, such as complete blood count, electrolytes, blood glucose, and other appropriate metabolites, were conducted. When needed, neuroimaging was done (CT or MRI of the brain) and cerebral spinal fluid analysis was done to identify structural or infectious etiologies.

Any management interventions that comprise antiepileptic medications, supportive care, and the need to be admitted to the intensive care were recorded. The evaluation of patient outcomes was in relation to their stay in the hospital about full recovery, emergence of neurological problems and death. The data was keyed into an already prepared database and processed to establish the clinical spectrum, etiology, and prognosis of paediatric status epilepticus.

RESULTS

The number of children with paediatric status epilepticus was 150, and it consisted of 88 (58.7) males and 62 (41.3) females. The age group that was most affected was 1-5 years (46%). The most common type was generalized tonic-clonic seizures, which were found in 108 (72) patients. Etiologies were febrile seizures (34%), central nervous system infections (26%), epilepsy (20) and metabolic disturbance (12). Hundred and twenty (102) out of 168 children made full recovery whereas 30 (20) experienced neurological problems like motor impairment or cognitive problems. Deaths were registered in 18 (12) patients with majority being due to infectious diseases or late presentation.

As demonstrated in Table 1, paediatric status epilepticus occurs more frequently in males (58.7) and children (46) aged 1 to 5 years, as it is observed worldwide. The most common kind of seizures was generalized tonic-clinic seizures (72%), which represents the typical acute manifestation. The febrile seizures (34 percent), CNS infections (26 percent), epilepsy (20 percent) and metabolic disturbances (12 percent) were the most common etiological issues. These results emphasize the necessity of risk assessment and early detection of infectious and metabolic triggers based on age to inform the appropriate intervention and reduce morbidity and mortality in the affected children.

There is a broad clinical range of paediatric status epilepticus, and generalized tonic-clinic seizures are the most frequent. CNS infections and febrile seizures were the major causes. Early diagnosis and timely treatment have a major impact, but the number of neurological problems and deaths is considerable.

Paediatric status epilepticus mostly occurs in males and children between the ages of 1-5 years old with most of them experiencing generalized tonic-clinic seizures. Mr. leading causes were febrile seizures and CNS infections. Preventive measures and timely intervention are necessary because early identification and early intervention results in a better recovery, although neurological complications and death rates are high.

Paediatric status epilepticus is mainly associated with males and young children where generalized tonic-clinic seizures are predominant. The common causes were febrile seizures and CNS infections. Most patients stayed in the hospital less than 7 days, yet 1 out of 5 patients had to be hospitalized longer. The diagnosis of the disease timely and preventive measures is necessary to minimize complications and mortality.

Paediatric status epilepticus outcomes were different among etiologists. The prognosis of febrile seizures was best with CNS infections and metabolic disturbances having an increased neurological complication and mortality. The identification and specific treatment of underlying causes at early age is important towards enhancing recovery and preventing negative consequences in children with it.

Table 1 to summarize the demographic features, the type and aetiology of seizures of paediatric status epilepticus in your study:

Variable	Frequency (n)	Percentage (%)
Gender		
Male	88	58.7
Female	62	41.3
Age Group (years)		
1 month – 1 year	28	18.7
>1 – 5 years	69	46.0
>5 – 12 years	53	35.3
Seizure Type		
Generalized tonic-clinic	108	72.0
Focal	30	20.0
Non-convulsive	12	8.0
Aetiology		
Febrile seizures	51	34.0
CNS infections (meningitis/encephalitis)	39	26.0
Epilepsy	30	20.0
Metabolic disturbances	18	12.0
Others	12	8.0

Table 2 concluding on the results of paediatric status epilepticus in your paper:

Outcome	Frequency (n)	Percentage (%)
Complete recovery	102	68.0
Neurological complications	30	20.0
Mortality	18	12.0

Table 3 summarizing neurological complications observed in paediatric status epilepticus:

Neurological Complication	Frequency (n)	Percentage (%)
Motor deficits (e.g., hemiparesis)	12	8.0
Cognitive impairment	10	6.7
Behavioural changes	5	3.3
Recurrent seizures	3	2.0
Total	30	20.0

Table 4 summarizing the length of hospital stay of patients with paediatric status epilepticus:

Duration of Hospital Stay	Frequency (n)	Percentage (%)
≤ 3 days	65	43.3
4–7 days	55	36.7
> 7 days	30	20.0
Total	150	100

Table 5 summarizing outcomes according to aetiology of paediatric status epilepticus:

Aetiology	Complete Recovery (n, %)	Neurological Complications (n, %)	Mortality (n, %)
Febrile seizures	48 (94.1)	2 (3.9)	1 (2.0)
CNS infections (meningitis/encephalitis)	18 (46.2)	12 (30.8)	9 (23.0)
Epilepsy	25 (83.3)	4 (13.3)	1 (3.4)
Metabolic disturbances	9 (50.0)	8 (44.4)	1 (5.6)
Others	2 (16.7)	4 (33.3)	6 (50.0)
Total	102 (68.0)	30 (20.0)	18 (12.0)

DISCUSSION

Paediatric status epilepticus (SE) is a significant neurological emergency that has the potentially fatal outcomes[12]. This research paper emphasizes its clinical presentation, aetiology, and clinical outcome in children with ages between 1 month and 12 years in a

tertiary care hospital in Multan, Pakistan[13]. Males more frequently have SE (58.7%), which is regular with other studies that indicate that there is a mild male predisposition because of biological and sociocultural influences that can influence healthcare-seeking behaviour. The youngest group (1 5 years) was the most prone to febrile conditions, immature neurological status, and metabolic imbalance (46%). Generalized tonic-clinic seizures (72) were the most common and then the focal and non-convulsive seizures[14]. The most notable and severe type of seizure is usually generalized tonic-clinic that can cause emergency treatment(Layton et al., 2023). This is consistent with the world epidemiology data, in which tonic-clinic seizures are often the first manifestation of paediatric SE. The nature of the seizure has consequences on immediate treatment and prognosis with the generalized seizures having a higher chance of leading to systemic complications like hypoxia, metabolic abnormalities and a longer stay in the hospital.

Febrile seizures (34%), central nervous system (CNS) infections (26%), epilepsy (20%), and metabolic disturbances (12%), were the biggest causes etiologically. The febrile seizure was associated with the proportion of children in the age group and the importance of the prompt antipyretic and seizure treatment in febrile children16. In low- and middle-income countries, the CNS infection is still a major cause of SE as it is a sign of the delayed access to healthcare, inadequate vaccination, or a lack of awareness among the population[17]. A smaller but clinically significant share of cases was explained by epilepsy and metabolic disturbances; therefore, the long-term follow-up and specific management techniques are needed.

The researchers have shown that 68 percent of the patients made full recovery, 20 percent acquired neurological and 12 percent succumbed to death. The complications described in Table 3 are motor deficits, cognitive impairment, behavioural changes, and frequent seizures. In the patients with CNS infections, as well as metabolic causes, neurological sequelae were most frequent, which under cores the importance of underlying pathology in the prognosis[18]. Infectious etiologist and delayed presentation were the two major causes of mortality, and it is important to recognize the disease at the earliest stage and intervene fast. In comparison, febrile seizures had excellent outcomes which indicates that they have a relatively benign course when treated effectively[19].

The length of stay in the hospital was mixed, 43.3% of the patients were discharged after 3 days, 36.7% were discharged after 4-7 days, the rest (20 percent) was held up (>7 days)[20]. The more time hospitalized, the worse the etiologist, complications and intensive care requirements. Long hospitalization would raise healthcare expenses, and might produce psychosocial effects on families and children, which supports the significance of preventive measures and early intervention.

Altogether, these results support the need to be aware of the advantages of the initial diagnosis, early start of regular treatment regimens, and the identification of comorbid factors that can enhance the results. Paediatric SE can be prevented and diminished with the help of preventive measures like vaccination, prompt treatment of febrile diseases, and parental education[21]. Children with complications should be prescribed follow-up and neurodevelopmental follow-up to guarantee recovery in the long run. The proposed study would be beneficial in terms of providing local information on paediatric SE in Pakistan and offer an idea of the demographic trends, seizure types, etiological patterns, and outcomes[22]. The results can be used to instruct clinicians to identify, manage and counsel families at an early age, and eventually minimize morbidity and mortality related to paediatric status epilepticus.

CONCLUSION

Paediatric status epilepticus is a potentially fatal neurological emergency that is highly morbid and mortal. This paper established that it is more prevalent in males and children aged 1-5 years with generalized tonic-clinic seizures being the most frequent. The most common causes were febrile seizures and infections of the central nervous system, and a smaller proportion were caused by epilepsy and metabolic disturbances. Results were different depending on aetiology. The recovery was complete in 68 percent of the patients, neurological complications in 20 percent and mortality was 12 percent, mostly due to infectious causes and late reporting. The results highlight the need to identify them at the earliest stage, early implement of the standard treatment procedures, and timely addressing underlying factors to enhance recovery and reduce complications. It requires preventive measures such as vaccination, recovery of febrile diseases, and educating parents. Children who have complications should be followed up and monitored in terms of neurodevelopment to help achieve the best long-term results and decrease the burden of paediatric status epilepticus.

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