

Original Research Article

Clinico-etiological profile of first episode of seizure and its correlation with electroencephalogram in children aged 2 months to 18 years

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ABSTRACT

Background: Seizure is one of the commonest neurological illnesses. About 4-10% of children experience at least one episode in the first 16 years of life. Approximately 30% of children who experience, first afebrile seizure later develop epilepsy. Risk is approximately 20% if neurological examination, electroencephalogram (EEG) and neuroimaging is normal. The objective of the study is to determine the age of onset, etiology of first episode of seizure in children between the age group of 2 months to 18 years and the pattern of EEG changes in the above group of children.

Methods: In a prospective single centre observational study at Cheluvamba tertiary care hospital in Mysore, around 80 children who were admitted with first episode of afebrile seizure to our emergency department between October-2020 to July-2021 (10 months) were studied. Seizures defined using international league against epilepsy (ILAE) and EEG was done for all 80 children and their records were analysed.

Results: A total of 80 children presenting with first episode of seizure were included in the study. Toddlers represented the major portion of our study with male gender predominance. Idiopathic seizure was the most common etiology identified (81.2%), followed by meningitis (7.5%). EEG abnormality was seen in 58.7% of the children which was statistically significant ($p < 0.05$). MRI was done in 72.5% of the children, of which abnormality was seen in only 8.6% of the children.

Conclusions: Seizure is mainly diagnosed clinically and EEG can be normal in many children. First episode of seizure is common in the age group of 1-3 years. Normal EEG at present may not indicate the non-recurrence in future. Though EEG interpretation is useful, treatment can be started based on clinical diagnosis and has to be individualized.

Keywords: Afebrile seizure, EEG, Meningitis

INTRODUCTION

Seizure is a transient occurrence of signs and symptoms resulting from abnormal excessive or synchronous neuronal activity in the brain.^{1,7} They account for 1% of all emergency department visits.^{1,9} Seizure is one of the commonest childhood neurological illnesses. About 4-10% of children experience at least one episode of seizure in the first 16 years of life.^{2,7} Incidence of first episode of seizure is highest in children less than 3 years of age.^{9,12}

The cumulative lifetime incidence of epilepsy is 3% and more than half of the disorders start in childhood. Approximately 30% of patients who have 1st afebrile seizure later develop epilepsy. Risk is 20% if neurologic examination, EEG and neuroimaging is normal.¹

Worldwide, febrile seizures are the most common type of acute seizures in children.^{8,9} Central nervous system infections are the main cause of seizures and acquired epilepsy in the developing world.^{6,7} Acute symptomatic

or provoked seizures occur secondary to an acute problem affecting brain excitability such as electrolyte imbalance.¹¹ However, sometimes these seizures signify major structural, inflammatory or metabolic disorders of brain such as meningitis, encephalitis, brain tumor.^{3,8,11,12}

Comorbidities should be considered at all levels which include developmental delay, behavioural issues, academic difficulties and movement abnormalities. Nearly 40-80% of children with their first non-febrile seizure may develop a second seizure regardless of what sort of evaluation they are exposed to.⁴ Predictors of such recurrence might include child age, seizure details, patient and family history, presence of medical comorbidity, neuroimaging pathology and certain EEG abnormality.

EEG abnormalities can be detected in up to 59% of children with first afebrile seizure and can identify subtle focality in presence of normal magnetic resonance imaging of brain.⁴ Right assessment and scrutiny of first seizure is crucial, not only for abortion of acute attack but also for long term control of epilepsy.

Information regarding etiological profile of first episode of seizure is scarce. There is paucity of data regarding use of EEG in first episode of seizure. Hence the study is undertaken with objective of ascertaining the etiology, clinical profile and its correlation with EEG in children presenting with first episode of seizure at Cheluvamba tertiary care hospital.

METHODS

A prospective observational study done at Cheluvamba children hospital, tertiary care centre in Mysore for a period of 10 months from October 2020 to July 2021 after ethical committee clearance.

Inclusion criteria

Study population included 80 children in the age group of 2 months to 18 years with onset of 1st episode of seizure.

Exclusion criteria

Simple febrile seizure, head injury, known case of developmental delay, hypocalcemic convulsions, known case of inborn error of metabolism were excluded from study.

Prior to inclusion of children in the study detailed history of presenting complaints like onset of seizures, type of seizures, duration of seizures, past history and family history were analysed. General physical examination and neurological examination was done in detail. Biochemical investigations like complete hemogram, serum electrolytes and blood glucose reports were obtained. EEG was done for all cases. Lumbar puncture

for cerebrospinal fluid analysis and magnetic resonance imaging (MRI) brain was done as and when required.

Children were classified based on latest guidelines of ILAE and started on antiepileptic drugs accordingly.

Data analysis was computed using SSPS software and $p < 0.05$ was considered statistically significant.

RESULTS

Following results were obtained from the study: $p < 0.05$ was considered significant statistical value obtained from the chi-square test and degree of freedom (df).

Children from the age group of 1-3 year (53.8%) formed majority with idiopathic seizure (81.5%) being most common etiology. Males had higher incidence (51.2%).⁵ In our study generalized seizure was the most common type of seizure which accounted 93.7%.¹⁰ The EEG abnormalities are seen in 58.8 % of children.

Table 1: Age wise distribution of first episode of seizure.

Age (years)	Frequency	Percentage (%)
2 months- 1	11	13.7
1- 5	43	53.8
5-18	26	32.5
Total	80	100

In our study, predominance of seizure was seen in the age group of 1-5 years with asymp. significance value of 0.000. Toddlers formed the major portion similar to other study which also had the same result.¹

Table 2: Gender distribution of first episode of seizure.

Gender	Frequency	Percentage (%)
Male	41	51.25
Female	39	48.75
Total	80	100

Male gender predominance was seen in our study similar to other two studies.^{4,5} (asymp. significance 0.910)

Table 3: Family history in a case of first episode of seizure.

Positive family history	Frequency	Percentage (%)
Yes	8	10
No	72	90
Total	80	100

About 90% of children who presented with first episode of seizure did not have any similar complaints of seizure disorder in the family.

Table 4: Number of seizure episode at the time of admission.

Episode	Frequency	Percentage (%)
1	25	31.2
2-5	49	61.2
Status	6	7.5
Total	80	100

Majority of children (61.2%) had multiple episodes of seizures on admission with asymp. significance value of 0.0.

Table 5: Type of seizure.

Type	Frequency	Percentage (%)
GTCS	75	93.7
Focal	5	6.3
Total	80	100

About 93.7% children had GTCS (generalised tonic clonic seizures) type of seizures on admission to our emergency department like in other studies.^{11,12} (asympt. significance statistical value 0.000).

Table 6: EEG findings in a case of first episode of seizure.

EEG finding	Frequency	Percentage (%)
Normal	33	41.2
Generalized discharge	19	23.7
Focal discharge	4	5
Temporal spikes	19	23.7
Central spike	3	3.7
Slow wave	2	2.5
Total	80	100

About 58.7% children had EEG abnormality with majority showing generalised discharges and temporal spike pattern which constituted 23.7% each with statistical value of asym. Significance 0.000

Table 7: MRI findings in a case of first episode of seizure.

MRI brain	Frequency	Percentage (%)
Normal	53	91.3
Tuberculoma	1	1.72
Periventricular leukomalacia	2	3.45
Subependymal tuber	1	1.72
Unilateral cortical atrophy with ventricular dilatation	1	1.72
Total	58	100

The MRI of brain was done for 58 children and only 5 of them had abnormality on imaging (8.6%)

Table 8: Etiology of first episode of seizure.

Etiology	Frequency	Percentage (%)
Idiopathic	65	81.2
Meningitis	6	7.5
Hyponatremia	4	5
Tuberculoma	1	1.2
CNS Malformations	4	5
Total	80	100

Idiopathic epilepsy formed the major etiology of first episode of seizure in our study followed by meningitis with asympt. significance value of 0.000.

DISCUSSION

In our study, about eleven (13.7%) children were infants, about forty-three (53.8%) were among the age group of 1-5 year.¹¹ About twenty-six (32.5%) were in the age group of 5-18 years (Table 1). About 51.2% were males and 48.7 % were females in the study (Table 2).¹¹ Similar results were found in study done by other researchers.^{4,5}

Family history of seizures was present in eight (10%) children and seventy-two (90%) did not have family history of seizures (Table 3).

Three children (3.7%) had global developmental delay noticed on admission whereas development was normal in seventy-seven (96.25%) children in our study.

Among eighty children about twenty-five (31.6%) had only one episode of seizure on admission, 49 children (61.2%) had multiple episodes on admission and 6 children (7.5%) presented in status epilepticus (Table 4).

About seventy-five (93.7%) children had generalized tonic clonic seizures.^{10,12} Five (6.2%) children presented with focal seizures on admission (Table 5). Since ours was a tertiary care centre, patients were referred from primary health care centre by which time secondary generalization would have occurred.

EEG abnormality was seen in forty-seven (58.7%) children which was statistically significant ($p < 0.05$). EEG was normal in 33 (41.2%) children, with generalized seizure activity was seen in nineteen (23.7%) children, focal slowing noted in 4 (5%) children, bilateral frontotemporal spike pattern seen in nineteen (23.7%) children, bilateral frontocentral pattern in three (3.75%) children and slowing of background activity seen in (2.5%) children (Table 6). In a similar study conducted same EEG findings were noted.⁴

Lumbar puncture for CSF analysis was done based on clinical features and examination findings in 13 children and was abnormal in 6 of them. MRI Brain could not be

done for all due to financial constraints and done on individual case basis, was abnormal in 5 of the 58 children. Among MRI brain findings tuberculoma was noted in one (1.7%) child, periventricular leukomalacia in two (3.45%), subependymal tuber in one child (1.72%) and unilateral cortical atrophy with ventricular dilatation in one child (1.72%) (Table 7).

In our study idiopathic epilepsy was noted in sixty-five (81.2%) children, six (7.5%) children had meningitis.¹⁰ About four (5%) children had electrolyte disturbance (hyponatremia), 4 children (5%) had CNS malformations and one child (1.2%) had tuberculoma (Table 8). In Singh et al study, 66.4% had idiopathic epilepsy, 30% had meningitis, 1.2 % had hyponatremia and 2.7% children had tuberculoma. Children were classified based on latest guidelines of ILAE and started on antiepileptic drugs accordingly and followed up.

Limitations

However, our study had a smaller sample size with selection bias and MRI brain was not done in all patients due to financial constraints. Hence a randomized control study with larger sample size is required to make EEG as the first line of investigation for first episode of unprovoked seizure.

CONCLUSION

Apart from febrile seizures, idiopathic seizure is the most common cause for seizure in children between 2 months to 18 years of age. EEG can be normal in up to 40% of children with first episode of afebrile seizure. EEG helps in identifying subtle focality which is not picked on neuroimaging and is easily available investigation nowadays.

EEG abnormalities aids in decision of starting antiepileptic drugs in first episode of afebrile seizure. First episode of any seizure can leave behind huge mental and physical consequence to the child and family. Hence the right assessment and scrutiny is crucial, not only for abortion of acute attack but also for long term control of epilepsy.

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