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Research Article

Clinicoetiological Profile, Need for Lumbar Puncture and Prevalence of Meningitis in Children with First Febrile Seizures

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Abstract: The primary objective of the present retrospective hospital based study is is to determine the clinico-etiological profile, need for lumbar puncture (LP) in children with febrile seizures and Our secondary objective is to assess the prevalence of meningitis in such children. Our study population consisted of 505 children aged between 6 months to 24 months with first episode of febrile seizures, out of which LP was performed in 322 children. Simple febrile seizures accounted for 63% (n=203) out of which none of them had CSF findings suggestive of meningitis, and complex febrile seizures accounted for remaining 37% (n=119) out of which 5(4.2%) children had CSF findings suggestive of meningitis which was statistically significant($p<0.05$). Upper respiratory tract infection was the commonest underlying cause for febrile seizures (69.9%).
Keywords: Simple febrile seizures, Complex febrile seizures, Meningitis, Lumbar Puncture (LP)

INTRODUCTION

Pediatric febrile seizures are, by far, the most common form of first-time seizure in child hood. The incidence of a single febrile seizure is approximately 4% of all children younger than 5 years [1]. Because these occur in otherwise healthy children, an episode of generalized tonic–clonic convulsion represents an unfamiliar and terrifying event for most caregivers. These children are typically transported by emergency medical services (EMS) to the nearest emergency department [2, 3]. For research and clinical purposes, pediatric febrile seizures have been divided into two categories: simple (typical) and complex (atypical) [4]. The case definition of simple febrile seizure is rigid and exclusive. The definition of complex febrile seizure is less structured, essentially encompassing a heterogeneous group of pediatric seizures with fever that cannot be classified as simple febrile seizure [4]. To be termed a simple febrile seizure, a case must meet all of the criteria presented in Table 1. Strict application of this definition is important because this type of seizure has been extensively studied and is known to have a benign prognosis [4, 5]. Complex febrile seizures represent a heterogeneous population, and no literature supports a standardized approach to these cases.

Table 1: Clinical elements of simple febrile seizure [6]

Patient age between 6 months and 5 years
Generalized tonic–clonic convulsion
Spontaneous cessation of convulsion within 15 minutes
Return to alert mental status after convulsion
Documentation of fever (>38.0C)
One convulsion within a 24-hour period
Absence of preexisting neurologic abnormality

The American Academy of Neurology practice parameter on the diagnostic evaluation of the child with status epilepticus supports the diagnostic utility of the LP [7]. These data do not contradict the current approach to LP in the child with a simple febrile seizure and the emerging consensus that children with apparent simple febrile seizures, who otherwise appear well, are at low risk for serious infection [8-10]. Careful search for other possible medical explanations should be done in children for unexplained CSF pleocytosis after seizures [10-13] than simply being attributed to a ictal phenomena [14], supported by our findings. Specific reports of CSF pleocytosis in children with SE of nonselective origin, both complex febrile seizures and status epilepticus, and children with simple febrile

seizures [8, 12, 13], support that excess numbers of WBC in the CSF should not be dismissed as an ictal phenomena. A higher degree of clinical suspicion may be needed in young infants, even in the absence of a clear pleocytosis, as they are considered to be at greater risk for presentation with central nervous system infection showing minimal signs [8, 11, 13].

. We investigated the prevalence of meningitis in children aged 6-24 months presenting with a first episode of seizures with fever, and we assessed clinicoetiological profile, need for lumbar puncture in such children.

MATERIALS AND METHODS

Study design

It was retrospective Hospital based study

Inclusion criteria

Children between 6mths to 6yrs of age having convulsions, associated with fever but without the evidence of intracranial infection or defined cause

Exclusion criteria

Seizures accompanied by fever in children who have suffered a previous afebrile seizure are excluded. Children with a known seizure disorder (one or more previous seizures without fever), underlying chronic neurologic condition (hydrocephalus, brain tumor, neurocutaneous syndrome, or cerebral palsy), metabolic abnormalities (hypoglycemia or hypocalcemia), were excluded.

This study was conducted in Department of pediatrics, Rajarajeshwari Medical College and Hospital, Bangalore. We analyzed clinical and investigative profiles of 505 children, aged 6-24 months, admitted to pediatric casualty wards with a diagnosis of first febrile seizures From January 2011 to January 2014, 505 patients exhibiting a first episode of seizures with fever were admitted. A lumbar puncture was performed in 322 (63.7%) patients. A diagnosis of meningitis was rendered on the basis of cerebrospinal fluid cell count, cerebrospinal fluid protein, and cerebrospinal fluid sugar levels. A positive cerebrospinal fluid Gram stain and cerebrospinal fluid culture were considered the gold standard for a diagnosis of meningitis. Descriptive and inferential statistical analysis has been carried out in the present study. Results on continuous measurements are presented on Mean ± SD (Min-Max) and results on categorical measurements are presented in Number (%). Significance is assessed at 5 % level of significance. Student t test (two tailed, independent) has been used to find the significance of study parameters on continuous scale between two groups (Inter group analysis) on metric parameters. Chi-square/ Fisher Exact test has been used to find the significance of study parameters on categorical scale between two or more groups The Statistical software namely SAS 9.2, SPSS 15.0, Stata 10.1, MedCalc 9.0.1, Systat 12.0 and R environment ver.2.11.1 were used for the analysis of the data.

Table 2: Etiology of febrile seizures

Cause	No. of patients	%
URI	224	69.6
LRTI	47	14.6
Age	23	7.1
UTI	9	2.8
Gastritis	7	2.2
Dengue	6	1.9
Meningitis	5	1.6
Malaria	1	0.3
Total	322	100.0

Table 3: Clinical variables

Clinical variables	Non-Meningitis (n=317)	Meningitis (n=5)	p value
Age in years			
6-12 months	170(53.6%)	5(100.0%)	0.065+
12-18 months	147(46.4%)	0	
Gender			
Male	191(60.3%)	5(100.0%)	0.161
Female	126(39.7%)	0	
Seizures			
Simple	203(64.1%)	0	0.007**
Complex	114(35.9%)	5(100.0%)	
Febrile Status			
No	296(84.1%)	4(80.0%)	0.300
Yes	21(5.9%)	1(20.0%)	
CSF cell count	1.78±0.91	35.80±3.11	<0.001**
Protein	38.75±14.92	61.20±11.30	0.001**
Sugar	55.33±24.91	36.40±12.99	0.091+
Hb	9.89±1.73	8.56±1.02	0.087+
Total count	14.42±6.14	18.60±4.95	0.131

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RESULTS AND DISCUSSION

All the babies whose CSF was suggestive of meningitis were between the age group of 6-12 months implicating clinical signs of meningitis may be more difficult to identify in this younger age group. And all cases of meningitis were reported in boys. This sex predilection appears to constitute a chance factor, and the results cannot be extrapolated to a wider context because of the small number of patients with meningitis. The prevalence of meningitis was nil in children with simple febrile seizures, and 4.2% (5 babies) in complex febrile seizures. 4 of them had focal seizures and one had febrile status with prolonged post ictal state. Family history of febrile seizures was present in 12.4% of children. 77% of babies were vaccinated against *H. influenzae* where as only 0.6% (2 babies) was vaccinated for streptococcus pneumonia and 22.4 % were not vaccinated for both.none of the babies in meningitis group was vaccinated for *H. influenzae* and streptococcus pneumonia. The mean cerebrospinal fluid cell count in patients with meningitis was 35.80±3.11 /mm3 S.D., the level of cerebrospinal fluid proteins was 61.20±11.30g/dL S.D., and the level of cerebrospinal fluid glucose was 36.40±12.99 g/dL S.D. Cerebrospinal fluid cultures were sterile in all cases. None of the blood cultures of patients demonstrated evidence of bacteremia. Prior antibiotic usage (62.1%) may be the reason for the cultures being sterile. The mean hemoglobin level in patients with a febrile seizure was 8.5 g/dL, which fulfilled the criteria for mild anemia according to the classification by the World Health Organization [15]. Some studies indicated a lower iron status and lower hemoglobin levels as a possible cause of febrile seizures [16, 17]. An interesting finding in our study involved the total leukocyte count of >15,000/mm3 in 48.8% patients with febrile seizures, which may constitute an immediate postictal phenomenon. And mean total leukocyte count among meningitis group was 18.60±4.95 cells / mm3 compared to non meningitis group of 14.42±6.14 cells/ mm^3. Upper respiratory tract infection was the most common cause of fever in both groups (meningitis and nonmeningitis), followed by lower respiratory tract infection and acute gastroenenteritis.

Three retrospective studies have looked at the incidence of bacterial meningitis in children presenting with febrile seizure [18, 19]. Teach and Geil [18] reviewed 243 febrile seizures, of which 66 led to lumbar puncture. No cases of bacterial meningitis were found. Similarly, in a larger study, Trainor and colleagues [20] reviewed 455 simple febrile seizures, of which 135 led to lumbar puncture. Again, no cases of bacterial meningitis were found. Most recently, Kimia and colleagues [21] reviewed 704 patients aged 6 to 18 months presenting with simple febrile seizures, 260 of whom underwent lumbar puncture. Once again, no cases of bacterial meningitis were found. An obvious weakness of these reviews is that not all children presenting with febrile seizure were tested for bacterial meningitis. Nevertheless, if one presumes that the subset tested represented the youngest or most ill-appearing patients, the absence of bacterial meningitis among a total of 461 these cases suggests that the upper limit of the 95% confidence interval for the incidence of the disease in this “high risk” population is well below 2%. The literature is devoid of any description of a child who met criteria for simple febrile seizure with no other clinical indications for lumbar puncture who was subsequently found to have bacterial meningitis (“occult” bacterial meningitis). In a study done by Kimia *et al*. the prevalence of meningitis in a first FS seizure was 0.86%, compared with 4.8% in a complex FS indicating children with complex febrile seizures are more prone to have meniningitis [22].

One child in our study had febrile status with prolonged post ictal drowsiness was found to have meningitis on CSF analysis similar case series were reported by R F M Chin. Out of 49 children with convulsive status epilepticus with fever Four (17%, 95% CI 15–18%) children, aged 3 months, 9.5 months, 18 months, and 26 months, were confirmed to have ABM and they concluded that the risk of ABM in convulsive status epilepticus (CSE) with fever is much higher than that of short febrile seizures (15–18% v 0.4–1.2%). And they suggested that ABM can be confirmed on a delayed LP. The cellular and biochemical changes remain in CSF up to 44–68 hours after the start of antibiotic treatment, and polymerase chain reaction for microbial DNA and RNA is highly sensitive and specific. In the absence of such a marker, all children with CSE with fever may need to complete a full course of parenteral antibiotic therapy in order to avoid partially treated meningitis. Blood cultures are not an adequate marker of CNS infection. If taken before administration of antibiotics, they are positive in 23% of cases of meningococcal meningitis without a rash, and 80–90% of cases of S pneumoniae and H influenzae meningitis. Even if microbes are isolated in blood samples, there remains no conclusive proof of CNS infection. Clinical improvement may be considered as a marker, but improvement may be due to treatment. They concluded that immediate administration of antibiotics in such cases should be followed by delayed LP [23].

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CONCLUSION

Though upper respiratory tract infection is the most common underlying cause for fever in children with febrile seizures other treatable causes like lower respiratory tract infection , dengue, malaria, urinary tract infection should be kept in mind.

LP should be strongly considered

- In infants younger than 12 months, because the clinical signs and symptoms associated with meningitis may be minimal or absent in this age

group. And especially when the child has not received scheduled immunization

- In a child between 12 and 18 months of age, because clinical signs and symptoms of meningitis may be subtle.
- In a child older than 18 months, although a LP is not routinely warranted, it is recommended in the presence of meningeal signs and symptoms (i.e., neck stiffness and positive Kernig and Brudzinski signs).
- LP is an option in a child who presents with a seizure and fever and was pretreated with antibiotics, because antibiotic treatment can mask the signs and symptoms of meningitis.(6) in children with complex FS and febrile status epilepticus

As a practical consequence, LP should not be performed routinely. current guidelines no longer support routine LP in well appearing, fully immunized children who present with a simple FS.

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