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Profile of children admitted with seizures in a tertiary care hospital in South India

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Abstract
Background: *Seizure is one of the common causes of childhood hospitalization with significant mortality and morbidity. There is limited data regarding acute seizures episodes form the developing countries. Current study aims to find the common etiology of seizure and classify seizure types and outcome in children presenting to a tertiary center in kanchipuram in south India.*
Methods: *This was a hospital based prospective study carried out in the Department of Pediatrics, Meenakshi medical college and research institute, kanchipuram from 1st Jan 2010 to 31st Dec 2012.Variables record were demographics, clinical presentations, laboratory tests, brain imaging studies, electroencephalography, diagnosis and hospital course.*
Results: *A total of 520 patients were admitted for seizures with 300 (57.7%) males and 220 (42.3%) females. Among these patients, 268(51.5%) presented with fever and 388 (74.6%) of children were less than 6 years of age. Generalized seizures were the most common seizure type (50.2%). Febrile seizures (36.5%), seizure disorder (33.2%), symptomatic seizures (20%) and space occupying lesions were common etiologies. Abnormal brain images were noted in (25%) of 424 patients and most common abnormality in space occupying lesion was neurocysticercosis (4%).*
Keywords: *children, febrile convulsions, generalized seizures, kanchipuram, neuroimaging*

I. Introduction

Acute seizures are a common neurological symptom in sick children. In patients with fever, they include febrile seizures [1,2], acute symptomatic seizures (e.g. in a child with pyogenic meningitis)[3] or initial seizures in a child with epilepsy or epilepsy syndrome[2].Worldwide, febrile seizures are the most common type of acute seizures in children[4]. Most are associated with infections and have a good outcome [5]. In tropical countries, febrile seizures are common but the prevalence of acute symptomatic seizures (which have a poorer outcome) may be higher than Western countries [6-8]. The incidence of both acute seizures and febrile status epileptics is higher[2,9] and the outcome is worse since the etiology is different[6,8,10,11]. Acute seizures are therefore a major risk factor for neurological and cognitive impairment [12-14] and for the development of epilepsy [15-17] in children living in these regions**.**

The incidence is highest in children less than 3 years of age, with a decreasing frequency in older children [18]. Seizures account for about 1% of all emergency department visits, and about 2% of visits of children's hospital emergency department visits [19]. In most of the studies, febrile seizures were reported to be the most common type seen in the pediatric population and account for the majority of seizures seen in children younger than 5 years of age [19-20].

Central nervous system (CNS) infections are the main cause of seizures and acquired epilepsy in the developing world [20, 21]. Geographical variations determine the common causes in a particular region. Acute seizures are common in meningitis, viral encephalitis and neurocysticercosis and in most cases are associated with increased mortality and morbidity, including subsequent epilepsy [22-25]. The standardized mortality rate (SMR) in patients with a 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 [26]. In most children with newly diagnosed epilepsy, the long-term prognosis of epilepsy is favorable, and in particular, patients with idiopathic etiology will eventually reach remission [27].

There are limited studies on causes and outcome of acute episode of seizure in developing countries. Most studies had done so far have focused on epilepsy and clinical seizure types [28, 29]. In this study, we therefore analyzed the prevalence of various etiologies, the clinical spectrum of seizure disorders and primary outcome of children admitted with acute seizure disorder.

II. Methods

All children admitted in the pediatric ward with complaints of seizures (including recurrent episodes) in the age group of 1month to 12 years and children admitted for other complaints and developing seizures during the course of their illness were included. Seizures in developmentally abnormal children were excluded. Furthermore, patients were divided into four age groups: age group (1 month − 1 year), (1–3 years), (4-6 years) and (7–12 years).The following information was obtained from each patient: age, sex, type of seizure, associated symptoms (fever, cough, rhinorrhea, vomiting, diarrhea and headache), and family history of seizure or epilepsy, developmental history. Laboratory test (hemogram, C-reactive protein, serum electrolytes, blood sugar) was done. Neuroimaging; CT scan head or cranial magnetic resonance imaging (MRI), electroencephalography (EEG), CSF analysis was done wherever indicated and results recorded. Final outcome was recorded in four categories: discharged after recovery, left against medical advice (LAMA), mortality and referral to other institutions. Seizure type classification, including generalized tonic-clonic (GTC), absence, myoclonic, partial and other seizures types was based on the Commission on Epidemiology and Prognosis, 1993 International League against Epilepsy [30].

III. Results

Table I Demographic data of patients presenting with seizure

Age	**Frequency**	**Percent**
1 month- 1year	152	29.2
1 – 3 yrs	142	27.3
4 – 6 yrs	94	18.1
7 – 12 yrs	132	25.4
Total	520	100
Sex		
Male	300	57.7
Female	220	42.3
Total	520	100
Type of seizure		
Generalised		
GTC	154	50
Tonic	90	29
Clonic	18	6
Myoclonic	14	5
Absence	16	5
Atonic	16	5
Total	**308**	**100**
Partial		
Simple	40	18.8
Complex	80	37.7
Secondary generalised	92	43.3
Total	**212**	**100**
Fever		
Present	265	51
Absent	255	49
Status epileptics		
Present	48	9
Absent	472	91

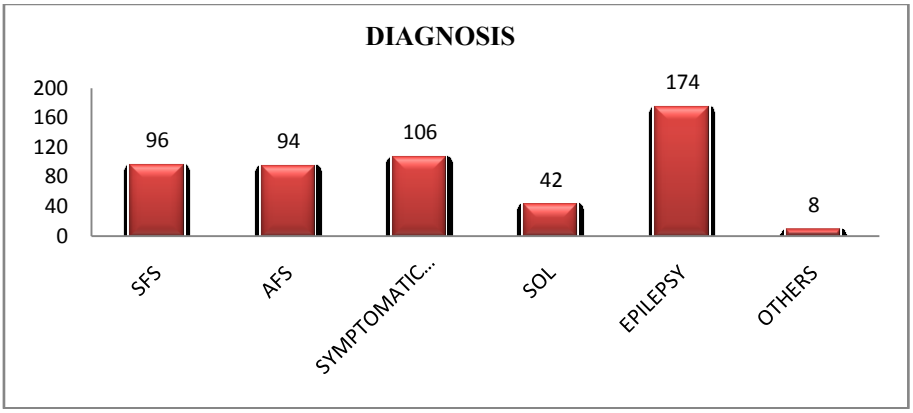
A total of 520 children were included of whom the incidence of seizures among different age group was: 1 month to 1 year 29.2% (152), 1-3 years 27.3 % (142), 4-6 years 18.1% (94) and 7 to 12 years was 25.4% (122). There were 300 (57.7%) males and 220 (42.3%) females with male to female ratio of 1.36:1.Fever was notably present in 51% of children at presentation. In generalized seizures, GTCS was seen in 50% of the children followed by tonic seizures which were present in 29%. Myoclonic, clonic, atonic and absence seizures were seen equally (5%).Among partial seizures, simple partial seizures were noted in 19%, complex partial in 38% and partial seizures with secondary generalization was seen in 43%. Status epilepticus was present in 48 (9.2%) of children.

3.2 Table II Incidence of partial and generalized seizure in different age groups

			Seizure type		
			Partial	General	Total
AGE	1 Month to 1 Year	Count	84	68	152
		% of Total	16.2%	13.1%	29.2%
	1 - 3 Years	Count	50	92	142
		% of Total	9.6%	17.7%	27.3%
	4 - 6 Years	Count	22	72	94
		% of Total	4.2%	13.8%	18.1%
	7 - 12 Years	Count	56	76	132
		% of Total	10.8%	14.6%	25.4%
Total		Count	212	308	520
		% of Total	40.8%	59.2%	100.0%

42% had partial seizures and 59% had generalized seizures. The incidence of general and partial seizures in different age group was in 1 month to 1 year partial was 52% and general was 48%. In 1 – 3 years age group partial was 35% and general the rest. In 4-6years age group partial was 23 % and general 77%. Beyond 7 years 42% had partial and the rest had general seizures.

3.3 Fig I



SFS-simple febrile seizures, AFS-atypical febrile seizures, SOL-space occupying lesion

In the present study SFS was found in 19% (96), AFS in 18% (94), symptomatic seizures in 20% (106), SOL in 8% (42), epilepsy in 33% (174) and others in 2% (8) of cases.

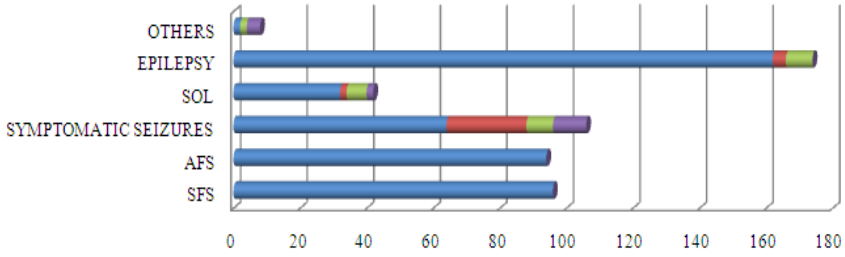
About 86.5% (450) of the children recovered normally. 6% recovered with deficit, 5% were either referred or discharged against medical advice and 3% died. Mortality was largely seen in the symptomatic seizures (viral encephalitis, meningitis, intracranial bleed) as shown in TABLE III and Fig II

3.4 Table III

Outcome

	Frequency	Percent	Valid Percent	Cumulative Percent
Recovered	450	86.5	86.5	86.5
Recovered with deficit	30	5.8	5.8	92.3
Not recovered/ AMA/abscond	24	4.6	4.6	96.9
Mortality	16	3.1	3.1	100.0
Total	520	100.0	100.0	

3.5 Fig II



	SFS	AFS	SYMPTOMATIC SEIZURES	SOL	EPILEPSY	OTHERS
RECOVERED NORMALLY	96	94	64	32	162	2
RECOVERED WITH DEFICIT	0	0	24	2	4	0
REFERRED/AMA	0	0	8	6	8	2
MORTALITY	0	0	10	2	0	4

IV Discussion

4.1 Demographics and clinical seizure types

This was a hospital based prospective study of children admitted with acute episode of seizure in a tertiary care center in south India from Jan 2010 to Dec 2012. It aimed in studying demographics, clinical seizure types, etiologies and outcome during the hospital stay of those children. Most studies show high incidence of seizures in younger children with a decreasing frequency in older age group and more common in males [19, 21]. Most children with seizures in our study were younger than 6 years of age. In our study the incidence of seizures among different age group was ;1month to 1year-29.2% (76/260),1-3 years - 27.3%(71/260) ,4-6 years - 18.1%(47/260) and 7 to 12 years was 25.4% (61/260).This correlated with many studies[31-33]. Males had higher prevalence compared to females similar to other studies. [33-35] Seizures coexisted with fever in 51.5% of cases. Most studies show generalized seizures are much more common compared to partial seizure [20, 21, 23, 31, 32] similar to our study. In the current study generalized tonic-clonic was commonest seizure type and partial seizure was common among children more than 7 years. Partial seizures represented 212(40.8%) of children in the current study. In our study we found that 81% of children presented with 1st episode of seizures whereas 19% of children already had one or more episodes before. Among those presenting with recurrent episodes of seizures most of the cases were associated with epilepsy followed by febrile seizures. Also at the time of hospitalization 43% of children had seizures only once and 57% of had multiple episodes (2 or more). It was interesting to know that in our study, most of the children (88%) presented with seizures during the day time, the rest presented during night.

4.2 Etiological profile

Whether routine neuroimaging should be done in all children admitted with acute episode of seizure is debated [21, 36]. In our study abnormal neuroimaging was present in only 106 (25%). We compared the type of seizures & abnormal imaging & found that 27% of partial seizures & 14% of general seizures showed abnormality. Among SOL, NCC was seen in 20(4.7%) cases, tuberculoma in 8(1.8%) cases, others including benign neoplasms of brain. Febrile seizures (CFS) did not show any abnormality in CT which correlated with many studies. Most of other studies [34,37]done showed higher incidence of abnormality in imaging studies associated with seizures, but many studies were not generalized to all type of seizures like our study.AAP recommends lumbar puncture for febrile seizure children aged less than 12 months [38]. CSF analysis was done for 160 children out of 520,we found abnormality in 66 children (41%)(Bacterial-60/ Viral-6) There are many possible etiologies of a first seizure attack in children, including infection, neurologic/developmental causes, traumatic head injury, toxins, and metabolic disturbances [20-22]. Febrile seizures have been reported to be one of the most common causes of seizure attack in children [19,20].Overall febrile seizures (36.5%), seizure disorder (33.2%), symptomatic seizures (20%) and SOL were common etiologies. Among symptomatic seizures ,the following types were seen meningitis-43% (46), encephalitis-18%(20), camphor poisoning-13%(14), post traumatic-11%(12), hyponatremia-5%(6), hypoglycemia-4%(4), hypocalcemia-6%(4).In our study. EEG was found to be abnormal in 70% (364) of the studies cases. Focal epileptiform abnormality was described in (86/364) 24% & generalized epileptiform abnormality was seen in 76% (278/364) similar to study by Mohd Ashraf et al[31].EEG abnormality was seen in 35% (104 out of 190) of children with febrile seizures. Most of

90% of the EEG abnormality contributed from CFS. In symptomatic seizures 58 % was abnormal. Most of the abnormality was seen with meningitis. Focal epileptiform discharges were associated with intracranial SOL.

4.3 Primary outcome of acute seizure

In our study, 86.5 %(450) of the children recovered normally, 6% recovered with deficit, 5% were either referred or discharged against medical advice and 3% died. Mortality was largely seen in the symptomatic seizures (viral encephalitis, meningitis, intracranial bleed). No mortality was seen with febrile seizures. All cases of death had refractory status epileptics, presented late to the hospital and succumbed within few hours of admission. Mortality rate during hospital course among children admitted with acute episode of seizure was similar with reports from other developing countries [20]. There was no significant difference in the outcome among males and females. Fever was not independently associated with increased mortality during the acute illness. Meningitis and encephalitis cause significant childhood mortality and morbidity [20, 22].

V. Limitations of the study

Outcome was defined as mortality during hospital stay and we were unable to study morbidities like neurological dysfunction and impact on scholastic performance. The details of other causes contributing for seizures like inborn error of metabolism could not be specified due lack of investigations. Multi centric prospective study is needed to find out details regarding these problems.

VI. Conclusions

Acute episode of seizures are one of the commonest cause of hospitalization with high mortality. Febrile convulsions and CNS infections were common causes of seizures in febrile children. Seizures were more common in age 1month to 1year. Neuroimaging should be advised in all afebrile children and in children with partial seizures. CNS infections like meningitis and encephalitis, neurocysticercosis can be prevented with improvement in health care facilities. Group of children presenting with unprovoked seizure require long term follow up studies including neurophysiologic studies and neuroimaging (CT or MRI) for better understanding of childhood seizure disorder in developing countries.

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