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Original Research Article

Predictors of meningitis in children presenting with first episode of febrile seizure

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ABSTRACT

Background: Febrile seizure is the most common cause of seizures in infants and toddlers presenting to the paediatric emergency department. Two to five percent of children experience at least one or more episodes of febrile seizures. Simple febrile seizures are benign and self-limiting. They have good prognosis and carry very low risk for epilepsy. Probability of acute bacterial meningitis presenting as fever with seizures varies from 0.6% to 6.7%. The American Academy of Paediatrics (AAP) strongly recommends lumbar puncture (for CSF analysis) in the work up of every child under 18 months of age with a first episode of febrile seizure to rule out acute bacterial meningitis. The objective of this study was to determine the occurrence of meningitis in children who presented with first episode of seizure and fever and also the predictors of meningitis among them.
Methods: The records of children admitted to Father Muller Medical College and Hospital between 1st January 2014 to 31st December 2015 were reviewed. All children between 6 months to 6 years of age having first episode of convulsions, associated with fever were included in the study and subjected to retrospective analysis of data collected from the case sheets.
Results: Our study included 105 children with febrile seizures, 49 children had simple febrile seizures (SFS) and 56 children presented as atypical febrile seizures (AFS). Lumbar puncture was performed in 43 children (15 with SFS and 28 with AFS). The CSF analysis was normal in all the children who presented as simple febrile seizures. There was 25.87% prevalence of meningitis in children with atypical febrile seizures who underwent lumbar puncture. The CSF yield suggestive of bacterial meningitis was as high as 50% in children below 1 year in whom lumbar puncture was done.
Conclusions: Children presenting with Atypical/Complex febrile seizures who were treated with antibiotics have more likelihood of having meningitis rather than those presenting with simple febrile seizures.

Keywords: Bacterial meningitis, Febrile seizures, Lumbar puncture

INTRODUCTION

Febrile seizure is the most common cause of seizures in infants and toddlers presenting in the pediatric emergency department. Two to five percent of children experience at least one or more episodes of febrile seizures.[1]

Febrile seizures are classified into simple and complex febrile seizures. Simple febrile seizures are defined as generalized seizures occurring only once in a 24-hour period and lasting less than 15 minutes. Whereas, complex/atypical febrile seizures are described as focal seizures, lasting more than 15 minutes and occurring more than one time in 24 hours.[2] Simple febrile seizures are benign and self-limiting. They have better prognosis and carry very low risk for further epilepsy. Probability of acute bacterial meningitis presenting as fever with seizures varies from 0.6 % to 6.7 %.[2]

The American Academy of paediatrics (AAP) strongly recommends lumbar puncture (for CSF analysis) in the work up of every child under 18 months of age with a first episode of febrile seizure since acute bacterial meningitis is difficult to be ruled out.[3] Many current studies have found that acute bacterial meningitis manifesting as simple febrile seizure is unlikely. Most emergency room Paediatricians decide on lumbar puncture solely on clinical grounds, in fact only about 50% children undergo Lumbar puncture with first episode of febrile seizure.[4]

METHODS

This is a hospital based cross sectional study with retrospective collection of data. All children admitted to our hospital between 6 months to 6 years of age presenting with first episode of convulsions associated with fever were included in our study. Children who had suffered a previous seizure, underlying chronic neurologic condition (hydrocephalus, brain tumor, neurocutaneous syndrome or cerebral palsy) and biochemical abnormalities (hypoglycemia, hypocalcaemia and hyponatremia) were excluded from the study. Inpatient medical records of all children admitted with complaints of fever with seizures, in the age group of 6 months to 6 years from 1st January 2013 to 31st December 2015 were reviewed. The collected data included age, gender, seizure type, and history of previous episode of Seizures, signs of meningeal irritation, postictal drowsiness, and pre-treatment with antibiotics, blood investigations, and CSF analysis including culture. CSF pleocytosis was defined according age adjusted CSF reference range according to AAP recommendations 2010. Bacterial meningitis (BM) was defined as growth of a pathogen from CSF culture or CSF pleocytosis with growth of a pathogen from the blood culture. In cases with CSF pleocytosis and history of pretreatment with antibiotics, we considered these cases as bacterial meningitis. CSF pleocytosis with no growth of a pathogen from CSF or blood culture was considered as aseptic meningitis if the patient was not pre-treated with antibiotics during the previous week. Data was analysed using SPSS version 16. A Fisher's Exact test was used for statistical analysis and a $p<0.05$ was considered significant.

RESULTS

A total of 105 patients with first episode of seizure with fever were included in our study. LP was performed in 43 patients (40.95%). Of those 14 patients were male (44.1%) and 21 were female (55.8%). CSF analysis was normal in 35 children (81.39%). Diagnosis of bacterial meningitis was made in 8 cases (18.6%). In all these patients no organism was grown either in CSF or in blood, but all of them had CSF pleocytosis and received antibiotics prior to admission into our hospital. All the patients who were diagnosed to have meningitis presented as complex/atypical febrile seizures. In children with normal LP, 15 were presented as simple febrile seizures and 20 presented as complex febrile seizures. Only one among 8 cases of meningitis presented with signs of meningeal irritation. Among 8 diagnosed cases of meningitis, majority 6 (75%) were aged less than 2 years and none of them had signs of meningeal irritation. The tables 1, 2 and 3 give comprehensive data regarding patients.

Table 1: Age wise distribution of simple febrile seizures.

Age group	SFS. LP done (no meningitis)	SFS LP done (meningitis)	Total no in respective age group
6 months to 1 year	3	0	3
1 year to 2 years	4	0	4
2 years to 3 years	2	0	2
3 years to 4 years	3	0	3
4 years to 5 years	0	0	0
5 years to 6 years	4	0	4

Table 2: Age wise distribution of complex febrile seizures.

Age group	CFS. LP done (no meningitis)	CFS LP done (meningitis)	Total no in respective age group
6 months to1 year	4	4 (50%)	8
1 year to 2 years	6	2 (25%)	8
2 years to 3 years	3	1 (25%)	4
3 years to 4 years	2	0	2
4 years to 5 years	1	0	1
5 years to 6 years	3	1 (33.3%)	4

Table 3: Characteristics among LP done patients.

Variables		Meningitis (n =8)	No-meningitis (n = 35) No.	P-value
Gender	Male	5	14	0.444
	Female	3	21	
Febrile seizure	Simple	0	15	0.05
	Atypical	8	20	
Duration of seizure	<15 min	4	23	0.678
	>15 min	4	12	
Postictal drowsiness	Present	7	26	0.745
	Absent	1	9	
Meningeal signs	Present	1	2	0.926
	Absent	7	33	
White blood cell count	Leukocytosis	5	30	0.304
	Normal	3	5	
Sr. CRP	Normal	2	16	0.507
	Elevated	6	19	
Hb	Normal	5	22	0.693
	Anemia	3	13	
Pre-treatment with antibiotics	Present	8	12	0.003
	Absent	0	23	

DISCUSSION

In this study, the prevalence of acute bacterial meningitis among children (6 months to 6 years) with a first episode of febrile convulsion that underwent lumbar puncture, was 18.60% which was relatively similar to results obtained by Owusu-Ofori et al in Ghana who found high prevalence (10.2%) of meningitis in children who presented with febrile seizure.[5] On the other hand few studies, done by Batra et al India and Kimia et al USA found very low prevalence of meningitis in children with febrile seizures i.e., 2.4% and 2.7% respectively.[6,7] Some studies showed intermediate prevalence 4.7% in a study done by Ghotbi and Shiva et al and 4.5% in study done by Batajoo J et al.[2,8]

In this study not even a single case of meningitis presented as simple febrile seizure, whereas the prevalence of meningitis in children with atypical febrile seizures was 25.87% which is statistically significant finding (P value = 0.05). Kimia et al found that 0.86% of children who presented as first episode of simple febrile seizure, compared with 4.8% of children who presented as complex febrile seizures had meningitis.[7] Najaf-zadeh et al reported that in children presenting with first episode of simple febrile seizure S0.2% had bacterial meningitis where as it was 0.6% in case of complex febrile seizures.[9]

In this study, the prevalence of meningitis was more in the age group less than 1 year. Many studies also reported similar results suggesting meningitis is more prevalent in children less than 1 year of age.[2,5,8,10,11]

In this study out of 8 children with bacterial meningitis only 1 child had signs of meningeal irritation. Whereas in studies done by Joshi-Batajoo and Laditan AA none of the children with bacterial meningitis had signs of meningeal irritation.[2,11] This clearly suggests that meningeal signs are not reliable in the clinical diagnosis of meningitis in infants.

In this study, we did not find any statistically significant correlation clinical or blood investigation variables that predict meningitis. Limitations of this study were small sample size and LP was not performed in all children presented with first episode of convulsion with fever.

CONCLUSION

Study results suggest that the prevalence of meningitis is quite high in children with first episode of febrile seizure. Complex nature of seizures shows higher association with meningitis. Lack of meningeal signs does not exclude meningitis especially in young infants, and pre-treatment with antibiotics can mask the signs of meningeal irritation. Hence we suggest that LP should be done in all cases who, present with first episode of complex febrile seizures and especially those treated with prior antibiotics.

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