

Bacterial Meningitis Among Pediatric Patients Presenting With Acute Febrile Seizure: A Report From A Tertiary Care Center Of Bihar

Syed Atif Hassan¹, Ranjit Kumar^{2*}, Madiha Shadab³, Binod Kumar Singh⁴

¹Senior Resident, Department of Pediatrics, NMCH, Patna, Bihar, India

²Senior Resident, Department of Pediatrics, NMCH, Patna, Bihar, India

³Senior Resident, Department of Anaesthesiology, PMCH, Patna, India

⁴Professor, Department of Pediatrics, NMCH, Patna, Bihar, India

Received: 11-11-2021 / Revised: 20-12-2021 / Accepted: 15-01-2022

Abstract

Introduction: Febrile seizures usually affect children between the ages of five months and six years with a prevalence of 3-8%, which makes them the most common type of seizures in childhood. Bacterial meningitis is one of the deadliest infections, affecting both adults and children, and defined as inflammation of the meninges covering the brain. With this background, a secondary data analysis was planned to find out the incidence of meningitis among pediatric patients presenting with febrile seizures. **Methodology:** A retrospective cross-sectional study on 150 Patients was conducted by the Department of Pediatrics Nalanda Medical College & Hospital, Patna, Bihar. Prior approval was obtained from the Institutional Ethics Committee. The study covered all patients who were diagnosed with or suspected of having febrile seizures in the period between September 2020 to August 2021. The patients' data were obtained from the hospital database and analyzed. **Results:** A total of 150 patients who presented to the hospital with febrile seizures in the period between September 2020 to August 2021 were identified, with a median age of 22.5 months. There was a male preponderance in the study population with 62.7% of patients being boys. Bacterial meningitis was suspected and lumbar puncture was performed among 17 out of 150 patients, this comprised 11.3% of the total study population. **Conclusion:** Febrile seizures are one of the most common presentations in the pediatric emergency department. Clinical judgment and balance between risk and reward remain the cornerstone in deciding which patients are more likely to benefit from the lumbar puncture.

Key Words: Bacterial Meningitis, Acute Febrile Seizure, Pediatric Patients

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/4.0>) and the Budapest Open Access Initiative (<http://www.budapestopenaccessinitiative.org/read>), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

A febrile seizure is generally defined as a seizure occurring with a febrile illness. The early literature did not exclude seizures that may have been associated with an underlying intracranial cause such as meningitis[1]. The definition of the 1980 febrile seizures consensus committee excluded seizures associated with an intracranial infection or had another identifiable cause or those presenting with a history of non-febrile seizures[2]. The International League Against Epilepsy (ILAE) 1993 committee established a more comprehensive definition of febrile seizures, "An epileptic seizure occurring in childhood after the age of one month, associated with a febrile illness not caused by an infection of the CNS, without previous neonatal seizures or a previous unprovoked seizure, and not meeting criteria for other acute symptomatic seizures"[3].

Febrile seizures usually affect children between the ages of five months and six years with a prevalence of 3-8%, which makes them the most common type of seizures in childhood[4]. Clearly, febrile seizures are a common issue, but they are usually considered benign and the treatment is generally supportive, including general principles of emergency care and abortion of the seizure, although most febrile seizures resolve spontaneously before arrival to the emergency department[5]. Febrile seizures are subdivided into simple and complex, simple febrile seizures are generalized, lasting less than 15 minutes and do not recur within 24 hours. In contrast, complex febrile seizures are either focal, prolonged (>15 minutes), or seizures that recur within 24 hours[6].

Bacterial meningitis is one of the deadliest infections, affecting both adults and children, and defined as inflammation of the meninges covering the brain[7]. While the worldwide incidence is difficult to determine, the median incidence globally in children was estimated to be 34 per 100,000 child-years, with a median fatality rate of 14.4%[8, 9]. Thus, early recognition and treatment are imperative to avoid poor outcomes[6]. Diagnosis of meningitis can often be difficult in the absence of signs of meningism, especially in children less than two years of age[10]. It is extremely rare for a simple febrile seizure to be the sole manifestation in patients with bacterial meningitis[11]. Yet one older study found that 70% of practitioners perform a lumbar puncture in patients presenting with febrile seizures[12]. This, combined with the high prevalence of febrile seizures in children means that many children may get exposed to unnecessary invasive procedures[13].

With this background, a secondary data analysis was planned to find out the incidence of meningitis among pediatric patients presenting with febrile seizures.

Methodology

A retrospective cross-sectional study was conducted by the Department of Pediatrics, Nalanda Medical College & Hospital, Patna, Bihar. Prior approval was obtained from the Institutional Ethics Committee. The study covered all patients who were diagnosed with or suspected of having febrile seizures in the period between September 2020 to August 2021. The patients' data were obtained from the hospital database and analyzed. The data included patient's demographics, clinical presentation and lab results. All the patients who presented with a seizure attack and a temperature of $\geq 38^{\circ}\text{C}$ (during or just after the seizure) were included. Any patients who had metabolic disturbances, a history of a non-febrile seizure or epilepsy

*Correspondence

Dr. Ranjit Kumar

Senior Resident, Department of Pediatrics, NMCH, Patna, Bihar, India.

E-mail: ranjit2k1dmch@gmail.com

syndrome, or those having major congenital or structural abnormalities were excluded.

All the collected data was entered and analyzed using Statistical package of Social Sciences, SPSS ver 20.0 (IBM Corp., Armonk, NY). Descriptive statistics was performed and result has been depicted in form of text, tables and figures.

Results

A total of 150 patients who presented to the hospital with febrile seizures in the period between September 2020 to August 2021 were identified, with a median age of 22.5 months. Age distribution of the patients has been shown in Figure 1. There was a male preponderance

in the study population with 62.7% of patients being boys. Bacterial meningitis was suspected and lumbar puncture was performed among 17 out of 150 patients, this comprised 11.3% of the total study population. Age and gender distribution of patients who underwent lumbar puncture and cerebral fluid study has been shown in Table 1. In total, a lumbar puncture was performed on 10 males and 7 females with a median age of 21 months.

The ones who tested positive for meningitis were four males and three females. Overall, only seven patients had meningitis. Overall, 7 out of 150 patients were tested positive for bacterial meningitis, hence overall incidence comes to 4.7%.

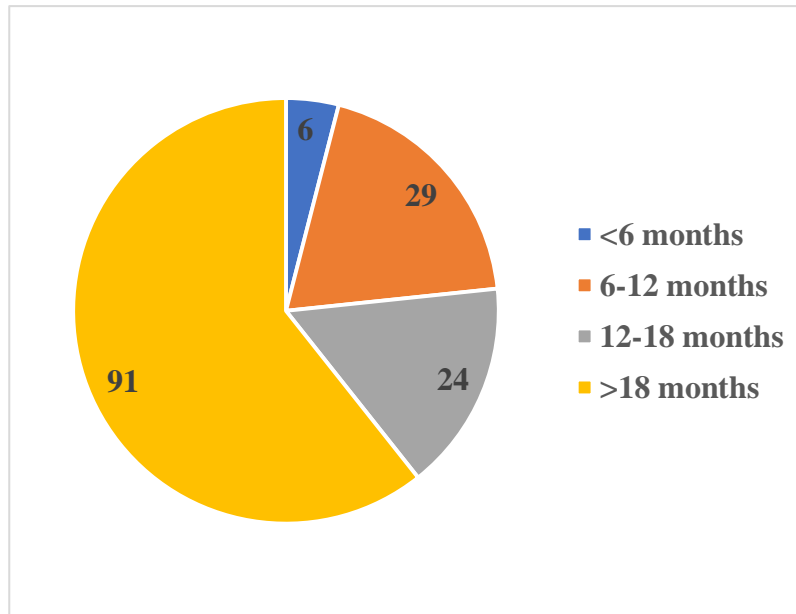


Fig. 1: Age distribution of the study participants

Table 1: Age and gender distribution of the study participants who underwent lumbar puncture

Age	Male	Female
< 6months	-	1
6-18 months	3	1
>18 months	7	5

Discussion

Out of the total number of patients presenting with febrile seizures, males constituted a higher proportion. This is consistent with the figures in a recently reported meta-analysis of 1.6:1 male-to-female ratio[14]. The results of the study clearly show that meningitis is not common among patients presenting with febrile seizures, with an overall incidence of 4.7%. This is, however, higher than the previously reported national incidence of 12 in 10,000, but it is up for debate whether this is enough difference to merit a higher index of suspicion of meningitis in patients with febrile seizures. In the study done by Casasoprana et al., their reported incidence of bacterial meningitis was much higher than this study, at 1.9% among patients with febrile seizures[15]. In the studies done by Fletcher and Sharieff and Kimia et al. where discrimination between simple and complex febrile seizures was done and only patients with complex febrile seizures were included, the reported incidence among the total population in those studies was 0.5% and 0.57%, respectively[16-19]. There was no significant difference in gender distribution of patients with bacterial meningitis (P>0.05). Similar results were reported by Owusu-Ofori et al. who found 19 cases of bacterial meningitis among 608 patients with febrile seizures; 9 were males and 11 were females[18]. In the study done by Tavasoli et al., they also reported a similar result, 19(4.5%) cases of meningitis among 681 patients with

febrile seizure. Eleven patients (58%) were males and nine patients (42%) were females[19].

Lumbar puncture was performed on 17 out of 150 patients; this rate is definitely lower than previously reported rates in other recent studies. Casasoprana et al. reported that 40% of patients with febrile seizures were subjected to lumbar puncture in Toulouse, France[15]. Kimia et al. reported a higher rate of 65%, and Fletcher et al. reported a similar rate of 70.5%[16, 17]. It is important to note, however, that both Kimia et al. and Fletcher et al. only included patients with complex febrile seizures in their studies, while the study done by Casasoprana et al. -similar to our study- did not make a distinction between the two types of seizures[15-17].

Conclusion

Febrile seizures are one of the most common presentations in the pediatric emergency department. While the disease is usually benign in nature, the distinction between it and bacterial meningitis is paramount to avoid poor outcomes associated with bacterial meningitis. Bacterial meningitis is rare among patients with febrile seizures and it is not often necessary to expose this population to redundant invasive testing. Clinical judgment and balance between risk and reward remain the cornerstone in deciding which patients are more likely to benefit from the lumbar puncture.

References

1. Stafstrom C. *Febrile Seizures*. Cambridge: Academic Press; 2002. The incidence and prevalence of febrile seizures; pp. 1–25.
2. Febrile seizures: long-term management of children with fever-associated seizures. Anonymous Anonymous. <https://pediatrics.aappublications.org/content/66/6/1009.2> *Pediatrics*. 1980; 66:1009–1012.
3. Guidelines for epidemiologic studies on epilepsy. Commission on Epidemiology and Prognosis, International League Against Epilepsy. Anonymous Anonymous. *Epilepsia*. 1993; 34:592–596.
4. Millichap J. Waltham: Up To Date; 2019. Clinical features and evaluation of febrile seizures.
5. Atualização no diagnóstico e tratamento das crises epilépticas febris. Siqueira L. *Rev Assoc Med Bras*. 2010; 56:489–492.
6. Febrile seizures: guideline for the neurodiagnostic evaluation of the child with a simple febrile seizure. American Academy of Pediatrics. *Pediatrics*. 2011; 127:389–394.
7. Management of acute meningitis. Griffiths M, McGill F, Solomon T. *Clin Med*. 2018; 18:164–169.
8. Epidemiology of bacterial meningitis. Gold R. *Infect Dis Clin North Am*. 1999; 13:515–525.
9. Estimating global and regional morbidity from acute bacterial meningitis in children: assessment of the evidence. Lukšić I, Mulić R, Falconer R, Orban M, Sidhu S, Rudan I. *Croat Med J*. 2013; 54:510–518.
10. Febrile seizures: an update. Waruiru C, Appleton R. *Arch Dis Child*. 2004; 89:751–756.
11. Can seizures be the sole manifestation of meningitis in febrile children? Green SM, Rothrock SG, Clem KJ, Zurcher RF, Mellick L. <https://pediatrics.aappublications.org/content/92/4/527?download=true>. *Pediatrics*. 1993; 92:527–534.
12. Management of febrile seizures: current concepts and recommendations for phenobarbital and the electroencephalogram. Millichap JG. *Clin Electroencephalogr*. 1991; 22:5.
13. Febrile seizures. Sadleir LG, Scheffer IE. *BMJ*. 2007; 334:307–311.
14. Febrile seizures: an overview. Leung A, Hon K, Leung T. *Drugs Context*. 2018;7:1–12.
15. Value of lumbar puncture after a first febrile seizure in children aged less than 18 months. A retrospective study of 157 cases. Casasoprana A, Hachon Le Camus C, Claudet I, et al. *Arch Pediatr*. 2013;20:594–600.
16. Necessity of lumbar puncture in patients presenting with new onset complex febrile seizures. Fletcher E, Sharieff G. *West J Emerg Med*. 2013;14:206–211.
17. Yield of lumbar puncture among children who present with their first complex febrile seizure. Kimia A, Ben-Joseph E, Rudloe T, et al. *Pediatrics*. 2018;126:62–69.
18. Routine lumbar puncture in children with febrile seizures in Ghana: should it continue? Owusu-Ofori A, Agbenyega T, Ansong D, Scheld W. *Int J Infect Dis*. 2019;8:353–361.
19. Frequency of meningitis in children presenting with febrile seizures at Ali-Asghar Children's Hospital. Tavasoli A, Afsharkhas L, Edraki A. *Iran J Child Neurol*. 2021;8:51–56.

Conflict of Interest: Nil Source of support: Nil