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Original Research Article

Prevalence of Acute Bacterial Meningitis (ABM) in Children Aged between 6 months to 5 years with First Complex Febrile Seizures: A Cross-Sectional Study

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Abstract

Background: The most frequent presentation seizure in children is fever with seizure. Fever with seizure can be caused by either febrile seizures or very serious conditions like meningitis. It is a frequent reason why children visit the emergency room, and it can happen in as many as 10% of those children. It is generally known that acute bacterial meningitis and febrile seizures are related.

Methods: The study was conducted in the department of Pediatrics at Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar between November 2021 and April 2022. The study includes children between the ages of 6 months to 5 years, admitted for their first complex febrile seizure.

Results: Out of the 250 study participants, the prevalence of ABM was 44.4% (n=8) in the 6–12-month age group, 33.3% (n=6) in the 13–24 month age group, 11.1% (n=2) in the 25–36 month age group, and 11.2% (n=2) in the 37–48 month age group. In the 49 to 60-month age group, there were no patients with ABM.

Conclusion: According to the findings, a distinct group of children under the age of 2 years, who arrive with their first episode of complex febrile seizure are more likely to have meningitis.

Keywords: Prevalence, Acute Bacterial Meningitis, First Complex Febrile Seizure.

Introduction

Fever is an increase in body temperature brought on by the hypothalamic thermoregulatory centre in response to specific circumstances. This symptom is thought to be an adaptive mechanism that was created to boost the immune system and protect cell membrane integrity in the face of assaults. Despite widespread dispute in the literature, it is generally agreed that children's normal body temperatures should range from 36.0°C in the morning to 37.7°C in the afternoon. Any values outside of this range ought to be considered abnormal [1]. It has been known for years that there is a substantial association between fever and epileptic seizures. The clinician may actually encounter at least four different patient subgroups when treating the child with fever

and epileptic seizure: children with febrile seizures; patients with controlled epilepsy in whom fever triggered new seizures; and patients with acute symptomatic seizures, which are seizures that are symptoms of non-epileptic conditions like metabolic changes or acute illness (central nervous system infection or severe water-electrolyte imbalance secondary to diarrhoea with dehydration, for instance).The last category of patients is made up of those whose fever developed postictally; these instances are particularly challenging to distinguish from true febrile seizures, particularly in children who appear with low-grade fever and early in the course of the episode [2]. 2% to 5% of children between the ages of 6 months and 5 experience FSs. The incidence is lowest before 6 months and after 3 years of age, peaking at around 18 months of age.

In general, the prevalence of FS sharply declines after age 4 (and the condition very infrequently affects children older than 7 years of age). In contrast to the United States and Western Europe, where FS affects just 2%–5% of children, FS is more common in the Asian population, affecting 3.4%–9.3% of Japanese children and 5%–10% of Indian children. Guam has the greatest incidence at 14%.

The prevalence of FS has continuously been higher in men (male to female ratio, 1.1:1 to 2:1). However, a number of noteworthy studies have found no discernible gender difference. There are two seasonal peaks in FS incidence: June–August, which coincides with the high of viral gastrointestinal disorders, and November–January, which corresponds to the peak of viral upper respiratory infections. Prevalence varies depending on case definitions, ascertainment techniques, geographic location, and cultural factors[3].

In a study of kids who had their first FS, the majority of seizures were simple, but about 35% of cases had at least one complex feature, such as focality (16.1%), multiple seizures (13.8%), prolonged duration (>15 minutes, 9.3%), and recurrent febrile seizures within 24 hours (16.2%). 6.5% also had two complex features, and 0.7% had three complex features. Only 5% of FS are characterised as febrile status epilepticus, which are seizures lasting longer than 30 minutes. These seizures account for around 25% of all occurrences of infantile status epilepticus, with more than two thirds of instances occurring before the age of two. Only 21% of children have seizures an hour or less after a fever starts, 57% have seizures between 1 and 24 hours after a fever starts, and 22% have febrile seizures more than 24 hours after a fever starts [4].

The majority of FS cases are widespread and convulsive, although about 5% of FS cases also exhibit nonconvulsive symptoms such unconsciousness, gazing, eye deviation, atonia, or cyanosis.

Because febrile convulsions typically happen at random at home, it can be difficult to assess temperature recordings when determining the height or duration of the fever. The fever that is connected to febrile convulsions is frequently brought on by viral illnesses. It has been shown that immunoglobulin is synthesised in the CSF of children experiencing febrile convulsions, indicating that encephalitis may occasionally occur but go undiagnosed. There is proof that exanthemsubitum, a condition usually worsened by febrile convulsions, is related to human herpes virus-6 (HHV-6). More recent research indicates that young infants who do not exhibit the symptoms of exanthemsubitum frequently experience febrile convulsions as a result of acute HHV-6 infection. It has been demonstrated that HHV-6B infection is usually linked to febrile status epilepticus, although HHV-7 is less frequently. They represented one-third of the patients in a study of febrile status

epilepticus, which is connected to a higher risk of temporal lobe epilepsy and hippocampus damage. Urinary tract infections, shigella, and pneumococcal bacteremia, for example, are bacterial illnesses that can cause febrile convulsions. It's crucial to keep in mind that convulsions can occur in children with bacterial meningitis when considering whether or not to undergo a lumbar puncture.

Increased risks of febrile seizures have been observed on the day after receiving the DPT vaccine and 8–14 days after receiving the MMR vaccine, however these risks do not appear to be linked to long-term negative effects. According to a UK study, there is a higher risk of complicated febrile convulsions lasting longer than 30 minutes between 6 and 11 days after receiving the MMR vaccine. However, a Danish study discovered that the marginal and temporary increase in the incidence of febrile convulsions following MMR immunisation. Additionally, as compared to infants who experienced febrile convulsions due to a different cause, children who experienced febrile convulsions following MMR immunisation did not have a higher long-term rate of epilepsy [5, 6].

Material and Methods

From November 2021to April 2022, a cross-sectional study involving children between the ages of 6 months and 5 years old who were hospitalised to the pediatrics department of the Sri Krishna Medical College and Hospital in Muzaffarpur, Bihar, for their first complicated febrile seizure was carried out. All patients aged 6 months to 5 years who were admitted to the paediatric department had their first complex febrile seizures, which were prolonged (lasting more than 15 minutes), focal, and/or recurrent within 24 hours.

The sample size is calculated using the formula of single proportions.

Sample size, n = {Z2 x P (1-P)}/E2

Where Z=value from standard normal distribution corresponding to desired confidence level (Z=1.96 for 95% CI)

P is expected true prevalence =5% =0.05

E is desired precision of estimate =0.05

After applying the formula, the minimum sample size is calculated to be equal to 62.

Expecting the non-response, the final sample size of 250 was taken for the study.

The following patients were not included in this study: those who did not meet the criteria for CFS, those who had previously experienced simple or complex febrile seizures, those who presented with unprovoked seizures (a febrile seizures), those who had any neurological abnormalities, and those who had previously experienced trauma.

Results

Table 1: Distribution of study subjects according to Etiology

Etiology	No. of cases	Percentage
ABM	18	7.2%
Acute Otitis Media	20	8%
AGE	34	13.6%
Dengue fever	14	5.6%
LRTI	22	8.8%
Malaria	2	0.8%
Unknown	28	11.2%

URTI	86	34.4%
UTI	18	7.2%
Viral meningitis	8	3.2%
Total	250	100.0%

Out of the 250 trial participants, 34.4% had URTI, followed by 13.6% with AGE, 8.8% with LRTI, 8% with acute otitis media, and 7.2% with both ABM and UTI.

Table 2: Distribution of study participants

Etiology	No. of cases	Percentage
ABM	18	7.2%
No ABM	232	92.8%
Total	250	100.0%

Patients with and those without ABM were generally divided into two groups for further examination based on the analysis of the CSF sample from the study subjects. Only 7.2% of the survey subjects had ABM.

Table 3: Prevalence of meningitis in different age groups

Age recorded	Etiology			Total			p-value
	ABM	%	No ABM	%	Number	%	
6-12 months	8	44.4%	78	33.6%	86	34.4%	
13-24 months	6	33.3%	70	0.1%	76	30.4%	
25-36 months	2	11.1%	50	21.5%	52	20.8%	0.0144
37-48 months	2	11.2%	18	7.7%	20	8%	
49-60 months	0	0	16	6.8%	16	6.4%	
Total	18	100%	232	100%	250	100%	

Out of the 250 study participants, the prevalence of ABM was 44.4% (n=8) in the 6–12 month period, 33.3% (n=6) in the 13–24 month period, 11.1% (n=2) in the 25–36 month period, and 11.2% (n=2) in the 37–48 month period. In the 49 to 60 month age range, there were no patients with ABM.

Table 4: Distribution of sex in study subjects

Sex	Etiology						p-value
	ABM	%	No ABM	%	Number	%	
Female	2	11.1%	88	37.93%	90	36%	
Male	16	88.8%	144	62.06%	160	64%	0.106
Total	18	100%	232	100%	250	100%	

Chi square -2.607, df-1 P value-0.106

In this study, males 16 (88.8%) had a higher prevalence of ABM than females 2 (11.1%). However, it was determined that this difference in ABM prevalence between genders was not statistically significant.

Discussion

One of the top 10 infectious diseases that lead to death worldwide, particularly in children, is acute bacterial meningitis. The mortality rate from ABM remains remarkably high in India and other impoverished nations, ranging from 16-32%, despite the availability of powerful modern antibiotics. Since the disease advances swiftly and can result in long-term damage in less than a day after symptoms appear, it is crucial to diagnose acute bacterial meningitis in young pediatric patients.

This will ensure the patient's life and long-term wellbeing. When a patient has their first complex febrile seizure, a lumbar puncture should be taken into consideration because it is the gold standard for the diagnosis of ABM. Meningitis and seizures (of any kind, whether protracted, focal, or recurrent) are known to be related. According to reports, children with ABM experience seizures at rates ranging from 12% to 27%. A clinical prediction rule for ABM was recently devised and validated by Nigrovic *et al*. [7], with the occurrence of seizures serving as the sole clinical predictor, highlighting the significance of this finding. The question is not if meningitic patients might experience seizures, rather patients who only have presented as CFS are at risk of having bacterial meningitis.

The majority of cases (64.8%) were between the ages of six months and two years, with a mean age of 22 months, a minimum age of 6 months, and a maximum age of 60 months. The gender ratio of the enrolled youngsters was 1.7:1, with 36% of the females and 64% of the males. When compared to other features, the focal component of complex febrile seizures was the most prevalent in our study. 12.8% of kids had a history of febrile seizures in their families. Vaccination against H. influenza was administered to 71.2% of infants, however Streptococcus pneumonia vaccination was not given to any of our study participants. According to a study by Kimia *et al*. [8] the study population's median age was 17 months, and 24% of cases had a family history of seizures. Females made up 44% of the study population. The median age of Fletcher and Sharieff's [9] study was 17.2 months, and 51.3% of the participants were female.

The study by Sangeeta VB *et al*.[10] found close to this study in regard of febrile illness leading to the seizures. In this study, URTI (34.4%) was the most frequent cause of febrile illness that resulted in seizures, followed by AGE(13.6%), LRTI (8.8%), and acute otitis media (8%). In Sangeeta VB *et al*. study, URTI was the most frequent cause, followed by LRTI and AGE. The strong reliance of respiratory tract infections on seasonal changes may be one explanation for the high prevalence of respiratory tract infections as the cause of fever. The high incidence of respiratory tract illnesses in a nation like India, where great seasonal variability is common, cannot be ignored.

In our study, we discovered that the overall prevalence of acute bacterial meningitis was 7.2%, which was comparable to Seltz LB *et al* [11] report of 4% in children with their first complex febrile seizure who underwent lumbar puncture and Tavasoli A [12] finding of 5.7% in patients aged between 1 month and 6 years with complex febrile seizure. However, Reddy *et al*. [13] discovered that children with atypical febrile seizures had a greater prevalence of meningitis (25.8%). The study's tiny sample size may be to blame for the high prevalence.

There aren't many research that show acute bacterial meningitis is less common. Children who experienced a complex febrile seizure had an ABM prevalence rate of 0.9% according to Kimia *et al*. and 0.7% according to Fletcher *et al*.

In the current study, there was a greater prevalence of ABM in the 6-24-month age range (8.6%), and 14 (77.7%) of the 18 patients with acute bacterial meningitis had instances in this age group. Acute bacterial meningitis is more common in younger age groups, according to other studies. In children aged 6 to 18 months, the prevalence of bacterial meningitis was 4.3%, with 80% of cases occurring in this age group, according to Nahid Khosroshahi [14]. Sangeeta VB *et al*. [10] reported a 4.2% prevalence of bacterial meningitis in children aged 6 to 24 months, with all cases occurring between 6 and 12 months.

Chirag Saluja *et al* [15] study shown40.6% of ABM cases were male and 59.4% were female as compared to present study which shown 11.1% of ABM cases were female and 88.8% were male.

Conclusion

According to study findings, a distinct group of children less than two years old who arrive with their first episode of a complicated febrile seizure are more likely to have meningitis. Meningitis cannot be ruled out in the absence of meningeal irritation signs, especially in small infants. Therefore, regardless of the presence or absence of meningeal signs, we recommend that LP should be performed in every case that presents as a first episode of complex febrile seizure.

References

1. Lambertucci JR. Fever. In: Lopez M, Laurentys-Medeiros J, editors. Medical semiology: the basis of clinical diagnosis. 4th edition. Rio de Janeiro: Livraria e: Revinter, 2004, 66-77.
2. Vasconcellos MC. Fever, cough and vomit. In: Leão E, Mota JAC, Corrêa EJ, Viana MB, editors. Outpatient Pediatrics. 4th edition. Belo Horizonte: COOPMED, 2005, 221-37.
3. Siqueira LFM de. Febrile seizures: update on diagnosis and management. Rev AssocMedica Bras 1992. Aug. 2010; 56(4):489-92.
4. Consensus statement. Febrile seizures: long-term management of children with fever-associated seizures. Pediatrics. 1980; 66(6):1009-12.
5. Guidelines for epidemiologic studies on epilepsy. Commission on Epidemiology and Prognosis, International League against Epilepsy. Epilepsia. 1993; 34(4):592-6.
6. Sugai K. Current management of febrile seizures in Japan: An overview. Brain Dev. 2010; 32(1):64-70.
7. Nigrovic LE, Kuppermann N, Malley R. Development and validation of a multivariable predictive model to distinguish bacterial from aseptic meningitis in children in the post-Haemophilusinfluenzae era. Pediatrics. 2002; 110(4):712-9.
8. Kimia A, Ben-Joseph EP, Rudloe T, Capraro A, Sarco D, Hummel D *et al*. Yield of lumbar puncture among children who present with their first complex febrile seizure. Pediatrics. 2010; 126(1):62-9.
9. Fletcher EM, Sharieff G. Necessity of Lumbar Puncture in Patients Presenting with New Onset Complex Febrile Seizures. West J Emerg Med. 2013; 14(3):206-11.
10. Kumar V. Clinicoetiological Profile, Need for Lumbar Puncture and Prevalence of Meningitis in Children with First Febrile Seizures. 2014; (2):595.
11. Seltz LB, Cohen E, Weinstein M. Risk of bacterial or herpes simplex virus meningitis/encephalitis in children with complex febrile seizures. PediatrEmerg Care. 2009; 25(8):494-7.
12. D SR, S HK, Hegde P. Predictors of meningitis in children presenting with

first episode of febrile seizure. Int J ContempPediatr. 2016; 4(1):136-9.
13. Singh A, Silayach J, Gathwala G, Kaushik J. Predictors of acute bacterial meningitis among children with a first episode of febrile convulsion from Northern India: A prospective study. Ann Trop Med Public Health. 2014; 7(1):9-13.
14. Khosroshahi N, Kamrani K, Zoham MH, Noursadeghi H. Factor's predicting bacterial meningitis in children aged 6-18 months presenting with first febrile seizure. Int J ContempPediatr. 2016; 3(2):537-41.
15. Chirag Saluja *et al*., Prevalence of Meningitis In First Episode of Febrile Seizure, Journal of Clinical and Diagnosis Research. 2021 Nov, Vol-15(11): SC01-SC05