CLINICOETIOLOGICAL PROFILE OF FIRST EPISODE SEIZURE IN CHILDREN 1 MONTH TO 12 YEARS

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ABSTRACT

BACKGROUND

Seizures are one of the most common neurological causes of childhood hospitalization having significant mortality and morbidity. There was limited data regarding acute seizure episodes in paediatric population from developing countries, and so this study was aimed to assess the age wise distribution, aetiology of seizures, classification of seizure types and outcome in children presenting with seizures in our hospital.

METHODS

This is a descriptive hospital based prospective study carried out in the Department of Paediatrics- Thanjavur Medical College, from October 2017 to June 2018. Parameters such as demographics, clinical presentation, laboratory test, neuroimaging, EEG, diagnosis and outcome during hospital stay were assessed.

RESULTS

A total of 150 children was admitted for seizures with 89 (59.3%) male and 61 (40.7%) female children. Among them, 109 (72.6%) presented with fever and 128 (85.3%) children were less than 5 years of age. Generalised tonic clonic seizure was the most common type (65.3%). Febrile seizure was the most common aetiology 75 (50%), followed by unprovoked seizures 34 (22.6%). Acute CNS infection 33 (22%), AGN with hypertensive encephalopathy 3 (2%), late onset HDN, neurocysticercosis 2 (1.3%) and tuberous sclerosis 1 (0.7%).

CONCLUSIONS

Acute episode of seizure is one of the commonest causes of hospitalization with high morbidity and mortality. Febrile seizures are the most common cause of seizures in febrile children. Seizures are more common in the age group of less than 5 years. Neuroimaging should be advised in all afebrile children, and children with partial seizures. CNS infections like meningitis, encephalitis, neurocysticercosis can be prevented with improvement in healthcare facilities. Children presenting with unprovoked seizure require long term follow up studies including neurophysiological studies and neuroimaging (CT/MRI) for better understanding of childhood seizure disorder in developing countries.

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BACKGROUND

Seizures are one of the most common paediatric neurological disorders. The incidence is greatest in children less than 3 years of age.^[1] 4-10% of children suffer at least 1 episode of seizure in the first 16 years of life. Seizures account for about 1% of all the emergency department visits.^[2] The incidence of epilepsy in children and adolescents seems relatively consistent across all populations studied, ranging from 50 to 100 per 1, 00, 000 person-years.^[3] In most of the studies, febrile seizures were reported to be the most common type seen in the paediatric population and account for the majority of seizures seen in children younger than 5 years of age.^{[4], [5]} Central Nervous System infections are the main cause of seizures and acquired epilepsy in the developing world.^{[4], [6]} Acute seizures are common in meningitis, viral encephalitis and neurocysticercosis and in most cases are associated with increased mortality and morbidity including subsequent epilepsy.^{[6], [7], [8], [9]}

The standardized mortality rate in patients with the 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.^[10] Children admitted in emergency department with new onset of non-febrile seizure are often evaluated using neuroimaging.^{[11], [12]} In patients with simple febrile seizures routine neuroimaging like CT or MRI is discouraged as it has no additional diagnostic and prognostic value.^[13] Treating physician have to decide for further investigations including septic screen, lumbar puncture, metabolic studies, EEG for patients who present with first attack of seizure. There is also concern for cost of these investigations in resource poor developing countries. There are limited studies on causes and outcome of acute episode of seizure in children in developing countries like India. Most studies done so far have focused on epilepsy and clinical seizure types.^{[14], [15], [16], [17]}

Therefore, in this prospective study, we analysed the incidence of various aetiologies, the clinical spectrum of seizure disorders and primary outcome of children admitted with first attack of seizure.

METHODS

Study Design

Descriptive hospital based, prospective study.

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Study Place

Government Raja Mirasudar Hospital.

Study Period

October 2017 to June 2018.

Study Population

Children admitted with first episode seizure 1 month to 12 years.

Sampling Method

Purposive sampling.

Sample Size

Since our study is a descriptive study, the total number of samples achieved during October 2017 to June 2018 was 150.

Inclusion Criteria

1. Children aged 1 month to 12 year.
2. Fever with seizures.
3. Family H/O seizure.
4. Status epilepticus.

Methodology

Our study was approved by the Institutional Ethical Committee. After eligibility for inclusion in the study, children are evaluated for the first attack of seizure and informed consent was obtained from parents. During the study period October 2017 to June 2018 (nine months) a total of 4200 children were admitted in the pediatric department. Among them 150 children (3.5%) admitted with first episode of seizure were included in the study.

The following information were obtained on a predesigned structured proforma from each patient: Age (1-12 years), Sex, Type of seizure, Associated symptoms (Fever, headache, altered sensorium), family history of seizure, mechanical ventilation, laboratory tests, neuroimaging, EEG, duration of hospital stay, duration of seizure, lumbar puncture, etiology, final outcome. Total 150 children were studied. Fever associated with seizure were 109 and among them 75 were febrile seizure, 34 were fever with other causes for seizures [Bacterial meningitis, viral encephalitis, cerebellitis, tuberculous sclerosis, acute glomerulonephritis].

Seizures without fever were 41 children, among them 34 had unprovoked seizure and 7 had seizure of other etiologies [AGN, HDN, neurocysticercosis, tuberculous sclerosis.]

Statistical Analysis

The statistical analysis was performed using Graph pad Prism version 5 software. Data was presented as mean with Standard deviation for normal distribution/scale data (Age). Data was presented as frequency with proportion n (%) for categorical. Unpaired 't' test was used to compare the means between the groups which follows parametric distribution. Mann Whitney 'U' test was used to compare the means between the groups which follows non-parametric distribution. Fisher's exact test (for sample <30) was used to compare the proportions between the groups as appropriate. $p < 0.05$ was considered statistically significant.

RESULTS

A total of 150 children were admitted for seizures with 89(59.3%) male and 61(40.7%) female. Among them, 109(72.6%) presented with fever. 128(85.3%) children were less than 5 years of age. Febrile seizures 75 (50%) was most common when compared to other etiologies. GTCS 98(65.3%) was the most common seizure type. Family history of seizures 33 (66%) was present in simple febrile seizures. Requirement of mechanical ventilation was needed more in viral encephalitis. In both CT/MRI tuberculous meningitis was the most common abnormal finding. EEG abnormality was maximum in unprovoked seizures. In CSF analysis bacterial meningitis was the most common finding. Mean duration of seizures in focal was 21 minutes and that of generalized seizures was 13 minutes (p value 0.001 significant). Febrile seizure was the most common etiology 75 (50%) followed by unprovoked seizures 34 (22.6%), acute CNS infection 33 (22%), AGN with hypertensive encephalopathy 3 (2%), late onset HDN and neurocysticercosis 2 (1.3%) and tuberculous sclerosis 1 (0.7%). The final outcome identified was, children with febrile seizures were discharged successfully after treatment and most of the children with viral encephalitis died during the hospital stay.

S. No	Age category in years	Male (n=89)		Female (n=61)	
		n	%	n	%
1	Less than 1 year	19	21.3	11	18
2	1 to 5 years	60	67.4	38	62.3
3	> 5 years to 10 years	7	7.9	10	16.4
4	> 10 years	3	3.4	2	3.3

Table 1. Frequency Distribution of Age with Respect to Gender

Data is expressed as n with %.

Fisher's exact test was used to compare the proportions. No difference in proportions was noted when gender was compared. (p=0.446). Seizures were more common in male in the age group 1 month to 5 years 79(88.7%). 5 years to 12 years females were more common (19.7%)

Sl. No.	Parameter	Focal Seizure			Generalized Seizure			P value
		n	Mean	SD	n	Mean	SD	
1	Age in years (median with IQ)	44	4 [#]	1.3 – 7.7 [#]	106	1.5 [#]	1 – 2 [#]	<0.001*
2	Temperature	25	39.6	0.39	85	38.8	0.4	0.912 (NS)
3	Duration of seizure in minutes	44	21.6	12.8	106	13.6	12.9	0.001*
4	Time of arrival in hospital in mins	44	23.7	11.86	106	17.6	9.4	0.001*
5	CBG at seizure (mg/dL)	44	91.1	24.1	93	87.4	24.3	0.413 (NS)
6	Duration of stay in hospital in days (Median with IQ)	44	10 [#]	6 – 18 [#]	106	5 [#]	3 – 9.25 [#]	<0.0001*

Table 2. Comparison of Various Parameters with Type of Seizure

Data expressed as mean with SD except age and duration of stay in which data are expressed as [#](median with IQ). Unpaired 't' test was done for all, except age and duration of stay in hospital for which Mann Whitney U test was done. * indicates p<0.05 and considered significant. NS= Not significant.

Mean duration of generalised seizure is 13.6 min.

Mean duration of focal seizure is 21.6 mins.

Mean age of generalized seizure is 2.24 years.

Mean duration of hospital stay in generalised seizure is 6.6 days.

Mean duration of hospital stay in focal seizure is 12.2 days.

Mean age of focal seizure is 4.46 years.

S. No	Etiology	CT Brain abnormal (n=3)		CT Brain Normal (n=40)		CT brain not done (n=107)	
		n	%	n	%	n	%
1	AGN with hypertensive encephalopathy	0	0	1	2.5	2	1.9
2	Bacterial Meningitis	0	0	2	5	9	8.4
3	Cerebellitis	0	0	0	0	2	1.9
4	Complex Febrile seizures	0	0	15	37.5	12	11.2
5	Late onset HDN	1	33.3	0	0	1	0.9
6	Neurocysticercosis	0	0	0	0	2	1.9
7	Simple Febrile seizures	0	0	0	0	48	44.9
8	Tuberculous Meningitis	2	66.7	2	5	3	2.8
9	Tuberous sclerosis	0	0	0	0	1	0.9
10	Unprovoked Seizure	0	0	16	40	18	16.8
11	Viral encephalitis	0	0	4	10	9	8.4

Table 3. Frequency Distribution of CT Brain Finding with Respect to Aetiology

Data expressed as n with %. CT Brain done in 43 children (28.6) %

Abnormal CT Brain was seen in 3(6.9) % children.

Tuberculous meningitis was the most common abnormal finding.

	Done		Not Done	
CSF Analysis	34(22.6%)		116(77.3%)	
	Bacterial Meningitis		viral encephalitis	
	Normal	Abnormal	Normal	Abnormal
CSF Analysis Done	1	8	1	7
	Tuberculous meningitis		Normal	Abnormal
			2	5

Table 4. Frequency Distribution of CSF Analysis with Aetiology

Data expressed as n with %. Bacterial Meningitis was found to be the most common CSF Abnormality.

S. No	Etiology	EEG abnormal (n=40)		EEG Normal (n=24)		EEG not done (n=86)	
		n	%	n	%	n	%
1	AGN with hypertensive encephalopathy	0	0	2	8.3	1	1.2
2	Bacterial Meningitis	0	0	2	8.3	9	10.5
3	Cerebellitis	0	0	0	0	2	2.3
4	Complex Febrile seizures	11	27.5	11	45.8	5	5.8
5	Late onset HDN	0	0	0	0	2	2.3
6	Neurocysticercosis	0	0	0	0	2	2.3
7	Simple Febrile seizures	0	0	0	0	48	55.8
8	Tuberculous Meningitis	0	0	0	0	7	8.1
9	Tuberous sclerosis	1	2.5	0	0	0	0
10	Unprovoked Seizure	26	65*	6	25	2	2.3
11	Viral encephalitis	2	5	3	12.5	8	9.3

Table 5. Frequency Distribution with EEG Finding with Respect to Aetiology

Data expressed as n with % Fisher's exact test was used to compare the proportions.

* indicates $p < 0.05$ and considered significant. EEG done in 64(42.6%) children. 40(62.5%) had abnormal EEG and most commonly seen in unprovoked seizure 26(65%) aetiology.

S. No	Etiology	Expired (n=10)		Discharged at request (n=27)		Discharged successfully (n=113)	
		n	%	n	%	n	%
1	AGN with hypertensive encephalopathy	0	0	1	3.7	2	1.8
2	Bacterial Meningitis	1	10	2	7.4	8	7.1
3	Cerebellitis	0	0	0	0	2	1.8
4	Complex Febrile seizures	0	0	9	33.3*	18	15.9
5	Late onset HDN	1	10	0	0	1	0.9
6	Neurocysticercosis	0	0	0	0	2	1.8
7	Simple Febrile seizures	0	0	0	0	48	42.5
8	Tuberculous Meningitis	1	10	2	7.4	4	3.5
9	Tuberous sclerosis	0	0	0	0	1	0.9
10	Unprovoked Seizure	0	0	10	37	24	21.2
11	Viral encephalitis	7	70*	3	11.1	3	2.7

Table 6. Frequency Distribution of Outcome with Aetiology

Data are expressed as n with %.

Fisher's exact test was used to compare the proportions.

* indicates $p < 0.05$ and considered significant.

Febrile seizures are mostly discharged successfully after treatment.

Totally 10 children died during hospital stay among which seven are due to viral encephalitis.

p value is < 0.05 and considered significant.

DISCUSSION

In this study it was found that 3.5% of all the pediatric inpatient admissions were due to first episode seizure which is similar to the finding seen in Chaudhary et al, Mwipopo EE et al. In our study, Febrile seizures (50%) was the main etiology of first attack of seizure in children and this was reported as 40% by Arpita Gogoi et al and 87.5% by Mwipopo EE et al study. Overall Febrile seizure (50%) was the common type of seizure in our study followed by unprovoked seizure (22.6%), CNS infection (22%) and other etiologies Acute Glomerulonephritis with hypertensive encephalopathy (3%), late onset HDN (1.3%), Tuberous Sclerosis (0.7%). In Adhikari et al study seizure disorder [33.3%] was the common etiology followed by febrile seizure [30.7%]. This depicts Geographical variations that determine the common causes in a particular region. In Arpita Gogoi et al study, also showed that febrile seizure was the common etiology (40%) followed by seizure disorder (12.3%), CNS infection and neurocysticercosis which was similar to our study.

Final outcome was noted as discharge at request, death, left against medical advice. 10 children died during hospital stay and among them 7 were due to viral encephalitis. Most of the febrile seizures were discharged successfully after treatment (75.3%). Children diagnosed as encephalitis had higher mortality.

CONCLUSIONS

Acute episode of seizure is one of the commonest causes of hospitalization with high morbidity and mortality. Febrile seizures are the most common cause of seizures in children. Seizures are more common in the age group of less than 5 years. Neuroimaging should be advised in all afebrile children and children with partial seizures.

CNS infection like meningitis, encephalitis, neurocysticercosis can be prevented with improvement in healthcare facilities.

Children presenting with unprovoked seizure require long term follow up studies including neurophysiological studies and neuroimaging (CT/MRI) for better understanding of childhood seizure disorder in developing countries.

Febrile seizures, unprovoked seizures, AGN, neurocysticercosis, tuberous sclerosis had good outcome and were discharged successfully after treatment. 7 children with encephalitis died. Attempt should be made to know the burden of other causative organisms for CNS infection and preventive measures should be undertaken. Healthcare facilities should be prepared for emergency management of seizures with intensive care units to decrease mortality and morbidity.

Limitations of This Study

Outcome is defined in terms of mortality during hospital stay and was unable to study morbidities like neurological dysfunction and impact on scholastic performance, as regular follow up could not be ensured owing to various factor like distance, monitoring issues. The details of other causes contributing to seizures, like inborn error of metabolism were not evaluated due to lack of investigation. Multicentric prospective study with longer follow up is needed to find out the details regarding these problems.

Abbreviation

1. GTCS - Generalized Tonic Clonic Seizure.
2. AGN - Acute Glomerulo Nephritis.
3. HDN - Haemorrhagic Disease of Newborn.
4. SE - Status Epilepticus.
5. AED - Anti Epileptic Drug.
6. CSF - Cerebro Spinal Fluid.

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