

ORIGINAL ARTICLE

Acute Bacterial Meningitis in Children with Fever and Fits Aged 6-59 Months Old

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ABSTRACT

Objective: To find out the frequency of acute bacterial meningitis (ABM) in children presented with fever and fits aged 6-59 months old.**Methodology:** This cross-sectional study was done at The Department of Pediatric Medicine, Bolan Medical College/Hospital Quetta from September 2017 to February 2019. A total of 168 children, of either gender, aged between 6-59 months who presented with 1st episode of febrile seizure, and who arrived at emergency department within 12 hours of episode were included. Samples of cerebrospinal fluid (CSF) were obtained. Later, results were analyzed.**Results:** Of total 168 patients, 111 (66.1%) were male. The mean age was 27.19±13.80 months while the mean weight and frontooccipital circumference (FOC) was found 12.01 ± 2.05 kg and 48.68 ± 2.77 cm correspondingly. Twenty-four (14.3%) patients were diagnosed with ABM. The most common organism found among 11 positive CSF cultures was *Streptococcus pneumoniae* in 6 (54.6%).**Conclusion:** Every clinician needs to thoroughly evaluate infants or young children after a simple febrile seizure. Lumbar puncture can be done in every child if there is any suspicion of meningitis.**Keywords:** Acute bacterial meningitis, febrile seizures, fever, fits.

INTRODUCTION

Febrile seizure (FS) is a common presentation among children presenting in pediatric emergency units¹. The FS is described as "a seizure that occurs in association with fever in children aged 6 months to 5 years, with no evidence of central nervous system (CNS) infection or other identifiable causes of seizure and no history of an afebrile seizure"². The FS is further categorized as either simple or complex. Between 65-90% of FS are found to be simple³. The global incidence of FS is estimated to be between 2-3% while 1-6% of these children go on to develop epilepsy in later years of the life⁴. Genetic susceptibility is a strong reason for the occurrence of FS but not much is known about the exact mechanism behind this genetic involvement⁵. For simple FS, no treatment is usually needed but in cases coming with complex FS (lasting > 5 minutes), acute abortive treatment is advised⁶. Appropriate parental counseling about the treatment of FS is considered to be important. Literature reveals no risk of morbidity or mortality in FS⁶.

Incidence of meningitis is estimated to be high among children presenting with 1st episodes of fever and seizures. Literature reports incidence of meningitis to be between 0.9-2.4% in children presenting with first simple febrile seizures⁷. In developing countries, mortality is estimated to be between 12-15% among cases having bacterial meningitis while these figures are around 5% for developed countries⁸. The FS is considered to be a common reason for hospitalization while its management is challenging⁹.

"American Academy of Paediatrics (AAP)" recommended lumbar puncture (for CSF analysis) in the work up of children aged < 18 months presenting with 1st episode of FS as acute bacterial meningitis (ABM) is not easy to be ruled out. Many clinicians decide lumbar puncture merely on clinical suspicion and it is estimated that only around half of the children with 1st episodes of seizure undergo lumbar puncture. The ABM is taken as an important cause of mortality and morbidity among children. *Haemophilus influenzae* type b (Hib), *Streptococcus pneumoniae*, and *Neisseria meningitidis* cause the majority of cases of ABM¹⁰. This study was done to determine the frequency of acute bacterial meningitis (ABM) in children presented with fever and fits aged 6-59 months old.

METHODOLOGY

This cross-sectional study was conducted in Department of Pediatric Medicine, Bolan Medical College/Hospital Quetta from September 2017 to February 2019. Sampling technique used was non-probability consecutive sampling. Sample size was calculated to be 168 by using WHO sample size calculator with Confidence level (1- α) is taken as 95%, with desired precision (d) of 4% and approximate population estimation of 7.6 % taken from the parent study¹¹.

A total of 168 children, of either gender, aged between 6-59 months who presented with first episode of febrile seizure, and who arrived at emergency department within 12 hours of episode were included. Children with any episode of afebrile seizure or seizures secondary to history of trauma, any congenital abnormality or history of delayed crying at birth were excluded. Moreover, any recent neurosurgical intervention or presence of shunt or those patients who were on antibiotics for >48 hours were also excluded. Fits was defined as any abrupt disturbance of nervous system function that causes sudden episode of stiffening followed by jerking of the limbs and body, associated with or without up rolling of eyes, which remained continue even while holding child's hand or body, and abort after sometime either by medication or spontaneously. Febrile seizures (FS) was documented if fever (>100.5 °F) recorded by keeping mercury thermometer under armpit for 2 minutes during or just after the fits episode. The ABM was labeled as children who presented with febrile seizures and CSF sample showed white blood cells (WBC) counts of >10/ul, proteins more than 40 mg % and glucose less than 2/3rd of blood sugar (which was taken prior to lumbar puncture). Any of the above two finding out of three in CSF sample were considered as positive for ABM. This test was performed by manual microscopy using the Fuchs-Rosenthal counting chamber.

Ethical review committee certificate was obtained. Then after taking an informed consent by the parents and detailed counseling of procedure of lumbar puncture, proforma was filled for patient ID number, sex and age of all children as per inclusion/exclusion criteria. Then under aseptic measurements, blood sugar was measured prior to lumbar puncture. Subsequently, samples of CSF were obtained by piercing CSF needle at lumbar (L3-L4) space. Approximately 3cc of CSF sample was collected which then was placed into sterile screw-cap tubes and immediately shifted to laboratory for processing. Test was

processed by trained phlebotomists. Later, results were analyzed by senior resident which again was checked by consultant before putting the data onto proforma.

A database was developed on SPSS version 26.0 for data analysis. Mean value and standard deviation were calculated for quantitative variables like age, weight, duration of hospitalization and fits. Frequencies with percentages were presented for qualitative variables like gender and ABM. Effect modifiers were controlled through stratification of age to see the effect of these on outcome variables by applying chi square test and $p < 0.05$ was taken as statistically significant.

RESULTS

In a total of 168 children, 111 (66.1%) were males and 57 (33.9%) females. The mean age was 27.19 ± 13.80 months while mean weight and frontooccipital circumference (FOC) were 12.01 ± 2.05

kg and 48.68 ± 2.77 cm respectively. Table-1 is showing characteristics of children.

Table-1: Characteristics of Children (n=168)

Characteristics	Number (%)
Gender	Male 111 (66.1%)
	Female 57 (33.9%)
Age (months)	6-12 20 (11.9%)
	13-24 60 (35.7%)
	25-59 88 (52.4%)

There were 24 (14.3%) children who were diagnosed with ABM. Table-2 is showing stratification of study variables with respect to ABM. No statistically significant association of ABM was found between gender ($p=0.690$) and age ($p=0.738$) while mortality was significantly association with the presence of ABM ($p = 0.025$)

Table-2: Stratification of Study Variables with respect to Acute Bacterial Meningitis (N=168)

Study Variables	Acute Bacterial Meningitis		P-Value
	Yes (n=24)	No (n=144)	
Gender	Male 15 (62.5%)	96 (66.7%)	0.690
	Female 9 (37.5%)	48 (33.3%)	
Age (months)	6-12 4 (16.7%)	16 (11.1%)	0.738
	13-24 8 (33.3%)	52 (36.1%)	
	25-59 12 (50.0%)	76 (52.8%)	
Outcome	Discharge 18 (75.0%)	123 (85.4%)	0.025
	Discharge on Request (DOR) 1 (4.2%)	13 (9.0%)	
	Left Against Medical Advice (LAMA) 1 (4.2%)	4 (2.8%)	
	Expired 4 (16.7%)	4 (2.8%)	

DISCUSSION

Meningitis is the major cause of mortality in developing countries. Early diagnosis and treatment of meningitis reduces fatality. The etiological agents of meningitis may vary according to age and geographical area¹²⁻¹⁴. In our study 168 patients were admitted with suspected complaints of ABM. Males were more affected than females in our study. Similar results were shown by study done by Hina et al¹¹ in year 2017 in which 58 % were males and 42 % were females. The frequency of ABM in children presented with fever and fits was 14.28 % while on the other hand study conducted by Eldardear A et al concluded that the frequency of ABM was around 8.3%¹⁵. Different studies, in different part of the world, have reported different prevalence of meningitis in children with febrile fits. From Saudi Arabia, it was reported to be 3.5%¹⁶, France 2%¹⁷ and Tunisia about 10%¹⁸. This might be due to the fact that the proportion of developing meningitis and pneumonia is high in our population due to unavailability of basic necessities of life plus the prevention mechanism by means of vaccines and health promotion awareness programs are lacking here compared to developed countries. Another interesting finding is that the major group of patients affected by ABM in our study is children whose ages are in between 3 – 5 years. This could be due to there is vast group of disease that affects children. Children of this age are school going and easily catch infection from their surroundings.

There were 11 patients with ABM whose culture came out to be positive out of 24 that is almost 50% of the patients who had developed severe infection. Moreover, it also gives us clue that lumbar puncture is the most important modality to correctly and timely diagnosed meningitis in both children and adults. In Hina et al¹¹ study, about 58% of patients with meningitis were culture positive which is comparable to our study. Similarly, the most common organism that was found in CSF culture was Streptococcus pneumonia followed by Hemophilus influenza and then Neisseria meningitidis respectively. Hina et al¹¹ also found Streptococcus pneumonia to be the most common pathogen, followed by Hemophilus influenza. However, Jiang H et al¹² results were different from our study. The most common pathogen isolated from CSF of meningitis patients was E. coli, followed by Streptococcus pneumoniae. Another interesting finding of our study is that, the toddlers are mostly affected in culture proven

meningitis. Five out of 11 cultures proven meningitis were found in toddlers followed by children 4 and only 2 infants had developed culture proven meningitis. Interestingly, Streptococcus pneumonia which is the most common organism in CSF was totally absent in infants. The total length of stay of patient in our study was around 4-5 days. Most of the patients in our study were discharged home successfully. About 84% were discharged home while some got DOR and LAMA. However, 8 patients expired which constitute about 4.7% of total patients admitted. In our study the significant relationship was found between outcome and patient who had developed ABM with ($p=0.025$).

CONCLUSION

It is imperative on every clinician to thoroughly evaluate infants or young children after a simple febrile seizure. In most cases, lumbar puncture should be done in every if there is any suspicion of meningitis. Early and real time identification and recognition of disease could prevent the children from lethal complications and prevent them to develop the squeale, thus by immediate management could improve the outcome of children presents with meningitis.

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