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Original Research Article

The rationality behind performance of routine lumber puncture in simple febrile seizure in 6-18 months old children

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ABSTRACT

Background: Pediatrics seizures can be either due to febrile seizure or underlying serious infection such as meningitis. It is important to rule out meningitis in children presenting with fever and seizure. The aim of the study was conducted to assess the necessity of routine lumber puncture and to determine the incidence of meningitis among children aged 6 to 18 months presenting with first episode of febrile seizure.
Methods: This prospective observational study was conducted among 47 children with first episode of simple febrile seizure presenting to emergency in Medical College Kolkata, West Bengal from April 2018 to September 2019.
Results: Total 47 children were studied among 32 (68%) children were between 6-12 months and 15 (32%) were between 12-18 months of age. Only 1 child (2.1%) diagnosed as meningitis. Clinically 7 children (14.9%) showed signs of sepsis and meningitis like picture and 6 children (12.8%) were in 6-12 months of age and only 1 child (2.1%) was in 12-18month of age. Only 1 child in 6-12 months of age showed CSF positive and all other CSF studies were within normal limit. A significant association was seen between age group and hyponatremia and family history of febrile seizure ($p<0.05$). There was no statically significant between clinical diagnosis and CSF results ($p=0.15$).
Conclusions: The risk of meningitis in children presenting with simple febrile seizure between 6-18 months of age is very low, specially in 12-18 months of age. Therefore, current guidelines regarding lumber puncture in simple febrile seizure should be reconsidered.

Keywords: Meningitis, Lumber puncture, Simple febrile seizure

INTRODUCTION

Febrile seizures are the most common type of seizure in childhood and account for a number of visits to the emergency department.[1] Meningitis is the most important differential diagnosis in children with a febrile seizure, although studies show that less than one third of children with meningitis have a seizure (13-30%).[2,3] Nevertheless, it is essential to rule out the possibility of meningitis in a child with a diagnosis of a febrile seizure. The possibility of meningitis occurring without the presence of meningeal signs (neck stiffness, Brudzinski's sign, Kernig's sign) is well known and this phenomenon is more common in infants younger than 18 months; however, it may also occur in older children and even in adults.[4] Therefore, it is important to differentiate febrile seizure from meningitis early and implement appropriate management. The AAP recommended that Lumber puncture (LP) be strongly considered for patients <12 months of age and be considered for patients 12 to 18 months of age in an effort to diagnose bacterial meningitis among children with febrile seizure as their sole clinical manifestation of infection.

The issue of whether a well appearing child presenting with a febrile seizure is at increased risk for bacterial meningitis has remained controversial.[5] Probability of bacterial meningitis in children with fever with seizure varies from 0.6 to 6.7%.[4] Although there are quantitative data regarding the lumbar puncture yield among patients presenting with FS, there is no data from the large cohort of patients.[6,7] The infections most commonly associated

with febrile seizures are those of the upper airways, pneumonias, gastroenteritis and urinary tract infections.[8,9] Studies show that the incidence of febrile seizure increases in winter when viral infections are more common.[10] It is also important to emphasize that an indication for LP is not only related to performing a differential diagnosis in cases in which meningitis is suspected, but may also be associated with other extrinsic factors such as (a) medico-legal issues (a defensive medicine practice that leads to unnecessary excesses); and (b) extremely busy healthcare services where it is difficult to keep the child under observation for the time required to enable re-examination to be performed after a febrile seizure when the patient's temperature has returned to normal or after getting anticonvulsants like diazepam. The objective of this study were to determine whether LP is necessary and to find out the incidence of meningitis in children aged 6 months to 18 months presenting with first episode Fever with seizure (FS).

METHODS

Settings and design

This is a prospective observational single centre tertiary care hospital, Medical College and Hospital, Kolkata, West Bengal, India.

Study period

The study period was from April 2018 to September2019.

Operational definitions

Febrile seizure

A febrile seizure is defined as a convulsive seizure accompanied by fever occurring in children from 6 month to 5 years of age with no sign of infection or inflammation of the Central nervous system (CNS), in the metabolic alteration and in the history of any previous non-febrile seizures.

Simple febrile seizure

A simple febrile seizure is a generalized seizure, often tonic-clonic, lasting less than 15 minutes in duration that does not occur more than once in 24 hours, and is followed by full recovery within one hour.

Complex febrile seizure

A complex febrile seizure is one with focal onset, one that occurs more than once during a febrile illness, or one that lasts more than 10 to 15 min.

Inclusion criteria

All children 6 to 18 months of age with the first episode of simple febrile seizure who presented to the emergency.

Exclusion criteria

Those diagnosed with previous history of seizure disorder, chronic illness, trauma, neurosurgical intervention and critically ill children were excluded from the study.

Study procedure and data collection

After initial stabilization of the children, detailed history was taken and examination done. Children were considered febrile if their axillary temperature exceeded 100.4˚F. Investigations were sent to determine the focus of infection. After informed and written consent LP was done according to the AAP guidelines. The children were then observed for at least 12 hours. The proportion of children with meningitis and no meningitis among the study population was determined based on LP reports and the incidence of meningitis in simple febrile seizure was calculated. Meningitis was considered in a child if he/she had CSF count >5 cells/mm, protein >40 mg/dl and sugar <2/3rd of blood sugar or gram stain positive for bacteria and/or positive CSF culture. Seizure characteristics as type, duration, character, interval between fever and seizure, number of seizure episodes and postictal drowsiness, the presence of meningeal signs and the presenting symptoms and signs were compared between the meningitis and no meningitis group. The causes of fever in febrile seizure were also identified and final diagnosis assigned after complete history, examination and investigation.

Statistical analysis

Data entry and analysis were done by using SPSS version 20. Categorical data was analyzed by chi-square test. P value of <0.05 was considered significant.

Ethical approval

The study was approved by of Medical College and Hospital, Kolkata, West Bengal ethics committee.

RESULTS

The study was conducted among 47 patients with a simple febrile seizure with male respondent was 26 (55.3%) and female respondent was 21 (44.7%) and 32 (68%) children were between 6-12 months and 15 (32%) were between 12-18 months of age (Table 1 and 2). About 40 (85.1%) children had immunization status up to date, 6 (12.7%) children were incompletely immunized and only 1 (2.2%) child was unimmunized (Figure 1).

Clinically 7 children showed signs of sepsis and meningitis like picture and 6 children (12.8%) were in 6-12 months of age and only 1 child (2.1%) was in 12-18 months of age but only 1 child out of 47 children (2.12%) was diagnosed as meningitis which was in the 6-12 months age group and 1 out of 32 children's CSF result showed meningitis (viral,

3.21%) in the 6-12 months age group (Table 3 to 5). We found 10.6% had underweight, 61.7% was from urban area, 80.8% parents were literate, 25.5% had family history of febrile seizure or epilepsy. We also observed 36% children had anaemia, 14.9% had hyponatremia, 6.4% had pneumonia,10.6 % had high CRP, 6.4% had UTI. There was no statistic significant between clinical diagnosis and CSF results (p=0.15). Table 1 shows sex distribution among study population presented with simple febrile seizure. Table 2 shows age distribution among study population presented with simple febrile seizure. Table 3 shows 6 children in 6-12 months of age and 1 child in 12-18 months of age were clinically suspected having feature of meningitis. Table 4 shows 1 child's CSF picture is positive for meningitis among 6 children in 6-12 months of age. Table 5 shows CSF positivity among clinically suspected meningitis.

Table 1: Sex distribution among study group.

Sex distribution	Absolute frequency	Relative frequency (%)
Male	26	55.3
Female	21	44.7

Table 2: Age distribution among study group.

Age group (months)	Absolute frequency	Relative frequency (%)
6-12	32	68
12-18	15	32

Table 3: Clinically suspected meningitis among study group.

Age group (months)	Clinically suspected meningitis (%)	Clinically no meningitis (%)
6-12	6 (12.8)	24 (51.2)
12-18	1 (2.1)	14 (29.8)

Table 4: Meningitis as diagnosed by CSF positivity among study group.

Age group (months)	Meningitis (CSF positive)	No meningitis (CSF normal) (%)
6-12	1 (2.1%)	31 (65.9%)
12-18	0 (0%)	15 (32%)

Table 5: Clinical diagnosis and CSF study result.

Clinical parameter	Meningitis (CSF positive)	Non-meningitis (CSF normal) (%)	P value
Clinically suspected meningitis	1 (2.1%)	6 (12.8%)	0.15
Clinically non-meningitis	0 (0%)	40 (85.1%)	

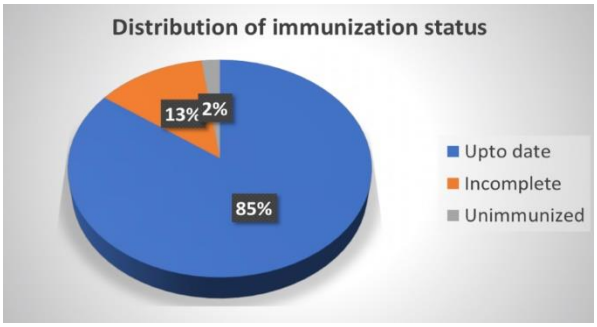

Figure 1: Distribution of immunization among study group.

DISCUSSION

A febrile seizure is a convulsion in a child that's caused by a fever. Febrile seizures occurring in young, healthy children who have normal development and haven't had any neurological symptoms previously. Febrile seizures usually happen between 6 months to 5 years of age and it typically happen during the first day of the fever and last for about three to five minutes. Febrile seizures are usually harmless and typically don't indicate a serious health problem. A child having a febrile seizure shakes all over the body and loses consciousness. Sometimes, the child may get very stiff or twitch in just one area of the body. The seizure lasts longer than five minutes or is accompanied by (1) vomiting, (2) stiff neck, (3) breathing problems, and (4) extreme sleepiness require investigation. Most febrile seizures produce no lasting effects. Simple febrile seizures don't cause brain damage, intellectual disability or learning disabilities but most common complication is the possibility of recurrence of seizures.

We observed 68% children were between 6- 12 months of age and 32% children were between 12-18 months of age that was similar to the finding reported by Bhandari NR in his study. [11] The present study showed 34 children (72.3%) were having seizure within 24 hours of onset of fever and 13 (27.7%) children were having seizure after 24 hours of onset of fever with mean duration of 16.7 hours of onset of fever. This finding similar to other studies where mean time interval from 16.5±2.13 hours described by Deng CT et al from Malaysian children to 2.2±1.8 days described by Winkler AS et al from Tanzanian rural Children.[12,13] The association between age group and time interval between onset of fever and seizure was not significant.

This study showed that family history of febrile seizure was present in 12 (25.5%) children and family history of epilepsy present in 3 (6.3%) children. Family history of epilepsy was varied from 0.4% to as high as 20.6% of children with febrile seizure as reported by Ojha et al in his study but Chung et al described less than 17.5% family history of febrile seizure in his study.[14,15] The association between age group and family history of febrile seizure was significant in our study. This study showed 7 children (14.8%) in 6-12 months were having hyponatremia and 25

children (53.2%) had normal Na level. In 12-18 months of age 8 child (17%) was hyponatraemic. Overall, 15 children (32%) were hyponatraemic. This finding was comparable to the study done by Rutter et al (1978).[16] There was significant association found between age group and hyponatremia in febrile seizure with p value<0.05. In the present study, out of 47 febrile seizure cases 15 (31.9%) cause of fever was URTI, followed by acute gastroenteritis 7 (14.9%), Ear discharged 5 (10.6%) then LRTI 7 (6.3%). Similar finding was found by Simpson and George with study of 28 patients 70% URTI, Sehgal and Bala et al who studied 150 cases and found 60.6% cause of fever with URTI.[17,18]

We found 1 patient (2.12%), 7-months-old baby, out of 47 cases, diagnosed as viral meningitis. Tavasoli et al found 4.5% children had viral meningitis and 1.65% children had bacterial meningitis in his study.[19] In another study done by Fletcher et al 'necessity of lumbar puncture in patients presenting with new onset complex febrile seizures' and reported the incidence of meningitis among all children was 0.5% in febrile seizure.[20] Lima et al showed the CSF findings was normal in 99.1% children and only 1 child (0.8%) was found viral meningitis.[21] We did not find any significant association between clinical diagnosis and CSF results (p=0.15).

In developed countries, meningitis is a rare disease and its incidence is 0.23% in patients with FS. Whereas in developing countries due to low sociocultural level it increases to 0.4-1.2%. The incidence rises up to 4.2% in underdeveloped countries.[22] In our study the incidence of meningitis is 2.12% close to developing-underdeveloped countries.

FS could be the first and only symptom of meningitis in 24% of cases.[23] Especially in infants younger than 12 months of age, meningeal irritation signs could be absent in 30-35% of cases.[24] For that reason, AAP strongly advice to perform LP in previous guideline.[25] However, due to the risks and complications LP as an invasive procedure is recommended only when it is necessary in many studies.[26] In our study meningeal irritation signs were absent in viral meningitis cases. According to our results, since antibiotics are not used in the treatment of viral meningitis, performing LP is worthless in the absence of meningitis sign. The lumbar puncture was already indicated in the bacterial meningitis case because of the presence of nuchal rigidity. Besides the AAP recommended that LP should be performed if there are clinical signs of meningitis in the recent guide 2011.[27]

The risk of bacterial meningitis associated with a simple febrile seizure when clinical examination is normal is extremely low even in children younger than 18 months.[7,28] Therefore, lumbar puncture is of little use in these children. A meta-analysis showed that the number of lumbar punctures that would have to be performed to identify a single case of a central nervous system infection (the number needed to treat) is 1,109 for children with a first simple febrile seizure and 180 children with a first complex febrile seizure. That same article concluded that careful clinical observation for a few hours after the seizure should be an acceptable strategy in these children. Patients who recover consciousness quickly should be kept under observation and the decision regarding lumbar puncture should be delayed.[25]

Additionally, an important change occurred in the epidemiological profile of bacterial meningitis following universal vaccination against Haemophilus influenzae, Streptococcus pneumoniae and meningococcus. The incorporation of these vaccines in the USA, in Brazil and in many other countries has led to a significant reduction in bacterial meningitis caused by these principal etiological agents.[8]

Therefore, following parameters should be considered before doing lumber puncture in an emergency room setting: (a) the patient's clinical condition and age, (b) the availability of an appropriate environment in which to keep the child under observation after the seizure, (c) the child's current immunization status, and (d) the experience of the attending physician in the management of such patients.

Limitations

An important limitation to our study is the small number of patients. The other limitation includes shorter period of study and one centre-based study.

CONCLUSION

The risk of meningitis presenting as simple febrile seizure among children 6 to 18 months of age is very low, especially in children between 12-18 months of age but in 6-12 months of age LP to be considered to rule meningitis. The rate of performing LPs in febrile seizure cases is low and decreasing.

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