

A DESCRIPTIVE STUDY ON CLINICO ETIOLOGICAL PROFILE OF CHILDREN WITH SEIZURES ADMITTED IN A TERTIARY CENTRE

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Abstract

Background: Epilepsy is a common neurological disorder among children. Despite its prevalence, two-thirds of children achieve seizure freedom and can be successfully weaned off antiseizure medication. Drug-resistant epilepsy can lead to comorbidities and other medical complications. This study investigated seizures' clinical characteristics and underlying causes in children admitted to a paediatric ward. **Material and Methods:** This descriptive study was conducted at Thoothukudi Medical College on 150 children admitted with seizures in the paediatric ward from November 2019 to October 2020. Appropriate laboratory tests were performed, such as CBC, C-reactive protein, serum electrolytes, and blood sugar. CSF analysis, EEG, and Neuroimaging were performed, and the results were recorded. **Results:** Most patients (44.7%) were under two years old, 55.3% were male, and the most common seizure type was generalised tonic-clonic seizures (95.3%). Of the febrile seizure patients, 46.2% had iron deficiency anaemia, with a correlation between the diagnosis and IDA history. 73% of patients aged 5.1-10 years had less than one seizure recurrence, with no correlation between the age of onset and recurrence. There was no correlation between EEG and CSF analysis or EEG and neuroimaging data. Neuroimaging was also correlated with the CSF analysis. Interestingly, 96.4% of febrile seizure patients had normal calcium levels, with no correlation between diagnosis and serum calcium level. **Conclusion:** The study found a male predominance and younger age at presentation of seizures, with GTCS being the most common type. The febrile seizure was the most common aetiology, with a family history of seizures correlated.

INTRODUCTION

Epilepsy is among the most common neurological disorders in children, with incidence rates ranging from 33.3 to 82 cases per 100,000 per year. The incidence is highest in the first year after birth and decreases in teenagers. The aetiology remains unknown in nearly half of the patients.^[1] Population-based studies have demonstrated that nearly two-thirds of children with epilepsy achieve seizure freedom for longer than 3–5 years, and nearly half of all patients can wean off antiseizure medication successfully. Unfortunately, approximately one-quarter of patients develop drug-resistant epilepsy, defined as the failure of two or more adequate trials of antiseizure medication to control seizures. Such

children are at risk for cognitive, behavioural, and psychiatric comorbidities as well as medical concerns such as osteoporosis, seizure-induced injury, and sudden unexpected death in epilepsy.^[2]

During infancy, there is a unique interface between epilepsy and normal brain maturation. The causes of remote symptomatic seizures in early childhood differ among adults. It also differs in developing countries, such as India, compared with developed countries. Very few studies are available from India, and no such studies are available from this part of the country. So, it is important to know the clinical and etiological profile of epilepsy in our children, which will help in adopting effective and better strategies for epilepsy management and prevention

or modifications of various factors relating to epilepsies.^[3]

Numerous studies have assessed the underlying factors that can increase the risk of febrile seizures in otherwise healthy children. Recent studies have identified a history of antenatal complications, zinc deficiency, and electrolyte disturbances, including hyponatraemia, hypomagnesaemia, and hypocalcaemia, as risk factors that may contribute to febrile seizures.^[4-7] Therefore, our study aimed to determine seizures' clinical and etiological profiles in children. The prevalence of various seizure types and their aetiology guide clinicians regarding the prevalence of various seizure types and various disease prevalent states in our population.

Aim

This study investigated the clinical characteristics and underlying causes of seizures in children admitted to the paediatric ward of Thoothukudi Medical College.

MATERIALS AND METHODS

This descriptive study was conducted at Thoothukudi Medical College on 150 children admitted with seizures in the paediatric ward from November 2019 to October 2020. The study commenced after the institution's ethical committee clearance and informed consent was obtained from the concerned parents/guardians.

Inclusion Criteria

The study included children who were admitted with seizures between 2 months and 12 years of age.

Exclusion Criteria

Children aged <2 months and >12 years and patients with seizures with head injury were excluded.

After the children were enrolled in the study, information such as age, sex, nature of seizures, additional symptoms (fever, headache, running nose, cough, vomiting, and diarrhoea), family history of epilepsy, and developmental history were obtained from each patient. Appropriate laboratory tests were performed, such as CBC, C-reactive protein, serum electrolytes, and blood sugar. CSF analysis, EEG, and Neuroimaging were performed wherever indicated, and the results were recorded. Other parameters, such as the duration of hospital stay, final diagnosis, and outcome, were recorded. The classification of seizures, including generalised tonic-clonic (GTCS), myoclonic, focal, and other seizure types, was based on the International League Against Epilepsy classification of the Commission on Epidemiology and Prognosis 2017 International League Against Epilepsy (ILAE) Classifications.

Statistical Analysis

Data were entered into a Microsoft Excel spreadsheet and analysed using SPSS statistical software. The Chi-square test and Fischer test were used for nominal data. Statistical significance was set at $P < 0.05$.

RESULTS

Most patients (44.7%) were under two years old, with a majority (65%) belonging to a lower socioeconomic class. Among the patients, 55.3% were male, and the most common seizure type was generalised tonic-clonic seizures (95.3%). Seizure disorders were present in most of the patients (26.7%). Nearly all patients (98.7%) experienced loss of consciousness, and 80% had associated complications.

Approximately 60% of patients had a history of seizures, with a similar percentage experiencing fever during seizures. The majority (70%) of the patients were administered a single antiepileptic drug. Most children (75.3%) were born at term, and 56.7% were delivered vaginally. Additionally, 43.3% were admitted to the NICU, primarily due to neonatal hyperbilirubinemia (30.8%), whereas 90.7% had no history of birth asphyxia. [Table 1]

Most patients (90.7%) had no history of iron-deficiency anaemia, and most (89.3%) followed the national immunisation schedule. Approximately 75.3% of the children showed normal development, whereas 24.7% had abnormal development based on TDSC. A family history of seizures was absent in 72.7% of the cases. Head circumference was normal for age in 84% of the children. Neurological examination results were normal in 81.4% of the patients and abnormal in 18.6%. Signs of meningitis were absent in 90% of the cases. Random blood sugar, C-reactive protein, and serum calcium levels were normal in 90%, 88%, and 77.3% of the patients. Most of the patients (90.7%) had normal serum electrolyte levels. CSF analysis of 38 patients revealed abnormal results in 15. Neuroimaging in 123 patients showed abnormal results in 45.5% of cases. Inborn errors of metabolism screening in 8 patients showed positive results in 37.5% of the cases. The recurrence of seizures was <1 in 59.3% of the patients. [Table 2]

Of the 14 patients, 46.2% with febrile seizures had iron deficiency anaemia. A correlation was found between the diagnosis and history of IDA. Of the patients' age ranges of 5.1-10 years, 73% had fewer than one recurrence. None of the patients over the age of 10 years had more than three seizures. There was no correlation between age at onset and recurrence of seizures. The maximum number of patients with both normal and abnormal EEG was those who had not undergone CSF analysis. There was no correlation between the EEG and CSF analysis. Fifty percent of the patients with normal EEG had normal imaging, while 51.3% of the patients with abnormal EEG had normal imaging. There was no correlation between the EEG and neuroimaging findings.

69.6% had normal neuroimaging findings, while 73% of patients with abnormal CSF analysis results had abnormal neuroimaging findings. There was a correlation between CSF analysis and neuroimaging

findings. Normal neuroimaging findings were observed in 56.6% of patients with normal neurological examination, while 76.5% had abnormal neurological examination findings. There was a correlation between the neurological examination and neuroimaging findings. 91% of the patients with normal EEG had a normal neurological examination, while 56.5% of the patients with abnormal EEG had a normal neurological examination. There was no correlation between the EEG and neurological examination.

Among the patients with febrile seizures, 96.4% had normal calcium levels. None of the patients with low calcium levels had febrile-provoked seizures. There was no correlation between the diagnosis and serum calcium levels. 43.9 Of the patients with febrile seizures, 43.9% had a family history of seizures, while 26.8% of the patients with seizure disorders had a family history of seizures. There was a correlation between the diagnosis and family history. [Table 3]

Table 1: Demographic data of the study population

		Frequency	Percentage
Age group	2 months – 2 years	67	44.7
	2-5	40	26.7
	5-10	37	24.7
	10-12 years	6	4
Sex	FCH	67	44.7
	MCH	83	55.3
Socio-economic status	Lower class	65	43.3
	Lower middle class	31	20.7
	Upper lower class	42	28
	Upper middle class	12	8
Pregnancy complications	Anemia	7	4.7
	BA	1	0.7
	GDM	1	0.7
	Hypothyroid	1	0.7
	PIH	3	2
	No	137	91.3
Type	Clonic	1	0.7
	Focal	2	1.3
	GTCS	143	95.3
	Myo jerk	4	2.7
Loss of consciousness	No	2	1.3
	Yes	148	98.7
Complaints	No	30	20
	Yes	120	80
Fever	No	60	40
	Yes	90	60
History of seizure frequency	No	60	40
	Yes	90	60
RX	One drug	105	70
	Two drugs	33	22
	Three drugs	9	6
	Four drugs	3	2
Gestational age	Preterm/AGA	11	7.3
	Preterm/SGA	7	4.7
	Term/ AGA	113	75.3
	Term/ SGA	19	12.7
Type of delivery	AVD	1	0.7
	LSCS	64	42.7
	NVD	85	56.7
NICU admission	NO	85	56.7
	YES	65	43.3
Reason for NICU admission	LBW	15	23.07
	Birth asphyxia	14	23.07
	RDS	14	21.06
	NNH	20	30.8
	NNS	12	18.4
	Neonatal seizure	1	7.5
H/O birth asphyxia	No	136	90.7
	Yes	14	9.3

Table 2: Various characteristics of the study population

		Frequency	Percentage
H/O iron deficiency anaemia	No	136	90.7
	Yes	14	9.3
Immunisation history	AFA	134	89.3
	IFA	16	10.7

Development of the children	Abnormal	37	24.7
	Normal	113	75.3
Family history of seizures	No	109	72.7
	Yes	41	27.3
Headcircumference	Macro	2	1.3
	Micro	22	14.7
	NFA	126	84
Neuro exam	Abnormal	28	18.6
	Normal	122	81.4
Menin sign	No	135	90
	Yes	15	10
RBS	Low	15	10
	Normal	135	90
C reactive protein	Negative	132	88
	Positive	18	12
Serum calcium level	Low	34	22.7
	Normal	116	77.3
Serum electrolytes	High	4	2.7
	Low	10	6.7
	Normal	136	90.7
CSF analysis	Abnormal	15	39.4
	Normal	23	60.4
Neurological Imaging	Abnormal	56	45.5
	Normal	67	54.4
EEG	Abnormal	115	90.5
	Normal	12	9.4
Inborn errors of metabolism	Abnormal	3	37.5
	Normal	5	62.5
Recurrence of seizures	<1	89	59.3
	2-3	52	34.7
	>4	9	6

Table 3: Correlation of diagnosis, CSF analysis, neuro exam between H/O IDA, neuroimaging, and family history

		H/O IDA		P value
		NO	YES	
Diagnosis	Febrile seizure	20 (71.4%)	8 (28.6%)	0.051
	AFS	14 (82.4%)	3 (17.6%)	
	Seizure disorder	37 (92.5%)	3 (7.5%)	
	Unprovoked seizure	11 (100%)	0.00%	
	Febrile status epilepticus	6 (100%)	0.00%	
		Neuroimaging		
CSF analysis	Abnormal	11 (73.3%)	4 (26.7%)	0.006
	Normal	6 (27.3%)	16 (72.7%)	
Neuro exam	Abnormal	23 (79.3%)	6 (20.7%)	<0.0001
	Normal	33 (35.1%)	61 (64.9%)	
		Family history		
		No	Yes	
Diagnosis	Febrile seizure	10 (9.2%)	18 (43.9%)	<0.0001
	Afs	12 (11%)	5 (12.2%)	
	Seizure disorder	29 (26.6%)	11 (26.8%)	
	Unprovoked seizure	8 (7.3%)	3 (7.3%)	
	Febrile status epilepticus	6 (5.5%)	0.00%	
	CNS infection	7 (6.4%)	0.00%	
	Tb meningitis	4 (3.7%)	0.00%	
	Cerebral palsy	3 (2.8%)	0.00%	
	Hypocalcemic seizure	4 (3.7%)	0.00%	
	Infantile spasm	4 (3.7%)	0.00%	
	Febrile provoked seizure	1 (0.9%)	2 (4.9%)	
Others	21 (19.3%)	2 (4.9%)		

DISCUSSION

In our study, of the 150 children, 83 (55.3%) were males, and 67 (44.7%) were females. The sex distribution of children showed overall male predominance (Male: Female=1.2:1). The study by Ramesh et al. also reported a male predominance in the ratio of (1.3:1).^[8] In our study, out of 150 children, a maximum of 67 (44.7%) children

between 2 months to 2 years of age, 40 (26%) between 2 to 5 years of age, 37 (24.7%) between 5 to 10 years age, 6 (4%) between 10 to 12 years of age group. Seizure occurrence was most common in the age group of 2 months to five years. This is in concurrence with a study by Ramesh et al., who reported that most seizures occurred in children between 1 and 5 years of age.^[8] Similar observations

were made in the study done by Saravanan and Chandini et al.^[9,10]

The International League against Epilepsy divides epileptic seizures into generalised and focal types. In our study, of 150 children, 143 (95.3%) had GTCS, 2 (1.3%) had focal seizures, 1 (0.7%) had clonic seizures, and 4 (2.7%) had myoclonic jerks. The study by Bharathi et al. also reported that GTCS was the most common type of seizure.^[11] Similar reports were made in the study done by Shivaprakash et al. and Dua H et al.^[12,13]

Developmental milestones should be assessed in all cases of childhood seizures. Prenatal/perinatal insults or CNS malformations present as seizures and developmental delays. Our study found that 24.7% of children had developmental delays. Similarly, a study by Chidambaram and Ravichandran found that 28% of children had developmental delays.^[14] In our study, out of 150 cases, we performed EEG in 127 patients as per indication; EEGs were abnormal in 115 (90.5%) patients and normal in 12 (9.4%) patients. The study done by Saravanan reported that 70% of the children with seizures had abnormal EEG findings.^[9]

In our study, 46.2% of patients with febrile seizures had iron deficiency anaemia, indicating a significant association between iron deficiency anaemia and febrile seizures. In a similar study, Kumar et al. found a significant association between iron deficiency anaemia and febrile seizures.^[15] Neuroimaging is mandatory in the workup of children with seizures. MRI is the preferred neuroimaging modality in children with seizures. In our study, out of 150 children, we performed neuroimaging (CT and MRI) in 123 cases as per the indication; 56 (45.5%) were abnormal, while 67 (54.4%) were normal. A study done by Saravanan also reported that 25% of children with seizures had abnormal neurological imaging.^[9]

In our study, out of 150 children, 90 (60%) presented with fever with a seizure, and we conducted lumbar puncture in 38 patients as per indication. CSF was abnormal in 15 patients (10%) and normal in 23 patients (15.3%), and 90 (60%) children had a history of seizures. These conditions, such as febrile seizures and seizure disorders, are more prone to recurrent seizures. Recurrence of febrile seizures was observed in 29.4% (15) of the 51 febrile seizure children. There was a significant correlation between a family history of seizures and children with seizures. A family history of seizures was present in 27.3% of our patients, out of which 56.1% of the patients with febrile seizures had a family history of seizures, while 28.6% of the patients with seizure disorders had a family history of seizures. There was a significant difference between the two groups. However, its association with the development of epilepsy was significant in other studies by Monetti et al.^[16]

In our study, out of 150 children, febrile seizures are the most common type, with simple seizures (20%), atypical seizures (11%), and febrile status

epilepticus (4%). Seizure disorders (30.7%), CNS infections (8%), unprovoked seizures (9.3%), cerebral palsy (4.6%), and metabolic causes (3.3%) were also common.

CONCLUSION

Seizures not only cause high morbidity and mortality in children but also cause physical, mental, and financial distress for their parents. Our study noted a male preponderance and younger age at presentation. GTCS was the most common type of seizure, followed by myoclonic jerks and focal seizures. A febrile seizure is the most common aetiology, followed by idiopathic seizures and CNS infection. We also noticed a significant correlation between a family history of seizures and seizures in children, and the EEG was abnormal in 90.5% of the patients. Neuroimaging, CSF analysis, and electroencephalogram (EEG) play the most important roles in diagnosing seizures.

Limitations

This study investigated all children based on clinical diagnosis. CSF analysis, neuroimaging, and electroencephalogram (EEG) were performed only in the indicated cases

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