



Review Article

A Prospective Observational Study to Assess the Incidence of Acute Bacterial Meningitis in First Episode of Febrile Seizures

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ABSTRACT

Objectives: 1) To assess the role of demographic factors leading to febrile seizures. 2) To assess the incidence of acute bacterial meningitis in first episode of febrile seizures.

Materials and Methods: This prospective observational study was conducted among children aged 6 months to 5 years with first episode of febrile seizures getting admitted to BIMS, BELAGAVI Intervention: Incidence of acute bacterial meningitis in first episode of febrile seizures will be found by doing lumbar puncture in all the children admitted with first episode of febrile seizures at BIMS, BELAGAVI Outcome Measures: Incidence of acute bacterial meningitis in first episode of febrile seizures.

Result: Results of the present study were presented in tables and graphs and P value was calculated for the associated factors with febrile convulsions, out of 35 children studied none of the children had incidence of acute bacterial meningitis in first episode of febrile seizures.

Conclusion: In the present study none of the patients had incidence of acute bacterial meningitis in the first episode of febrile seizures.

Keywords: Incidence, Acute Bacterial Meningitis, First Episode, Febrile Seizures.

INTRODUCTION

Febrile seizures are common among children Aged 6 to 60 months following an acute febrile illness. The yield of meningitis associated with febrile seizures from western data is from 2 to 5 %.¹ Systematic reviews from western studies suggest that pooled prevalence of acute bacterial meningitis in first episode of febrile seizures is around 2.6%, with prevalence of acute bacterial meningitis in first episode of simple febrile seizure being 0.2%, and in atypical febrile seizure being 0.6% .² However ,data from Indian children is limited to large number of retrospective studies where prevalence of meningitis with first episode of simple febrile seizure and complex febrile seizure is 0.86 % and 4.8% respectively.³

So the present study was carried out to find the incidence of acute bacterial meningitis in first episode of febrile seizures

MATERIAL AND METHODS

This Prospective observational study was conducted at Department of Pediatrics, BIMS, Belagavi from February 2021 to March 2022, 35 children in the age of 6 months to 5 years with febrile convulsions were studied.

Inclusion Criteria

1. children aged 6 months to 5 years with first episode of febrile seizures

Exclusion Criteria

1. patients who have received antibiotics prior to hospitalization.
2. Past history of neonatal seizures or known seizure disorder

Initial stabilization of the child is done by giving supplemental oxygen, Injection midazolam 0.1mg /kg and further

treatment is

initiated according to standard guidelines.

Detailed history was taken and examination findings were recorded in a predesigned proforma. Lumbar puncture was done using strict aseptic precautions and CSF collected was sent analysis of cell count and type, for biochemical analysis of sugar and protein, for microbiology analysis to look for AFB and gram stain and culture before the administration of antibiotics

CSF parameters obtained will be compared with standard reference values which are normal for age.

Cell counts less than 5 cells out of which more than or equal to 75% lymphocytes, with neutrophils accounting for less than 5%, CSF protein of 20-45 mg/dl and CSF glucose of >50 mg/dl (or 75% of serum glucose) will be considered as normal for age.¹⁴

Anemia was defined as a reduction of the hemoglobin concentration or red blood cell (RBC) volume below the range of values occurring in healthy persons. Anaemia was defined as hemoglobin level of less than 11 gm/dl.¹⁵

Following investigations were done for all children with Complete blood counts

- Peripheral blood smear
- Chest x ray if needed
- Serum electrolytes
- Serum calcium
- Random blood sugar
- Urine routine, stool routine if indicated
- Blood culture and sensitivity

Sample Size: Sample size was calculated using by taking incidence of febrile seizures as 10%¹⁶

$$n = \frac{Z^2 pq}{d^2} \quad \text{Where}$$

Z = Z value for α error = 1.96

$$n = \frac{[(1.96)]^2 \times 10 \times 90}{10^2} = 35 \quad Q = 100 - P$$

Statistical Analysis

Collected data will be presented in percentage or proportions and graphs and association between febrile seizures and other socio demographic factors will be seen by using chi square test. P value of less than 0.05 will be considered significant

RESULTS

Among 35 children studied, 3 children were in the age group of 6 to 12 months, 11 children were in 13-24 months of age, 2 children in 24-36 months of age, 9 children in 36 to 48 months of age, with 10 children being in the age group of 48-60 months. Most of the study subjects in the study group were between 13-24 months followed by 48-60 months of age. P value of 0.04 is considered as significant association

Among 35 children studied, 21 (60%) children were male, and 14 (40%) children were female. P value is 0.237.

TABLE 1: Type of Convulsions

TYPE OF CONVULSIONS	Number of cases	Percentage of cases
TYPICAL FEBRILE SEIZURES	32	91
ATYPICAL FEBRILE SEIZURES	3	9
Total cases	35	100

Among 35 cases studied, 32 cases (91%) had typical febrile seizures on admission, and 9 cases (9%) had atypical febrile seizures on admission. P value is 0.001 which is significant association.

TABLE 2

Symptoms	Number of cases	Percentage of cases
fever	35	100
LRTI	6	17
ACUTE GE	12	34
URTI	17	49

P value 0.12 which is not significant

Out of 35 cases studied all 35 (100%) patients were immunised up to date Out of 35 subjects studied , none of the patients 35 (100%) had positive family history of febrile convulsions or epilepsy. Out of 35 subjects studied, none of them had 35(100%) had any significant antenatal and birth history Out of 35 subjects studied, none of them had 35(100%) had developmental delay.

TABLE 3: Nutritional Status

NUTRITIONAL STATUS	NUMBER OF CASES	PERCENTAGE OF CASES
SEVERE ACUTE MALNUTRITION	9	26%
MODERATE ACUTE MALNUTRITION	12	34%
MEDIAN FOR AGE	14	40%

Out of 35 subjects studied, 60 % of children were malnourished and 40% of children had no malnutrition , among malnourished children 26% (9 cases) had severe acute malnutrition and 34% cases (12) had moderate acute malnutrition. P value was 0.283 which was not a significant association. Out of 35 subjects studied all patients had pallor on head to toe examination 35(100%).

TABLE 4: Neurological Examination

NEUROLOGICAL EXAM	TOTAL	NUMBER
NORMAL	35	100%
Abnormal neurological examination	0	0

Out of 35 patients studied, serum glucose concentrations were normal in all of them

>60mg/dl, with mean glucose being 90mg/dl ,and range being 60 -120mg/dl .

Out of 35 subjects studied all subjects had anaemia 100% , mean haemoglobin levels in the study subjects was 8gm/dl , range of haemoglobin levels being 7 to 10 gm/dl.

Studied peripheral smear showed microcytic hypochromic picture in all the study subjects. Out of 35 patients studied serum calcium was within normal limits in all the patients , mean calcium levels were 9mg/dl, with range being 8.1 to 10.2gm/dl

Out of 35 children studied, normal sodium levels were seen in all 35 children (100%), with serum sodium levels ranging between 135-145meq/l, with mean serum sodium being 138meq/l.

TABLE 5: CSF Examination

CSF ANALYSIS	No of cases	Percentage
Normal study	35	100
Abnormal study	0	0
Total cases	35	100

Out of 35 CSF samples studied, there were no abnormalities noted in CSF cell count and type, CSF protein and sugar in all samples were within normal limits, gram stain and ZN stain of CSF did not reveal any organism

TABLE 6: Blood culture

Blood culture	Number of cases	Percentage of cases
No growth	35	100
Bacteremia	0	0
Total no of cases	35	100

Out of 35 CSF Samples studied, none of them revealed growth of organisms after 24 and 48 hrs of incubation

DISCUSSION

In the present study incidence of febrile convulsions is seen mostly in children aged 13 to 24 months, as age increases the incidence of febrile seizures also decreases which can be explained by the fact that maturity and myelination of the brain progressively increase, which is comparable to studies done by Rana et al⁴, Syndi et al⁵ and ramachandra et al⁶. In the present study febrile seizures were noticed in 21(60%) males and 14 (40%) females.

Our study is comparable to other studies stated above which shows male predominance in febrile seizures

Among 35 cases studied, 32 cases (91%) had typical febrile seizures on admission, and 9 cases (9%) had atypical febrile seizures on admission

TABLE 7

Berg and Shinnar et al ,1997 ⁷	Simple febrile seizures account for about two thirds of all febrile seizures
Khosroshahi et al , 2016 ⁸	Out of 458 patients studied with first episode of febrile seizure, 98 % of them had simple febrile seizures, 2 % presented with complex febrile seizures
In our study	Simple febrile seizures (32) were the most common type of seizures compared to complex febrile seizures (3)

Our study is comparable to above studies which also state that simple febrile seizures are the most common type of febrile seizure

Among 35 cases studied, 17 patients had URTI (48%), and 12 cases had ACUTE GE (35%), 6 cases had LRTI (17%) as trigger for febrile convulsions

TABLE 8

Nelson K B and Ellenberg J H (NCCP STUDY 1959 TO 1966)⁹	38% URTI , 23% OTITIS MEDIA , 15% PNEUMONIA ,7% ACUTE GE , 5% ROSEOLA INFANTUM , 12 % other ailments
Dr Amarendra et al 1997¹⁰	86% URTI, 8% ACUTE GE
Samir S Shah , Elizabeth Alpern et al 2002¹¹	61% otitis media , 23.2% URTI,6.2% pneumonia,2.5% Acute GE
In present study	48% rhinorrhea, 17 % cough , 25% loose stools , 5% vomiting

Our study is comparable to other studies stated above in which Upper respiratory tract infections are the most common causes for febrile convulsion.

Out of 35 children studied , all the patients had been immunized up to date for age. . Amir Kimia , Andrew Caparo et al , 2009¹². Out of 704 cases studied with first episode of febrile seizures , out of which more than 90% of the patients received immunisation with Haemophilus Influenzae B and streptococcus Pneumoniae.

In the above studies conducted by Kimia et al, 2009 the vaccination coverage was especially focused on immunisation against Haemophilus Influenzae B and Streptococcus Pneumoniae since these are the most common organisms implicated in causing meningitis over one month of age, while vaccination coverage with Haemophilus Influenzae B and streptococcus Pneumoniae is relatively low in Indian scenario and hence the above results are not comparable with these studies , and further studies which determine the incidence of acute bacterial meningitis in first episode of febrile seizures with respect to vaccination coverage are needed in Indian population

In our study out of 35 children studied, none of them had positive family history of febrile seizures or epilepsy

Family history of febrile seizures or epilepsy is a risk factor for both recurrence of febrile seizure and development of epilepsy, In the present study although none of them had positive family history of febrile seizures or epilepsy, however studies done by berg et al showed that out of 482 patients studied 36% had positive family history of epilepsy and these studies were not comparable with our study probably due to small sample size of population taken in our study

Out of 35 subjects studied, 60 % of the children were malnourished compared to 40 % who were well nourished, out of 60 % of children with malnutrition 34% had moderate acute malnutrition and 26 % had severe acute malnutrition

Malnutrition increases risk of various infections like Upper respiratory tract infections , Acute gastroenteritis which may all precipitate febrile convulsions in a child , however no significant association was found between febrile seizures and malnutrition in our study

In our study out of 35 patients studied none of them had neurological deficits or signs suggestive of meningitis , which is comparable to other studies as stated above except in study done by L G Rider et al where 2 children with complex febrile seizures had abnormal neurological examination who turned out to have Acute bacterial meningitis indicating that incidence of acute bacterial meningitis in complex febrile seizures is higher than that of simple febrile seizures especially when child has signs of meningeal irritation .

In the present study out of 35(100%) children studied all the children in the present study had anaemia , the above study is comparable to all other studies as above where anemia is seen in children with febrile seizures at a significantly higher rate and anaemia especially Iron deficiency anemia is a well known risk factor for febrile convulsions

TABLE 9: TOTAL LEUCOCYTE COUNTS AND FEBRILE SEIZURES

Mc Inytre P Susan V¹³	Out of 197 patients studied leucocytosis was a sensitive diagnostic aid but poorly specific for bacteremia .
Deepak Tiwari et al ,2016¹⁴	Out of 125 patients studied , 9 diagnosed to have acute bacterial meningitis , out of which 8 patients had peripheral leucocytosis (88%) and it was significant association
In our study	21 (60%) patients had leucocytosis out of 35 patients studied and P value was not significant

In the present study 60% patients had peripheral leucocytosis and P value was not significant , among studies done by McNytre et al it was shown that peripheral leucocytosis was sensitive diagnostic aid for bacteremia but the specificity was poor since it can occur in viral infections too, however study done by Deepak Tiwari et al showed that there was significant association between peripheral leucocytosis and acute bacterial meningitis in the patients studied.

Low serum sodium at the time of admission has been postulated to be as one of the factors that increases the risk of recurrent febrile convulsions, however none of the patients in our study had hyponatremia on presentation. However in study done by Deepak Tiwari et al it was postulated that hyponatremia was seen in Seven cases of acute bacterial meningitis presenting as febrile convulsions, which can be occur due to syndrome of inappropriate anti diuretic hormone secretion, cerebral salt wasting syndrome or due to increased administration of hypotonic fluids.

In the present study out of 35 children studied none of them had CSF abnormalities , however in study done by kimia et al and khosroshahi et al, CSF pleocytosis was seen in 10 % and 9.8 % of patients with febrile seizures which were attributed to postictal pleocytosis , however none of these children had underlying acute bacterial meningitis or derangement in other CSF parameters like sugar and protein.

TABLE 10: CSF CULTURE, BLOOD CULTURE AND MENINGITIS

A Kanik et al ¹⁵	Out of 564 patients studied , no organisms were detected in CSF culture , and blood culture positive in 2 patients yielded contaminants
J Milichap Gordon et al ¹⁶	Out of 564 patients studied , 1 patient had positive CSF culture for streptococcus pneumoniae who presented with first episode of complex febrile seizures
In the present study	None of the CSF or blood culture samples yielded positive growth

None of the patients in our study had positive CSF or blood culture and it is comparable to the studies mentioned above , however in study done by Milichap it was observed that 1 patient with complex febrile seizure had CSF culture which yielded Streptococcus Pneumoniae. None of the children in our study had acute bacterial meningitis presenting as first episode of febrile seizures

CONCLUSION

There was no significant association between first episode of febrile seizures and acute bacterial meningitis. Age between 13-24 months , male gender , simple febrile seizures , associated respiratory tract infections and anemia were the most significant factors associated with first episode of febrile seizures .

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