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Frequency of Meningitis Among Children 6-18 Months of Age With First Episode of Fever and Fit

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ABSTRACT

Objective: To determine the frequency of meningitis in children, 6 to 18 months of age, presenting with first episode of fit and fever. **Study Design & Setting:** This was a descriptive case series performed as a cross sectional survey carried out in the Department of Paediatrics, Sheikh Zayed Hospital Lahore. **Patients and Methods:** This study was carried out from 1-04-2009 to 30-03-2010. 423 patients, who fulfilled the inclusion criteria,.were selected for this study. Blood glucose was recorded before lumbar puncture to compare with CSF glucose. CSF was sent for analysis of protein, glucose and white blood cell count to assess the presence of meningitis. **Results:** Mean age of the patients was 11.9±3.5 months with age range of 6 to 18 months. There were 262 (62%) males and 161 (38%) female patients. The mean blood sugar at the time of lumbar puncture was 104.8±10.9 mg/dl. There were 9 (2%) patients who had raised CSF leucocyte count , 9(2%) patients had raised CSF protein and 9 (2%) patients had reduced CSF glucose.There were 9 (2%) patients who had meningitis so frequency of meningitis was 2% in our population under study. **Conclusion:** Frequency of meningitis in children presenting with first episode of fit and fever in the absence of any other symptoms is very low. Majority of children are, therefore, cases of simple febrile seizures rather than meningitis. It is suggested that unnecessary lumbar puncture can be avoided as this invasive procedure has its own complications.

Key Words: Febrile seizures, meningitis, fits with fever, lumbar puncture, frequency.

INTRODUCTION

Febrile seizures are defined as seizures associated with fever in the absence of central nervous system infection in a young child.[1]

The prevalence of febrile seizures is between 3% and 8% in children from 6 months to 6 years of age.[1] They occur in at least 2-5% of children in United States.[2,3] The peak age is 14 to 18 months.[4] Febrile convulsions are provoked by fever of infective origin and are the most common cause of admission to paediatric emergency worldwide.[5] Febrile seizures are of two types, simple and complex.[2] Simple febrile seizures are defined as generalized seizures, lasting less than 15 minutes, not recurring within the same illness.[2] Febrile seizures result from combination of environmental and genetic factors.[1]

Fit with fever, a common presentation with, which a child may present to the emergency, is mostly due to febrile seizure but it may also be due to meningitis. Acute bacterial meningitis is defined as inflammation of leptomeninges. Meningitis is a medical emergency and should not be missed in any child as delay in treatment can result in permanent neurological sequelae. Therefore, it is important to differentiate febrile seizure from meningitis early and implement appropriate management.[6]

The signs of meningitis can be reliably elicited above the age of 18 months. Children under 18 months with meningitis show subtle features such as vomiting, excessive crying, irritability, sick, toxic look, reluctance to feed, poor sleep, staring gaze, lip smacking, cyclical movements or bulging fontanelle. Therefore vigilance is needed in young children who may not show typical signs of meningitis such as neck stiffness, kernig's or brudzinski's signs.[6,7]

The diagnostic procedure to rule out meningitis is lumbar puncture but it is a potentially dangerous procedure with complications[8] and various studies have been done to see whether it is mandatory in every case of fit with fever. The incidence of bacterial meningitis as a cause of fever and fits has decreased over the past 20 years and is between 0.23% and 2%.[7] Lumbar puncture has been strongly recommended in the past but new studies shows lumbar puncture may not be necessary for a first simple febrile seizure because it is quite uncommon for a simple, brief, non focal seizure to be the sole manifestation of bacterial meningitis.[9.10] A study of 254 children showed positive lumbar puncture in only 4.7%.[10] However, the occurrence of meningitis may be more for developing countries due to inadequate vaccination.

With this background we made an effort to find the occurrence of meningitis in children presenting with first episode of fit with fever based on CSF findings. If the frequency of meningitis is low, then unnecessary lumbar puncture can be avoided as this invasive procedure has its own complications. It will guide us to manage and plan these patients in a better and non-invasive way. It will also generate data of our local population as this frequency can vary greatly from population to population.

Objective

To determine the frequency of meningitis in children 6 to 18 months of age presenting with first episode of fit and fever.

Study design and setting

Descriptive case series done as a cross sectional survey conducted in the Department of Paediatrics, Sheikh Zayed Hospital Lahore.

PATIENTS AND METHODS

This study was conducted during one year period extending from 01-04-2009 to 30-03 2010.

Patients included in the study were both male and female children, of age 6 to 18 months, who had first episode of generalized fit observed by the doctor or parents, lasting for less than 15 minutes, with fever more than 100°F recorded by parents or the doctor with thermometer.

Children with history of known epilepsy (documented on EEG), administration of antibiotics prior to lumbar puncture, duration of fit >15 minutes and altered sensorium at presentation determined by Glasgow Coma Scale were excluded from the study.

Meningitis was defined on cerebrospinal fluid analysis .having more than 5 white blood cells, raised CSF protein more than 45 mg/dl and decreased CSF glucose less than 2/3rd of blood glucose.

423 patients admitted to Paediatric Department of Sheikh Zayed Hospital, Lahore who fulfilled the inclusion and exclusion criteria were selected for this study. Informed consent was taken from the parents before doing lumbar puncture. Blood sugar recorded before lumbar puncture to compare with CSF glucose to interpret the results and the procedure was done as per standardized protocol under aseptic measures. CSF was sent to biochemistry and microbiology laboratorys for analysis of protein, glucose and white blood cell count to assess the presence of meningitis. All information was collected through specially designed performa. All the patients presenting with fits and fever were started with intravenous antibiotics in combination of Ampicillin (300mg/kg/day) and Ceftriaxone (150mg/kg/day) in meningitic doses immediately after performing lumbar puncture. Doses were adjusted after CSF reports. Fits were treated with intravenous anticonvulsants such as Diazepam (1-2mg/kg/dose), Phenobarbitone (Loading dose:20mg/kg/dose followed by Maintenance dose of 5mg/kg/day) or Midazolam (0.1-0.4mg/kg/dose in infusion, titrated according to response). Antipyretics were given when necessary.

Statistical analysis

Sample size of 423 cases was calculated with 95% confidence level, 3% margin of error and taking expected percentage of meningitis that is 4.7% in children presenting with first episode of fit and fever on lumbar puncture. Non-probability purposive sampling technique was employed. All collected data was entered into SPSS computer software version 12 and analyzed. Mean and standard deviation were calculated for age and

blood sugar, CSF leucocyte count, CSF proteins and CSF glucose. Frequency and percentages were calculated for gender and presence or absence of meningitis.

RESULTS

The mean age of the patients was 11.9±3.5 months with age range of 6 to 18 months. There were 273 (64.5%) patients in the age range of 6-12 months and 150 (35.5%) patients in the age range of 13-18 months (Table 1). There were 262 (62%) male and 161 (38%) female patients (Table 1).The mean blood sugar at the time of lumbar puncture was 104.8±10.9 mg/dl. There were 175 (41.5%) patients in the blood sugar range of 90-100 mg/dl, 188 (44.5%) patients in the blood sugar range of 101-110 mg/dl, 31 (7.5%) patients in the blood sugar range of 111-120 mg/dl 29 (6.5%) patients in the blood sugar range of 121-130 mg/dl (Table 2).In the distribution of patients by CSF parameters, 9 (2%) patients had CSF leucocyte count >5 and 414 (98%) had CSF leucocyte count less than 5 (Table 2).9(2%) patients had raised CSF protein and 414 (98%) did not have raised CSF protein (Table 2).9 (2%) patients had low CSF glucose and 414 (98%) did not have low CSF glucose (Table 2).In the distribution of patients by frequency of meningitis, there were 9 (2%) patients who had meningitis and 414 (98%) did not have meningitis (Table 1).

Table 1: Distribution of patients by age, sex, frequency of meningitis (n=423)

Parameters	Number	Percent
Age (Months)		
6-12	273	64.5
13-18	150	35.5
Sex		
Male	262	62.0
Female	161	38.0
Meningitis		
Yes	9	2.0
No	414	98.0
Mean±SD for age	**11.9±3.5**	

DISCUSSION

Febrile seizures is defined as seizures associated with fever in the absence of central nervous system infection or acute electrolyte imbalance in a young child. The prevalence of febrile seizures is between 3% and 8% in children up to 7 years of age. Variation in prevalence relates to differences in case definitions, ascertainment methods, geographical variations and cultural factors[1]

Table 2: Distribution of Patients by CSF Leucocyte counts, CSF Protein and CSF Glucose, Blood Sugar at the time of Lumbar Puncture (n=423)

Parameters	No.	%	Mean±SD
CSF Leucocyte Counts>5			
Yes	9	2.0	**5.22±30.924**
No	414	98.0	
CSF Protein >45 mg/dl			
Yes	9	2.0	**27.75±11.91**
No	414	98.0	
CSF Glucose <2/3rd of Blood Glucose			
Yes	9	2.0	**106.31±115.31**
No	414	98.0	
Blood Sugar			
90-100	175	41.5	
101-110	188	44.5	**104.8±10.9**
111-120	31	7.5	
121-130	29	6.5	

Febrile seizures are defined as either simple or complex, may be provoked by any febrile bacterial or viral illness. Simple febrile seizures are defined as generalized seizures lasting less than 15 minutes not recurring within the same febrile illness[2]. Complex febrile seizures (CFSs) are defined as seizures that are focal, prolonged (> 15 minutes), or recurrent (recur with the same febrile illness).[4]

A child with a complex febrile seizure has an 85% to 95% probability of not developing epilepsy. Prophylactic use of paracetamol, ibuprofen or a combination of both in febrile seizures is debatable. There is reason to believe that children who have experienced a simple febrile seizure are over-investigated and over-treated.[5]

Although febrile seizures are a benign disorder with an excellent outcome they are particularly stressful for parents, who often develop a high level of anxiety in the fear of recurrence. Since education and reassurance are the mainstay of

management, parents of children should be informed about the clustering of events during winter and in the evening.[1]

Lumbar puncture has been strongly recommended in the past but new studies shows lumbar puncture may not be necessary for a first simple febrile seizure because it is quite uncommon for a simple, brief, non focal seizure to be the only manifestation of bacterial meningitis.[6,9,.10]Lumbar puncture is frightening to children and their parents, even with adequate local anesthesia, and is associated with moderate levels of pain and discomfort. Theoretically, the spinal needle used in the procedure could actually introduce meningeal infection, but the risk of such a complication appear small.[10]

A study of 254 children showed positive lumbar puncture in only 4.7%.[10] However, the incidence of meningitis may be more for developing countries due to inadequate vaccination coverage. After Pneumococcal Conjugate Vaccine (PCV7) introduction (2001–2004), an estimated 1822 pneumococcal meningitis hospitalizations were prevented in persons aged <5 years[11]

In our study the mean age of the patients was 11.9±3.5 months with age range of 6 to 18 months. As compared with the study of Batra et al[14] the mean age of the patients was 12.2±4.1 months with age range of 6 to 18 months, which is comparable with our study.

In our study there were 62% male and 38% female patients. As compared with the study of Batra et al[14] there were 51% male and 49% female patients, which is comparable with our study.

In our study the frequency of meningitis in children 6 to 18 months of age was in 2% patients. As compared with the study of Batra et al[14], who also conducted his study on children 6 to 18 months of age and frequency of meningitis was found in 2.4% patients, in children with first febrile seizures, 0.86% in simple febrile seizures.

In another study conducted by Ghotbi and Shiva[10] the frequency of meningitis in children was found in 4.7% patients, while in our study the frequency of meningitis in children was found in 2% patients, which is comparable with the above study.

A recent retrospective cohort review was performed for patients 6 to 18 months of age who were evaluated for first simple febrile seizure in a pediatric emergency department in which no patient with simple febrile seizure was diagnosed as having bacterial meningitis.[15]

Meningitis was diagnosed in 2% of the children in our study. These numbers compare well with previous studies performed by Akpede[15] in which 4.2% of 522 children between ages of 1-6 months presenting with fever and seizure were diagnosed as meningitis and Al-Essai[16] who reported 3.5% of their patients as having meningitis; however others authors are of the opinion that the risk of bacterial meningitis is extremely small (less than one in two hundred), even in children under 1 year of age who are hospitalized with a febrile convulsion. In contrast Offringa's study on 309 children with fever and seizure reports a higher incidence, (7%), of meningitis in their patients.[18] These figures are in stark contrast to those quoted by Teach and colleagues who claim that in a study done on 243 children admitted due to seizure and fever, without any clinical signs of meningitis, none of them had meningitis.[19] Other studies that show the incidence of bacterial meningitis in children who presented to the emergency room because of their first febrile seizure but with no clinical signs of meningitis are as follows: Dawson and Capaldi,[20] (100 patients, 0 meningitis); Anderson et al,[21] (100 patients, 0 meningitis); Von Stuijvenberg,[22] (203 cases, 0 meningitis); Kinsella et al,[23] (47 patients, 0 meningitis). However there have been reports of missing meningitis in children with febrile seizures, notably a case report of a 12-month old infant with acute bacterial meningitis with a simple febrile seizure with no other signs.[7]

In another retrospective, cohort review of patients aged 6 to 60 months who were evaluated in a pediatric emergency department (ED) between 1995 and 2008 for their first complex febrile fit had a lumbar puncture (LP). Two patients had meningitis and both of the patients with CSF-positive meningitis had abnormal findings (physical examination and/or neurologic status) upon presentation.[24]

So the decision to proceed for lumbar puncture depends on clinical expertise and clinical observation of the clinician along with other factors such as previous administration of antibiotics .The

signs we should look for in young children are irritability ,lethargy ,bulging fontanelle, sick look[12,13] as the classical signs of meningeal irritation are not present before 18 months of age.[7]It has been shown repeatedly that a high white blood cell count (WBC ≥ 15,000/mm3) occurs 2 or 3 times more frequently in children with bacterial infections than in those with viral infections[25]. An elevated ESR or C-reactive protein (CRP) contributes diagnostic information independent of the total white cell count.

On the above discussion it is concluded that frequency of meningitis in children presenting with first episode of simple fit and fever is low. On the other hand Meningitis should be considered in the differential diagnosis for any febrile child, and lumbar puncture should be performed if there are clinical signs or symptoms of concern. For any infant between 6 and 12 months of age who presents with a seizure and fever, a lumbar puncture is an option (when the child is considered deficient in Haemophilus influenzae type b (Hib) or Streptococcus pneumoniae immunizations, or when immunization status cannot be determined,) because of an increased risk of bacterial meningitis. A lumbar puncture is an option for children who are pretreated with antibiotics. However In general, a simple febrile seizure does not usually require further investigations.[1]

CONCLUSION

Frequency of meningitis in children presenting with first episode of fit and fever in the absence of any other symptoms is very low. Majority of children are, therefore, cases of simple febrile fits rather than meningitis It is suggested that unnecessary lumbar puncture can be avoided in these cases as this invasive procedure has its own complications. The decision to avoid lumbar puncture should be based on general condition of the child, clinical signs and symptoms (such as absence of irritability, sick, toxic look, excessive crying, vomiting, reluctance to feed, staring gaze, lip smacking, poor sleep, cyclical movements, lethargy and bulging fontanelle), vaccination status , prior to antibiotic use and inflammatory laboratory markers of the patient.

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