



PREDICTORS OF MENINGITIS IN 6 MONTHS TO 6 YEARS CHILDREN PRESENTING WITH FIRST EPISODE OF SEIZURE WITH FEVER

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ABSTRACT

BACKGROUND: Febrile seizures are seizures that occur in conjugation with high fever. Febrile seizures are classified as simple or complex. Simple febrile seizures are generalized, last less than 15 minutes, and do not recur within 24 hours. All others are considered complex seizure. 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: Prospective study done at Department of pediatrics SGGIM&HS, Patel Nagar, Dehradun, Uttarakhand between 1st January 2015 to 30th June 2016 for a duration of 18 months. All children between 6 months to 6 years of age having first episode of convulsions, associated with fever were included into the study.

RESULTS: During study time total of 146 patients of seizure with fever between 6month to 6years of life reported to hospital, only 96 patients fulfilled the inclusion criteria of first episode of seizure with fever into our study. 58 children had simple febrile seizures (SFS) and 38 children presented as atypical febrile seizures (AFS). Lumbar puncture was performed in 62 children (24 with SFS and 38 with AFS). The CSF analysis was normal in all the children who presented as simple febrile seizures. There was 34.2% prevalence of meningitis in children with atypical febrile seizures who underwent lumbar puncture.

CONCLUSION: Prevalence of bacterial meningitis in children between 6months to 6year of life, having first episode of seizure with fever who underwent LP was 21%, which is quite high. Complex nature of seizures shows higher association with meningitis (34.2%). Meningeal signs, gender, duration of seizure, post ictal drowsiness, white blood cell count and CRP does not predict 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.

KEYWORDS : Simple febrile seizure, complex febrile seizures, lumbar puncture, meningitis

INTRODUCTION

Febrile seizures are seizures that occur in conjugation with high fever. They occur in up to 5% of children, typically between the ages of 6 months and 5 years.^{1,2} Febrile seizures are classified as simple or complex. Simple febrile seizures are generalized, last less than 15 minutes, and do not recur within 24 hours. All others are considered complex and comprise 35% of first time febrile seizures.³ Most children do not experience long-term effects due to simple febrile seizures.⁴ However, complex febrile seizures may have been suggested to increase the risk of epilepsy in some children, particularly those with previously existing neurological abnormalities.²

A practice parameter developed by the American Academy of Pediatrics (AAP) for the treatment of children presenting with a simple febrile seizure (SFS) provides a guideline for treatment. The SFS practice parameter focuses on identifying the source of fever rather than performing a standard seizure work up, and examining for signs of encephalitis or meningitis by performing a lumbar puncture on children presenting with clinical signs of neurological disease.⁴ No such guideline exists for children presenting with a first complex febrile seizure, and current treatment plans for this population vary greatly among pediatric emergency care providers.^{1,5}

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.⁶ 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.⁷

METHODS

This is a hospital based prospective study done at the Department of pediatrics SGGIM&HS, Patel Nagar, Dehradun, Uttarakhand, from

1st January 2015 to 30th June 2016, for a duration of 18 months. Patients presenting with first episode of seizure associated with fever were included into study.

Children who had history of 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. All children admitted with complaints of fever with seizures, in the age group of 6 months to 6 year were followed. 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 cultures and CSF analysis including cultures.

Cerebrospinal fluid (CSF) pleocytosis was defined as CSF white blood cell (WBC) count of $> 7/\mu\text{L}$.⁸ In the case of blood-contaminated CSF samples, the authors used the correction equation: corrected CSF WBC count = $(\text{CSF WBC count} - [\text{CSF red blood cell count}/500])$.⁸

Also complete blood count and C-reactive protein (CRP) measurements were also taken and recorded with values of CRP over 5 mg/L and white blood cell (WBC) over 17,000/ μL being deemed to be 'high'.⁹

Bacterial meningitis (BM) was defined as isolation of a pathogen from CSF culture/gram staining 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 week¹⁰. 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

There were total of 146 patients of seizure with fever only 96 patients

fulfilled the inclusion criteria of first episode of seizure with fever in our study.

Children who had history of a previous seizure (32), underlying chronic neurologic condition {hydrocephalus(4), neurocutaneous syndrome(2) and cerebral palsy(6)} and biochemical abnormalities {hypoglycemia(2) and hyponatremia(4)} were excluded from the study. So total number of patients excluded from study were 50.

After thorough history taking, clinical examination and following AAP guidelines for lumbar puncture in children, lumbar puncture was done in 62(64.6%). Out of 62 patients studied for CSF changes,

it was normal in 49 patients and meningitis was diagnosed in 13(21%) patients.

All 13 patients which were diagnosed as cases of meningitis on CSF study had already received oral antibiotics before time of presentation to the hospital. Out of which 10(77%) patients were showing only CSF pleocytosis and were pretreated before reporting to hospital, other 2(15.4%) patients showing pleocytosis on CSF, organisms were isolated from their CSF cultures and one patient showing pleocytosis with negative cultures of CSF and blood was not responding to the

Table 1: distribution of SFS (simple febrile seizure) with respect to age group.

S. NO	Age group	SFS.LP done (no meningitis)	SFS.LP done (meningitis)	Total number in respective age group
1	6months to 1year	3	0	3
2	1year to 2years	8	0	8
3	2years to 3years	5	0	5
4	3years to 4years	3	0	3
5	4years to 5years	4	0	4
6	5years to 6years	1	0	1
Grand total		24	0	24

Table 2: showing distribution of CFS (Complex febrile seizure) with respect to age group.

S.NO	Age group	CFS.LP done(no meningitis)	CFS.LP done(meningitis)	Total number in respective age group
1	6months to 1year	1	5	6
2	1year to 2years	3	3	6
3	2years to 3years	4	1	5
4	3years to 4years	3	0	3
5	4years to 5years	8	2	10
6	5years to 6years	6	2	8
Grand total		25	13	38

Table 3: distribution of variables among LP(lumbar puncture) patients.

S.NO.	Variables	Sub variables	Meningitis(n=13)	No meningitis (N=49)
1	Gender	Male	7	30
		Female	6	19
2	Febrile seizure	Simple	0	24
		Complex/Atypical	13	25
3	Duration of seizure	<15 min	5	32
		>15 min	8	17
4	Postictal drowsiness	Present	10	21
		Absent	3	28
5	Meningeal signs	Present	2	3
		Absent	11	46
6	White blood cell count	Leucocytosis/high	6	20
		Normal	7	29
7	CRP	Elevated/high	5	32
		Normal	8	17
8	Pretreatment with antibiotics	Present	13	26
		Absent	0	23

antibiotic therapy, was managed as case of tubercular meningitis and later discharged on antitubercular therapy.

All the patients which were diagnosed as cases of meningitis presented as of complex febrile seizures at time of admission. In 49 children CSF finding was normal. Out of 49 patients 24 presented as simple febrile seizures and 25 patients presented as complex febrile seizures. Table 1 and table 2 are showing age wise distribution of patients between simple and complex febrile seizures. Table 3 showing distribution of patients among variables across groups having meningitis and no meningitis diagnosed on lumbar puncture.

DISCUSSION

There were total of 96 patients with first episode of seizure with fever included into our study. LP was done in 62(64.5%) and CSF proven meningitis was diagnosed in 13 which is 20.9%. So prevalence of bacterial meningitis in children between 6months to 6year of life, having first episode of seizure with fever who

underwent LP was 21%. Another study done by Suresh Reddy D Et al¹⁰ shows a prevalence of 18.6% which is relatively similar to our study. Results obtained by Owusu-Ofori et al¹¹ in Ghana who found high prevalence (10.2%) of meningitis in children who presented with febrile seizure. On the other hand few studies, done by Batra et al¹² India and Kimia et al⁸ USA found very low prevalence of meningitis in children with febrile seizures i.e., 2.4% and 2.7% respectively. Studies done outside show less prevalence of meningitis as compared to our study, which could be due to high coverage of pneumococcal and haemophilus influenza vaccination in children of developed countries. Also high prevalence of meningitis in our study could be due to framing of criteria (CSF pleocytosis >7/µl in patients with first episode of seizure with fever and who have received antibiotics before reporting to hospital) for diagnosis of meningitis and more traumatic LPs (18 out of 62) in our study than in proportion to other studies.

In our study all diagnosed cases of meningitis reported to hospital as complex febrile seizures at time of hospitalization, with

prevalence of meningitis 34.2% in complex febrile seizure patients, which is statistically a significant finding (P Value<0.05). Prevalence of meningitis out of total hospitalized patients with first episode of seizure with fever in our study was 13.5%. In another study Suresh Reddy D Et al¹⁰ found a prevalence of meningitis 25.87% in complex febrile seizure patients. But Najaf-zadeh¹³ et al reported that in children presenting with first episode of simple febrile seizure 0.2% had bacterial meningitis where as it was 0.6% in case of complex febrile seizures. There was no patient diagnosed of meningitis in patients with simple febrile seizure in our study.

In our study majority of patients diagnosed with meningitis were diagnosed in less than 2 years . Suresh Reddy D Et al¹⁰ had also noticed more prevalence of meningitis in children less than 1 year of age. Similar results were also noticed in other studies¹³. Such pattern could be due to weak immunological strength and more invasive nature of infection in smaller kids.

In our study only two patients out of 13 had meningeal irritation at time of presentation with P value >0.05. Whereas in studies done by Joshi-Batajoo¹⁴ and Laditan AA¹⁵ none of the children with bacterial meningitis had signs of meningeal irritation.

There was nothing statistically significant among variables (gender, duration of seizure, post ictal drowsiness, white blood cell count and CRP) which could predict meningitis.

CONCLUSION

Prevalence of bacterial meningitis in children between 6 months to 6 year of life, having first episode of seizure with fever who underwent LP was 21%, which is quite high. Complex nature of seizures shows higher association with meningitis. Meningeal signs, gender, duration of seizure, post ictal drowsiness, white blood cell count and CRP does not predict 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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