

Investigation into the Etiopathological Factors of Seizure Disorders in Children Aged 1 Month to 18 Years

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Received: 11-03-2024 / Revised: 05-04-2024 / Accepted: 30-05-2024

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Conflict of interest: Nil

Abstract:

Background and Objectives: Seizure disorder is the most common pediatric neurological disorder. 4-10% of children suffer at least one episode of seizure in the first 16 years of life. The incidence is highest in the children less than 3 years, with decreasing frequency in older children. Seizure account for about 1% of all emergency visits. The incidence of epilepsy in children and adolescents seems relatively consistent across all populations studied ranging from 50-100/100000 person years. The objective of this study is to study clinical profile of children presenting with seizures and to study aetiopathological basis of seizure disorder in children. Methods: All Children of age from 1 month to 18 years presenting with seizures to Department of Paediatrics, Patna medical college and Hospital Patna. will form the data for the present study. Conclusions: Generalized seizures are more common presentation than partial seizures in younger age group. Febrile seizures are a leading cause of seizures in younger age group, whereas space occupying lesion are common in older age group. In partial seizures Neurocysticercosis is a common cause followed by Tuberculoma. Most of the seizures are controlled by monotherapy with appropriate antiepileptic drugs like Clobazam in Typical Febrile Seizures, and Sodium Valproate in other conditions.

Keywords: Febrile seizures, Neurocysticercosis, Electroencephalogram, Antiepilepticus.

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Introduction

Seizures are common in pediatric age group and occur in 10% of children [1]. Less than 1/3rd of seizures in children are caused by epilepsy (3%)¹. A seizure is a transient occurrence of signs and/or symptoms resulting from abnormal excessive or synchronous neuronal activity in the brain¹. Worldwide, febrile seizures are the most common type of acute seizures in children [2]. In developing countries, febrile seizures are common but the prevalence of acute symptomatic seizures may be higher than developed countries [3,4,5]. The incidence is highest in children less than 3 years of age, with a decreasing frequency in older children [6]. Seizures account for about 1% of all emergency department visits, and about 2% of visits of children's hospital emergency department visits [6]. In most of the studies, febrile seizures were reported to be the most common type seen in the pediatric population and account for the majority of seizures seen in children younger than 5 years of age [7,8]. Central nervous system (CNS) infections are the main cause of seizures and acquired epilepsy in the developing world [8,9]. Acute seizures are common in meningitis, viral encephalitis and neurocysticercosis and in most cases are

associated with increased mortality and morbidity, including subsequent epilepsy [10,11,12,13]. The standardized mortality rate (SMR) in patients with a newly diagnosed unprovoked seizure ranges from 2.5 to 4.1 according to the study population and design. The SMR is highest in the youngest patients and in those with symptomatic seizure [14]. In most children with newly diagnosed epilepsy, the long-term prognosis of epilepsy is favorable, and in particular, patients with idiopathic etiology will eventually reach remission [15].

Objectives

To study clinical profile of children presenting with seizures.

To study aetiopathological basis of seizure disorder in children

Materials and Methods

Analytical descriptive study, All Children of age from 1 month to 18 years presenting with seizures to Department of Paediatrics, at Patna medical college and Hospital Patna, Bihar will form the data for the present study. Study duration of 18 months .

Inclusion Criteria: Age group between 1 month to 18 years presenting with Seizures.

Exclusion Criteria

Neonatal Seizure

The study is analytical descriptive study.

Children of 1 month to 18 year age group, satisfying inclusion and exclusion criteria were recruited into the study after taking informed consent from caregivers.

All children of 1 month to 18 years age group admitted in Department of Pediatrics with history of seizures and children admitted for other complaints and developing seizures during the course of their illness were included.

Patient details, history, clinical information (in a pre-designed datasheet format- Annexure-1) laboratory investigations like complete blood count,

serum electrolytes, blood sugar, serum calcium, CRP, CSF Analysis etc., neuroimaging, EEG were done.

The collected data was analyzed using appropriate statistical tests.

The etiology was derived from detailed history, clinical examination including CNS examination and investigations as required. The etiological profile was studied and analyzed with respect of incidence, age of onset, sex, type of seizures, any comorbid conditions and outcome both immediate and long term.

Results

The study was a hospital based cross sectional observational study conducted on children of age group 1 month to 18 years admitted to the Department of Pediatrics, PMCH, Patna. A total number of 156 children were included in this study.

Table 1: Incidence of convulsions in different age groups

Age group	No. of cases	Percentage
1 month-3 years	90	57.6%
3 years-6 years	40	25.6%
6 years-12 years	19	12.2%
12 years-18 years	7	4.5%
Total	156	100%

This table shows the incidence of convulsions in different age groups. Occurrence of convulsions was highest 90 cases (57.6%) in the age group between 1 month to 3 years in the present study.

Table 2: Gender wise distribution of seizures

Gender	No of cases	Percentage
Male	99	63.5%
Female	57	36.5%

Of the 156 cases included in study, 99(63.5%) were males and 57 (36.5%) were females. The overall male female ratio is 1.7 : 1.

Table 3: Type of seizures

Type of Seizures	No of cases	Percentage
GTCS	129	82.6%
Focal	27	17.4%
Total	156	100%

This table shows the type of seizures. Maximum number of cases were GTCS 129 (82.6%). 27 (17.4%) cases of focal seizures were noted.

Table - 4 : EEG Abnormalities

Seizure type	Normal EEG	Abnormal EEG	Total
GTCS	48(57.8%)	35(42.2%)	83(100%)
Focal	16(57.1%)	12(42.9%)	28(100%)

$$X^2 = 26.7, P \text{ value} < 0.001$$

Among 156 children included in the study, EEG was done for 111 children and 47 (42.3%) had EEG abnormality. 35(42.2%) children with generalized seizures had EEG abnormality, 12(42.9%) children with partial seizure had EEG abnormality.

Table 5: Distribution of Etiologies in Patients with Seizures

Etiology	Number (n=156)	Percentage
Febrile seizures	85	54.5%
Typical febrile seizures	50	32.1%
Atypical febrile seizures	35	22.4%
Intracranial infections	21	13.6%
Tuberculous meningitis	4	2.5%
Pyogenic meningitis	8	5.1%
Viral encephalitis	9	5.7%
Space occupying lesion	14	8.9%
Neurocysticercosis	10	6.4%
Tuberculoma	4	2.5%
Epilepsy	12	7.6%
Metabolic	7	4.4%
Hypoglycemia	4	2.5%
Hypocalcemia	3	1.9%
Others	3	1.9%
Hypertensive encephalopathy	3	1.9%
Unidentifiable	14	8.9%
TOTAL	156	100%

Discussion

Seizures are common disorders in children found all over the world and are frequently and most commonly observed finding in Pediatric clinical practice. Presently CNS infections like Meningitis, Neurocysticercosis, Tuberculoma account for significant number of cases in developing countries. 156 children with new onset seizures formed the study group as per the criteria mentioned in the materials and methods. The observations are compared with the studies done by others on the similar subject. In our study the highest incidence of seizures 90 cases (57.6%) recorded in the age group of 1 month to 3 years, followed by 40 cases (25.6%) in the age group 4 years to 6 years, 19 cases (12.2%) in age group 7 years –12 years and 7 cases (4.5%) in age group of 13 years to 18 years.

This indicates the incidence of seizures is more when the child is younger and younger. This study

observations are comparable with that of study done by Udani V et al and Bhat BV et al as shown below. A survey done to know the prevalence of epilepsy by Udani V et al¹⁶ found that the peak age of onset was around 1 year and 90% of the attacks occurred during the first three years. In a study done by Bhat BV et al This indicates the incidence of seizures is more when the child is younger and younger. This study observations are comparable with that of study done by Udani V et al and Bhat BV et al as shown below. A survey done to know the prevalence of epilepsy by Udani V et al found that the peak age of onset was around 1 year and 90% of the attacks occurred during the first three years. In a study done by Bhat BV et al, in 256 cases of bacterial meningitis over a period of 8 years, 83.6% of the cases were < 3 years.

Incidence of Seizures in 1 month-3 years of age

Study	Incidence
Udani V et al	90%
Bhat B V et al	83.6%
Our study	57.6%

Ramesh Baheti et al observed 76.9% of children had abnormal EEG in generalized seizure group and 73.0% of children had abnormal EEG in partial seizure group. Kurupath Radhakrishnan et al observed EEG abnormality in 83.6% of children studied and were generalized in 74% of children. Luiz Eduardo Betting et al observed 33% of children with idiopathic generalized seizure having EEG abnormality.

In study done by Shinnare et al EEG abnormality was observed in 42% of children. Among them 56% of children with partial seizure and 35% of children with generalized seizure had abnormal EEG and the difference was statistically significant. There is high incidence of EEG abnormality in partial seizure group.

Study	Percentage
CRESS	6.2%
Kerala	4.9%
Our study	7.6%

3 case of hypertensive encephalopathy presented with seizures. Acute glomerulonephritis is identified as cause in all 3 cases of hypertensive encephalopathy.

Metabolic

Metabolic abnormalities like hypoglycemia and hypocalcemia were seen in 2.5% and 1.9% cases respectively. There is no comparative study available for both the above conditions.

Unidentified

In present study out of 156 children in 14 children (8.9%) etiology was not detectable.

Conclusion

Generalized seizures are more common presentation than partial seizures in younger age group. Febrile seizures are a leading cause of seizures in younger age group, whereas space occupying lesion are common in older age group.

In partial seizures Neurocysticercosis is a common cause followed by Tuberculoma. Most of the seizures are controlled by monotherapy with appropriate antiepileptic drugs like Clobazam in Typical Febrile Seizures, and Sodium valproate in other conditions.

References

1. Nelson textbook of paediatrics; Behrman, Kleigman, Jenson, chapter Nervous system, 20th edition: 3: 2823-2862.
2. Hauser WA. The prevalence and incidence of convulsive disorders in children. *Epilepsia*. 1994; 35 Suppl 2:S1-6.
3. Akpede GO, Abiodun PO, Sykes RM. Pattern of infections in children under-six years old presenting with convulsions associated with fever of acute onset in a children's emergency room in Benin City, Nigeria. *J Trop Pediatr*. 1993; 39:11-15.
4. Birbeck GL. Seizures in rural Zambia. *Epilepsia*. 2000; 41:277-281.
5. Waruiru CM, Newton CR, Forster D, New L, Winstanley P, Mwangi I, Marsh V, Winstanley M, Snow RW, Marsh K. Epileptic seizures and malaria in Kenyan children. *Trans R Soc Trop Med Hyg*. 1996; 90:152-155.
6. Friedman MJ, Sharieff GQ. Seizures in children. *Pediatr Clin North Am*. 2006; 13:257-277.
7. Martindale JL, Goldstein JN, Pallin DJ. Emergency department seizure epidemiology. *Emerg Med Clin North Am*. 2011 Feb; 13(1): 15-27.
8. Idro R, Gwer S, Kahindi M. The incidence, aetiology and outcome of acute seizures in children admitted to a rural Kenyan district hospital. *BMC Pediatr*. 2008; 13:5.
9. Chen CY, Chang YJ, Wu HP. New-onset Seizures in Pediatric Emergency. *Pediatr Neonatol*. 2010; 13(2):103-111.
10. Murthy JMK, Yangala R. Acute symptomatic seizures-incidence and etiological spectrum: a hospital-based study from South India. *Seizure*. 1999; 13:162-165.
11. Huang CC, Chang YC, Wang ST. Acute Symptomatic Seizure Disorders in Young Children-A Population Study in Southern Taiwan. *Epilepsia*. 1998; 13(9):960-964.
12. Basu S, Ramchandran U, Thapliyal A. Clinical profile and outcome of pediatric neurocysticercosis: A study from Western Nepal. *J Pediatr Neurol*. 2007; 13:45-52.
13. Rayamajhi A, Singh R, Prasad R, Khanal B, Singhi S. Study of Japanese encephalitis and other viral encephalitis in Nepali children. *Pediatr Int*. 2007; 13(6):978-984.
14. Allen Hauser W, Beghi E. First seizure definitions and worldwide incidence and mortality. *Epilepsia*. 2008; 13(Suppl. 1):8-12.
15. Geerts A, Arts WF, Stroink H, Peeters E, Brouwer O, Peters B. Course and outcome of childhood epilepsy: A 15-year follow-up of the Dutch Study of Epilepsy in Childhood. *Epilepsia*. 2010; 13(7):1189-1197.
16. Frontiers in pediatric neurology volume II edited by Dr. P. Nagabushana Rao, chapter: management of focal seizures with CT lesions, 1998; 198-200.