

## Epidemiological study of Paediatric Seizures and Its Management in Paediatric Emergency Department

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### Abstract

**Introduction:** Pediatric seizures are a common occurrence and frequent presentation to emergency department (ED). Seizures result from paroxysmal involuntary disturbance of brain function. The history and physical examination guide us to manage and assist in differentiating seizures from nonepileptic disorders. **Methodology:** This study was carried out to know the trends of paediatric seizures and their management in ED. We had included all patients less than 12 years of age with seizures, admitted to our hospital's pediatric ED between May and August 2012. All demographic findings, seizure characteristics and laboratory findings were recorded. **Results:** A total of 53 children were enrolled in the study of which 38 (71.7%) children were male and 15 (28.3%) were female. The mean age of presentation was 2.42 years. 66.7% of patients had generalized seizures and 33.3% of patients had partial seizures. Out of total study population, 49% had febrile seizures and 20.8% had afebrile seizures. The majority of seizures (69.8%) lasted less than 10 minutes of which 54% were afebrile. Status epilepticus (SE) was found most commonly in 30.2% children. Out of 16 patients with SE 10 (62.5%) were less than two years of age. The common causes of SE were fever, Central Nervous System (CNS) infection, and epilepsy, accounting for 31.3%, 37.5% and 31.2% respectively. The children with underlying CNS abnormalities (cerebral palsy) had poorer outcomes. Mortality found in SE (9.4%) was related to an acute neurologic insult or a chronic CNS condition. Metabolic abnormalities were detected in 28.3% patients. The frequency of metabolic abnormalities was significantly higher in patients under two years of age (66.7%). 53.7% had hypocalcemia, 33.3% had hypoglycaemia and 20% had hyponatremia. MRI (Magnetic resonance imaging) of brain or EEG (electroencephalogram) or both was carried out in only 13.2% patients. 85% of patients had undergone laboratory investigations. Lumbar puncture was performed in 26.4% patients.

**Key Words:** Pediatric seizures, Epilepsy, Febrile seizures, Status epilepticus

### Introduction

A seizure or convulsion is a paroxysmal, time-limited change in motor activity and/or behaviour that results from abnormal electrical activity in the brain. Most seizures in children are provoked by somatic disorders originating outside the brain, such as high grade fever, infection, syncope, head trauma, hypoxia, toxins, or cardiac arrhythmias. Other events, such as breath-holding spells and gastro-oesophageal reflux, can cause events that simulate seizures.

Less than one third of seizures in children are caused by epilepsy, a condition in which seizures are triggered recurrently from within the brain. The cumulative lifetime incidence of epilepsy is 3%; more than half of

cases begin in childhood. The annual prevalence of epilepsy is lower (0.5-0.8%) because many children outgrow epilepsy. Although the outlook for most children with symptomatic seizures or those associated with epilepsy is generally good, seizures may signal a potentially serious underlying systemic or central nervous system (CNS) disorder that requires thorough investigation and management. For children with epilepsy, the prognosis is generally good, but 10-20% has persistent seizures refractory to drugs, and those cases pose a diagnostic and management challenge.<sup>(1)</sup> The objective of the study was to know the trends of paediatric seizures and their management in Emergency Department.

### Methodology:

This was a descriptive, prospective hospital based study. All patients less than 12 years of age (including

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newborns) with seizures admitted to our Hospital's pediatric ED between May and August 2012 were included in the study. Written informed consent was taken from legal guardian of the patient to be included in the study. All demographic findings, seizure characteristics and laboratory findings (Blood glucose, Serum electrolytes, Serum calcium, and Complete blood count) were recorded. Patients not fulfilling inclusion criteria and cases having incomplete data were excluded from the study.

Emergency management of convulsing patient focused on securing the airway, maintaining oxygenation and blood pressure, obtaining intravenous access and protecting the patient from injury. Head and neck was positioned to keep the airway open and if needed an oral airway was inserted. Bag mask ventilation or endotracheal intubation was done in patients who required respiratory assistance. IV access was rapidly secured and immediate determination of blood sugar was done. If hypoglycemia was documented (blood sugar level <40 mg/dl), 2 mL/kg of 25% dextrose or 5 mL/kg of 10% dextrose was given intravenously. Hypotension can potentiate or exacerbate any derangement in cerebral physiology and function so systolic BP was maintained at normal levels (as per their age). Hyperthermia occurs frequently in status epilepticus and is primarily due to motor activity. Given the damaging effects of fever in patients with central nervous injury, hyperthermia, if present, was treated promptly by antipyretics and passive cooling. The goal of anticonvulsant treatment is the rapid termination of clinical and electrical seizure activity by the prompt administration of appropriate drugs in adequate doses, with attention to the possibility of complicating apnea, hypoventilation, and other metabolic abnormalities. When the patient arrived in ED with seizures lasting for more than 5 minutes, initial treatment with benzodiazepines [IV midazolam 0.1 mg/kg (max 4 mg)] was given and was repeated after 5 minutes if needed (maximum 2 doses).

Status epilepticus was defined as any seizure lasting for more than 30 minutes. If a seizure persisted for another 5 minutes after two doses of a benzodiazepine then phenytoin (20mg/kg over 20 mins) or phenobarbital (20 mg/kg, 800 mg max) was the preferred second-line

treatment choice. Abnormal levels of glucose, sodium, calcium, and magnesium, especially low levels can cause seizures. Abnormal levels of electrolytes were corrected promptly.

The data were analyzed using Epi info software (version 3.5.3).

### Results:

All patients less than 12 years of age with seizures admitted to our hospital's pediatric ED between May and August 2012 were included in this study. A total of 53 children were enrolled in the study of which 38 (71.7%) children were male and 15 (28.3%) were females. The mean age of presentation was 2.42 years. Patients of 1 day age group comprised of 26.4% (14) of study population. 3.8% (2) patients belonged to 2 days - 1month age group. 13.2% (7) patients were infants (>1month - 1 year). There were 22.6% (12) patients who belonged to 1-2 years age-group, 18.9% (10) patients belonged to 2-5 years age-group and 15.1% (8) patients belonged to 5-12 years age-group. 66.7% of patients had generalized seizures while 33.3% of patients had partial seizures (Table 1).

**Table 1: Type of seizures**

Type of seizures	Number of patients (%)
1) Generalized seizures	35 (66.7%)
Tonic clonic	32
Absence	2
Clonic	1
2) Partial seizures	18 (33.3%)

Out of total study population, 49% patients had febrile seizures, 20.8% patients had birth asphyxia, 22.6% patients had metabolic abnormalities and 7.5% patients had miscellaneous causes. Of the patients with febrile seizures, 46.2% patients had simple febrile seizures, 23% patients had complex febrile seizures, 11.5% patients had febrile encephalopathy and 19.2% patients had meningitis. In the neonates 68.7% patients had birth asphyxia as the cause of seizures. The common causes of seizures according to age in our study are shown in Table 2.

**Table 2: Common cause of seizures according to age group**

Age Group	Commonest cause of seizures in that age group	Number of patients having commonest cause (total patients in that age group)	Percentage of patients having commonest cause
1 day	Birth asphyxia	11 (14)	78.5%
1 day 1 month	Septicemia	1 (2)	50%
1month 1 year	Metabolic abnormality	5 (7)	71.4%
1 year 2 year	Simple febrile seizures	5 (12)	41.5%
2 year 5 year	Simple febrile seizures	5 (10)	50%
5 year 12 year	Febrile encephalopathy	6 (8)	75%

69.8% of patients had seizures which lasted less than 10 minutes of which 46% were febrile (Table 3). Status epilepticus (SE) was found in 30.2% children. Out of 16 patients with SE, 10 patients were less than two years of age. The common causes of SE were fever, CNS infection, and epilepsy, accounting for 31.3%, 37.5% and 31.2% respectively. The children with underlying CNS abnormalities (cerebral palsy) had poorer outcomes. Mortality found in SE (9.4%) was related to an acute neurologic insult or a chronic CNS condition.

**Table 3 : Duration of seizures**

Duration of seizures	Number of patients (%)
Seizures lasting for < 30 mins	37 (69.8%)
Afebrile	20
Febrile	17
Status epilepticus (>30 min)	16 (30.2%)
Febrile	5
CNS infection	6
Epilepsy	5

Metabolic abnormalities were detected in 28.3% of patients. The frequency of metabolic abnormalities was higher in patients under two years of age (66.7%). 53.7% had hypocalcaemia, 33.3% had hypoglycaemia and 20% had hyponatremia.

MRI (Magnetic resonance imaging) of brain or EEG (electroencephalogram) was carried out in only 13.2% patients. 85% of patients had undergone laboratory investigations. Lumbar puncture was performed in 26.4% patients.

**Discussion**

Unusual movements and changes in behaviour in children often lead to an ED visit. Although seizures

account for many of these events, as many as 30% or more of paroxysmal events may be misdiagnosed as seizures. Most seizure activity stops before the child is seen in an ED. Therefore, history is the key to make the correct diagnosis. The frequency of seizures among pediatric population has been reported as 1-2 % of ED visits.<sup>(2, 3)</sup> There are many different causes of pediatric seizures. The goal is to identify and treat the underlying cause. Fortunately, most pediatric seizures stop without intervention prior to medical assessment. Some seizures require emergency management and extensive evaluation (e.g., neonatal seizures). However, other seizures are very common and benign and need very little evaluation (e.g., febrile seizures). Neonatal seizures present with twitching of the limbs, fluttering of the eyelids, sucking movements, and conjugate deviation of the eyes. These are distinguished from jitteriness, tremors, startle response to stimuli, sudden jerks on awakening and tremulousness of the hungry child.

In our study 49% patients had febrile seizures and 20.8% patients had afebrile seizures. P Alizadeh Taheri et al<sup>(4)</sup> studied 81 patients with seizures (51.8% males and 48.2% females). The most common clinical type of seizure was the generalized form 97.5% (either tonic, clonic, tonic clonic or atonic). Febrile seizure was the most common etiology in 61% of patients. Febrile

seizure is the most common type of pediatric seizure, affecting 2% to 5% of children between 6 months and 5 years of age. The peak age of onset is around 14-18 months of age. A simple febrile seizure is usually associated with a core temperature that increases rapidly to  $\geq 39^{\circ}\text{C}$ . It is initially generalized and tonic-clonic in nature, lasting a few seconds and rarely up to 15 min, followed by a brief postictal period of drowsiness, and occurs only once in 24 hr. A febrile seizure is described as complex when the duration is  $>15$  min, when repeated seizures occur within 24 hr, or when focal seizure activity or focal findings are present during the postictal period. Febrile seizures generally have an excellent prognosis but may also signify a serious underlying acute infectious disease such as sepsis or bacterial meningitis. Therefore, each child with a febrile seizure must be carefully examined and appropriately investigated for the cause of the fever, especially when it is the first seizure.<sup>(5,6)</sup>

Routine management of a normal pediatric patient with simple brief febrile seizures includes a careful search for the cause of the fever and reassurance and education of the parents. Although antipyretics do not prevent seizure recurrences, active measures to control the fever, including the use of antipyretics, reduced discomfort and are reassuring. The seizures lasting for more than 5 min should be treated with a benzodiazepine as a first-line therapy. Phenobarbital prevents recurrent febrile seizures.

Approximately 30-50% of children have recurrent seizures with later episodes of fever and a small minority has numerous recurrent febrile seizures. Factors associated with increased recurrence risk include age less than 12 months, lower temperature before seizure onset, a positive family history of febrile seizures, and complex features.<sup>(7)</sup> During the acute evaluation, a physician's most important responsibility is to determine the cause of the fever and to rule out meningitis or encephalitis. If any doubt exists about the possibility of meningitis, a lumbar puncture with examination of the cerebrospinal fluid (CSF) is indicated. A lumbar puncture should be strongly considered in children less than 12 months of age and considered in children 12-18 months of age, especially if seizures are complex or sensorium remains clouded

after a short postictal period.<sup>(8)</sup>

Seizure induced CSF abnormalities are rare in children and all patients with abnormal CSF after a seizure should be thoroughly evaluated for causes other than seizure. The possibility of viral meningoencephalitis should also be kept in mind, especially that caused by herpes simplex virus. Viral infections of the upper respiratory tract and acute otitis media are most frequent causes of febrile seizures. Aside from glucose determination, laboratory testing such as serum electrolytes and toxicology screening should be ordered based on individual clinical circumstances such as evidence of dehydration. An electroencephalogram (EEG) is not warranted after a simple febrile seizure but may be useful for evaluating patients with complex or atypical features or with other risk factors for epilepsy. Similarly, neuroimaging is also not useful for children with simple febrile seizures, but may be considered for children with atypical features, including focal neurologic signs or pre-existing neurologic deficits.

SAZ et al<sup>(9)</sup> studied 83 patients with seizures. The mean age of the group was 5.5 years, with a range from 0.25 to 17 years. Fifty patients were male and thirty-three were female. Acute febrile seizures (AFS) were reported in 66% of patients. Most of the described seizures' (83.2%) durations were shorter than 10 minutes. In both age groups (younger than 5 years and older than 5 years) the rate of seizures shorter than 10 minutes, was 80.4% and 92.8% respectively. Inaam N M et al<sup>(10)</sup> studied 109 males and 73 females with seizures and male to female ratio of 1.5:1. The mean age at seizure onset was 3.48 years. The generalized seizures (47.8%) were slightly higher than focal seizures (44.5%). The tonic clonic subtype was the commonest (66.7%).

Valencia et al<sup>(11)</sup> studied 107 children who presented to the ED with unprovoked seizures prospectively. The incidence of abnormal serum biochemical values was 14.8%; it was higher in patients with a first seizure, younger age, gastrointestinal symptoms, or change in mental status. Maytal et al<sup>(12)</sup> conducted a study on 66 children with seizures (34 males and 32 females). Their age range at the time of presentation in the ED was 1 month to 16 years (mean, 4.9 years). They were found to have abnormal CT findings in 14 (21.2%).



## Conclusion

Based on our study and previous reports, we recommend a more rational use of biochemical analysis, CBC, MRI scans or EEGs in children arriving with seizures to EDs. Routine examinations of CBC as well as serum biochemical values for children with seizures are unnecessary unless specific clinical data strongly suggests otherwise. Since the metabolic abnormalities were more likely seen in children younger than two years of age in our study, it might be a rational approach to make the metabolic screening in children either younger than two years or those having gastrointestinal symptoms (vomiting, diarrhea, poor oral intake). Since the metabolic abnormalities are less frequently seen in patients older than five years, metabolic screening is usually unnecessary in this group.

Our results also showed that neuroimaging and EEGs should not be requested unless there are clinical indications. With the exception of trauma these indications were as follows: acute development of focal neurological deficits, prolonged postictal periods, a first focal seizure and changes in mental status. At Emergency departments, the rational requesting of laboratory tests in patients with seizures is important for both the comfort of patients and the incurred costs of examinations.

## References

1. Nelson Textbook of Pediatrics, 18th edition
2. Pallin DJ, Goldstein JN, Moussally JS (2008). Seizure visits in US emergency departments: epidemiology and potential disparities in care. *Int. J. Emerg. Med.* 1:97-105.
3. Huff JS, Morris DL, Kothari RU (2001). Emergency department management of patients with seizures: a multicenter study. *Acad. Emerg. Med.* 8:622-628.
4. P Alizadeh Taheri, M Naseri, M Lahooti, M Sadeghi (2009): The Life Time Prevalence of Childhood Seizure, *Iranian J Publ Health.* 38-1:69-73
5. Kimia AA, Capraro AJ, Hummel D, et al: Utility of lumbar puncture for first simple febrile seizure among children 6 to 18 months of age. *Pediatrics* 123(1): 6, 2009.
6. Shaked O, Garcia Peña BM, Linares MY, Baker RL: Simple febrile seizures: are the AAP guidelines regarding lumbar puncture being followed? *Pediatr Emerg Care* 25(1): 8, 2009.
7. Steering Committee on Quality Improvement and Management, Subcommittee on Febrile Seizures: Febrile seizures: clinical practice guideline for the long-term management of the child with simple febrile seizures. *Pediatrics* 121(6): 1281, 2008.
8. Sharma S, Riviello JJ, et al: The role of emergent neuroimaging in children with new-onset afebrile seizures. *Pediatrics* 111(1): 1, 2003.
9. E Ulas SAZ, Tugcin Bora Polat, Sarenur Gokben (2010). Are laboratory workup really needed on management of pediatric seizures at emergency rooms? *Journal of Medicine and Medical Sciences.* 1 (8).
10. Inaam N Mohammed, Maha Abdel Moneim, Ahlam A. Rahman (2010). The profile of childhood epilepsy in Sudan, *Khartoum Medical Journal.* 03-02:444-447
11. Valencia I, Sklar E, Blanco F, Lipsky C, Pradell L, Joffe M, Legido A (2003). The role of routine serum laboratory tests in children presenting to the emergency department with unprovoked seizures. *Clin. Pediatr. (Phila).* 42:511-517.
12. Maytal J, Krauss JM, Novak G, Nagelberg J, Patel M (2000). The role of brain computed tomography in evaluating children with new onset of seizures in the emergency department. *Epilepsia.* 41:950-4.