http://jmscr.igmpublication.org/home/
ISSN (e)-2347-176x ISSN (p) 2455-0450
crossref DOI: https://dx.doi.org/10.18535/jmscr/v11i3.31

IGM Publication
Journal Of Medical Science And Clinical Research
An Official Publication Of IGM Publication

Research Article

Clinico-Etiological Profile and Outcome of Children with first Seizure at Tertiary Care Centre

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Abstract
Aim: *Seizure is the most common paediatric neurologic disorder. The aim is to study the clinico-etiological profile in children aged 1month to 12 years presenting with first seizure at a tertiary care hospital.*
Methods: *This is a retrospective observational study carried out on 328 children between age group 1month to 12 year who were admitted with first episode of seizure in our tertiary care hospital over period of one year (Jan 2022- Dec 2022). A detailed case record form was filled which included the sociodemographic profile, clinical features, neuroimaging findings, cerebrospinal (CSF) findings, Electroencephalographic (EEG) findings. This data was analysed by IBM SPSS software. We studied the type of seizure (ILAE classification of seizure 2017), aetiology of seizure and the outcome.*
Results: *The male–female ratio among patients was 1.2: 1. Highest number of cases were noted in age group 5-12 years (48.1%). Total 10.1% cases had family history of seizure. Abnormal birth history was observed in 27.1% cases and abnormal development was observed in 26.5% cases. Seizures of generalized onset were most common (74.1%).Generalized seizures were present mostly in age group of 5-12 years (31.1%) followed by the age group 1-5 years (28.4%) and the age group 1 month to 1 year (14.6%) respectively. The aetiologies were epilepsy syndrome (32.3%), structural (25%), infective (12.2%), febrile seizure (10%), unknown (10%), and metabolic (8%) with immune (0.6%) being the least common. CSF examination was done in 33 cases of which 79% had abnormal finding. Neuroimaging was done in 146 cases,of which 53% had abnormal finding. EEG was done in 196 cases, with 47% showed abnormal findings. Majority of patient had no neuro-deficit on discharge (93%), 6.7% cases had neuro-deficit and 0.3% cases had mortality.*
Conclusions: *Male preponderance was noted. Highest number of cases were seen in age group 5-12 years of age. Generalised onset seizure was the most common type. In our study Epilepsy syndrome (32.3%) and structural (25%) were the most common aetiology followed by infective(12.2%) and febrile seizure (10%). About 10 % of children had epilepsy of unknown aetiology. In our study only 6.7 % cases had neurological deficit.*
Keywords: *First seizure, Epilepsy, EEG,CSF, MRI, outcome.*

Introduction

Definition of epileptic seizure is a transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in brain.[1] Seizure is the most common paediatric neurologic disorder with 4% to 10% of children suffering at least one seizure in the first 16 years of life.[2] More than 50% of seizure has their onset in childhood.[3] Nearly 1/5th of total children with unprovoked seizures may develop epilepsy. [7]

Structural/metabolic causes are the most common aetiologies in infants with seizure.[8] Worldwide, febrile seizures are the most common type of acute seizures in children.[9,10] Central nervous system (CNS) infections are the major cause of seizures in developing countries.[11] Aim of studying clinical spectrum and aetiological factors determining the first episode of seizure in children is to guide acute management and also long- term prognostic plan. Determination of aetiology of first seizure might help to determine the risk of recurrence as well as epilepsy.

Materials and Methods

It was a retrospective observational study conducted at a tertiary care medical institute in India over one year. Children (one month to 12 years of age) with the first episode of a seizure were enrolled in the study population. Demographic profile, seizure history, birth and development history, family history, central nervous, examination, biochemical profile, electroencephalogram (EEG), and neuroimaging and outcome on discharge were noted from the case records. Children were categorized as generalized-onset, focal-onset, and unknown-onset seizures based on the International League Against Epilepsy 2017 seizure classification. Children were also classified according to specific aetiologies such as structural, metabolic, or other specific causes. All data were entered in a Microsoft Excel sheet. Descriptive statistics were represented as number and percentage, mean and median as applicable. The strength of association between variables was analysed using Chi- square test and expressed as odds ratio. $P < 0.05$ were considered statistically significant. The data were analysed using IBMSPSS 16 (2007) software.

Results

Table-1 Demographic details

	1month-1yr n (%)	1-5yr n (%)	5-12yr n (%)	Total n (%)
Male	23(7%)	63(19.2%)	92(28%)	178(54.2%)
Female	33(10%)	51(15.5%)	66(20.1%)	150(45.7%)
Family history of epilepsy	8(2.4%)	7(2.1%)	18(5.5%)	33(10.1%)
Consanguinity	21(6.4%)	14(4.2%)	17(5.2%)	52(15.8%)
Abnormal Birth history	14(4.2%)	36(11%)	39(12%)	89(27.1%)
Abnormal Developmental history	13(4%)	40(12.2%)	34(10.4%)	87(26.5%)
Past history of seizure	8(2.4%)	24(7.3%)	30(9.1%)	62(18.9%)
Past history of febrile seizure	4(1.2%)	12(3.7%)	12(3.7%)	28(8.5%)
Status epilepticus	5(1.5%)	21(6.4%)	31(9.5%)	57(17.3%)

Figure-1 Type of seizure (based on onset of seizure)

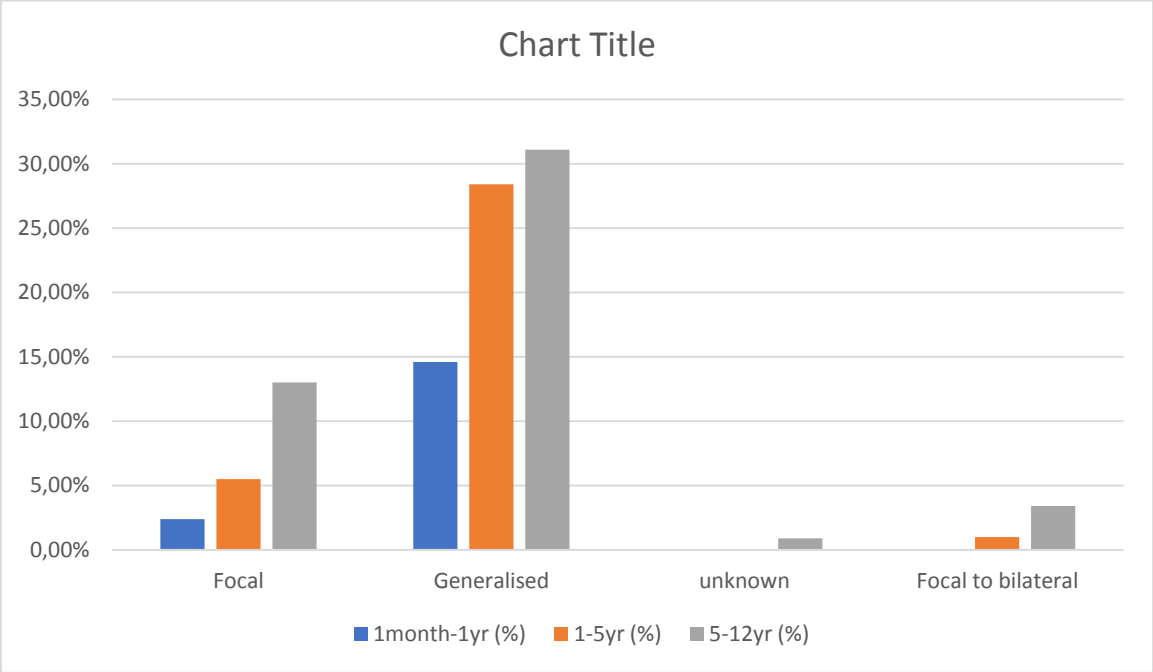

Table-2 Subtype of seizure

	1month-1yr n (%)	1-5yr n (%)	5-12yr n (%)	Total n (%)	P value
Clonic	21(6.4%)	49(14.9%)	78(23.7%)	148(45.1%)	0.001
Tonic	23(7%)	31(9.4%)	30(9.1%)	84(25.6%)	
Tonic-clonic	3(0.9%)	19(5.8%)	26(7.9%)	48(14.6%)	
Spasms	9(2.7%)	10(3%)	4(1.2%)	23(7%)	
Myoclonic	0(0%)	3(0.9%)	8(2.4%)	11(3.3%)	
Absence	0(0%)	0(0%)	6(1.8%)	6(1.8%)	
Automatism	0(0%)	2(0.6%)	2(0.6%)	4(1.2%)	
Unknown	0(0%)	0(0%)	3(0.9%)	3(0.9%)	
Atonic	0(0%)	0(0%)	1(0.3%)	1(0.3%)	
Total	56(17.1)	114(34.7%)	158(48.2%)	328(100%)	

Figure-2 Aetiological distribution of seizure

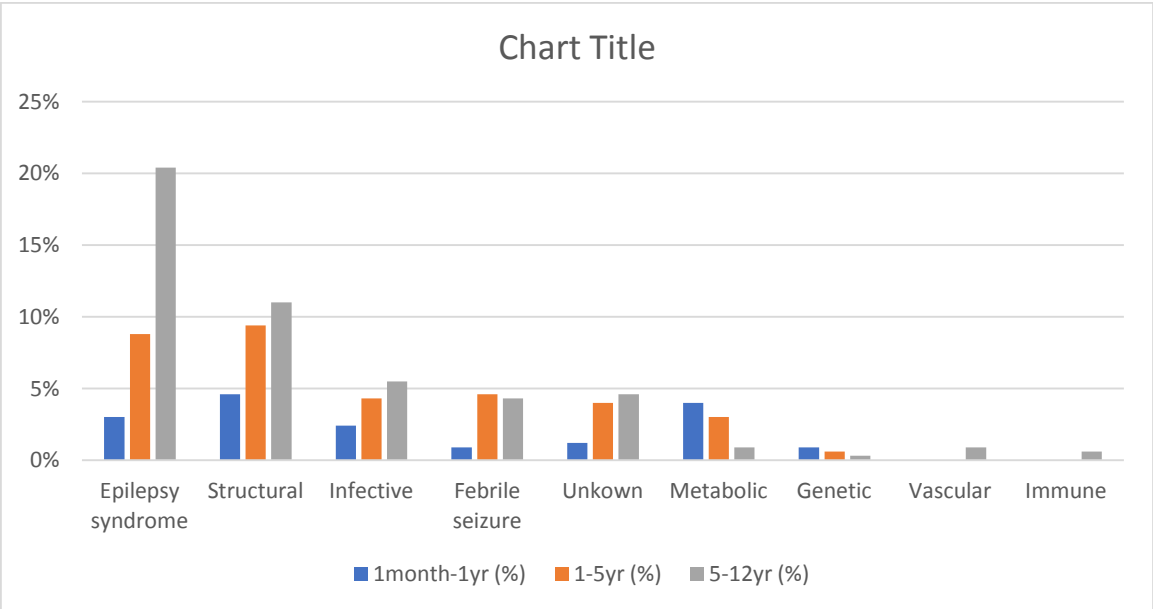

Table-3 Investigations and outcome

	1month-1yr n(%)	1-5yr n(%)	5-12yr n(%)	Total patients n(%)
CSF (n=33)				
Normal	1(3%)	3(9%)	3(9%)	7(21%)
Abnormal	7(21.2%)	10(30.3%)	9(27.3%)	26(79%)
NEUROIMAGING (n=146)				
Normal	10(7%)	20(13.5%)	39(26.7%)	69(47%)
Abnormal	9(6.1%)	27(18.5%)	41(28%)	77(53%)
EEG (n=196)				
Normal	7(3.6%)	35(18%)	61(31%)	103(53%)
Abnormal	12(6%)	30(15.3%)	51(26%)	93(47%)
OUTCOME (n=328)				
No neuro-deficit	52(16%)	107(32.6%)	146(44.5%)	305(93%)
Neuro-deficit	4(1.2%)	6(2%)	12(3.6%)	22(6.7%)
Death	0(0%)	1(0.3%)	0(0%)	1(0.3%)

Total 328 cases which presented with first seizure were enrolled, of which 54.2 % cases were male and45.7% cases were female. The male:female ratio was 1.2:1. Age group wise, maximum number of cases were noted in age group 5-12 years(48.1%) followed by 34.7% cases in age group of 1 to 5 years and 17% cases in age group 1month to 1 year.

Consanguinity was noted in 15.8% cases. It was also observed that 10.1% cases had family history of seizure. Of total 328 cases studied, past history of seizure was present in18.9% cases, out of which 8.5%were febrile seizure .Significant birth history was noted in27.1% cases, whereas it was normal in 72.9% cases. Majority of patients had history of birth asphyxia (11.2%), low birth weight (6%), neonatal seizure (3.6%), neonatal jaundice (1.8%), respiratory distress syndrome (1.5%), intrauterine growth retardation (1.2%), sepsis (0.9%), hypoglycaemia (0.3%), congenital heart disease (0.3%). Of the 328 children studied, 73.4% children with seizure had normal development, 23.2% had global developmental delay, 2.4% had language delay, and neuro-regression in 0.9% cases. Total 73.4% children in the age group of 5-12 years had normal development history and this was statistically significant (p- value – 0.024). Status epilepticus was observed in 17.3% of which maximum number i.e 54.3% were in age group 5-12 years. (Table-1)

According to type of seizure, 74.1% cases had generalised-onset seizure, 20.7% cases had focal-onset seizure, and 4.3% cases had focal to bilateral seizure. However, 0.9% cases had unknown onset. 41.7% of children in age group 5-12 years had generalised onset seizure and this was statistically significant (p-value – 0.004). (Figure-1)Subtypes of seizures noted in the study were as follows-clonic (45.1%), tonic (25.6%), tonic-clonic (14.6%), spasms (7%) myoclonic (3.3%), absence (1.8%), automatism (1.2%), atonic (0.3%), unknown (0.9%). Highest number of cases were of clonic type with a significant p value -0.001 (Table-2)

On CNS examination, 75.9% children were normal in age group 5-12 years which was statistically significant (p-value – 0.010). The finding noted on examination in remaining24.1% cases were microcephaly, abnormal tone and power, cerebellar signs, meningeal signs, nystagmus, dysmorphism, myoclonic jerks. From the case record form, following was the distribution of diagnosis in our studyi. eepilepsy syndrome (30%), cerebral palsy (13%), febrile seizure (10%),metabolic (7%), west syndrome (5%), meningitis (4%), CNS Tuberculosis (2%), and others (29%).

According to 2017 ILAE Classification, most common aetiology of seizure noted in this study was epilepsy syndrome (32.3%). About 63.2% cases of epilepsy syndrome were seen in age

group 5-12 years which was statistically significant (p-value- 0.001). Other aetiology noted in this study were, structural (25%), infective (12.2%), febrile seizure (10%), unknown (10%), metabolic (8%), genetic (1.8%), vascular (0.9%), immune (0.6%). However, most common aetiology in 1month-1yr (26.7%) and 1-5yr age (27%) group was structural. Majority of febrile seizure was noted in age group of 1-5years (46.8%), whereas maximum cases of infective cause was in age group of 5-12 years(45%). (Figure-2)On biochemical investigation, metabolic causes of seizures observed in our study were, hypocalcaemia (4.8%), hyponatremia (1.2%) and hypoglycaemia (0.9%).

CSF examination was done in 33 cases, of which 26 cases (79%) showed abnormal report. Neuroimaging (MRI /CT SCAN) was done in 146 cases, of which abnormal neuro-imaging was observed in 77 cases(53%) .The most common MRI abnormality noted were hypoxic ischaemic changes (HIE) (16.4%), tuberculoma (4.1%), hydrocephalus (5.4%), cortical dysplasia (2.7%), meningitis/meningoencephalitis (4.1%), neurocysticercosis (2%). EEG was recorded in 196 cases, of which 53% were reported normal. (p-value- 0.001). Abnormal EEG were noted in this study were as follows- generalised discharges in36.7% cases, focal discharges in 10.2% cases, and 3Hz and spike wave in 0.5% cases. Outcome was good in 93% cases with no neuro-deficit. But 6.7% cases were discharged with neuro-deficit and 1 deathwas (0.3%) noted. (Table-3)

Discussion

In this study male:female ratio was 1.2:1. In global studies, the male-to-female ratio is 1.35:1 [2,9].This finding was similar to studies conducted by Adhikari et al and Gowda et al[9,10]

Among 328 cases, the highest number of seizures (54.2%) was in the age group of 5 to 12 years. Inthe studies by Kumar *et al.* and Adhikari *et al.*, the largest (30%) proportion of children were in the age group of 1–2 years.[9,11]

It was also noted that 10.1% cases had family history of seizure. In studies done by Alakkodan et al , a positive family history of seizures was present in 25.2% of cases.[12] However, Chen et al. reported a family history of seizures in only 8.2% of the cases.[2There is an increased risk of seizure in children with a family history of epilepsy or seizures.

Of total 328 cases studied, past history of seizure was present in 18.9% cases, out of which 8.5% cases were febrile seizure. The explanation for this could be due to the fact that conditions like epilepsy and febrile convulsions are known to have recurrent seizure, and epilepsy syndrome is the commonest cause recorded in this study.

Significant birth history was noted in 27.1% cases, whereas it was normal in72.9% cases. Development history was normal in majority of patients (73.4%). Only 26.5% cases had abnormal development history.A study by Arundhati et al showed that developmental history was normal in 89.6% of cases, while 10.3% had delayed developmental milestones.[13]

In our study, status epilepticus was observed in 17.3% cases.which is in accordance with other studies that have an incidence between 7.3% and 10.9%.[14,15] Alakkodan et al reported that 27% of children had status epilepticus, which was higher than the percentage in this study.[12]

In this study, generalised-onset seizure (74.1%) was reported as the most common seizure type in all the age groups.Studies by, Kumar *et al.*, also reported generalised seizure in91.4% patients and focal seizure in 8.6% patients.[16] However, in study by Alakkodan et al, 54.12% of children presented with generalized onset seizures and 45.87% with focal onset seizures. [12]

The predominant subtype of seizure in our study was clonic seizure in age group of more than 1yr and tonic seizure in age group less than 1 year. However in study by Gupta A et al, the most common seizure type was generalised tonic-clonicin the age group 2 months - 5 years, focal and absence seizures in 5–12 years group.[17] In our study it was also noted that Spasms were seen

more in age group less than 5yr age (5.7%) and absence were predominantly seen in age group more than 5yr age (1.8%).

Our study revealed that the most common diagnosis for first seizure was epilepsy syndrome (30%) followed by cerebral palsy (13%), febrile seizure (10%), metabolic (7%), west syndrome (5%), meningitis (4%), CNS Tuberculosis (2%).In study by Mondal B et al, the leading diagnosis was febrile seizure (56%) and other causes noted were epilepsy syndrome (8%), cerebral palsy (8%), acuteviral meningoencephalitis (7%), pyogenic meningitis (6%).[18]

According to 2017 ILAE Classification most common aetiology of seizure noted in this study was epilepsy syndrome (32.3%). Other aetiology observed in this study were, structural (25%), infective (12.2%), febrile seizure (10%), unknown (10%), metabolic (8%). In study by Kumar *et al.* febrile seizure (46.7%), seizure disorder (19.2%), cerebral palsy (15%), were the most common aetiology of seizure.[11] In our study, 10% cases had no aetiology diagnosed (investigations like EEG and MRI both were done) which was similar to study by Sartori et al.[19]

Metabolic causes of seizures observed in this study were, hypocalcaemia(4.8%), hyponatremia (1.2%)and hypoglycaemia (0.9%). Similar findings were noted in study byArundhati et al, in which 2.5%, 3.17% and 0.79% cases had hypoglycaemia, hyponatremia and hypocalcaemia respectively.[13]

CSF examination was done in 33 cases, of which 79% had abnormal report. Similar finding was noted in study by Mondal B et al, where CSF abnormality was seen in 52% of patients respectively. [18]

Neuroimaging helps to recognize the aetiology of symptomatic epilepsy and its associated pathology. Neuroimaging was done in 146 cases of which, abnormal neuroimaging was observed in53% cases. The most common MRI abnormality noted were hypoxic ischaemic changes (16.4%), hydrocephalus (5.4%), tuberculoma (4.1%). Kumar *et al.* reported abnormal neuroimaging findings in 51.2% of the cases in their study. [11]Among children with focal seizure, 33% had abnormal imaging compared to 25% in other types of seizure. Similar finding was noted by Gupta et al in their study with abnormal neuroimaging in 72.7% and 37.5% in patients with focal and other seizure types respectively.[17]

EEG was recorded in 196 cases, of which 47% were reported abnormal.Kumar *et al.* reported abnormal EEG findings in 70% of the patients.[16] Chen et al. reported 77.8% had normal EEG findings, which is higher than this study.[2]

Outcome was good in majority of cases (93%) with no neuro-deficit. However, 6.7% cases were discharged with neuro-deficit and one mortality was noted which was a case of Acute necrotizing encephalopathy of childhood (ANEC).In study by Gupta A et. al of total 86 cases, 19% was discharged with neurological deficit and mortality was 2.3%. [17]

Limitations of the study

This study is single centre-based research. Further studies with larger population and wide geographic distribution is required.

Conclusion

Male preponderance was noted. Highest number of cases were seen in age group of 5-12 years of age. Generalised onset seizure was the most common type. Epilepsy syndrome was most common aetiology of seizure in our study, followed by structural abnormality, infection and febrile seizure. The most common abnormal neuro-imaging finding was HIE. In children with focal seizure, one-third patients had abnormal MRI findings. Outcome was good in 93% cases in our study, this could be due to epilepsy syndrome being the most common cause. In 10% cases, the aetiology was unknown even after the investigations, this probably suggests that the first seizure is either an isolated single unprovoked event or probably indicator of onset of epilepsy syndrome.

Acknowledgements

1) Dr. Radha Ghildiyal: Head of Department, Department Of Paediatrics, LTMMC, Sion.
2) Dr. Mohan Joshi: Dean, LTMMC, Sion.

Declarations

Funding: none

Conflict of Interest: None

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