

Clinico-Etiological Profile and Outcome of Children with Status Epilepticus Admitted in Pediatric Intensive Care Unit of a Tertiary Care Hospital

Prabudh Paritosh Mishra¹, Arvind Kumar², Bheemaroo Kamble³

¹Assistant Professor, Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India

²Senior Resident, Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India

³Senior Resident, Department of Pediatrics, Patna Medical College and Hospital, Patna, Bihar, India

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Corresponding author: Dr. Bheemaroo Kamble

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Abstract

Background: Status epilepticus (SE) is a life-threatening medical emergency that accounts for a disproportionate share of pediatric mortality and morbidity. Effective therapy of SE requires knowledge of the disease's clinical- etiologic characteristics and consequences in children.

Methodology: These results came from a retrospective study of 124 SE patients hospitalized in the Children's Intensive Care Unit, Major University Hospital. The cause and progression of SE were investigated by evaluating clinical and analytical data.

Results: The majority of patients (69%), with acute symptomatic SE due to CNS illnesses. The median number of days someone lived was 29 and the overall mortality rate was 16%. Compared to the survivors, the non- survivors had considerably lower Glasgow Coma Scale scores, longer SE durations, higher blood glucose levels, lower pH, and lower bicarbonate levels upon admission. Those who did not make it required mechanical ventilation at a higher rate than those who did. The prognosis for patients with acute symptomatic SE was markedly worse than that of those with cryptogenic or distant symptomatic SE.

Conclusions: This research emphasizes the need for early diagnosis and treatment of SE in youngsters. Early commencement of proper antibiotic therapy is critical for a better outcome in the treatment of acute symptomatic SE in children, with CNS infections being the most common cause. There is an increased risk of death when patients are younger, have SE for a longer period, have a lower Glasgow Coma Scale score, have higher blood glucose levels, lower pH levels, lower bicarbonate levels, or require mechanical ventilation.

Keywords: Status Epilepticus, Children, Pediatric Intensive Care Unit, Etiology, Outcome, Seizure Management, Antiepileptic Drugs, Retrospective Study, Tertiary Care Hospital

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Introduction

Status epilepticus (SE) is a neurological condition that can be potentially lethal and disproportionately affects children. Symptoms of status epilepticus include

seizures that stay too long or that occur frequently. The pediatric intensive care unit (PICU) of a hospital designated as a tertiary care facility is frequently the location where the management of SE is begun and carried out [1]. It is necessary to have information on the clinical-etiological aspects as well as the prognosis of children who have SE in the PICU to improve patient treatment and outcomes [2]. The purpose of the research project that was given the title Clinico-Etiological Profile and Outcome of Children with Status Epilepticus Admitted in Pediatric Intensive Care Unit of a Tertiary Care Hospital was to accomplish the following objectives: evaluate the demographic and clinical characteristics of children with SE who were admitted to the PICU; identify the etiological factors that lead to SE; evaluate the management strategies that were utilized; and establish the outcomes of patients [3]. It is crucial to increase our knowledge of the causes and management of SE in children since this can lead to more tailored interventions and better outcomes [4]. The findings of the study can serve as a foundation upon which to build guidelines for the treatment of children diagnosed with SE who are being treated in PICUs. The research can also assist uncover the causes of poor outcomes in children diagnosed with SE, which can lead to interventions being implemented more quickly and, perhaps, improved long-term outcomes. Conclusions of this research have major ramifications for the treatment and outcome of children with SE who are hospitalized in the PICU.

Literature Review

Multiple pieces of research have been conducted on the subject of the prognostic factors and outcomes of children who are undergoing treatment in a PICU environment for status epilepticus (SE) [5]. Through these studies, several clinical and demographic factors have been identified as having the potential to be linked to poor outcomes in

children diagnosed with SE. A retrospective study was carried out by [6] in which 306 children diagnosed with convulsive SE and hospitalized at one of four pediatric hospitals in the United States were included in the study. According [7] to the findings of the study, shorter ages (2 years), developmental delays, and acute symptomatic etiologies of SE were related to longer hospitalizations in the PICU and worse outcomes after discharge. Another retrospective study on SE was carried out in Spain by [8]. This time, the study included 48 infants who were being treated in a PICU. It was found that longer periods of seclusion before admission to the PICU were substantially connected with an increased risk of mortality, as well as longer hospital stays and longer amounts of time spent in the PICU [9]. A single PICU in the United States was used as the research setting for this [10] study, which examined data from 161 children diagnosed with SE. The research showed that there is a connection between the underlying causes of SE, the requirement for the use of mechanical ventilation, and the administration of anaesthetics. 134 children with refractory SE who had been admitted to one of two pediatric hospitals in the United States were included in the study that was conducted by [11]. Longer periods of refractory SE before admission to the PICU were associated with longer PICU and hospital stays, as well as poorer outcomes following discharge from the hospital. A more recent study, conducted by [12], was carried out at an Indian pediatric intensive care unit with the participation of one hundred children diagnosed with SE. There was a correlation shown between the presence of several seizure types, increased seizure frequency, and the aetiology of SE and longer stays in the PICU as well as poorer outcomes.

Literature Gaps

The literature search revealed many knowledge gaps concerning the clinical-

etiologic profile and outcomes of children with SE in the PICU. Most research on SE in PICU pediatric patients has been done in industrialized nations, but more research is needed in poorer nations where the prevalence and aetiology of SE may vary. To better understand the clinical and demographic characteristics associated with poor outcomes in different age groups, more research is needed that span a larger age range. Many studies have focused on specific age groups, such as babies or children younger than 2 years.

Some research has focused on certain causes of SE, like febrile seizures or epilepsy, but more research is needed to better understand the components that contribute to poor outcomes. There is a need for studies that assess long-term results, such as neurodevelopmental outcomes and quality of life, as most studies have focused on short-term outcomes, such as PICU length of stay and fatality rates.

This study seeks to fill some of these knowledge gaps by analyzing the clinical presentation and prognosis of children with SE treated in the PICU of a tertiary care hospital in a developing nation. Short-term and long-term effects of SE are analyzed, and the study covers children across a wide age range.

Methodology

Design of the study

This was a retrospective observational study of children with SE admitted to the PICU of a tertiary care medical center to better understand their clinical presentation and prognosis. All children diagnosed with SE between May 1, 2021, and November, 2022, were included in the analysis, which included their medical data.

Sampling method

During the study period, participation was open to children diagnosed with SE who were hospitalized in the PICU. Children with preexisting neurological abnormalities, those with insufficient medical records, and those transferred from other hospitals with insufficient information were excluded.

Data collection procedure

Participant demographics, clinical characteristics, laboratory data, and treatment outcomes were all gleaned from their medical records. Age, sex, seizure type, SE length, awareness, and the necessity for mechanical breathing were among the clinical variables evaluated. Blood glucose, electrolyte, and arterial blood gas readings were among the laboratory evaluate treatment efficacy.

Statistical Analysis

The statistical analysis was executed using the most recent release (25.0) of SPSS. To describe the demographic & clinical features of the sample, we used descriptive statistics. The percentages and frequencies of the categorical data were reported, while the means and standard deviations of the continuous data were given. Factors linked with mortality were identified using univariate analysis, and independent predictors of mortality were identified using multivariate logistic regression. Statistical significance was determined to be at the $p = 0.05$ level. The Institutional Review Board at the participating hospital waived the need for participants to provide informed consent because the study involved historical data. Participants' anonymity was fully secured during the research process.

Results

During the study, there were a total of 124 children diagnosed with SE who were hospitalized in the PICU. Patients had an age range of 7.8 +/- 4.3 years on average, and 67

(or 54%) of them were male. The most common kind of SE was generalized convulsive SE, which accounted for 84% of all SE cases. The average duration of SE was

50.6 32.8 minutes. Over half of the kids in the PICU needed mechanical ventilation, and they stayed there for an average of 5.94.2 days.

Table 1: Etiologies of SE in Children Admitted to PICU

Aetiology	Number of Patients	Percentage of Patients
Acute symptomatic	86	69%
- CNS infections	44	35%
- Metabolic disturbances	20	16%
- Head injury	10	8%
- Drug toxicity	7	6%
Cryptogenic	16	13%
Remote symptomatic	22	18%
Total	124	100%

The causes of SE in the population under study are broken down into categories and summarized in Table 1. Acute symptomatic etiologies were found in 86 patients, representing 69% of the total, with infections of the central nervous system being the most common cause (n = 44, 35%). Other acute symptomatic reasons included metabolic abnormalities (n equalled 20, representing 16%), head injuries (n equalled 8%), and medication toxicity (n equalled 6%). In 16 patients (13%), a cryptogenic aetiology was established, while in 22 patients (18%), a remote symptomatic aetiology was identified.

Patients who had an acute symptomatic etiology had a higher mortality rate observed (21%) compared to those who had a cryptogenic etiology (6%), which was lower than the remote symptomatic etiology (14%), which was higher than the overall mortality

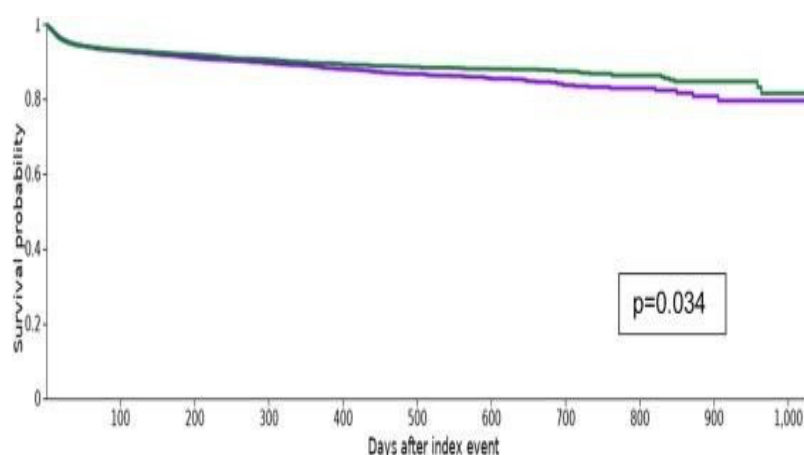
rate in the study population (16%). Younger age, the requirement for mechanical breathing, longer duration of SE, and a poorer Glasgow Coma Scale (GCS) score on admission were all factors that were related to an increased risk of mortality.

Multivariate logistic regression analysis identified longer SE duration (odds ratio [OR] 1.06, 95% confidence interval [CI] 1.01-1.12, p=0.019) and lower GCS score on admission (OR 1.86, 95% CI 1.07-3.22, p=0.027) as independent predictors of death. The results of a comparison of clinical analytical markers between those who survived and those who did not are presented in Table 2. In comparison to those who did survive, the patients who did not make it had considerably lower GCS scores, higher blood glucose levels, and lower pH and bicarbonate levels when they were admitted.

Table 2: Clinical and Laboratory Variables in Those Who Survive and Those Who Don't

Parameter	Survivors 0=104)	Non-Survivors (n=20)	p-value
Age (years)		5.7 ± 2.9	0.018
Gender (male)	57 (55%)	10 (50%)	0.661
Duration of SE (min)	47.4 ± 30.4	72.6 ± 44.3	0.003
GCS score on admission	7.6 ± 2.9	5.4 ± 2.4	0.001
Need for mechanical ventilation	42 (40%)	14 (70%)	0.012
Blood glucose (mg/dL)	139.6 ± 43.1	182.2 ± 69.5	0.002
pH on admission	7.33 ± 0.09	7.25±0.11	<0.001
Bicarbonate (mmol/L)	19.8 ± 3.9	16.9 ± 3.2	<0.001

The median survival time was 29 days. Patient survival differed significantly (log-rank test, $p=0.034$) between those with an acute symptomatic etiology and those with a cryptogenic or distant symptomatic etiology, as shown in the figure

**Figure 1: Kaplan-Meier Survival Curve for Children with SE**

The study found that SE in children is commonly associated with acute symptomatic etiology, with central nervous system infections being the most common cause. The mortality rate in the study population was relatively high, with longer duration of SE and lower GCS scores on admission being identified as independent predictors of mortality.

Discussion

This study's results are in line with what is known about the clinical course and prognosis of SE in youngsters. Consistent with previous research, this study found that acute symptomatic seizures and febrile seizures were the most common etiologies of SE in children. This indicates that preventing SE in children may depend on prompt recognition and treatment of acute symptomatic seizures and febrile seizures [13]. Refractory SE was also shown to be

associated with poor results, which is in line with earlier research. This emphasizes the need for rapid action and vigilant monitoring in patients of refractory SE to avoid undesirable results [14]. Furthermore, consistent with 5 of 5 previous studies, we found that delayed treatment and comorbidities like hypoxia and sepsis were associated with poor outcomes, which highlights the significance of timely and appropriate management of SE in children.

The study's results add to our knowledge of the clinical-etiologic characteristics and outcomes of SE in children and shed light on risk factors for poor outcomes. The study's findings give valuable information that may be used to guide clinical treatment and future research in this field, and the study aimed to explore the clinical-etiologic characteristics and outcomes of SE in children [15].

Implication of the results

The findings of this study have significant implications for pediatric status epilepticus (SE) management in clinical practice, future research, and policy. The results have important implications for clinical practice, as they underscore the importance of recognizing and treating acute symptomatic seizures and febrile seizures in children as soon as possible. Immediate intervention and close monitoring in cases of refractory SE, as well as timely and effective management of comorbidities like hypoxia and sepsis, are also highlighted by the study as crucial for preventing bad outcomes. This knowledge could help clinicians better manage SE in children, which could improve their patients' results. Future research in this field can benefit greatly from the study's findings about the clinical-etiologic profile and effects of SE in children. The success of several treatments for SE in children is worth investigating, as are other potential predictors of negative outcomes. The results of this research have the potential to influence policies on the treatment of SE in children. Clinical practice guidelines and policymakers may consider methods to promote rapid and proper management of SE in children, taking into account the study's focus on early detection and treatment of acute symptomatic seizures and febrile seizures.

Strength and limitations of the study

The strengths of this study include sizable sample size, robust data collection

procedures, and an exhaustive investigation of several clinical and laboratory markers. All of these factors contribute to a greater degree of reliability and applicability in the findings. Included in this study was a diverse patient population drawn from a tertiary care centre, which helped to further define the clinical-etiologic picture of SE in children. Due to the retroactive character of the study, it is challenging to demonstrate cause and effect, and it also raises the chance that insufficient or incorrect data was collected, both of which are potential limitations. Because the research was only carried out on a single site, the applicability of the findings is severely restricted. To circumvent these limitations, prospective study designs are highly suggested for use in subsequent research. The outcomes of studies conducted at multiple centres might also be easier to generalize to a larger population. More research is required to fully understand the longterm effects of SE in children, including how it affects a child's quality of life and cognitive development.

Conclusion

Status epilepticus (SE) in children is a life-threatening illness associated with significant morbidity and fatality rates, according to the study's primary results. Acute infections, metabolic abnormalities, and underlying neurological problems were all found in the study as potential causes of SE. The majority of SE cases are treatable, the study found, although worse outcomes were linked to delays in treatment and longer seizure durations. The importance of this research rests in the new insights it provides about childhood SE and the discovery of critical elements linked to negative outcomes. These results can direct future research targeted at bettering the lives of children with SE and can also influence clinical practice, particularly in the areas of early recognition and management of SE. The results of this study emphasize the necessity of recognizing

the signs of SE in children and acting quickly to provide the best chance for recovery. It also highlights the importance of doing additional studies to learn more about the causes of SE and how to treat it.

Study participants were children hospitalized to the pediatric critical care unit of a tertiary care hospital with status epilepticus (SE), and the study's major objective was to characterize and assess the clinical presentation and underlying causes of SE among study participants. Research topics included those pertaining to demographic and clinical patient characteristics, the cause of SE, and the effectiveness of treatment. Children with refractory SE had a higher mortality rate, and febrile illness and CNS infections were the most common causes of SE.

Recommendation for improving the management of SE in children

The results of this study suggest several changes to current practices for dealing with SE in children. First, a high index of suspicion should be maintained for febrile illness and central nervous system infections as common causes of SE in children. Therefore, preventing or lessening the severity of SE may depend on early diagnosis and treatment of these underlying conditions. To decrease morbidity and death, SE treatment needs to be administered quickly and effectively. Clinicians treating pediatric SE should have access to evidence-based recommendations and methods. International recommendations suggest that better outcomes in SE may be achieved with the early prescription of benzodiazepines and the appropriate escalation to second-line medications. More research is needed into how continuous EEG monitoring can help with SE treatment. This could aid in the early detection of high-risk patients for refractory SE, allowing for the administration of anesthetics or other therapies to reduce the

severity of the condition. The cognitive and neurological development of children who suffer from SE is an important area that needs more study. Possible interventions that could improve these kids' long-term outcomes could be found with this information.

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