# **Original Research**

# Evaluation of Etiology and Clinical Features of Seizures in Critically Ill Children Admitted to a Pediatric Intensive Care Unit (PICU): An Institutional Based Study

Sarika Swami<sup>1</sup>, Mahendra Singh Sisodiya<sup>2</sup>

<sup>1</sup>Associate Professor, Department of Pediatrics, Sardar Patel Medical College, Bikaner, Rajasthan, India <sup>2</sup>Assistant Professor, Department of Neurology, Sardar Patel Medical College, Bikaner, Rajasthan, India

**Corresponding Author:** 

Dr. Mahendra Singh Sisodiya Assistant Professor, Department of Neurology, Sardar Patel Medical College, Bikaner, Rajasthan, India **Email:** drmssisodiya@gmail.com

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#### ABSTRACT

**Background:** The present study was conducted for determining the etiology and clinical features of seizures in critically ill children admitted to a pediatric intensive care unit (PICU).

**Materials &Methods:** Assessment of a total of 50 subjects of less than 16 years of age was done. Only those subjects were analyzed who were presented with seizures and needed admission to intensive care unit. Exclusion criteria for the present study included pediatric subjects who were admitted to PICU for non-neurological emergencies. Complete demographic and clinical details off all the subjects were obtained. Details regarding clinical presentation, Pediatric Early Warning Signs score (PEWS) at presentation and etiological diagnosis.

**Results:** A total of 50 patients were analyzed. The mean age of the patients was 8.9 years. The majority of subjects were girls. 24 percent of the subjects had positive history of pre-existing epilepsy.82 percent of the subjects were of high risk as per PEWS score. Most common type of seizure was generalized tonic-clonic. Mean duration of seizure was 25.3 minutes. Acute etiology was seen in 34 percent of the subjects. CNS infection was the most common etiologic type. 12 percent of the subjects had unknown etiology.

**Conclusion:** A large number of critical children had prolonged seizures, recurrent seizures and had CNS infection as the etiology. Hence; there is a need to emphasize the scope of preventive strategies in reducing disease burden.

Key words: Seizures, Critically Ill, Pediatric.

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#### INTRODUCTION

Seizures are defined as a transient occurrence of signs and symptoms due to the abnormal, excessive, or synchronous neuronal activity in the brain characterized by abrupt and involuntary skeletal muscles activity. The adjective "transient" in the definition, indicates a time frame with a clear onset and remission. Febrile seizures are defined as critical seizures which occurs in children aged between 1 month and 6 years with temperature rise over 38 °C and without signs of infectious disease of the central nervous system (CNS).<sup>1,2</sup>

In the case of infantile spasms, no model has been able to replicate all of these conditions, and lack of an adequate animal model has hindered ongoing research. Several recently refined hypotheses are offering new insights into this challenging and devastating disorder. Early studies focused on the role of ACTH and its effect on seizures in the developing brain using traditional kindling models. Expanding knowledge of the role of ACTH as a neuroendocrine molecule and participant in the stress response via its interaction with corticotropin releasing hormone (CRH) led to the implication of CRH in the pathophysiology of infantile spasms. Experimental injection of CRH into the ventricles causes limbic seizures in an age-dependent manner.<sup>3-5</sup>

The first approach in SE should focus on airway management and adequate ventilation and circulation. It is important to safeguard patients from injuries caused

by uncontrolled movement. It is also important to place the patient in a lateral position to prevent inhalation and position a peripheral venous catheter.Monitoring vital signs (heart rate, blood pressure, oxygen saturation, and temperature) is essential to evaluate the course of SE. A rapid blood test should be done to recognize hypoglycemia or poisoning.<sup>5-7</sup>Hence; the present study was conducted for determining the etiology and clinical features of seizures in critically ill children admitted to a pediatric intensive care unit (PICU).

#### **MATERIALS & METHODS**

The present study was conducted in Department of Pediatrics and Department of Neurology, Sardar Patel Medical College, Bikaner, Rajasthan(India) for determining the etiology and clinical features of seizures in critically ill children admitted to a pediatric intensive care unit (PICU). Assessment of a total of 50 subjects of less than 16 years of age was done. Only those subjects were analyzed who were presented with seizures and needed admission to intensive care unit. Exclusion criteria for the present study included pediatric subjects who were admitted to PICU for nonneurological emergencies. Complete demographic and clinical details off all the subjects were obtained. Details regarding clinical presentation, Pediatric Early Warning Signs score (PEWS) at presentation and etiological diagnosis. All the results were recorded on a Microsoft excel sheet followed by statistical analysis using SPSS software. Univariate analysis was done for assessing the level of significance.

#### RESULTS

A total of 50 patients were analyzed. The mean age of the patients was 8.9 years. The majority of subjects were girls. 24 percent of the subjects had positive history of pre-existing epilepsy.82 percent of the subjects were of high risk as per PEWS score. Most common type of seizure was generalized tonic-clonic. Mean duration of seizure was 25.3 minutes. Acute etiology was seen in 34 percent of the subjects. CNS infection was the most common etiologic type. 12 percent of the subjects had unknown etiology.

Table 1: General and chilical characteristics					
Variable		Number	Percentage		
Mean age (years)		8.9			
Gender	Boys	23	46		
	Girls	27	54		
History of pre-existing epilepsy		12	24		
PEWS score	High risk	41	82		
Type of seizure	Generalized tonic-clonic	35	70		
	Focal	10	20		
	Unknown	5	10		
Duration of seizure		25.3 minutes			
Recurrent seizures		16	32		

Table 1: General and clinical characteristics

Table 2	: Etiology	of seizures
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Etiology of seizures		Number	Percentage		
Remote	CNS infection	4	8		
	Structural	3	6		
	Perinatal hypoxia	3	6		
Acute	Hypocalcaemia	12	24		
	Febrile	5	20		
	Metabolic	5	10		
	CNS infection	10	10		
	Others	2	4		
Unknown		6	12		
Total		50	100		

#### DISCUSSION

A seizure is defined as a transient alteration of consciousness, manifested as a specific behavioral and motor activity due to excessive electrical discharges from a group of cerebral neurons. Epilepsy is a disorder of the brain characterized by an enduring predisposition to generate epileptic seizures, and it requires the occurrence of at least one epileptic seizure. Pediatricians get scared and will not feel comfortable dealing with children who have epilepsy. Pediatricians should be aware of this disorder and should know how to approach a child who presents with a seizure.<sup>8-</sup>

<sup>11</sup>Febrile convulsions (related to a fever) are the most common type of convulsion in early childhood. But most children who have these convulsions don't have epilepsy because they only occur when they have a fever. About 3% of all children have at least one febrile convulsion before 7 years of age.It is harder to recognize epileptic seizures in newborn babies and infants than it is in older children. The symptoms can sometimes be seen as eye movements, lip smacking, flailing arms and jerking movements. They often already occur in the first few days of life.Convulsions in babies are usually the result of a medical problem such as a lack of oxygen, bleeding or poor blood circulation in the brain. But there are also mild forms of epilepsy that go away again on their own within a few weeks of the birth. In rarer cases, epilepsy is inherited (passed down from parents through their genes). Then it starts soon after birth and is usually very severe.<sup>12-15</sup>Hence; the present study was conducted for determining the etiology and clinical features of seizures in critically ill children admitted to a pediatric intensive care unit (PICU).

A total of 50 patients were analyzed. Mean age of the patients was 8.9 years. Majority proportion of subjects were girls. 24 percent of the subjects had positive history of pre-existing epilepsy.82 percent of the subjects were of high risk as per PEWS score. Most common type of seizure was generalized tonic-clonic. Sahin S et al determined the etiology and clinical features of seizures in critically ill children admitted to a pediatric intensive care unit (PICU). The most common causes of seizures were acute symptomatic. Most frequent coexistent diagnosis was infectious diseases, and 53.3% had recurrent seizures. Medications were administered to 51.1% of the patients before admission. Seizures were focal in 21 (46.7%). generalized in 11 (24.4%) and 13 (28.9%) had status epilepticus. Intravenous midazolam was first-line therapy in 48.9%. Acute symptomatic seizures were usually new-onset, and duration was shorter. Epileptic seizures tended to be recurrent and were likely to progress to status epilepticus. However, type of seizures did not change severity of the disease. Also, laboratory test results, medications administered before admission, requirement and duration of ventilation, mortality and length of stay were not significant between epileptic/acute symptomatic patients.Seizures in critically ill children, which may evolve into status epilepticus, is an important condition that requires attention regardless of cause.<sup>15</sup>

Mean duration of seizure was 25.3 minutes. Acute etiology was seen in 34 percent of the subjects. CNS infection was the most common etiologic type. 12 percent of the subjects had unknown etiology. In another previous study conducted by Amonkar et al, authors studied the clinical profile, immediate outcome and risk factors associated with poor outcome in critically ill children presenting with seizures requiring PICU admission. The records of 157 children aged 1 month to 16 years admitted in the PICU at a tertiary hospital in India with seizures as the presenting symptom during a three-year period were studied retrospectively. Median age of patients was 4 years. 34 (21%) had pre-existing epilepsy and 33 (21%) had previous developmental delay/neuro-deficit. Seizure duration was > 30 min in 75 (47.7%) and 56 (35.6%) required the use of more than 2 antiseizure drugs. 101 (64%) had acute symptomatic seizures, 28 (17%) remote symptomatic and 27 (17.1%) had unknown cause. New onset neurological deficit was seen in 18 (15.6%) and 14 (8.9%) died. Young age, high PEWS score at presentation, prolonged/recurrent seizures, CNS infection, need for multiple antiseizure drugs and ventilation/pressor use were risk factors for poor outcome. Neurological outcome and survival of children in their study were good.<sup>16</sup>

### CONCLUSION

A large number of critical children had prolonged seizures, recurrent seizures and had CNS infection as the etiology. Hence; there is a need to emphasize the scope of preventive strategies in reducing disease burden.

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