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Original Research Article

A study of etiology and characteristics of febrile convulsions and epilepsy among children

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ABSTRACT

Background: Globally in all parts of the world, epilepsy is the most common neurological disorder of chronic nature. Seizures among children are common and challenging for the pediatrician. The objective of this study was to study etiology and characteristics of febrile convulsions and epilepsy among children
Methods: The present study was a prospective observational study conducted in a tertiary care centre among subjects who had seizures. Subjects were recruited from pediatric ward, consecutively hospitalization of pediatric patients, and of either sex who presented with history of seizures. The data included demographic details and history.
Results: Total febrile seizures were 25.46% and overall incidence was around 2.57%. Preponderance of male constituting 62.65% over female 37.35% was observed. Most of the febrile seizures were simple type. Fever due to upper respiratory tract infection was commonest cause. It was not associated with any complications. Epileptic cases were 38.65% of total cases and overall incidence was 3.9%. In this group also, there was male preponderance. It increased with age. Commonest presentations of epileptic seizures were generalized in 67.46%. Most common cause of acute symptomatic seizures was viral encephalitis (28.34%). Numbers of deaths were more in acute symptomatic.
Conclusions: As there were no morbidity and mortality with febrile seizures so it is possible to explain the benign nature of febrile seizures to their parents. Acute symptomatic seizures are to be identified and treated immediately.

Keywords: Characteristics, Etiology, Febrile convulsions

INTRODUCTION

Fever is the most common cause of convulsions among the children of age less than five years. Febrile seizures are the most common among early childhood. Till date the etiology, importance as well as management of febrile seizures remained controversial. It is mainly aggravated by pyrexia due to infection which is outside the central nervous system. It has been estimated that 2-4% of children are affected by febrile seizures. Boys are commonly affected than girls.[1,2] There are two types of febrile seizures i.e. complex and simple. Complex type of febrile seizures may be focal or may manifest as generalized, they continue for more than 15 minutes, they are characterized by multiple seizures. On the contrary, the simple febrile seizures are isolated, they are brief, they last for less than 15 minutes and they are not repeated.[3]

Globally in all parts of the world, epilepsy is the most common neurological disorder of chronic nature. Prevalence of epilepsy is higher in developing countries, especially India. The reason for high prevalence is due to high incidence of infections of the cranium, trauma to

head, injuries during birth, and perinatal birth asphyxia etc. Epilepsy is responsible for about 33% of seizures among children. In epilepsy, the centre of focus is in the brain. The incidence of epilepsy in developing countries is 2-6 times more than in developed countries i.e. it is 18 per 1000 population in developing countries compared to only 2.7-8 per 1000 population in the developed countries.[4]

If any child is having more than two episodes of epilepsy which are happening 24 hours apart as well as which are not provoked seizures then it can be called as epilepsy. Generalized epilepsy and partial epilepsy are the two types of epilepsy. Generalized seizures include absence seizures, petit mal, myoclonic, clonic, tonic, atonic and tonic-clonic. Whereas partial seizures may be simple without impairment of consciousness or complex with impaired consciousness. Seizures among children are common and challenging for the pediatrician.[5]

Present study was carried out with the objective to study etiology and characteristics of febrile convulsions and epilepsy among children.

METHODS

The present study was a prospective observational study. Study was conducted in a tertiary care centre, located at Vidarbha region. It caters to a large number of populations from Vidarbha, Marathwada and also from few districts of Andhra Pradesh. This hospital admits about six thousand children aged less than twelve years annually and is one of the major hospital in the area which admits very sick children. However, not every child with a seizure from this region is admitted to this hospital.

Subjects were enrolled during the period from 1st July 2010 to 30th April 2011. Subjects who had seizures were included in the study.

Inclusion criteria

- Pediatric patients of either sex who presented with history of seizures with any etiology
- Those who were willing to participate in the study.

Exclusion criteria

- Seizure cases that went discharge against medical advice
- Seizure cases who expired immediately after hospitalization (before diagnosis)
- Not willing to give consent.

Ethical clearance was obtained from Institutional Ethics Committee. An informed written consent was taken from the relatives of the subjects who were enrolled in the study and all the information obtained was strictly kept confidential.

Sampling method

Study subjects were recruited from pediatric ward, consecutively hospitalization of pediatric patients, and of either sex who presented with history of seizures.

The data included demographic details, history of fever, duration and type of seizure, repetition of seizure within 24 hours. History of epilepsy and anti-epileptic drug use, seizure type, duration of seizures level of consciousness, as well as relevant past history and family history was recorded.

Investigation data, treatment and outcome were also collected. All the relevant investigations were carried out as per standard guidelines. Data was collected in a data collection form.

Definition of seizures

Febrile seizures

Febrile seizures as per definition by NIH "An event in infancy or childhood, usually occurring between 3 months and five years of age, associated with fever but without evidence of intra-cranial infection or defined cause".[7] Febrile seizures were classified into simple and complex type as per duration, type of presentation and repetition of seizure within 24 hours.[3]

Epileptic seizures

Transient occurrence of signs and/or symptoms due to abnormal excessive or synchronous neuronal activity in the brain. Disorder of the brain characterized by an enduring predisposition to generate epileptic seizures and by the neurologic, cognitive, psychological, and social consequences of this condition.[7,8]

Epileptic seizures were classified according to ILAE into partial and generalized type, 8 and as per etiology it is divided into cryptogenic (idiopathic), acute symptomatic and remote symptomatic.

Lab data

Relevant investigations were done as needed. Peripheral smear, complete blood count. Random blood sugar, serum sodium, serum potassium, serum calcium, blood urea, serum creatinine, liver function tests, blood culture and sensitivity, HIV-ELISA, urine examination, lumbar puncture, fundoscopy, Monteux test, Chest X-ray, NSG, CT scans brain, EEG.

Serum lactate, serum magnesium, therapeutic drug monitoring, toxicology study, continuous EEG monitoring and MRI were not available in the institution during the present study and hence were not done in any of the participants.

Drug treatment

All patients were treated according to established guidelines.

Outcome

The outcome was measured as:

- 'Discharge' from hospital with complete recovery or with some morbidity.
- 'Expired' i.e. mortality which was defined as 'death' during hospital admission.

Statistical analysis

For the purpose of analysis statistical test like percentage, proportion, chi-square and chi-square for trend were used where ever applicable. P value <0.05 was considered as statistically significant.

RESULTS

The above table shows out of total 209 cases beyond neonatal age group 125 (59.8%) cases were male and 84 (40.2%) were female thus male to female ratio is 1.49:1. The incidence of seizure was maximum in the age group of 6 months to 3 years i.e. 89 (42.6%) cases. Chi square test was applied to study the distribution of seizure cases as per the sex distribution and it was found statistically not significant (χ^2 = 2.32, df = 3 p>0.05).

Table 1: Age and sex wise distribution of seizure cases.

Age	Male	Female	Percentage
<6 months	10 (04.8%)	09 (04.3%)	19 (09.1%)
>6 months to 3 years	50 (23.9%)	39 (18.7%)	89 (42.6%)
>3-5 years	19 (09.1%)	08 (03.8%)	27 (12.9%)
>5-12 years	46 (22.0%)	28 (13.4%)	74 (35.4%)
Total	125 (59.8%)	84 (40.2%)	209 (100%)

χ^2 = 2.32, df =3 p>0.05

Table 2: Age and sex wise distribution of febrile seizures.

Age	Male	Female	Total
<6 months	02 (02.40%)	01 (01.20%)	03 (03.60%)
>6 months to 1 yr	09 (10.84%)	09 (10.84%)	18 (21.68%)
>1-3 yrs	23 (27.71%)	14 (16.87%)	37 (44.58%)
>3-5 yrs	10 (12.05%)	05 (06.02%)	15 (18.09%)
>5-12 yrs	08 (9.64%)	02 (02.40%)	10 (12.05%)
Total	52 (62.65%)	31(37.35%)	83 (100%)

X^2 for linear trend up to 3 years = 0.231; p<0.05 odds ratio = 1

Table 2 shows out of 83 cases of febrile seizures 52 (62.65%) were male and 31 (37.35%) were female, i.e. male to female ratio is 1.68:1. When chi square for linear trend test was applied for up to the age of 3 years it was found statistically significant.

Table 3 shows out of 83 cases of febrile seizures typical type were more common 56 (67.47%) cases compare to atypical type, with 27 (23.53%). Amongst atypical type generalized pattern of seizures were more common.

Table 3: Distribution of febrile seizures according to type and presentation.

Type	Typical	Atypical			Total
		Generalized	focal	Total	
No. of cases	56	24	03	27	83
%	67.47	23.53			100

Table 4 shows that cause of fever in febrile seizures was mainly secondary to upper respiratory tract infection, i.e. 63.85%, followed by malarial fever 9.64%.

Table 4: Etiological distribution of febrile seizures.

Etiology	No. of cases	Percentage
URTI	53	63.85
Malarial fever	08	09.64
LRTI	07	08.44
AGE	03	03.62
Others	12	14.45
Total	83	100

Table 5 shows out of 126 epilepsy cases 85 (67.46%) were generalized seizure, 36 (28.57%) were focal seizures and 5 (3.97%) remain unidentified.

Table 5: Distribution of epilepsy cases according to presentation.

Type of presentation	No. of cases (n=126)	Percentage
Generalized	85	67.46
Focal	36	28.57
Undetermined	05	03.97
Total	126	100

Table 6 shows amongst total 126 cases of epilepsy acute symptomatic were 60 (47.62%) most common, followed by idiopathic 45 (35.71%), and 21(16.66%) were remote symptomatic.

Table 6: Etiological distribution of epilepsy cases.

Etiology	No. of cases (n=126)	Percentage
Idiopathic (Cryptogenic)	45	35.71
Remote symptomatic	21	16.66
Acute symptomatic	60	47.62
Total	126	100

Table 7 shows out of 60 cases of acute symptomatic (CNS infection), 17 (28.34%) were viral encephalitis, 12 (20%) were bacterial meningitis followed by cerebral malaria 9 (15%), TB meningitis 8 (13.33%), neurocysticercosis (NCC), 5 (8.33%) and 9 (15%) were others.

Table 7: Distribution of epilepsy cases caused by CNS infection (acute symptomatic).

Cause of CNS infection	No. of cases (60)	Percentage
Viral encephalitis	17	28.34
Bacterial meningitis	12	20.00
Cerebral malaria	09	15.00
TB meningitis	08	13.33
NCC	05	08.33
Others	09	15.00
Total	60	100

Out of 126 epilepsy cases 110 (87.30%) cases survived while 16 (12.70%) died. Common cause of death was in acute symptomatic type of epilepsy 11 (73.33%). The various causes of death were compared with sex of the study subjects, it was found statistically non-significant ($X^2 = 1.59$, df = 2 $p>0.05$).

Table 8: Causes of mortality in epilepsy cases.

Causes	Sex		Total
	Male	Female	
Idiopathic	01	00	01
Cryptogenic	02	02	04
Acute symptomatic	04	07	11
Total	07	09	16

$X^2 = 1.59$; df = 2 $p>0.05$

DISCUSSION

There were total 3233 patients up to 12 years admitted during the study period. There were 209 seizure cases out of which 83 were febrile seizures, with over all incidences of 2.57%. Similar finding of febrile seizures was shown in the study of Forsgren, Sidenvall R et al who found the incidence 4.1%.[8] In the present study out of 83 cases of febrile seizures 52 (62.65%) were male and 31 (37.35%) were female cases. Thus, the present study shows male preponderance, with male to female ratio of 1.68:1. Preponderance of male was also noted in the study by Sehagal H, Bala K et al who studied 150 case and found 65% male 35% female and Forsgren, Sidenvall R et al who studied 128 cases and found male to female ratio as 1.72:1.[8,9]

In the present study, the incidence of febrile seizures was 66.26% in between 6 months to 3 years, and there were 18.07% cases in between 3-5 years. Only 3.6% cases were below the age of 6 months and 12.04% above the age of 5 years. Similar type of finding was reported by Bhandari NR that 76.5% developed seizures before the age of three years.[10]

In the present study simple, febrile seizures were 56 (67.47%) and complex was (23.53%), which is similar to the findings by Deng CT et al who studied total 117 case and noted 66.6% simple febrile seizures and 33.3% were complex.[11]

In the present study generalized type of presentation was 96.38% and focal was 3.62%. Similar results were observed in the study of Bhandari NR as 100% were generalized presentation, Ramakrishnan K and Thomas K studied 120 cases found 95% as generalized presentation.[10,12]

In the present study, out of 83 febrile seizure cases 53 (63.85%) cause of fever was URTI, followed by malarial fever 9.64% then LRTI (8.44%). Similar finding were with the study by Simpson and George with study of 28 patients 70% URTI and 20% with LRTI, Sehgal and Bala K et al who studied 150 cases and found 60.6% cause of fever was URTI.[9,13]

In the present study, out of 3233 total cases (beyond neonatal age group up to 12 years) admitted during study period there were 126 cases of epileptic seizures with the incidence of 3.9%. Out of which 74 (58.73%) were male and 52 (41.27%) were female. There are very few epidemiological studies looking at the incidence of epilepsy from India specially hospital based. The limited data show that the incidence rates are surprisingly similar to those in developed countries. A recent study conducted in Kolkata urban population showed an annual incidence rate of 27.27 / 100,000 population/year.[14]

In the present study 209 seizure cases were beyond neonatal age, out of which 126 (60.3%) were epileptic and 83 (39.7%) were febrile seizures. Similar finding was shown in the study of Kokkat AJ, Verma AK et al who studied 69 cases of seizures and found 48 (69.5%) epileptic seizures and 21 (30.5%) were febrile seizures.[15]

In the present study, out of 126 epileptic cases common type of presentation was generalized 85 (67.46%), focal was 36 (28.57%) and 5 (3.97%) were unrecognized. Similar findings were noted in the study by Riwiza et al with 58% generalized, 32% focal and 10% unclassified.[16]

In the present study, out of 126 epilepsy cases 60 cases were due to CNS infection i.e. 47.62% followed by idiopathic (cryptogenic) which were 45 (35.71%) and remote symptomatic 21 (16.6%). Similar findings were presented by Murthy JMK et al with 54% acute symptomatic, 19% idiopathic (cryptogenic) 27% were remote symptomatic.[17]

In the present study 60 cases were due to CNS infection out of which 17 (28.34%) were viral encephalitis, 12 (20%) were bacterial meningitis, 9 (15%) were cerebral

malaria followed by neuro-tuberculosis 8 (13.33%), 5 (8.33%) were neurocysticercosis and 9 (15%) were having other causes.

CONCLUSION

As there were no morbidity and mortality with febrile seizures so it is possible to explain the benign nature of febrile seizures to their parents. Acute symptomatic seizures are to be identified and treated immediately.

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Ethical approval: The study was approved by the Institutional Ethics Committee

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