

“Frequency of Meningitis in Children Aged 06 Months to 59 Months Presenting with First Episode of Fits with Fever in Pediatric Emergency Department”

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ABSTRACT

Objective: The study was aimed to determine the frequency of bacterial meningitis in children aged six months to 5 years presenting with fever and fits for the first time in emergency department.

Materials and Methods: This cross sectional study was conducted at the Aga Khan Hospital Karachi and its secondary hospitals including Kharadar, Hyderabad, Garden, Karimabad sites. Using a non-probability consecutive sampling method the data was collected from 135 children over a period of 12 month from august 2019 to April 2020. In this study, we included the male and female children aged between 6 month to 60 months, Children presenting with fever and first episode of seizure, CSF examination done prior for inclusion in the study.

Results: Out of 135 children in the study, 71 (52.30%) children were male, 51(38.46%) were aged between 6months to 24 years, 55(40%) children were in age range 13 to 36 months, 69 (51.50 %) children were completely immunized, 33 (24.60 %) partially immunized.

Out of of 135 children ,130 (96%) presents with fits less than 15 minutes duration, whereas 5(4%) children presented with fits more than 15 minduration. Among 50(37%) children who were meningitis positive, 8(6%)were bacterial, 13(10%) were viral and 29 (21%) were partially treated meningitis.

Conclusion: Substantial number of children presented with seizures had meningitis. Significant proportion of unimmunized children presenting with seizures had meningitis. , 8(6%)reported with bacterial Meningitis

Keywords: Febrile Seizures, Meningitis, Bacterial Meningitis

INTRODUCTION

Estimated 1%-5% all visits to emergency departments (ED) are due to seizures, which are common in the context of numerous pediatric disorders. 1 Acute symptomatic seizures and febrile seizures, both of which are brought on by CNS febrile illnesses, are both classified as seizures with fever (2). The most frequent type of childhood seizures are called febrile seizures (FS), which affect between 2-5% of newborns and early children in the United States, 6-9% of children in Japan, and 5- 10% of children in India (3-4). More over half (65.4% of admissions) of seizures occurring in children are febrile seizures. A febrile seizure is one that happens between the ages of 6 and 60 months and is accompanied by fever (defined as a temperature more than 100.4°F or 38°C using any technique) (5). Generalized seizures that happen just once per 24 hours and last less than 15 minutes are known as simple febrile seizures. Complex seizures, on the other hand, are defined as focal seizures that last longer than 15 minutes and happen more than once every 24 hours (6). The prevalence of febrile seizures is higher in children under the age of five (77.3%), peaking between 1-3 years(7).

The diagnosis of febrile seizure is one of exclusion. Therefore, it's crucial to rule out any further causes of seizures.(8)Previous studies(9) have found clear connections between seizures and bacterial meningitis. There is a 0.6% to 6.7% chance that acute bacterial meningitis would manifest as fever and seizures(10).In newborns that are feverish, bacterial meningitis may only manifest as seizures(11). In 16.7% of children and in one-third of these patients, seizures are the earliest indication of meningitis; nevertheless, meningeal signs and symptoms may not be obvious(12). Other symptoms, such as being sick for a few days, vomiting, drowsiness, petechiae, decreased feeding, or complicated febrile seizures, are frequently present in children under two who have meningitis without meningism(13). Even in young infants, the absence of meningeal symptoms does not rule out meningitis, and pretreatment with antibiotics can conceal the symptoms of meningeal irritation.(14) The absence of prior FS in all febrile patients with seizures may

increase suspicion that meningitis is a factor.(15)

This study will help us to find frequency of meningitis in children presenting with fever and fits in our population. There is literature available internationally, but no local studies have been done so far in our population. As our population is genetically and geographically different from other populations, applicability of their results is not possible. This provides a strong reason for conducting research in our population. The results this study may lead to reconstitution of necessity to do lumbar puncture to rule out meningitis in every child.

MATERIALS AND METHODS

This cross sectional study was conducted at the Aga Khan Hospital Karachi and its secondary hospitals including Kharadar, Hyderabad, Garden, Karimabad sites. Using a non-probability consecutive sampling method the data was collected from 135 children over a period of 12 month from august 2019 to April 2020.

In this study, we included the male and female children aged between 6 month to 60 months, Children presenting with fever and first episode of seizure, CSF examination done prior for inclusion in the study. However, Children having prior history of fits or epilepsy, neurological condition (Genetic, traumatic or otherwise), children presenting with biochemical abnormalities and the children having immunodeficiency state were excluded from the study.

Data collection was started after approval from CPSP and Ethical review committee of Aga Khan University Hospital. Children's demographic data of patients like; name, age, sex, history of fever and CSF findings was recorded on a predesigned proforma. CSF was analyzed as per standard laboratory methods by a pathologist.

The entire amount of data was entered into SPSS 23. For quantitative variables like age, weight, and height, ABM, Mean, and standard deviations were utilized. Frequency and percentages were derived for categorical variables like gender. Chi-square analysis will be used after stratification, with a p-value of 0.005 considered significant.

RESULTS

Out of 135 children in the study, 51(38.46%) were aged between 6 months to 24 years, 55(40%) children were in age range 13 to 36 months, 29 (21.53%) were in the age range of 37 to 60 months. Average (Median) age was 17 months with Interquartile range of 24. In this study, 71 (52.30%) children were male while 64 (47.70%) were female.

We observed that 69 (51.50 %) children were completely immunized, 33 (24.60 %) partially immunized and 33(24%) either not vaccinated or don't remember the vaccination status.

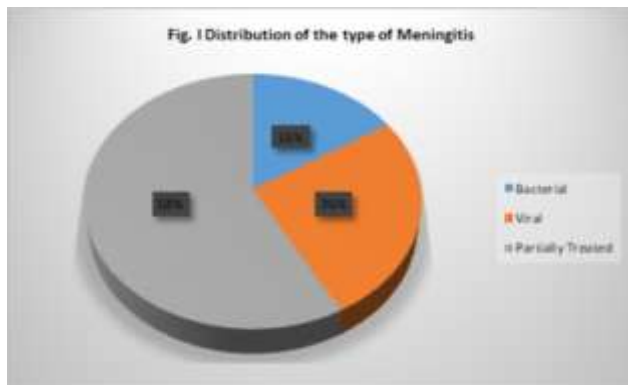
Out of 135 children ,130 (96%) presents with fits less than 15 minutes duration, whereas 5(4%) children presented with fits more than 15 minduration. 92 (68.46 %) children presents with one episode of fits, 27 (20%) with 2 episodes of fits , 16(11.53%) with 3 or more than 3 episodes of fits within 24 hours.

Out of these 135 children who underwent lumbar puncture 50(37%) shown evidence of meningitis that is CSF pleocytosis more than 5mm3 and 85(63%) did not show evidence of meningitis in CSF.

Among 50(37%) children who were meningitis positive, 8(6%) were bacterial, 13(10%) were viral and 29 (21%) were partially treated meningitis. **Table 1**

Table 1: Frequency Distribution of Various Factors in the Study

Variable	n	%
Gender		
Male	71	0.52
Female	64	0.48
Age		
6 to 24 months	51	37.78
25 to 36 months	55	40.74
36 to 60 months	29	21.48
Immunization		
Completely Immunized	69	51.11
Partially Immunized	34	25.19
Unknown Status of Vaccination	32	23.70
Duration of Fits (last 24 Hours)		
less than 15 Min	130	96.30
More than 15 min	5	3.70
Episodes of Fits		
One Episode	92	68.15
Two Episodes	27	20.00
Three Episodes	16	11.85
Meningitis		
Yes	50	37.04
No	85	62.96
Type of Meningitis		
Bacterial	8	5.93
Viral	13	9.63
Partially Treated	29	21.48



The objective of this study was to determine the frequency of bacterial meningitis in children aged six months to 5 years presenting with fever and fits for the first time in emergency

department, hence we observed that there were 8 cases who had bacterial meningitis out of the total 50 positive cases. **Figure 1.**

There was no statistical significance seen between genders, duration of fits, with Meningitis. Meningitis was more seen among children with older age and this was statistically significant. Meningitis was seen more among children who were less vaccinated, however it was no statistically significant. Children with Meningitis had higher CSF TLC and Proteins. **Table II**

Table 2: Chi Square Association of Various Factors with the Meningitis

Variable	Meningitis		P-Value	
	Yes	No		
Gender	Male	23(33.8%)	45(66.2%)	0.34
	Female	26(41.9%)	36(58.1%)	
Duration of Fits	Less than 15 min	48(38%)	78(62%)	0.59
	More than 15 min	1(25%)	3(75%)	
Vaccination	Complete	18(26.9%)	49(73.1%)	0.068
	Partial	15(46.9%)	17(53%)	
	Unvaccinated	16(51.6%)	15(48.3%)	

DISCUSSION

The most frequent convulsive disorder in children is called a febrile seizure (FS), and it affects 2-4% of kids between the ages of 6 months and 5 years old. One in six people with meningitis will experience a seizure, of which one-third will show no symptoms of meningeal involvement. According to Joshi et al., meningitis is present in roughly one fifth of kids who report to the emergency room with an apparent febrile seizure 6.

Meningitis has been linked to seizures, and this linkage has been documented in 12–27% of instances. Since the introduction of universal immunization against bacterial infections, the likelihood of BM in a febrile child has decreased; however, this is still a major worry in any child presenting with FS, especially in populations with lower immunization rates. Pakistan is Immunization rate is low 54%(66% in urban, 45% in rural). According to global burden of disease survey (GDC 2017), Pakistan stands third in mortality due to meningitis among 195 countries with total deaths 21,390. This is due to low vaccination coverage in developing countries Progress in reducing mortality and morbidity has lagged behind that for other vaccine-preventable diseases.

In our study ,we found frequency of meningitis among children presenting with first episode of fever with fits is 38%. This was comparable with study done by Batajoo R et al found frequency of meningitis among nepalian children with febrile fits 17% . In another study done by Suresh Reddi et al, frequency of meningitis was found to be 25%. Owusu-Ofori et al found 10.2% rate of BM among children with FS in China. Tavasoli A et al found 7% of meningitis among Iranian children, which was comparable with study done by hina Batool et al in which she find frequency to be 7.6% . However Frequency of meningitis in developed countries shows different results.

Children with complex FS 25 had a BM rate of 0.9%, according to Kimia et al. According to Najaf-zadeh et al., bacterial meningitis was found in 0.6% of children who experienced complicated febrile seizures as opposed to 0.6% of children who had their first episode of simple febrile convulsions. Meningitis is more prevalent in some nations than others because of greater vaccine coverage against common bacterial infections that cause childhood meningitis in those populations. As a result, poor immunisation and poor socioeconomic status are significant risk factors. In our research, we were unable to identify any conclusive links between meningitis and gender. In line with earlier investigations (22, 24, 25), this has been done. According to numerous studies on FS, meningitis is more prevalent in children under age five. While, in our study, meningitis was more prevalent in children more than 24 months , this was statistically significant. This may be due to more older children were included in sample size who underwent lumbar puncture, parents of children

of younger age group were more reluctant for lumbar puncture which could miss meningitis in younger age group. We did not find any correlation between duration of fits and meningitis however previous studies shows complex febrile fits are more associated with meningitis. Kimia et al. discovered that meningitis was present in 0.86% of kids who had their first episode of a simple febrile seizure as opposed to 4.8% of kids who had their first episode of complex febrile seizures.²⁵

Our study found that frequency of meningitis in children with first episode of fits with fever is 38% . CSF yield in our study is 4%. 49 cases had meningitis based on CSF cytological and biochemical criteria while 5 have culture proven meningitis. This is also comparable to study done by Joshi et al, in which CSF yield was 4.5%, eight cases had culture positive meningitis while 22 cases had meningitis based on CSF cytological and biochemical criteria.⁶ In children aged six months to six years who presented with a febrile seizure but had no indications of meningeal irritation, meningitis was detected in 6.3% of routine LP cases in Saudi Arabia.

CONCLUSION

Substantial number of children presented with seizures had meningitis. Significant proportion of unimmunized children presenting with seizures had meningitis. The risk of bacterial meningitis presenting as first simple febrile seizure at ages 6 to 18 months is high, therefore meningitis should be kept as high suspicion in our population and lumbar puncture should be performed for prompt identification of meningitis.

REFERENCES

1. Pallin DJ, Goldstein JN, Moussally JS, Pelletier AJ, Green AR, Camargo CA, Jr. Seizure visits in US emergency departments: epidemiology and potential disparities in care. *Int J Emerg Med.* 2008;1(2):97-105.
2. Symon M, Kariuk et al, Prevalence, causes, and behavioral and emotional comorbidities of acute symptomatic seizures in Africa: *Epilepsia Open*, 2(1):8–19, 2017
3. Fetveit A. Assessment of febrile seizures in children. *European journal of pediatrics.* 2008;167(1):17-27.
4. Febrile seizures: an overview *Drugs Context.* 2018; 7: 212536.
5. Subcommittee on Febrile Seizures, American Academy of Pediatrics. Neurodiagnostic valuation of the Child with a Simple Febrile seizure. *Pediatrics.* 2011; 127:389-94.
6. Joshi BR, Rayamajhi A, Mahaseth C. Children with first episode of fever with seizure: is lumbar puncture necessary? *J Nepal Med Assoc.* 2008;47:109-12
7. Assogba K, Balaka B, Touglo FA, Apetsè KM, Kombaté D. Febrile seizures in one-five aged infants in tropical practice: Frequency, etiology and outcome of hospitalization. *J Pediatr Neurosci.* 2015; p. 9-12
8. Hina Batool Siddiqui, Nighat Haider, Zarmast Khan. Frequency of acute bacterial meningitis in children with first episode of febrile seizures. *J Pak Med Assoc.* 2017; 67: 1054.
9. Dubos F, Korczowski B, Aygun DA, Martinot A, Prat C, Galetto-Lacour A, Casado-Flores J, Taskin E, Leclerc F, Rodrigo C, Gervais

- A. Distinguishing between bacterial and aseptic meningitis in children: European comparison of two clinical decision rules. *Archives of disease in childhood.* 2010 Dec 1;95(12):963-7.
10. American Academy of Pediatrics. Provisional Committee on quality improvement, Subcommittee on Febrile Seizures. Practice parameter: the neurodiagnostic evaluation of the child with a first simple febrile seizure. *Pediatrics* 1997; 769-772.
11. Rosman NP. Evaluation of the child who convulses with fever. *Paediatric drugs.* 2003;5(7):457-61.
12. Teng D, Dayan P, Tyler S, Hauser WA, Chan S, Leary L, et al. Risk of intracranial pathologic conditions requiring emergency intervention after a first complex febrile seizure episode among children. *Pediatrics.* 2006;117(2):304-8.
13. Suresh Reddy D, Habib Khan S. Predictors of meningitis in children presenting with first episode of febrile seizure, *Int J Contemp Pediatr.* 2017 Jan;4(1):136-139
14. Tavasoli A, Afsharkhas L, Edraki A. Frequency of Meningitis in Children Presenting with Febrile Seizure in AliAsghar Children's Hospital. *Iran J Child Neurol.* 2014 Autumn; 8(4):51-56.
15. Rabbani MA, Khan AA, Ali SS, Ahmad B, Baig SM, Khan MA. Spectrum of complications and mortality of bacterial meningitis: an experience from a developing country. *J Pak Med Assoc.* 2003;53(12):580-3.
16. Kohli-Lynch M, Russell NJ, Seale AC, et al. Neurodevelopmental impairment in children after Group B streptococcal disease worldwide: systematic review and meta-analyses. *Clin Infect Dis* 2017; 65: S190–99.
17. Ramakrishnan M, Ulland AJ, Steinhardt LC, Moïsi JC, Were F, Levine OS. Sequelae due to bacterial meningitis among African children: a systematic literature review. *BMC Med* 2009; 7: 47
18. Hasbun R, Rosenthal N, Balada-Llasat JM, et al. Epidemiology of meningitis and encephalitis in the United States, 2011–2014. *Clin Infect Dis* 2017; 65: 359–63.
19. Ayieko P, Akumu AO, Griffiths UK, English M. The economic burden of inpatient paediatric care in Kenya: household and provider costs for treatment of pneumonia, malaria and meningitis. *Cost Eff Resour Alloc* 2009; 7: 3.
20. Ai J, Xie Z, Liu G, et al. Etiology and prognosis of acute viral encephalitis and meningitis in Chinese children: a multicentre prospective study. *BMC Infect Dis* 2017; 17: 494.
21. M. C. Brouwer, A. R. Tunkel, and D. van de Beek, "Epidemiology, diagnosis, and antimicrobial treatment of acute bacterial meningitis," *Clinical Microbiology Reviews*, vol. 23, no. 3, pp. 467–492, 2010.
22. Riaz et al. / *International Journal of Infectious Diseases* 80 (2019) 28–33
23. Owusu-Ofori A, Agbenyega T, Ansong D, Scheld WM. Routine lumbar puncture in children with febrile seizures in Ghana: should it continue?. *International journal of infectious diseases.* 2004 Nov 1;8(6):353-61.
24. Tavasoli A, Afsharkhas L, Edraki A. Frequency of Meningitis in Children Presenting with Febrile Seizures at Ali-Asghar Children's Hospital. *Iranian journal of child neurology.* 2014;8(4):51.
25. Kimia AA, Capraro AJ, Hummel D, Johnston P, Harper MB. Utility of Lumbar Puncture for First Simple Febrile Seizure Among Children 6 to 18 Months of Age. *Pediatrics.* 2009; 123:6-12.
26. Najaf-Zadeh A, Dubos F, Hue V, Pruvost I, Bennour A, Martinot A. Risk of bacterial meningitis in young children with a first seizure in the context of fever: a systematic review and meta-analysis. *PLoS One.* 2013 Jan 28;8(1):e55270.