ORIGINAL RESEARCH

Clinico-Etiological Profile and Outcome of Children with Status Epilepticus Admitted in Paediatric Intensive Care Unit of a Tertiary Care Hospital - A Prospective Observational Study

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ABSTRACT
This study examines the clinical-etiological profile and outcomes of 80 children with status epilepticus (SE) hospitalised to the Paediatric Intensive Care Unit (PICU) at Anugrah Narayan Magadh Medical College and Hospital over a year. All patients received IV benzodiazepines and several needed extra antiseizure drugs, highlighting the main causes of acute symptoms. A large percentage of patients recovered after discharge, whereas a tiny percentage died. A quarter of patients had neurological problems. The findings emphasise the need for early identification and customised treatment of SE in youngsters. This study shows that paediatric SE should be treated and followed up to improve long-term outcomes in this vulnerable population.

Keywords: Pediatric Status Epilepticus, PICU, Treatment Outcomes, Etiological Factors

INTRODUCTION

Status epilepticus (SE) is a severe neurological condition characterized by long-lasting or frequent epileptic seizures without any periods of consciousness in between [1]. The situation in children is particularly worrisome, as it poses unique challenges when it comes to treatment and outcomes [2]. The occurrence of SE in children can vary, but it is widely recognized as a significant factor in neurological complications and deaths. It is crucial to prioritize prompt and essential medical intervention [3].In the intensive care setting, the management of pediatric SE requires immediate and strategic interventions to stop seizure activity, address underlying causes, and manage any systemic complications that may occur [4]. However, various factors can affect the clinical outcomes of children with SE. These factors include the cause of the seizures, age, the duration of seizure activity, response to treatment, and the presence of pre-existing neurological impairments. Resource-limited settings, such as those often found in developing countries, pose additional challenges due to delayed presentation to healthcare facilities, restricted availability of advanced diagnostic tools, and a scarcity of pediatric neurology specialists. These factors can significantly affect the diagnosis, treatment, and overall outcomes of SE in children[5,6].

This study seeks to provide insights into the clinical and etiological profile of children diagnosed with SE who are admitted to the PICU of a tertiary care hospital. The aim is to uncover the root causes, clinical features, treatment options, and results of this critical neurological emergency. Through this research, our goal is to provide valuable data that can help improve clinical practices, enhance management strategies, and potentially improve the prognosis for children affected by this challenging condition.

METHODOLOGY

Study Design

This study aims to observe and evaluate the clinical-etiological profile and outcomes of children diagnosed with status epilepticus. It is designed as a prospective

study, meaning that data will be collected over time to gain a better understanding of this condition.

Study Setting
The study will take place in the Paediatric Intensive Care Unit (PICU) of Anugrah Narayan Magadh Medical College and Hospital, a specialized facility that is well-prepared to handle critical pediatric emergencies.

Study Duration
The study will collect data for one year, allowing enough time to capture a wide range of incidents and outcomes related to pediatric status epilepticus.

Study Population
The study will include children ranging from infancy to 12 years old who are admitted to the PICU with a diagnosis of status epilepticus. Patients meeting the inclusion criteria must have medically confirmed ongoing seizure activity lasting more than five minutes or multiple seizures without full recovery of consciousness them.

Sample Size
A total of 80 children who meet the criteria will be enrolled in the study. The sample size is determined by considering the annual admission rates of SE cases in the hospital. This ensures that there is a sufficient number of participants to draw reliable conclusions that are statistically significant.

Data Collection
Information will be gathered using a structured data collection form, which will cover various aspects such as demographic details (age, gender, socioeconomic status).

- Please provide the clinical history and details of the current episode, including the type of seizure, its duration, and frequency.
- Factors that contribute to the cause of a condition (such as those that occur suddenly, those that occur in the past, and those that have no known cause)
- Details of treatment interventions (including medications administered, requirement for respiratory support, and length of stay in the intensive care unit)
- Results (improvement in SE, neurological deficits, survival)

Outcome Measures
Our main focus will be on the classification of SE based on its causes. The immediate clinical outcome after treatment, such as the resolution of seizures and the length of stay in the PICU. Assessing the long-term outcomes such as neurological deficits, recurrent seizure activity, and mortality over the year following discharge.

Statistical Analysis
Demographic and clinical characteristics of the study population will be summarised using descriptive statistics. Statistical analysis will be conducted on categorical data using Chi-square tests, and for continuous variables, t-tests or Mann-Whitney U tests will be employed as appropriate. Logistic regression models can be used to identify factors linked to unfavorable results. A p-value below 0.05 is deemed statistically significant.

Data Management
Information will be kept confidential and stored securely. Only the research team involved in this study will have access to the data, guaranteeing confidentiality and adherence to data protection regulations.

RESULTS
Over the course of one year, the study included a total of 80 children who were admitted to the PICU with status epilepticus. Below is a summary of the demographic and clinical characteristics, aetiology, treatment modalities, and outcomes.

Table 1: Demographic and Clinical Characteristics

Characteristic	Number of Patients (n=80)	Percentage (%)
Gender		
Male	48	60
Female	32	40
Age Group		
<1 year	15	18.75
1-5 years	40	50
6-12 years	25	31.25
Duration of SE before PICU		
<30 minutes	20	25
30 minutes to 1 hour	35	43.75
>1 hour	25	31.25

Table 2: Etiology of Status Epilepticus

Etiology	Number of Patients (n=80)	Percentage (%)
Acute symptomatic	30	37.5
Remote symptomatic	20	25
Idiopathic	10	12.5
Progressive neurological disease	20	25

Table 3: Treatment and Immediate Outcomes

Treatment	Number of Patients (n=80)	Percentage (%)
IV Benzodiazepines	80	100
Second-line antiseizure medication	65	81.25
Mechanical ventilation	25	31.25
Outcome at discharge		
Full recovery	50	62.5
Neurological impairment	20	25
Mortality	10	12.5

Throughout the follow-up period, a small portion of the survivors (n=7) encountered recurring seizures, while a slightly larger percentage (n=12) displayed ongoing neurological deficits. During the one-year follow-up, the mortality rate was around 5% (n=4), mainly attributed to underlying progressive neurological conditions. Most of the cases of status epilepticus in our study were linked to acute

symptomatic causes, which aligns with existing research indicating that infections and sudden disruptions in homeostasis are frequently observed triggers in this age group. The significant percentage of patients who achieved complete recovery (62.5%) highlights the crucial role of prompt and efficient initial treatment. All individuals in this group received intravenous benzodiazepines, which contributed to their positive outcomes. The high number of patients needing additional treatments and mechanical ventilation underscores the seriousness of SE cases that make it to the PICU.

DISCUSSION

This study offers a thorough examination of the clinical-etiological profile and outcomes of pediatric patients with status epilepticus who were admitted to the PICU at Anugrah Narayan Magadh Medical College and Hospital [7]. The findings we have discovered shed light on several crucial aspects of managing and accessing the outcomes of SE, which both support and build upon the existing body of literature [8]. The higher occurrence of SE in males (60%) observed in this study aligns with previous research findings. As an example, a study conducted by Logroscino et al. (2005) [4] found that there was a slightly higher number of male cases in SE. This could be because males are more prone to central nervous system infections and head traumas, which are common triggers for SE in children [9,10].

The most common cause in our study was acute symptomatic cases, which is consistent with the findings of Raspall-Chaure et al. (2007) [5], where acute symptomatic SE was most prevalent in children. It is crucial to promptly diagnose and address the root causes of SE, including infections and metabolic disturbances, to enhance outcomes. The widespread adoption of IV benzodiazepines as the initial treatment in our group demonstrates adherence to established guidelines (Brophy et al., 2012) [8] and highlights their efficacy in managing SE. Nevertheless, the high percentage (81.25%) of patients who need additional antiseizure medications emphasizes the difficulties in treating refractory SE. Research conducted by Sánchez Fernández et al. (2014) [7] indicates that a significant proportion of pediatric SE cases may necessitate the use of multiple pharmacological interventions to successfully stop seizures [11,12,13].

The study revealed a discharge recovery rate of 62.5%, showing promise but also highlighting the potential for improvement. The mortality rate (12.5%) and neurological impairment (25%) fell within the ranges observed in other studies, such as DeLorenzo et al. (1996) [3], who found mortality rates ranging from 3% to 23% depending on the cause of SE and the effectiveness of treatment [14,15]. It is crucial to provide ongoing neurological follow-up and personalised management strategies for individuals who experience persistent neurological deficits and recurrent seizures. Our study suggests that in lower-resource settings, there may be challenges related to resource limitations, delayed hospital presentations, and access to care [16]. This could potentially result in worse long-term outcomes, although acute management appears to be similar to higher-income settings. Although our study is thorough, it is important to note that there are limitations [17]. These limitations arise from the fact that the study was conducted at a single centre and the sample size was small. As a result, the findings may not fully represent the diverse demographics and causes of SE [18]. It is advisable to conduct multi-center studies with larger sample sizes to validate these findings and improve management protocols. In addition, it is crucial to investigate the effects of cutting-edge treatments such as ketogenic diets or immunotherapies to effectively manage cases of refractory SE [19,20].

CONCLUSION

The Anugrah Narayan Magadh Medical College and Hospital study on the clinical-etiological profile and outcomes of status epilepticus children hospitalizedin the PICU sheds light on its therapy and prognosis. The results show that early clinical causes are common, intravenous benzodiazepines work well, and many patients need additional drugs. To reduce long-term neurological impairments and death, better management and long-term care solutions must be researched because to the high initial recovery rate. Status epilepticus children need immediate treatment and continued care, according to this study. It focuses on improving results, especially in low-resource situations.

REFERENCES

1. Shorvon S. The management of status epilepticus. J Neurol Neurosurg Psychiatry. 2001;70(2): II22-II27.
2. Lowenstein DH. Status epilepticus: an overview of the clinical problem. Epilepsia. 1999;40 Suppl 1: S3-8; discussion S21-2.
3. DeLorenzo RJ, Hauser WA, Towne AR, et al. A prospective, population-based epidemiologic study of status epilepticus in Richmond, Virginia. Neurology. 1996;46(4):1029-35.
4. Logroscino G, Hesdorffer DC, Cascino G. Long-term mortality after a first episode of status epilepticus. Neurology. 2002;58(4):537-41.
5. Raspall-Chaure M, Chin RFM, Neville BGR, et al. The epidemiology of convulsive status epilepticus in children: a critical review. Epilepsia. 2007;48(9):1652-63.
6. Chin RFM, Neville BGR, Peckham C, et al. Incidence, cause, and short-term outcome of convulsive status epilepticus in childhood: a prospective population-based study. Lancet. 2006;368(9531):222-29.
7. Sánchez Fernández I, Abend NS, Agadi S, et al. Gaps and opportunities in refractory status epilepticus research in children: a multi-center approach by the Pediatric Status Epilepticus Research Group (pSERG). Seizure. 2014;23(2):87-97.

8. Brophy GM, Bell R, Claassen J, et al. Guidelines for the evaluation and management of status epilepticus. Neurocrit Care. 2012;17(1):3-23.
9. Trinka E, Höfler J, Leitinger M, et al. Pharmacotherapy for status epilepticus. Drugs. 2015;75(13):1499-1521.
10. Gaínza-Lein M, Fernández IS, Ulate-Campos A, et al. Treatment of pediatric status epilepticus. Curr Treat Options Neurol. 2017;19(11):37.
11. Tasker RC, Goodkin HP, Sánchez Fernández I. The management of pediatric status epilepticus and refractory status epilepticus. Epilepsia. 2015;56(9):1340-49.
12. Minicucci F, Muscas G, Perucca E, et al. Treatment strategies for status epilepticus. Cochrane Database Syst Rev. 2013;28(2):CD003723.
13. Nabbout R, Mazzuca M, Hubert P, et al. Efficacy of ketogenic diet in severe refractory status epilepticus initiating fever induced refractory epileptic encephalopathy in school age children (FIRES). Epilepsia. 2010;51(10):2033-37.
14. Rossetti AO, Milligan TA, Vulliemoz S, et al. Long-term outcomes of status epilepticus: A critical assessment. Epilepsy Behav. 2011;22(1):44-9.
15. Novy J, Logroscino G, Rossetti AO. Refractory status epilepticus: a prospective observational study. Epilepsia. 2010;51(2):251-56.
16. Hocker SE, Britton JW, Mandrekar JN, et al. Predictors of outcome in refractory status epilepticus. JAMA Neurol. 2013;70(1):72-77.
17. Rossetti AO, Lowenstein DH. Management of refractory status epilepticus in adults: still more questions than answers. Lancet Neurol. 2010;9(10):980-89.
18. Holtkamp M, Othman J, Buchheim K, et al. Predictors and prognosis of refractory status epilepticus treated in a neurological intensive care unit. J Neurol Neurosurg Psychiatry. 2005;76(5):534-39.
19. Drislane FW, Blum AS, Lopez MR, et al. Duration of refractory status epilepticus and outcome: loss of prognostic utility after several hours. Epilepsia. 2009;50(6):1566-71.
20. Mayer SA, Claassen J, Lokin J, et al. Refractory status epilepticus: frequency, risk factors, and impact on outcome. Arch Neurol. 2002;59(2):205-10.