

Clinical Characteristics of Children with Febrile Seizure

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ABSTRACT

Background: Febrile seizure is common in children below five years of age. This study was conducted to evaluate the clinical profile of children presenting with febrile seizure in a teaching hospital.

Methods: This was a descriptive retrospective study among children presenting with febrile seizure in a teaching hospital from July 2009 to June 2013. Children between six months to six years were included in the study while patients with prior episodes of afebrile seizures, abnormal neurodevelopment and not meeting the age criteria were excluded. Patient's demographic and clinical data were collected from the in-patients records and analyzed.

Results: This study included 103 children with febrile seizure. Out of which 67% were male. Simple febrile seizure and complex febrile seizure were observed in 76.7% and 23.3% of patients respectively. Majority of children (71.8%) had generalized tonic clonic seizure followed by tonic seizures. Most of children (72.8%) who developed first episode of seizure were below 24 months of age with the mean age of 20.7 (± 12.1) months. Overall 33% of patients developed recurrence of febrile seizure and first episode of febrile seizure at age one year or below was associated with the seizure recurrence. Upper respiratory tract infections were the commonest cause of fever in these children.

Conclusions: Febrile seizure was observed predominantly in children below age of two years and simple febrile seizure was the commonest variety. Recurrence of febrile seizure was common and significantly associated with the first episode of febrile seizure at the age of one year or below.

Keywords: Complex febrile seizure; febrile seizure; recurrence; simple febrile seizure.

INTRODUCTION

Febrile seizure is the most common type of seizures seen in 2-5% of children aged below five years and in which seizure is accompanied by fever, but without evidence of intracranial infection and acute electrolyte imbalance.¹

Recurrence of seizure episodes and concern about epilepsy are major parental concerns regarding long term effects of febrile seizure. Attempts to identify factors associated with recurrence have been made and first episode of febrile seizure below 12 months, complex febrile seizure, family history and temperature below 40°C were found associated with the recurrence.² However, few studies showed conflicting results.^{3, 4} Similarly etiology of fever varies in various studies.^{3, 5-7}

Hence this study was conducted with objectives to evaluate demographic and clinical profile of children with febrile seizures presenting in our teaching hospital during a period of July 2009 to June 2013.

METHODS

This was a descriptive retrospective study conducted from July 2009 to June 2013 among children admitted with febrile seizure in the teaching hospital. Records of all the patients with a diagnosis of febrile seizure based on standard definition were included. Patients with prior episodes of afebrile seizures, abnormal neurodevelopment and age below six months and above six years were excluded from the study.

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Simple febrile seizure was defined as generalized seizure, duration less than 15 minutes, single episode of seizure per febrile episode and occurring within 24 hour of onset of fever based on previous literatures.^{1, 8} Febrile seizure that was focal, prolonged (≥ 15 minutes), and/or recurrent within 24 hours usually in the same febrile illness was classified as complex febrile seizure. Patient's demographic and clinical data regarding type of seizure, duration, number of episodes, interval from onset of fever to seizure, past episodes of febrile seizure, family history of febrile seizure and epilepsy and cause of fever were obtained from the patient records. Lab investigation for each patient was guided by clinical examination. Lumbar puncture for cerebrospinal fluid analysis was considered in all patients aged below 12 months with simple febrile seizure, patients aged 12-18 months after clinical decision and all patients with complex febrile seizure.

Manual checking and coding of data were undertaken before data entry commenced to clean the data and ensure consistency and entered into Epi Data 3.1. Once entered, data were checked for any anomalies; any necessary checks with the original questionnaires were undertaken and corrected before further analysis.

All analyses were conducted using SPSS 17 Version. A chi-square test was used to test association between the factors and outcome variables. A $p < 0.05$ was considered as statistically significant.

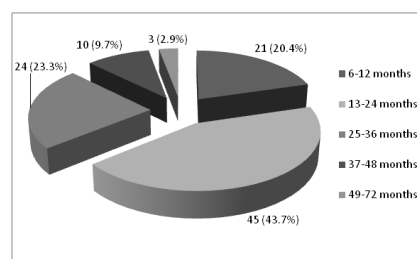
RESULTS

There were 103 children with febrile seizure out of 1965 pediatric in-patients admitted during the study period which constituted 5.2% of total pediatric admissions. Mean age of presentation was 24.9 (± 13.7) months and the highest prevalence was reported among 13-24 months age group. Additionally, the study revealed age has an inverse relation with the prevalence of febrile seizure as the lowest prevalence was noted among 49 months and above age group (Figure 1). More than two-third patients (67%) were male and 34 patients (33%) were female.

Simple febrile seizure was observed in 79 (76.7%) children and complex febrile seizure was seen in 24 (23.3%) children. Generalized tonic clonic seizure was the predominant type of seizure which was seen in 74 (71.8%) children while generalized tonic seizure was seen in 28 (27.2%) children and only one child had focal seizure.

Most of the children 83 (80.6%) had single episode of seizure per febrile episode. Whereas nine (8.7%) children had two episodes, 9 (8.7%) children had three episodes and 2 (1.9%) children had four episodes of seizures in the present febrile episode.

Figure 1. Age-wise distribution of children (N=103)

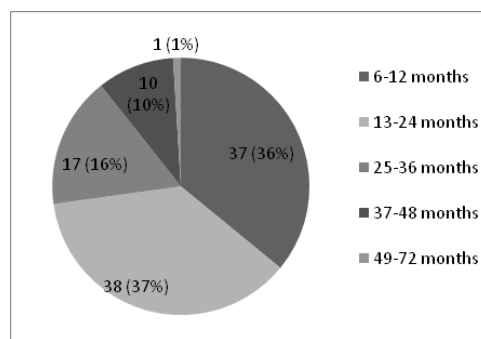


Mean duration of seizure was 4.9 (± 4.5) minutes and 81 (78.6%) children had seizure for five minutes or less duration. Majority of children developed seizure within 24 hours of onset of fever with mean of 9.3 (± 7.4) hours of onset of fever. Temperature of $\geq 38^\circ\text{C}$ was documented in 66 patients at presentation to the hospital and mean temperature was 38.3 (± 0.8) $^\circ\text{C}$.

12 (11.7%) children had positive history of febrile seizure in other family members and 2 (1.9%) children had history of epilepsy in family.

The first episode of febrile seizure commonly occurred in the age group of 13-24 months and 6-12 months with the mean age of 20.7 (± 12.1) months (Figure 2).

Figure 2. Age-wise distribution of children at the first episode of febrile seizure (N=103)



Upper respiratory tract infections were the most common cause of fever in children which was seen in 58 (56.3%) of children. Other causes are shown in the Table 1.

Total leucocyte count, hemoglobin, serum electrolytes and blood sugar were done as clinically indicated;

however the results were not significant statistically. Out of 103 children, 39 (37.9%) children required lumbar puncture for cerebrospinal fluid analysis. 25 (24.3%) children had normal cerebrospinal fluid results while 14 (13.6%) patients refused lumbar puncture despite the medical advice.

Table 1. Etiology of fever in children with febrile seizure.

Diagnosis	Frequency (N=103)	Percentage
Upper respiratory tract infection	58	56.3
Pneumonia	16	15.5
Acute gastroenteritis	20	19.4
Urinary tract infection	8	7.8
Abscess	1	1.0

Table 2 prescribes association between patients' conditions and recurrence of febrile seizure. Among children with simple and complex febrile seizure, recurrence of febrile seizure occurred in 27 and 7 children respectively. Altogether recurrence of febrile seizure was observed in 34 (33%) patients. The study revealed that the likelihood of recurrence of febrile seizure was associated with age at first episode. It was noted that the recurrence among the younger age groups (12 months or less) were almost half (46%) in comparison to age group of more than 12 months (26%) ($p=0.037$). The study did not find any association with type of febrile seizure, sex, family history of febrile seizure, seizure duration, temperature at presentation, interval between seizure and onset of fever and frequency of seizure with the recurrence of febrile seizure. Recurrence was observed after mean duration of 2.6 ± 4.9 months of last episode of febrile seizure..

Table 2. Association of patients conditions with recurrence of febrile seizure.

Parameters	Recurrence of febrile seizure				Total Number	p value
	Absent		Present			
	Number	%	Number	%		
Type of febrile seizure						0.64
Simple febrile seizure	52	65.8	27	34.2	79	
Complex febrile seizure	17	70.8	7	29.2	24	
Sex						0.58
Male	45	65.2	24	34.8	69	
Female	24	70.6	10	29.4	34	
Age category at first episode of febrile seizure						0.03*
≤ 12 months	20	54.1	17	45.9	37	
13-24 months	49	74.2	17	25.8	66	
Family history of febrile seizure						0.18
Positive family history of febrile seizure	6	50	6	50	12	
Negative family history of febrile seizure	63	69.2	28	30.8	91	
Seizure duration						0.73
5 to 10 minutes	66	67.3	32	32.7	98	
10 to 15 minutes	3	60	2	40	5	
Temperature at admission						0.35
$\leq 37.8^\circ\text{C}$	22	61.1	14	38.9	36	
$> 37.8^\circ\text{C}$	47	70.1	20	29.9	67	
Interval between seizure and fever						0.81
≤ 10 hours	43	66.2	22	33.8	65	
> 10 hours	26	68.4	12	31.6	38	
Seizure frequency						0.75
One	55	66.3	28	33.7	83	
More than one	14	70	6	30	20	

* $p < 0.05$ significant

Febrile seizure was a common problem in children and represented 5.2% of total pediatric admissions which was similar to other studies that showed the proportion as high as 4.0 to 6.1% of total pediatric admissions.^{5, 7} It predominantly occurred in children below 20 months of age in this as well as other studies.⁶ The mean age of children in this study was comparable to other studies.^{5-7, 9} This study reemphasized as previous studies^{3, 5, 6, 9, 10} that febrile seizure was more frequent in boys than girls. Male children may be biologically more vulnerable to febrile seizure. However, this study was hospital based and probable gender bias for health seeking behavior might also be the limiting factors.

Simple febrile seizure (84% to 89%) is more common than complex febrile seizure (11% to 16%) in different studies worldwide.^{11, 12} While a study from Nepal showed simple febrile seizure and complex febrile seizure in 80% and 20% of children respectively³ which was comparable to this study. As described in previous studies^{6, 11}, generalized seizure was the most frequent seizure, out of which majority of patients had generalized tonic clonic seizure in this study. Similarly the mean duration of seizure (4.9 minutes) was comparable with other study (5 minutes)¹¹ while few studies showed higher mean duration of seizures (8-9.5 minutes).^{5, 9} Majority of children in this study had single episode of seizure which was similar to previous studies.^{5, 9} The seizure occurred after mean duration of 9.3 (± 7.4) hours of onset of fever in this study while this duration varied in other studies from 16.5 (± 21.3) hours⁹ to 2.2 (± 1.8) days.⁵

Family history of epilepsy also varied from 0.4% to as high as 20.6% of children with febrile seizure as reported in previous studies.^{3, 5, 12} Only 1.9% of patients had family history of epilepsy in this study and was not significantly associated with the seizure recurrence. Similarly family history of febrile seizure was noted in 11.7% of patients that was similar to a study in Nepal⁵ but less than 17.5% as reported in earlier study.¹² However, it should also be noted that parents may be unaware of their past episodes of febrile seizure and thus may confound the exact family history.

Biochemical, hematological investigations and lumbar puncture for cerebrospinal fluid were performed when indicated clinically as per guidelines.¹ Blood counts and serum electrolytes were not found to be statistically significant in the children with febrile seizure. 39 (37.9%) patients were eligible for lumbar puncture, of which 25 (24.3%) children had normal cerebrospinal fluid analysis while 31% of patient required cerebrospinal fluid analysis in a previous study.⁵ However, lumbar puncture could not be performed in 14 (13.6%) patients due to

refusal by parents even after informed consent and the diagnosis of febrile seizure was made based on clinical observation.

Cause of fever in children with febrile seizure varies in different studies depending on geographical location. Viral prodrome, nonspecific febrile illness and urinary tract infection were common causes of fever which accounted for 59%, 15% and 10% of patients respectively in a study among children with febrile seizure in Kathmandu.³ Whereas acute pharyngotonsillitis, otitis media, dysentery and pneumonia were identified as a cause of fever in 4% of patients in the same study.³ Upper respiratory tract infections were the commonest cause of fever in children in this study which was similar to other studies.^{5, 9, 10, 13} Viral infections were presumed in majority of these children with upper respiratory tract infection based on clinical features and the course of illness. Acute gastroenteritis was the second commonest cause of fever in children in this study whereas it was the commonest cause of fever in children with febrile seizure a study in Iran, followed by upper respiratory tract infection and urinary tract infection.⁶ In the tropics, malaria was the commonest cause of fever.^{3, 9}

Recurrence of seizure is one of the major concerns in children with febrile seizure. This study showed recurrence in 33% of children which was comparable to 37% in another study.¹⁴ Recurrence was observed after mean duration 2.6 \pm 4.9 months of last febrile seizure in this study and mean recurrence time was 6.7 \pm 5.9 months in a previous study.¹⁴ Children with first episode of febrile seizure at an age below one year or below was found to have significantly increased likelihood of recurrence. Recurrence has been associated with early age of onset and family history^{4, 12}, complex febrile seizure¹² while another study correlates recurrence with low temperature at onset of seizure and duration fever of <12 hours prior to onset of seizure.^{3, 14} However age of the child at the onset of first febrile seizure and family history³ and complex febrile seizure⁴ were not associated with recurrence. This study illustrated febrile seizure recurrence was associated with age of onset of febrile seizure at one year or below but significant association with complex febrile seizure and family history of seizures were not found.

This study had inherent limitations being a hospital based study. Recall bias regarding history of febrile seizures in parents as well as exact duration of seizure and details of first episode of febrile seizure could not be minimized and these patients were not followed up to determine the risk of epilepsy.

Population based studies are needed to evaluate an exact incidence of febrile seizure in Nepalese children. While prospective studies with follow up of patients after first episode of febrile seizure would be of great value to identify factors determining the recurrence and its relation to future epilepsy in Nepalese population.

CONCLUSIONS

Simple febrile seizure was most common type of febrile seizure and febrile seizure predominantly affected children below three years of age. First episode of febrile seizure occurred in majority in the age group of 13 to 24 months age group. Recurrence of febrile seizure was common and was significantly associated with age of first episode at one year or below. Hence it is recommended that parents of patients with first episode of febrile seizure occurring at an age of one year or below should be appropriately counseled regarding seizure recurrence and measures during seizure activity as well as benign nature of illness; which might reduce parental anxiety during further episodes of febrile seizure.

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