

Study of clinical and epidemiological profile in children with febrile seizures at BPKIHS

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Abstract

Background: Febrile seizure is the most common seizure disorder in childhood, many cases of febrile seizure may go unnoticed, late presentation, inability to make accurate diagnosis in certain condition and improper treatment may result in significant patient apprehension and family. Evidence suggests, febrile seizure has no impairment of cognitive functions and the long- term prognosis for normal neurologic function is excellent. Present prospective study was done to study clinical and epidemiological profile febrile seizure in childhood, in paediatric patients admitted at our tertiary health center.

Material and Methods: Present study was a hospital based prospective, observational study, conducted in department of paediatrics in 6 months- 5 years age children with febrile seizure. **Results:** During study period, 80 children with febrile seizure fulfilling inclusion criteria were evaluated. Out of 80 children with febrile seizure 44 (55%) were boys and 36 (55%) were girls. We observed boys: girls ratio as 1.2:1. Median age of onset of febrile seizure was 18 months with IQ range of 10-24 months. Febrile seizure is more common among children residing in rural area (61.2%) compared to the urban residence (38.8%). Most of the cases of febrile seizure occurred at a temperature $\geq 102^{\circ}\text{F}$ (38.9°C). 58(72.5%) had simple febrile seizure, 22(27.5%) had complex febrile seizure and 2(2.55%) had febrile status epilepticus. 63 cases (78.8%) had first febrile seizure and 17cases (21.3%) had recurrent febrile seizure. Most common cause of fever among febrile seizures was upper respiratory tract infection (66%) followed by viral exanthematous fever (13%) and urinary tract infection (13%). There was no significant differences regarding place of delivery, h/o prolonged labor, instrumental delivery and breastfeeding. Gestational age at delivery was 38.93 ± 1.73 . Average birth weight was 2.77 ± 0.44 kg. Family history of febrile convulsion in first degree relative was 14%. Among febrile seizure patients 20 cases (25%) had moderate wasting and 3 case (3.8%) had severe wasting and stunting. Mean hemoglobin in case group was 10.9 ± 1.19 g/dl. 61 cases (76.25%) were anemic out of which 46 cases (75.4%) had simple febrile seizure and 15 cases (24.6%) had complex febrile seizure.

Conclusion: The common clinical and epidemiological factors associated with febrile convulsion were infections, nonexclusive maternal breast feeding, family history of febrile seizure, malnutrition and anaemia.

Key Words: Febrile seizure, nonexclusive maternal breast feeding, family history of febrile seizure, malnutrition, anaemia.

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INTRODUCTION

Febrile seizure is the most common seizure disorder in childhood, which exists only in association with an elevated temperature. Its incidence is approximately 2-5% in neurologically healthy infant and children but the incidence is as high as 14% in some population.¹ The incidence of febrile seizure is 3%-4% of children worldwide.² The incidence varies between 5% and 10% for India.³ Febrile seizure can be defined as a seizure occurring in childhood after one month of age, associated with a febrile illness not caused by an infection of the central nervous system or any metabolic encephalopathy, without previous neonatal seizures or a previous unprovoked

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seizure, and not meeting criteria for other acute symptomatic seizures.⁴ It is often characterized by a generalized tonic-clonic convulsion lasting less than 15 min, fever of non-central nervous system infection with full regaining of consciousness after the convulsion and occurring commonly in children between 3 months and 5 years. Many cases of febrile seizure may go unnoticed, late presentation, inability to make accurate diagnosis in certain condition and improper treatment may result in significant patient apprehension and family. Evidence suggests, febrile seizure has no impairment of cognitive functions and the long-term prognosis for normal neurologic function is excellent. Present prospective study was done to study clinical and epidemiological profile of febrile seizure in childhood, in paediatric patients admitted at our tertiary health center.

MATERIAL AND METHODS

Present study was a hospital based prospective, observational study, conducted in department of pediatrics, BPKIHS. Study duration was 1 year (February 20XX- January 20XX). Ethical clearance was obtained from the Institutional Ethical Review Board (IERB) of B.P. Koirala institute of health sciences, Dharan.

Inclusion criteria

- Child with febrile seizure, 6 months- 5 years age, parent giving consent for participation.

Exclusion criteria

- Child with history of epilepsy or afebrile seizure
- Presence of focal neurological deficit
- Acute symptomatic seizures such as meningitis or CNS infection proven by lab reports and seizure apparently proven to be due to CNS insult other than febrile seizure.
- Major congenital malformations
- Developmental delay
- Genetic abnormality
- Parents not willing for participation.

Children with febrile seizures attended in pediatric outpatient department/emergency unit/inpatient wards were considered for present study. A written informed consent was taken from parents/caregiver for participation in present study. Parents/caregiver of children selected for present study were interviewed and information such as age, gender, nature of illness, maternal history of smoking/alcohol consumption/use of recreational drugs, obstetric factors like gestational age at delivery/prolonged labor/mode of delivery, birth weight, feeding practices such as exclusive MBF, top up feed, bottle feed family history, duration and level of fever, birth weight and immunization status was collected. A complete description of seizure history was taken. Clinical examination for heart rate, respiratory rate, capillary refill

time, temperature, pallor, icterus, clubbing, cyanosis, lymphadenopathy and edema was done. Anthropometric measurements such as weight (kg), length (cm), head circumference, mid upper arm circumference were taken. Head to toe examination and neurologic assessment was carried in detail to find the neurocutaneous marker and/or other features suggestive of different syndromes. Developmental assessment was done by detail history and examination for estimation of developmental age in each domain of gross motor, fine motor, social and language skills. Biochemical investigations for fever and serum sodium were sent. Serum iron was investigated if ordered by treating pediatrician. Lumbar puncture was done in indicated case and samples were sent in 2 vials with 8 drops in each for CSF routine examination, CSF biochemistry and CSF culture sensitivity. Relevant data was collected and entered Microsoft excel and analysed with software SPSS version 20. Statistical analysis was done using descriptive statistics.

RESULTS

During study period, 80 children with febrile seizure fulfilling inclusion criteria were evaluated. Out of 80 children with febrile seizure 44 (55%) were boys and 36 (55%) were girls. We observed boys: girls’ ratio as 1.2:1.

Table 1: Gender distribution

Gender	No. of patients	Percentage
Boys	44	55%
Girls	36	45%
Total	80	

Minimum age of presentation was 6 month and maximum age of presentation was 60 month with median age of presentation was less than 18 months (63%). Median age of onset of febrile seizure was 18 months with IQ range of 10-24 months.

Table 2: Age distribution

Age of onset	No. of patients	Percentage
Age < 18 months	50	63%
Age > 18 months	30	38%

Febrile seizure is more common among children residing in rural area (61.2%) compared to the urban residence (38.8%).

Table 3: Residence

Residence	No. of patients	Percentage
Rural	49	61 %
Urban	31	39 %

Most of the cases of febrile seizure occurred at a temperature $\geq 102^{\circ}\text{F}$ (38.9⁰C). Mean temperature at presentation in present study was 102.51 \pm 0.693⁰F.

Table 4: Distribution of level of fever at seizure onset

Temperature	No. of patients	Percentage
101°F(38.3°C)	6	7.5
102°F(38.9°C)	37	46.3
103°F(39.5°C)	25	31.3
104°F(40°C)	12	15.0
Total	80	100.0
Mean temperature at presentation	102.51 ± 0.693°F	

Most of the febrile seizure occurred within 24 hours of the onset of fever with 57.5% of cases occurring within 12 hours of fever onset.

Table 5: Distribution of duration of seizure onset after fever

Duration	No. of patients	Percentage
<12 hours	46	57.5
12-24 hours	22	27.5
>24 hours	12	15
Total	80	100.0

Most common seizure type among febrile seizure at presentation was Generalized tonic clonic seizure (GTCS) in 80% cases.

Table 6: Seizure characteristics at presentation

Seizure	No. of patients	Percentage
Generalize tonic clonic seizure	64	80
Focal seizure	9	11.2
Generalized Tonic seizure	7	8.8

Of 80 cases 58(72.5%) had simple febrile seizure, 22(27.5%) had complex febrile seizure and 2(2.55%) had febrile status epilepticus.

Table 7: Type of febrile seizure.

Seizure	No. of patients	Percentage
First	63	79
Recurrent	17	21

63 cases (78.8%) had first febrile seizure and 17cases (21.3%) had recurrent febrile seizure.

Table 8: Type of febrile seizure.

seizure	No. of patients	Percentage
Simple	64	72.5
Complex	9	27.5
Febrile status	7	2.55

Most common cause of fever among febrile seizures was upper respiratory tract infection (66%) followed by viral exanthematous fever (13%) and urinary tract infection (13%).

Table 9: Causes of fever in febrile seizure cases

Seizure	No. of patients	Percentage
Upper respiratory tract infection (URTI)	53	66%
Viral exanthematous fever	10	13%
Urinary tract infection (UTI)	10	13%
Acute gastroenteritis (AGE)	4	5%
Pneumonia	3	4%

There was no significant differences regarding place of

delivery, h/o prolonged labor, instrumental delivery and breastfeeding. Gestational age at delivery was 38.93 ± 1.73. Average birth weight was 2.77 ± 0.44 kg.

Table 10: Obstetric factors and breastfeeding

Birth history	No. of patients	Percentage
Place of delivery		
Home delivery	42	53%
Hospital delivery	38	48%
Prolonged labor	5	6%
Instrumental delivery	7	9%
Gestational age (mean ± SD)	38.93 ± 1.73 weeks	
Birth weight (mean ± SD)	2.77 ± 0.44 kg	
Breast Feeding		
Exclusively breast fed	45	56%
Bottle-fed babies	35	44%

Family history of febrile convulsion in first degree relative was 14%.

Table 11: Family history of febrile convulsion and epilepsy

Past history	No. of patients	Percentage
Family history of febrile seizure in first degree relative	11	14%
Family history of febrile seizure in second degree relative	1	1%
Family history of epilepsy in second degree relative	1	1%
Family history of epilepsy in third degree relative	2	3%

Among febrile seizure patients 20 cases (25%) had moderate wasting and 3 case (3.8%) had severe wasting and stunting.

Table 11: Nutritional status distribution among cases

Nutritional status	No. of patients	Percentage
Normal	57	71%
moderate wasting	20	25%
severe wasting and stunting	3	4%

Mean hemoglobin in case group was 10.9±1.19 g/dl. 61cases (76.25%) were anemic out of which 46 cases (75.4%) had simple febrile seizure and 15 cases (24.6%) had complex febrile seizure.

Table 13: Anemia among febrile seizure patients

	anemia (n=61)	No anemia (n=19)
Simple febrile seizure	46 (75%)	12 (63%)
complex febrile seizure	15 (25%)	7 (37%)
Total (n=80)	61 (76%)	19 (24%)

Mean serum sodium concentration was 137.94±2.99 mEq/L. 8 cases (10%) had hyponatremia (serum sodium<135 mEq/L) out of which 5 cases (62.5%) had simple febrile convulsion and 3cases(37.5%) had complex febrile convulsion.

Table 14: Abnormality of serum sodium (hyponatremia)

Hyponatremia	No. of patients (n=10)	Percentage
Simple febrile seizure	5	62.5%
complex febrile seizure	3	37.5%

62 (77.5%) patients were treated with antipyretics and 18 (22.5%) were treated with antipyretics and anticonvulsant. Among anticonvulsant used phenytoin was used in 10(12.5%) case and midazolam only in 8(10%) cases. Anticonvulsant for intermittent prophylaxis was used in 15 cases (18.8%) in which Clobazam was used in 13(16.3%) and diazepam was used in 2 cases (2.5%). All of the case showed complete improvement without any complication or long-term hospital admission.

DISCUSSION

Febrile seizure is the most common form of seizures among all children’s neurological problems; commonly affect children under 5 years of age. Febrile seizure is an age-dependent response of the immature brain to fever. The etiology of febrile seizure is unknown but genetic factors or electrolyte disturbances may have a role in its occurrence or recurrence. The median age of onset of febrile seizure is 18 months as mentioned by previous studies.^{6,7} Similar findings were noted in present study. Febrile seizures occur in young children at a time in development when seizure threshold is low and increase susceptibility of seizure to immature brain is there.¹ Most population-based studies have not found any significant effect of gender but slight male preponderance is seen in the incidence of febrile seizure in different regions.⁷ An institution-based study in Nepal showed Males accounted for 62% and females 38% febrile seizure.⁶ Similar findings were noted in present study. Male predominance in febrile convulsions can be explained on the basis of socio demographic and cultural background of our society where male are given more attention and hence seek prompt medical advice in case of febrile convulsions in male. Febrile seizures were more common among children residing in rural area, Aydin A *et al.* also noted increased prevalence of febrile seizure, increased complications, and increased chances of epilepsy in children from rural area.⁸ Level of temperature at seizure onset in present study was 102.54 ± 0.841 °F. These findings were consistent with the findings of Berg *et al.*⁹ and El Radhi *et al.*¹⁰. Mukherjee *et al.* mentioned that the incidence of febrile seizure occurring within 1hr of fever onset is 21% between 1- 24 hrs. is 57% and after 24 hrs in 22%.¹¹ Puri *et al.*¹² mentioned febrile convulsion occurs almost always within <24 hrs of fever onset. Similar findings were noted in present study. A Nepalese hospital-based study found Simple Febrile Seizures in 80% and complex febrile seizures in 20%.¹³ Findings were consistent with present study. In this study recurrent episode of febrile convulsion was found in 21.3%. Knudsen *et al.* pointed out

approximately 30% to 40% of children who experience a febrile seizure will have a recurrence, but less than 10% will have three or more recurrences.¹⁴ In this study the important causes of fever are Upper respiratory tract infection, viral exanthema, Urinary tract infection, acute gastroenteritis and pneumonia. Berg *et al.*¹⁵ found Nonspecific cause in 26%, otitis media in 65% gastroenteritis in 9% invasive bacterial infection in 6%. In Iranian hospital-based study found upper respiratory tract infections 53.8%, gastroenteritis in 24.4%, acute otitis media in 9%, urinary tract infection in 6.4%, and pneumonia in 3.8%.¹⁶ The cause of fever varies among different geographical location depending upon prevalence, disease pattern and hospital presentations of different diseases. Viral infections were presumed in majority of these children with upper respiratory tract infection based on clinical features and the course of illness. Chung *et al.* showed that type of viral infection is not important in predicting a child to have febrile seizure.¹⁷ Antenatal exposure to smoking is also considered as a risk factor. The hypothesis behind maternal smoking as being a risk factor of febrile seizure is maternal smoking reduces fetal oxygenation and impairs fetal blood flow and it has been associated with afebrile seizures and impaired brain development.¹⁸ The low occurrence of maternal smoking in present study reflects the social and cultural background of our community where maternal smoking is socially unacceptable. Place of delivery (home delivery Vs hospital delivery), prolonged labor and instrumental delivery had been evaluated in this study but none of these factors were associated with febrile seizure. Our findings are in conjuncture with studies where perinatal and delivery related insult is not associated with increased incidence of febrile seizures.^{13,16} Exclusive breast feeding considered as protective in febrile convulsion, as it provides immunological boost to protect from common infections in early childhood. Human breast milk also have nerve growth factor, lactose, cholesterol, copper, unsaturated fatty acids and DHA (Docosahexaenoic Acid). These can help in better growth of the brain and its myelination which can prevent the occurrence of febrile seizure.¹⁹ This study shows that the family history of febrile seizure (first degree relative and second degree relative) is statistically significant risk factor of febrile seizure. Similar results were noted in previous studies which indicate positive family history of febrile seizures is a definite risk factor for febrile seizure.^{16,20} Genetic influences are evident. Overall, there appears to be a multifactorial mode of inheritance for febrile convulsions, but there may be a subset of children with an autosomal dominant mode of inheritance. Malnutrition causes decrease immunity and increase infection rate in children which attributes to high chances of fever episode hence

more chances of febrile seizure. In this study the nutritional status of control could not be assessed because the selection of controls were retrospective history based, hence the relative prevalence of malnutrition and its statistical significance in relation to febrile seizure could not be evaluated. Kumari *et al.*²¹ performed a study on 308 children aged 6 months to 3 years old and found 63.6% of the case group suffered from iron deficiency in comparison with 24.7% of the control group. They concluded that iron deficiency was an important risk factor in simple febrile convulsion. The pathophysiology of febrile seizures is incompletely understood. The cause of febrile seizure is multifactorial in origin. Present study was a hospital based, observational study. Large, multicenter, comparative studies are needed for epidemiological assessment and to outline risk factors for febrile seizures.

CONCLUSION

The common clinical and epidemiological factors associated with febrile convulsion were infections, nonexclusive maternal breast feeding, family history of febrile seizure, malnutrition and anaemia. Parents should be counselled for extra care for infants with family history of febrile seizure and for exclusive maternal breast feeding. Social workers and clinicians should focus on prevention and treatment of infections, anaemia and malnutrition.

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