Section: Neurology

Original Research Article

CLINICAL AND ETIOLOGICAL PROFILE OF SEIZURES IN CHILDREN: A HOSPITAL-BASED OBSERVATIONAL STUDY

R.Malaiarasu[1], G.Surya[2]

[1]Assistant Professor, Department of Neurology, Government Medical College Hospital, Ramanathapuram, Tamilnadu, India
[2]Postgraduate, Department of Pediatrics, Government Medical College Hospital, Ramanathapuram, Tamilnadu, India

Received : 10/01/2025
Received in revised form : 17/02/2025
Accepted : 04/03/2025

Keywords:
Seizures, Pediatrics, Generalized tonic-clonic seizures, Febrile seizures, EEG abnormalities.

Corresponding Author:
Dr. R.Malaiarasu,
Email: leelamalai@icloud.com

DOI: 10.47009/jamp.2025.7.2.100

Source of Support: Nil,
Conflict of Interest: None declared

Int J Acad Med Pharm
2025; 7 (2); 491-495

Abstract

Background: Seizures in children pose a significant clinical challenge because of their varied aetiologies and manifestations. This study aimed to assess the clinical and etiological profiles of seizures in children. **Materials and Methods:** A hospital-based observational study was conducted on 65 children aged 2 months to 12 years who were admitted with seizures at Government Medical College, Ramanathapuram, from January 2024 to June 2024. Clinical data, laboratory investigations, and neurological findings were analysed. Seizures were classified according to the 2017 International League Against Epilepsy (ILAE) classification system. **Result:** Most children were aged 2 months to 2 years (46.2%) and were male (58.5%). They belonged to the upper-lower socioeconomic class (33.8%), with pregnancy complications absent in 89.2% of cases. Generalised tonic-clonic seizures (GTCS) were the most common (93.8%), with loss of consciousness in 98.5% of cases. Fever occurred in 60% of the children and seizure recurrence in 41.5%. EEG abnormalities were detected in 86.2% of patients, and neuroimaging abnormalities were detected in 36.9% of patients. A family history of seizures was noted in 27.7% of the patients. Most children (78.5%) achieved typical developmental milestones, while 21.5% experienced delays. CRP was negative in 87.7%, and serum electrolytes were normal in 90.8%. NICU admission was 56.9%, and low birth weight was 18.5%. The most frequent diagnoses were seizure disorder (29.2%), febrile seizures (18.5%), and acute symptomatic seizures (10.8%). Most children were managed with monotherapy (80%). **Conclusion:** Generalized tonic-clonic seizures were the most common, with fever as a key trigger. EEG and neuroimaging abnormalities influenced prognosis, while monotherapy remained the preferred treatment for adequate seizure control.

INTRODUCTION

Childhood seizures are a significant clinical issue with a wide range of aetiologies and presentations. The extent of the disease necessitates comprehensive understanding of the clinical and etiological patterns to treat and manage it accordingly. The incidence of seizures among children is disastrous, with a presumed number of between 4% to 10% of all children having had one or more seizures by the age of 16 years.[1] The fact is evidence of the need to rethink the aetiology and clinical manifestations of seizures in children because they may include various forms depending on demographics and geography.[2] The aetiology of seizure in children is multifactorial, and the most frequent cause is febrile seizure, especially among children younger than five years. Fever seizures account for a high percentage of childhood seizures in most studies and have been reported to occur in 2% to 5% of children, usually between 3 months and 5 years of age.[2] It is reassuring that the fever seizures are usually benign, but this should not lower the level of observation and evaluation provided since some of the children will go on to develop epilepsy.[3] Moreover, the clinical presentation of children with seizures is incredibly varied, and age, underlying disease, and the presence of neurological diseases all contribute to presentation and outcome.[4]

Apart from febrile seizures, other causes, including neurocysticercosis, encephalitis, and metabolic disturbances, are part of the clinical presentation of paediatric seizures. For example, neurocysticercosis is one of the major causes of acquired childhood epilepsy and emphasises the requirement of specific diagnostic procedures in endemic areas.[5] Clinical implications of various seizure types should be noted as well because children with diagnosed conditions

ISSN (O): 2687-5365; ISSN (P): 2753-6556

such as encephalitis or status epilepticus have a poorer prognosis compared to children with a diagnosis of febrile seizures.[6]

Ongoing electroencephalography (EEG) monitoring to detect subclinical seizures has recently gained attention. Evidence points towards electrographic seizures, in the absence of apparent clinical symptoms, occurring most frequently in populations suffering from certain neurological conditions.[7] This discovery is significant in children with complex medical histories, where faint seizure activity might escape detection if not closely monitored.[8]

The long-term effects of seizures in children should also include the risk of subsequent epilepsy following the first seizure, which can be influenced by many factors, such as the nature of the seizure and the clinical history of the child.[8] For instance, studies have shown that children with their first seizure as part of a febrile illness have a fairly low chance of having subsequent unprovoked seizures. Children with afebrile seizures have a higher chance of developing subsequent epilepsy.[9]

The clinical and etiological patterns of seizures in children are multifactorial and require careful and systematic diagnosis and care. The extensive spectrum of seizures and variable causative factors highlight the need for careful clinical evaluation and ongoing research to explain the challenges of paediatric seizures. With the progress of medical science, medical professionals have to stay vigilant and proactive to improve results in children suffering from seizures in receiving appropriate and timely treatment following their requirements.

Aim

This study aimed to assess the clinical and etiological profiles of seizures in children.

MATERIALS AND METHODS

This observational study included 65 children from the Department of Neurology at Government Medical College, Ramanathapuram, between January 2024 and June 2024. The study commenced after obtaining ethical clearance from the institution's ethics committee, and informed consent was obtained from the parents or guardians of the participants.

Inclusion and exclusion criteria

Children aged 2–12 years who were admitted with seizures were included, while those with seizures caused by head injury were excluded.

Methods

Following enrolment, pertinent clinical information was gathered, including age, sex, seizure characteristics, and associated symptoms such as fever, headache, runny nose, cough, vomiting, and diarrhoea, along with family and developmental histories of epilepsy. All patients underwent laboratory tests, including complete blood count (CBC), C-reactive protein measurement, serum electrolyte assessment, and blood sugar level measurement. Additional diagnostic methods, such as cerebrospinal fluid (CSF) analysis, electroencephalography (EEG), and neuroimaging, were implemented when clinically necessary, and the results were carefully documented. Other factors, such as length of hospital stay, ultimate diagnosis, and clinical outcomes, were also noted. Seizures were categorised according to the 2017 International League Against Epilepsy (ILAE) classification as generalised tonic-clonic seizures (GTCS), myoclonic, focal, or other types. Data are presented in terms of frequencies and percentages.

RESULTS

Most children 30 (46.2%) were aged 2 months to 2 years, and 38 (58.5%) were male. Most 22 (33.8%) belonged to the upper-lower socioeconomic class. Pregnancy complications were absent in 58 (89.2%) cases. The most common seizure type was GTCS, 61 (93.8%), with loss of consciousness, 64 (98.5%) occurring in nearly all cases. Fever was present in 39 (60%) participants, and a history of seizure frequency was reported in 39 (60%). Monotherapy was the most frequently used treatment 52 (80%). Most children were born at term and appropriate for gestational age, 49 (75.4%) and delivered via expected vaginal delivery, 40 (61.5%). NICU admission was required in 37 (56.9%) cases, primarily due to low birth weight 12 (18.5%). A history of birth asphyxia was absent in 59 (90.8%) cases [Table 1].

Table 1: Demographic and clinical characteristics.

		N (%)
Age	2 months-2 years	30 (46.2%)
	2-5 years	19 (29.2%)
	5-10 years	14 (21.5%)
	10-12 years	2 (3.1%)
Sex	FCH	27 (41.5%)
	MCH	38 (58.5%)
Socio-economic status	Lower class	14 (21.5%)
	Lower middle class	18 (27.7%)
	Upper lower class	22 (33.8%)
	Upper middle class	11 (16.9%)
Pregnancy complications	Anaemia	3 (4.6%)
	BA	1 (1.5%)
	GDM	1 (1.5%)
	Hypothyroid	1 (1.5%)
	PIH	3 (4.6%)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

	No	58 (89.2%)
Type	Clonic	1 (1.5%)
	Focal	1 (1.5%)
	GTCS	61 (93.8%)
	Myo jerk	2 (3.1%)
Loss of consciousness	No	1 (1.5%)
	Yes	64 (98.5%)
Complaints	No	13 (20%)
	Yes	52 (80%)
Fever	No	26 (40%)
	Yes	39 (60%)
History of seizure frequency	No	26 (40%)
	Yes	39 (60%)
RX	One drug	52 (80%)
	Two drugs	11 (16.9%)
	Three drugs	3 (4.6%)
Gestational age	Preterm/AGA	2 (3.1%)
	Preterm/SGA	3 (4.6%)
	Term/AGA	49 (75.4%)
	Term/SGA	8 (12.3%)
Type of delivery	AVD	1 (1.5%)
	LSCS	24 (36.9%)
	NVD	40 (61.5%)
NICU admission	No	28 (43%)
	Yes	37 (56.9%)
Reason for NICU admission	LBW	12 (18.5%)
	Birth asphyxia	6 (9.2%)
	RDS	6 (9.2%)
	NNH	9 (13.8%)
	NNS	5 (7.7%)
H/O birth asphyxia	No	59 (90.8%)
	Yes	6 (9.2%)

The majority had no history of iron deficiency anaemia (59, 90.8%), and 58 (89.2%) had received age-appropriate immunisation. Most children had normal development 51 (78.5%) and no family history of seizures (47, 72.3%). Head circumference was normal for age in 54 (83.1%) cases. C-reactive protein levels were harmful in 57 (87.7%) patients, and serum calcium levels were normal in 50 (76.9%) patients. Serum electrolytes were within normal limits in 59 patients (90.8%). CSF analysis was standard in 10 (15.4%) patients, while neurological imaging was standard in 29 (44.6%) patients. EEG abnormalities were noted in 56 (86.2%) cases. Regarding seizure recurrence, the majority experienced fewer than one episode, 38 (58.5%) [Table 2].

Table 2: Mean Demographic and biochemical characteristics

		N (%)
H/O iron deficiency anaemia	No	59 (90.8%)
	Yes	6 (9.2%)
Immunisation history	AFA	58 (89.2%)
	IF	7 (10.8%)
Development of the children	Abnormal	14 (21.5%)
	Normal	51 (78.5%)
Family history of seizures	No	47 (72.3%)
	Yes	18 (27.7%)
Head circumference	Macro	1 (1.5%)
	Micro	10 (15.4%)
	NFA	54 (83.1%)
C reactive protein	Negative	57 (87.7%)
	Positive	8 (12.3%)
Serum calcium level	Low	15 (23.1%)
	Normal	50 (76.9%)
Serum electrolytes	High	2 (3.1%)
	Low	4 (6.2%)
	Normal	59 (90.8%)
CSF analysis	Abnormal	6 (9.2%)
	Normal	10 (15.4%)
Neurological Imaging	Abnormal	24 (36.9%)
	Normal	29 (44.6%)
EEG	Abnormal	56 (86.2%)
	Normal	9 (13.8%)
Recurrence of seizures	<1	38 (58.5%)
	02-03	23 (35.4%)
	>4	4 (6.2%)

ISSN (O): 2687-5365; ISSN (P): 2753-6556

The most common diagnosis was seizure disorder 19 (29.2%), followed by febrile seizure, 12 (18.5%). Other diagnoses included AFS, 7 (10.8%), and other conditions contributing to fewer cases. TB meningitis, cerebral palsy, and febrile seizures were 1 (1.5%) [Table 3].

Table 3: Clinical characteristics and diagnosis

		N (%)
Diagnosis	Febrile seizure	12 (18.5%)
	AFS	7 (10.8%)
	Seizure disorder	19 (29.2%)
	Unprovoked seizure	4 (6.2%)
	Febrile status epilepticus	2 (3.1%)
	CNS infection	3 (4.6%)
	TB meningitis	1 (1.5%)
	Cerebral palsy	1 (1.5%)
	Hypocalcemic seizure	2 (3.1%)
	Infantile spasm	2 (3.1%)
	Febrile provoked seizure	1 (1.5%)
	Others	11 (16.9%)

DISCUSSION

Our study provides valuable insights into the clinical and etiological profiles of seizures in children, recurrence patterns, treatment outcomes, and associated risk factors. Comparisons with previous studies highlighted the similarities and differences in the broader understanding of paediatric seizures. We found that most children presenting with seizures were between 2 months and 2 years old (46.2%), aligning with findings from Adhikari et al., who reported that 57.5% of seizure cases occurred in children younger than five years.[10]

Our study found that GTCS was the most common seizure type (93.8%), aligning with the findings of Adhikari et al., who reported GTCS as the predominant seizure type (69.9%) in children admitted to a tertiary care hospital in Nepal. However, our prevalence was higher, possibly due to differences in the study populations and diagnostic criteria. Febrile seizures were present in 18.5% of cases, similar to the 30.7% reported by Adhikari et al., suggesting that febrile conditions remain a significant trigger for seizures in paediatric patients.[10]

We found that EEG abnormalities were identified in 86.2% of our cases, consistent with the study by Kanemura et al., in which EEG paroxysms, particularly in the frontal region, were significant predictors of epilepsy development.[11] Similarly, Akter et al. found that abnormal EEG findings were strongly associated with seizure recurrence. These results reinforce the role of EEG as a crucial tool in the evaluation and prognosis of pediatric seizures.[12]

Our study observed seizure recurrence in 41.5% of children. This aligns with the findings of Kim et al., who reported a recurrence rate of 44.8% in developmentally normal children with unprovoked seizures.[13] Mizorogi et al. reported an even higher recurrence rate of 57.5%, emphasising that children with focal epileptic discharge had a significantly higher recurrence risk than those with normal EEG findings.[14]

Our study found that a family history of seizures was present in 27.7% of cases, consistent with Eftekhaari et al., who reported a higher recurrence rate in children with a family history of febrile seizures (38.9%) compared to those without (22%).[15] Moreover, Machado et al. found that younger age at seizure onset was a potential risk factor for recurrence, particularly in children under five years old.[16] Similarly, Kumar et al. reported a higher recurrence rate in children younger than 18 months (41.3%) compared to older children (24.1%), reinforcing the impact of early-onset seizures on recurrence probability.[17]

In our study, a significant proportion (56.9%) of children required NICU admission, primarily due to low birth weight (18.5%). This is consistent with findings from Saini et al., who reported that epilepsy was prevalent in children with neurocutaneous syndromes, highlighting neonatal complications as potential contributors.[18] Previous studies, such as Özdemir et al., also suggested that seizure occurrences during pregnancy might influence neonatal outcomes.[19]

Our study reported that monotherapy was the preferred treatment modality (80%), which aligns with the findings of Kodama et al., who noted that potassium bromide (KBr) was effective in 59.1% of patients with generalised epilepsy.[20] Similarly, our finding that 89.2% of children had received age-appropriate immunisation suggests adequate healthcare access, possibly contributing to better seizure management.

In our study, serum electrolyte levels were normal in 90.8% of the cases, indicating that metabolic disturbances were not a significant contributing factor in most cases. This aligns with findings by Machado et al., where metabolic abnormalities were not a substantial cause of unprovoked seizures.[16] However, neuroimaging abnormalities were observed in 36.9% of our cases, comparable to Adhikari et al., who reported abnormal brain imaging in 45.9% of cases, with neurocysticercosis being the most common finding.[10]

ISSN (O): 2687-5365; ISSN (P): 2753-6556

Limitations

The small sample size in our study may restrict the applicability of the results to a larger population. It may not accurately reflect regional differences in seizure causes and treatments as a single-centre investigation. Furthermore, the absence of long-term follow-up data limits our ability to evaluate the recurrence of seizures and the effectiveness of treatment. Reliance on hospital-based data may lead to selection bias, as children with less severe seizures treated in outpatient settings were excluded. Additionally, EEG and neuroimaging were conducted according to clinical necessity rather than established protocols, which may have affected our ability to identify the underlying causes. More extensive multicentre studies with extended follow-up periods are necessary to better understand paediatric seizures.

CONCLUSION

Our study found that generalised tonic-clonic seizures were the most common in children, with fever being a frequent precipitating factor. Electroencephalographic abnormalities are commonly observed, highlighting their role in seizure evaluation and prognosis. Seizure recurrence was associated with EEG abnormalities and a family history of seizures. Although metabolic disturbances were not a major contributing factor, neuroimaging abnormalities were observed in many cases. Monotherapy is the preferred treatment approach to ensure effective seizure control. These findings emphasise the need for early diagnosis, comprehensive evaluation, and individualised management strategies to improve outcomes in children with seizures.

REFERENCES

1. Nc DS, Ahmed DT, Rao DR, B.G Nagara. Profile of children admitted with seizures to a tertiary care rural hospital in Mandya district. Pediatr Rev Int J Pediatr Res 2015; 2:83–7. https://doi.org/10.17511/ijpr.2015.i04.09.
2. Ghazavi M, Nasiri J, Yaghini O, Soltani R. Oral diazepam for febrile seizures following acellular pertussis vaccination. Adv Biomed Res 2019; 8:29. https://doi.org/10.4103/abr.abr_96_18.
3. Almojali AI, Ahmed AE, Bagha MY. Prognostic factors for epilepsy following first febrile seizure in Saudi children. Ann Saudi Med 2017; 37:449–54. https://doi.org/10.5144/0256-4947.2017.449.
4. Arıcan P, Salman H, Dündar NO. Clinical profile and long-term outcome of the first seizures in children. Turk J Pediatr 2021; 63:612–7. https://doi.org/10.24953/turkjped.2021.04.008.
5. Sangale D, Adhikari A, Gajre M. Clinico-demographic profile of children with neurocysticercosis and risk factors for persistent seizures. Int J Contemp Pediatr 2023; 10:300–4. https://doi.org/10.18203/2349-3291.ijcp20230423.
6. Aiyaloo D, C. B. Clinical profile of children presenting with seizure. Int J Med Biomed Stud 2020;4. https://doi.org/10.32553/ijmbs.v4i2.938.
7. Gwer S, Idro R, Fegan G, Chengo E, Garrashi H, White S, et al. Continuous EEG monitoring in Kenyan children with non-traumatic coma. Arch Dis Child 2012; 97:343–9. https://doi.org/10.1136/archdischild-2011-300935.
8. Poudel P, Parakh P, Mehta K. Clinical profile, aetiology and outcome of afebrile seizures in children. JNMA J Nepal Med Assoc 2013; 52:260–6. https://doi.org/10.31729/jnma.572.
9. Mwipopo EE, Akhatar S, Fan P, Zhao D. Profile and clinical characterisation of seizures in hospitalised children. Pan Afr Med J 2016; 24:313. https://doi.org/10.11604/pamj.2016.24.313.9275.
10. Adhikari S, Sathian B, Koirala DP, Rao KS. Profile of children admitted with seizures in a tertiary care hospital of Western Nepal. BMC Pediatr 2013; 13:43. https://doi.org/10.1186/1471-2431-13-43.
11. Kanemura H, Sano F, Ohyama T, Mizorogi S, Sugita K, Aihara M. EEG characteristics predict subsequent epilepsy in children with their first unprovoked seizure. Epilepsy Res 2015; 115:58–62. https://doi.org/10.1016/j.eplepsyres.2015.05.011.
12. Akter N, Rahman MM, Akhter S, Fatema K, Billah SMB. Predictors of recurrence after a first unprovoked seizure in childhood: A prospective study. Europ J Clin Med 2021; 2:77–80. https://doi.org/10.24018/clinicmed.2021.2.3.42.
13. Kim H, Oh A, de Grauw X, de Grauw TJ. Seizure recurrence in developmentally and neurologically normal children with a newly diagnosed unprovoked seizure. J Child Neurol 2016; 31:421–5. https://doi.org/10.1177/0883073815596616.
14. Mizorogi S, Kanemura H, Sano F, Sugita K, Aihara M. Risk factors for seizure recurrence in children after first unprovoked seizure: Risk factors for seizure recurrence. Pediatr Int 2015; 57:665–9. https://doi.org/10.1111/ped.12600.
15. Eftekhaari T, Farah M, Ali Reza M. Febrile seizures: Factors affecting risk of recurrence. J Pediatr Neurol 2015; 06:341–4. https://doi.org/10.1055/s-0035-1557485.
16. De Rezende Machado M, Bruck I, de Paola L, Cat MNL, Antoniuk SA, Silvado CES. The first unprovoked seizure in typically developing children: A real-life setting in Southern Brazil. Clin EEG Neurosci 2021; 52:455–61. https://doi.org/10.1177/1550059420965391.
17. Kumar N, Midha T, Rao YK. Risk factors of recurrence of febrile seizures in children in a tertiary care hospital in Kanpur: A one year follow up study. Ann Indian Acad Neurol 2019; 22:31–6. https://doi.org/10.4103/aian.AIAN_472_17.
18. Saini L, Mukherjee S, Gunasekaran PK, Saini AG, Ahuja C, Sharawat IK, et al. The profile of epilepsy and its characteristics in children with neurocutaneous syndromes. J Neurosci Rural Pract 2024; 15:233–7. https://doi.org/10.25259/JNRP_510_2023.
19. Ozdemir O, Sarı ME, Ertuğrul FA, Kurt A, Selimova V, Atalay CR. The effects of a history of seizures during pregnancy on umbilical arterial blood gas values in pregnant women with epilepsy. J Turk Ger Gynecol Assoc 2014; 15:135–9. https://doi.org/10.5152/jtgga.2014.13118.
20. Kodama K, Omata T, Watanabe Y, Aoyama H, Tanabe Y. Potassium bromide in treating pediatric refractory epilepsy. J Child Neurol 2019; 34:582–5. https://doi.org/10.1177/0883073819847862.

ISSN (O): 2687-5365; ISSN (P): 2753-6556