

CLINICAL PROFILE AND ROLE OF LUMBAR PUNCTURE IN FEBRILE CONVULSION

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ABSTRACT

Background: Febrile seizure is a common and benign condition but if misdiagnosed for CNS infection then the outcome can be fatal. **Objectives:** To analyze the clinical profile and decide the role of lumbar puncture in febrile convulsion in children. **Results:** This was a cross sectional study in 76 children between 6 months to 5 years admitted in department of pediatrics, NMCTH, Birgunj with first episode febrile convulsion from April 2022 to March 2023. Out of 76 children, 43 (56.58%) were male and 33 (43.42%) were female with common causes URTI 29 (38.16%), AGE 16 (21.05%), UTI 13 (17.11%), Bronchopneumonia 11(14.47%) and Meningitis 7 (9.21%). In the age group of 18 months to 60 months 16.27% of the children had meningitis, as compared to 0 % of 12- 18 months and 2.63% in 6 to 12 months. **Conclusions:** Based on available clinical data, routine lumbar puncture and CSF analysis is required in all cases of febrile convulsion as meningeal signs alone will not be sufficient to detect meningitis in febrile convulsions. Commonest cause of febrile convulsion was URTI and AGE.

Keywords: Febrile Seizure, Meningitis, Lumbar Puncture, CSF

INTRODUCTION

The occurrence of febrile seizure in childhood is quite common. Majority is benign. It is emotionally traumatic, frightening and anxiety provoking when witnessed by the parents and perceive that their child is dying.^{1, 2} It is defined as a seizure accompanied by fever of at least 38°C or higher without central nervous system infection, with no metabolic abnormalities, and that occur in the absence of prior afebrile seizure occurring in children of 6 months to 5 years of age.^{3, 4} A simple febrile seizure is a generalized, usually tonic-clonic, attack with fever for maximum of 15 min, and does not recur within 24hr period.^{5, 6} Studies have shown it is more common in males.⁷ URTI, gastroenteritis, bronchopneumonia, UTI, meningitis, non-specific infection are causes of febrile seizures. The sign and symptoms of meningism in the younger age group are subtle.⁸ Early detection of the CNS infection in association with FSFS requires lumbar puncture and CSF analysis, else will be missed. Febrile convulsion are managed by prompt reduction of temperature with antipyretics or hydrotherapy.⁹ CNS infection requires admission with long term IV antibiotics and anticonvulsants' infections such as meningitis or encephalitis are important causes of convulsion associated with fever and easily confused with simple febrile seizure. Recent studies have showed encephalitis and meningitis incidence in children with simple febrile seizure.

The aims of the study were to analyze the clinical profile associated with febrile convulsions in patients presented to department of Pediatrics of NMCTH and to find out the incidence of meningitis in febrile convulsion

RESEARCH DESIGN AND METHODOLOGY

Hospital-based cross-sectional study was conducted in the Department of Pediatrics and Emergency, National Medical College & Teaching Hospital, Birgunj, Nepal, to find out the clinical profile and role of lumbar puncture in first simple febrile seizure in age below five years. The duration of the study was 12 months (April 2022 to March 2023). All the children age 6 months to 5 years presenting to Pediatrics department with first simple febrile seizure. Sociodemographic variables such as Age, Sex and Illness Variables-Fever, Seizure, CSF values was considered. To analyze the clinical profile associated with febrile convulsions in patients presented to department of Pediatrics of NMCTH.

SLECTION CRITERIA

Inclusion criteria for this study

In the study following parameter are taken as inclusion criteria.

- 1 Six months to five years
- 2 1st episode of fever with seizure
- 3 Fever > 100 F
- 4 Lumbar puncture and CSF analysis to be carried out in all cases of FSFS irrespective of presence of signs of meningism or not.

Exclusion criteria

The following parameters are excluded from the study.

1. Children with neurological diseases like cerebral palsy, mental retardation, fever after occurrence of seizure and history of asphyxia in early neonatal period.
2. Those growing contaminated organisms in CSF culture
3. Convulsions due to metabolic disturbances
4. Cases of pseudo seizures, breath holding spells and gastroesophageal reflux.
5. Those who refused inclusion in the group.

Criteria for making diagnosis of meningitis after lumbar puncture and CSF cytological and biochemical analysis are as follows:

1. CSF cells > 5/cu/mm
2. Protein > 40mg%
3. Sugar < 2/3 of blood sugar
4. Culture positivity
5. Positive staining for organisms

Tools and Techniques for Data collection

Ethical Committee clearance was obtained from the institution (Ref- F-NMC/571/078-079) before starting the study. Informed written consent from the caregivers of children was taken.

All children aged 6 months to 5 years presented to emergency department or pediatrics department of NMCTH with first episode of simple febrile seizure were asked for history, clinically evaluated and investigated with the perform to rule out any other cause than febrile seizure. All patients meeting the inclusion criteria are enrolled with the written consent.

A detailed history was recorded in each case on a pretested Performa. Emphasis was laid on occurrence of first seizure and subsequent seizures regarding duration of seizures, accompanying aura and loss of consciousness and postictal phenomenon or neurologic deficit. A detailed past history of similar illness, birth history, development history, family history of seizure and other siblings too. A thorough general and systemic examination was conducted and noted. A neurological examination including higher mental functions, cranial nerves, sensory and motor system and signs of meningeal irritation were noted. During lumbar puncture pressure was assessed and macroscopic appearance of fluid was noted. Altogether 0.5ml -1ml of CSF was collected in 2 clean sterile bottles. All the sample were immediately taken for analysis. Biochemical analysis for CSF protein, sugar, RBS was done in department of biochemistry and CSF cytology was studied in department of cytology. In microbiology department all the cases, smear stained with gram stain and Z-N stain for identification of organism. The CSF was analyzed as per standard laboratory methods by laboratory technicians.

Meningitis was diagnosed in a child presenting with fever and seizure if he/she had a combination of all three of the following: CSF cells $>5/mm^3$, protein more than 40 mg% and sugar $< 2/3$ of blood sugar. Growth of bacteria in the CSF and/or positive Gram's stain was considered as bacterial meningitis. Those growing contaminated organisms were excluded in the analysis.

Other investigations done: In all cases routine urine examination, Blood Hb, Total count, differentials were done. Peripheral smear was studied in all cases for evidence of sepsis. Blood sugar estimation was done in all cases to compare with CSF sugar. Other serum biochemical studies like sodium, potassium, calcium were done. X-ray chest, stool examination, CT scan of head and EEG done if indicated.

RESULTS AND OBSERVATION

Seventy-six patients of febrile seizures aged 6 months to 5 years attending Department of Pediatrics were evaluated for diagnosis of simple febrile seizure. Those with first episode of simple febrile seizure were enrolled. All the seventy-six enrolled underwent lumbar puncture and CSF analysis as mentioned in the protocol.

CLINICAL PROFILE

A total of 76 patients of febrile seizures were studied during the study period. Out of 76 children, 43 (56.58%) were male and 33 (43.42%) were female.

Table 1: Showing Gender Distribution.

Sex	Frequency	Percentage
Male	43	56.58%
Female	33	43.42%
Total	77	100.00%

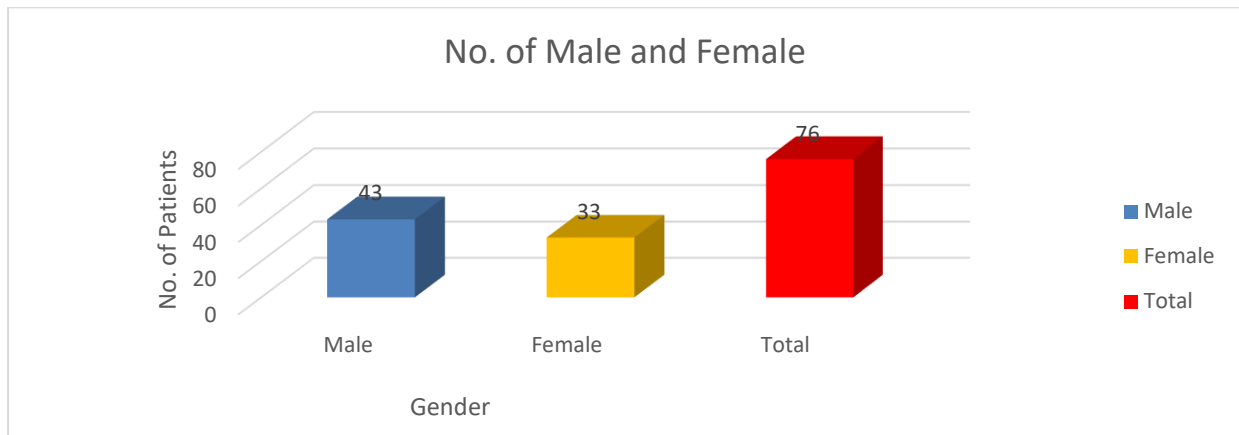


Figure 1: Showing gender distribution

Table: 2 Frequency of cases in different age group in male

Age group(months) (Male)	Frequency	Percentage
6-12	14	32.56%
13-18	5	11.63%
19-60	24	55.81%
TOTAL	43	100.00%

Table 3: Frequency of cases in different age group in female.

Age group (Month) (Female)	Frequency	Percentage
6-12	8	24.24%
13-18	6	18.18%
19-20	19	57.58%
TOTAL	33	100.00%

Age Distribution

There were a total of 22(28.95%) patients in the 6-12 age group out of which 8 female and 14 male. Total of 11 (14.47%) patients in the 12-18 age group out of which 6 female and 5 males.

Total of 43 (56.58%) patients in the 18-60 age group out of which 19 female and 24 males. P: 0.28. There is no significant relationship between age group and gender.

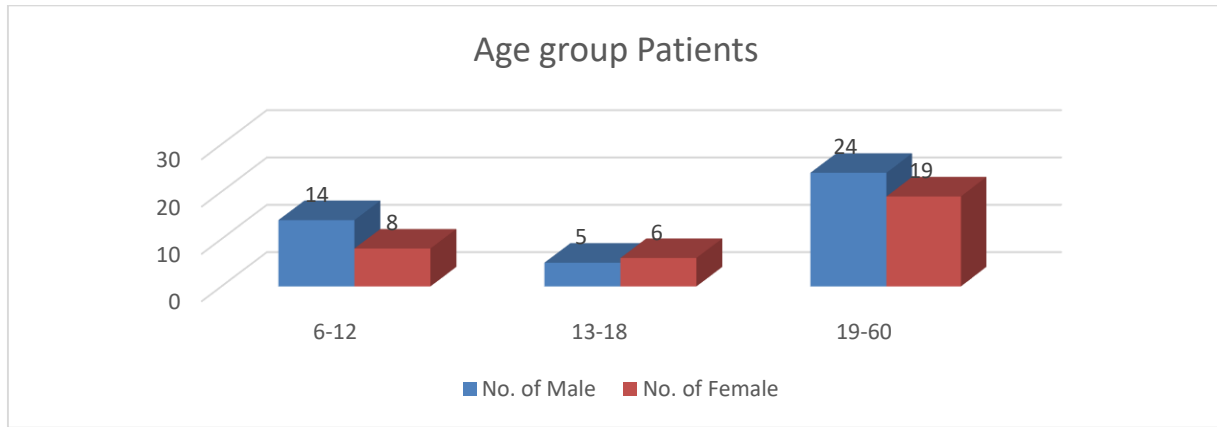


Fig 2: Distribution of cases according to the age and gender.

Etiology

The most common cause of febrile convulsions of patient is URTI 29 (38.16%), AGE 16 (21.05%), UTI 13(17.11%), Bronchopneumonia 11(14.47%) and Meningitis 7 (9.21%). Among 76 patients meningitis was found to be in 7 (9.21%).

Table 4: Etiology attributed to febrile convulsion

Causes of febrile convulsions	Number	Percentage %
URTI	29	38.16%
AGE	16	21.05%
BRONCHO-PNEUMONIA	11	14.47%
MENINGITIS	7	9.21%
UTI	13	17.11%
Total	76	100.0%

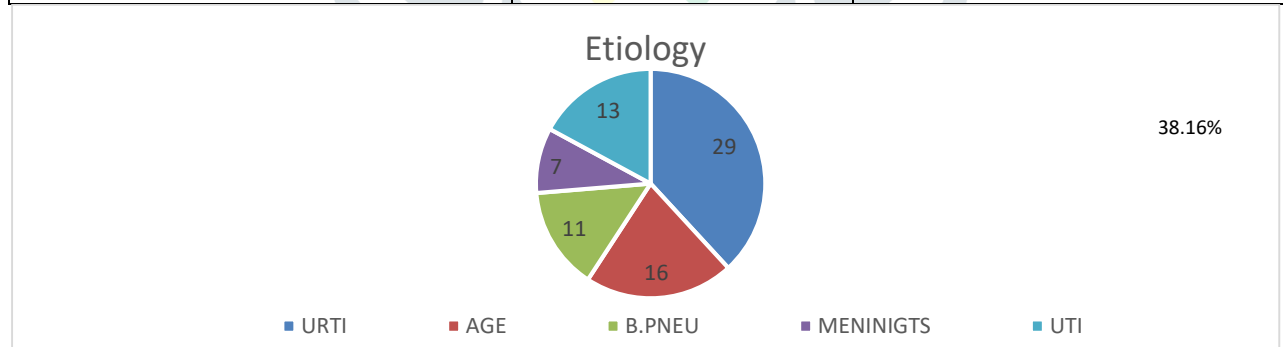


Fig3: Etiology attributed to febrile convulsions.

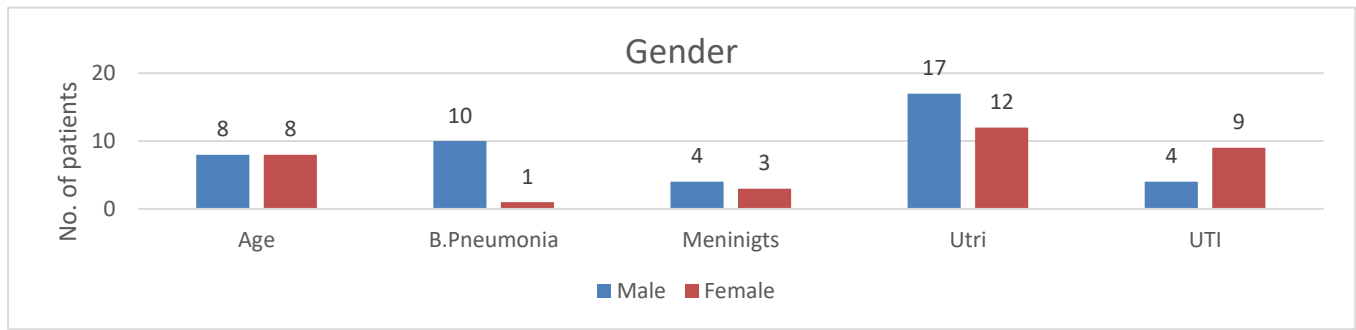


Fig: Etiology attributed in different gender

Among the total cases, 7 cases (9.21%) had meningitis and 69 cases had febrile seizure.

Table 5: Meningitis as predicted from meningeal signs

Meningeal signs	Meningitis	No Meningitis	TOTAL
Present	1(a)	7(b)	8
Absent	6(c)	62(d)	68
Total	7	69	76

Using a, b, c, d, Sensitivity = 12%, Specificity = 89 %, Odds ratio=1, P value = 1

With meningeal signs, meningitis alone is not having any statistical relationship as sensitivity - 12%, and P value is not significant. So lumbar puncture should be taken as a final method for diagnosing meningitis in febrile convulsions.

Table 6: Meningitis in different age groups with/without meningeal signs

Age Months	With meningeal signs		Without meningeal signs	
	Meningitis	No meningitis	Meningitis	No meningitis
6-12	0	0	2	22
12-18	0	0	0	11
18-60	1	7	4	31

In the age group of 6 – 12 months, 2 cases out of 22(9.09%) had meningitis while in 12-18 months, 0 out of 11 cases had meningitis and in more than 18 months age group 7 out of 43cases (16.27 %) were detected with meningitis. Incidence of meningitis amongst those presenting with febrile seizure were found to have significantly higher in Children aged more than 18 months as compared to younger children.

Positive meningeal signs were not significantly present in most children with meningitis and it was seen to have a low sensitivity. A significant number of children between 18-60 months of age had meningitis without signs of meningeal irritation as compared to younger children.

Table 7: Effect of disease prevalence on predictive values

	Meningitis	No Meningitis	Total
(Test positive) Lumbar puncture showed	7	0	7
(Test Negative) Lumbar puncture did not showed	0	69	69

Sensitivity- $7/7 = 100\%$, Specificity- $69/69 = 100\%$.

Positive predictive value - $7/7 = 100\%$

Negative predictive Value- $69/69 = 100\%$.

P value- 0.0001.

So, there is a statistically significant relationship between lumbar puncture for predicting meningitis. (p value- 0.0001)

DISCUSSION

One of the most important clinical decision to make in febrile seizure is whether a lumbar puncture (LP) is necessary to rule out pyogenic meningitis or encephalitis¹⁰. Several researchers are of the opinion that meningitis may be present in children presenting with seizure and fever in the absence of typical clinical manifestations; these investigators recommend a lumbar puncture in all children with seizure and fever.

The AAP recommendations published in 1996 regarding the evaluation of young children with FSFS consider the possible role of a simple febrile seizure as a clinical predictor of bacterial meningitis, as well as clinicians' limited ability to identify clinical signs of meningitis at this challenging age¹¹.

The present study was a cross sectional, hospital-based study conducted in the Department of Pediatrics, National Medical College and Teaching Hospital from April 2022 to March 2023 in all the children age 6 months to 5 years presenting to Pediatrics department with first simple febrile seizure to analyze the clinical profile and find out the incidence of meningitis in febrile convulsion.

The study included 76 Cases after clinical examination and CSF analysis. Etiological spectrum depends upon age, sex, geography and medical settings. Out of 76 patients 43 were male and 33 were female with a male to female ratio 1.30. In a study Joshi et al¹² out of 175 children, 121 (69.1%) were male and 54 (30.9%) were female children and male to female ratio of 2.24. In another study done in Western Regional hospital, Department of Pediatrics, Pokhara, Nepal including 110 hospitalized children showed, 64 (58%) were male and 46 (42%) were female children and male to female ratio of 1.39¹³. In another study from Fatemeh Ghotbi et al¹⁴ showed the ratio of male to female is 1.2: 1.

All studies were slightly male predominance which was similar to the finding in this study. The mean age of onset of febrile convulsions is 28.25 months in this study, 43 (56.57%) children in the 18-60 months age group. In a study from Fatemeh Ghotbi et al¹⁴ average age of onset was 19.3 months. In another study from Trainor JL, Hampers LC, Krug SE, et al¹⁵ mean age was 21 months. Another study by Joshi Batajoo R, Rayamajhi A, Mahaseth et al¹² showed there were a total of 53 (30.2%) children in 6-12 months age, 43 (24.5%) in 12-18 months and 79 (45%) in above 18 months age group.

In this study URTI accounts for the most common cause of febrile seizure. URTI in 29 (38.16 %), Gastroenteritis in 16 (21.05%), UTI in 13 (17.11%) and Bronchopneumonia in 11 (14.47%). Among 76 children meningitis was found to be in 7 (9.2%). In a study by Fatemeh Ghotbi et al¹⁴ showed URTI in 110 cases, gastroenteritis in 73 cases, otitis media in 35 cases and meningitis in 12 cases. In another study by Shrestha SK et al²⁴ showed Upper Respiratory Tract Infection in 31 (28%), Urinary Tract Infection in 18 (16%), Pneumonia in 27 (24.5%), Encephalitis 4 (4%), Gastroenteritis and other non-specific infection in 14 (13%).

In this study the incidence of meningitis is 9.21%. Children of more than 18 months were found to have meningitis significantly as compared to younger children. In the age group of 6 – 12 months, 2 cases (9.05%) had meningitis while in 12-18 months, no cases out of 14 cases had meningitis and in more than 18 months age group 5 out of 48 cases (16.27%) were detected with meningitis. Laditan AA et al¹⁶ had meningitis in 6.3%. The CSF analysis revealed six cases of meningitis comprising an eight-month-old infant.

In another study by Shrestha SK et al¹³ in 16 (14.54%) children had meningitis and contrast to other studies, children aged >12 months had higher incidence of meningitis. In this study children aged > 18 months showed higher incidence of meningitis which is comparable to above study.

In Batajoo study¹², the age group of 6 – 12 months, 17 cases (32%) had meningitis while in 12-18 months, 9 out of 43 cases (20%) had meningitis and in more than 18 months age group 4 out of 79 cases (5%) were detected with meningitis. In this study the incidence of meningitis was more in more than 18 months of age which is different from the other studies, possibly due to lesser number of cases in the age group of 6-12 months.

In this study, out of 76 cases 7 had meningitis and were detected by LP and CSF analysis. Among 7, meningeal signs were detected in 1 child of > 18 months. So, for detecting meningitis in febrile convulsion, the presence of signs of meningism is of low sensitive value and LP with CSF analysis is mandatory.

Positive meningeal signs were not significantly associated with the occurrence of meningitis and it was seen to have a low sensitivity. A significant number of children between 18-60 months of age had meningitis without signs of meningeal irritation as compared to younger children.

Seven children altogether had meningitis without meningeal sign. Around 2.63 % of children in the age group of 6-12 months had meningitis without meningeal signs as compared to 0% in more than 12-18 months of age and 6.57 % in more than 18 months age group. This is comparable to other studies.

Meningitis is a medical emergency in children and should not be missed in any children with fever with seizure. It was seen that in the younger age group, there was significant probability of having meningitis without signs of meningeal irritation than in older children. Guidelines for the neurodiagnostic evaluation and management of febrile convulsion have strongly recommended the performance of LP in all children below 12 months presenting with fever and seizure.

Clinicians evaluating infants or young children after a simple febrile seizure should direct their attention towards identifying the cause of the child's fever. Meningitis should be considered in the differential diagnosis for any febrile child, and lumbar puncture should be performed.

CONCLUSIONS

Clinicians should be aware of the possibility and in cases of apparent febrile seizure, meningitis should always be considered as a differential diagnosis. Lumbar puncture is necessary to rule out meningitis in all children between the ages of 6 months to 60 months presenting with first episode of fever with seizure to rule out

meningitis, even in the absence of meningeal signs. Male gender majority was observed in febrile convulsion. Most common cause of febrile convulsion in children is URTI

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