ISSN: 2091-2749 (Print)
2091-2757 (Online)

Submitted on: 2026 May 4
Accepted on: 2026 Jun 23

https://doi.org/10.3126/jpahs.v13i1.96336

Outcome of lumbar puncture in children with first episode of complex febrile seizure admitted at tertiary care hospital in Nepal: a retrospective descriptive cross-sectional study

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Abstract

Introduction: Complex febrile seizures (CFS) occur in 15–20% of children experiencing febrile seizures and often prompt lumbar puncture (LP) to rule out meningitis. However, widespread immunization with Haemophilus influenzae type b (Hib) and pneumococcal conjugate vaccines (PCV) has significantly reduced the incidence of bacterial meningitis. This study aimed to assess the diagnostic yield of LP in children presenting with a first episode of CFS at a tertiary care center in Nepal.

Method: This descriptive cross-sectional study was conducted at Patan Hospital from January 2021 to December 2023. Medical records of children aged 6 months to 5 years admitted with a first episode of CFS were retrospectively reviewed. CFS was defined as a febrile seizure lasting >15 minutes, focal, or recurring within 24 hours. Meningitis was defined by Cerebrospinal fluid (CSF) pleocytosis (>5 WBC/mm^3) or positive culture. The data were analyzed via Microsoft Excel and the Statistical Package for Social Sciences (SPSS) version 16. We used descriptive statistics to determine the frequency of meningitis among children with CFS.

Result: Out of 76 children included, 50(65.79%) were male and the mean age was 2.04±0.94 years. LP was performed in 13(17.11%) children; 2(2.63%) had CSF pleocytosis. No pathogens were isolated on culture. All children had received Hib vaccination and 74(97.37%) received PCV. All recovered fully.

Conclusion: The proportion of meningitis was low among children with CFS who underwent LP, supporting selective LP use in fully immunized, well-appearing children. Clinical judgment and vaccination history remain key to avoiding unnecessary invasive procedures.

Keywords: Complex Febrile Seizure; Lumbar Puncture; Meningitis

How to Cite: Pokhrel B, Poudel A, Bijukchhe SM, Giri A. Outcome of lumbar puncture in children with first episode of complex febrile seizure admitted at tertiary care hospital in Nepal: a retrospective descriptive cross-sectional study. J Patan Acad Health Sci. 2026 Jun;13(1):70-73.

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Introduction

Febrile seizures typically occur in children between the ages of 6 months and 5 years, with a fever greater than 100.4 °F (38 °C) in absence of central nervous system (CNS) infection, metabolic imbalance, and prior afebrile seizures.[1] The prevalence of febrile seizures in healthy children is estimated at 2–5%, with complex febrile seizures accounting for approximately 15–20% of these cases.[2,3] Lumbar puncture (LP) is often done to rule out meningitis in children presenting as febrile seizures who have clinical suspicion of meningitis, taken antibiotics prior to presentation, and who have not completed their immunization with Pneumococcal or Haemophilus vaccines. [4]

The prevalence of bacterial meningitis in children has drastically reduced due to the use of the conjugate vaccines.[5] A study done in France over a period of five years found 0.7 % prevalence of meningitis among children diagnosed with CFS.[2]

There is no recent Nepal – specific data on the yield of LP in children presenting with complex febrile seizure in Nepal. So, this study aimed to find the yield of lumbar puncture in children with the first episode of CFS admitted to Patan Hospital.

Method

A descriptive cross-sectional study was conducted at Patan Hospital. We performed a retrospective review of records of all children from six months to five years of age with complex febrile seizure admitted to the pediatrics department from January 2021 to December 2023.The hospital number of all the children admitted with the first episode of CFS were noted from the daily log record of all the admissions available from the paediatric department and their charts were retrieved from the record section of the hospital to collect all the relevant data including the vaccination status which is recorded in their admission details. The study was conducted after ethical clearance from the Institutional Review Committee of PAHS (reference number drs2501171975). All the children from six months to five years of age with the first episode of complex febrile seizure admitted to the pediatrics department were included for the study. The missing records of any of the study variables, children with prior afebrile seizures, children with known comorbidity causing seizure, children with neurosurgical intervention and children with alleged history of head trauma were excluded from our study.

CFS was defined as febrile seizure which lasted for more than 15 minutes, focal and/ or recurred within 24 hours. Leukocyte count more than 5/mm3 was considered as CSF pleocytosis.[1] Meningitis was considered if Cerebrospinal Fluid (CSF) had White Blood Count (WBC) >5, or pathogen was isolated from the CSF culture.[1]

The data were analysed via Microsoft Excel and the Statistical Package for Social Sciences (SPSS) version 16. We used descriptive statistics to determine the frequency of meningitis among children with CFS.

Result

A total of 76 children under five years of age presenting with a first episode of CFS were included in the study. The mean age of the study population was 2.04±0.94 years. Among the children 31(40.79%) were between 1–2 years of age. (Table 1)

Table 1. Clinico-demographic profile and outcome among children with first episode of complex febrile seizure, N=13

Variables	*f* (%)
Age group in year	
<1	8(10.53%
1-2	31(40.79%)
2-3	27(35.52%)
3-4	7(9.21%)
>4	3(3.95%)
Gender	
Male	50(65.79%)
Female	26(34.21%)
Vaccination status	
Hib	76(100.00%)
PCV	74(97.37%)
LP performed	
Yes	13(17.11%)
No	63(82.89%)
Treatment outcome	
Recovered	76(100.00%)

Among the children, 50(65.79%) were male. All children had received Haemophilus influenzae type B (Hib) vaccination, and 74(97.37%) had received the pneumococcal conjugate vaccine (PCV). LP was performed in 13(17.11%) children. Out of these, 2(2.63%) patients had meningitis. All children included in the study had full clinical recovery. (Table 2)

Table 2. Proportion of Cerebrospinal fluid pleocytosis and culture positivity among children with first episode of CFS

Variables	*f* (%)
CSF pleocytosis	
Yes	2(2.63%)
No	74(97.37%)
CSF culture	
Positive	0(0.00%)
Negative	76(100.00%)

Discussion

In this study, we found the prevalence of meningitis among children presenting with a first episode of CFS to be 2.63%. Notably, both cases occurred in children aged below 12 months, a group in which clinical signs of meningitis may be subtle or absent due to the presence of an open anterior fontanelle.[6] This anatomical feature can reduce the likelihood of raised intracranial pressure presenting with classical

meningeal signs, thereby complicating early clinical detection.[1] Epidemiologically, this age group also bears the highest population risk for meningitis, estimated at 115 per 100,000, compared to 28.5 per 100,000 among children aged 1–5 years.[7] However, the widespread administration of Hib and PCV vaccines has significantly reduced the incidence of invasive bacterial infections in this age group.[8]

Our findings align with several international studies. A study from Israel further supports our findings, reporting that among children with febrile seizures, aseptic meningitis occurred in only two infants, and no case of bacterial meningitis was identified, similar to our results.[9] This consistency across various geographic regions suggests that the true prevalence of bacterial meningitis in immunized children presenting with CFS is exceedingly low.[10]

Another study from South Korea reported CSF pleocytosis in 19 (2.79%) children with febrile seizures, closely resembling the 2.63% observed in our study.[11] A large retrospective study from Boston Children's Hospital found CSF pleocytosis in 14 (2.7%) out of 526 children with febrile seizures, which was similar to our finding. Notably, most cases in the Boston cohort were also diagnosed as aseptic meningitis.[12]

Similarly, a study conducted in France observed pleocytosis in 22 children, of which 5 had positive CSF cultures for bacterial pathogens, again indicating a higher yield of confirmed bacterial meningitis compared to our findings where there were no culture confirmed meningitis.[2] This discrepancy may be due to prior antibiotic use before performing lumbar puncture and inadequate CSF samples, both of which can lead to sterilization or reduced diagnostic yield of CSF cultures.

Taken together, these findings reinforce that routine lumbar puncture may not be necessary in well-appearing, fully immunized children with CFS, especially beyond infancy, unless other risk factors or clinical signs are present.[4,13] However, caution is warranted in infants under one year, where clinical signs are unreliable and the risk of meningitis remains relatively higher.

In our study, 100% had received Hib vaccination, and 97.37% were immunized with PCV, underscoring the critical role of immunization in preventing invasive bacterial infections. A systematic review reported that three doses of the Hib vaccine prevented 38–43% of childhood meningitis-related deaths, while PCV provided an additional 28–35% mortality reduction.[14] This reinforces the impact of conjugate vaccines not only in reducing disease incidence but also in lowering meningitis-related mortality among children.[8,15]

In our study, 17.1% of children underwent lumbar puncture, a proportion comparable to a study from Israel reporting a rate of 18.7%.[9] In contrast, a substantially higher proportion of 64% was observed in a study conducted at Boston Children's Hospital.[12] The disparity in LP rates across different studies likely reflects variations in clinical guidelines adherence, institutional protocols, physician training, and local epidemiology of bacterial meningitis.[16]

In our study, 65.79% of children with CFS were male, indicating a male predominance. Similarly, a study conducted in the United States reported that 57.1% of children with CFS were male.[17] Complex febrile seizure are more frequently observed in males, potentially due to sex-related neurobiological differences that lead to greater neuronal excitability in males compared to females.[18, 19]

This study has several limitations. Firstly, this was a single-center study, which may limit the generalizability of findings. Secondly, the number of participants was relatively small, potentially affecting the precision of the prevalence estimate for meningitis. Thirdly, not all children underwent lumbar puncture, and the decision to perform LP was based on clinical judgment, which may have introduced selection bias. So this finding shows the prevalence of meningitis only among those cases of complex febrile seizures who underwent lumbar puncture based on clinical suspicion of meningitis. Lastly, data limitations due to retrospective chart reviews, including incomplete documentation and potential variability in clinical assessment may have influenced the accuracy of recorded variables and outcomes.

Conclusion

The prevalence of meningitis among children with a first episode of complex febrile seizures in our study was low indicating a low diagnostic yield of lumbar puncture in this population. This supports the selective use of lumbar puncture, particularly in children who are fully immunized and do not exhibit clinical signs suggestive of central nervous system infection.

Our findings also highlight the reassuring outcomes in children with complex febrile seizures, with complete recovery in all cases and no culture-positive bacterial meningitis observed. Judicious clinical evaluation, supported by vaccination history and neurological assessment, remains essential in determining the need for invasive investigations like lumbar puncture.

Acknowledgement

None

Conflict of Interest

None

Funding

None

Author Contribution

Concept, design, planning: BP, AP, SMB, AG; Literature review: BP, AP, SMB, AG; Data collection: BP, AP; Data analysis: BP, AP, SMB, AG; Draft manuscript: BP, AP, SMB, AG; Revision of draft: BP, AP, SMB, AG; Final manuscript: BP, AP, SMB, AG.

References

1. Kliegman RM, Stanton BF, St. Geme JW, Schor NF, Behrman RE, editors. Nelson Textbook of Pediatrics. 20th ed. Philadelphia: Elsevier; 2016. 2017 p. Weblink
2. Guedj R, Chappuy H, Titomanlio L, De Pontual L, Biscardi S, Nissack-Obiketeki G, et al. Do All Children Who Present With a Complex Febrile Seizure Need a Lumbar Puncture? Ann Emerg Med. 2017 Jul;70(1):52-62.e6. DOI
3. Rivas-García A, Ferrero-García-Loygorri C, Carrascón González-Pinto L, Mora-Capín AA, Lorente-Romero J, Vázquez-López P. Simple and complex febrile seizures: is there such a difference? Management and complications in an emergency department. Neurologia (Engl Ed). 2022 Jun;37(5):317-24. DOI
4. Subcommittee on Febrile Seizures, American Academy of Pediatrics. Neurodiagnostic evaluation of the child with a simple febrile seizure. Pediatrics. 2011 Feb;127(2):389-94. DOI
5. Koelman DLH, van Kassel MN, Bijlsma MW, Brouwer MC, van de Beek D, van der Ende A. Changing Epidemiology of Bacterial Meningitis Since Introduction of Conjugate Vaccines: 3 Decades of National Meningitis Surveillance in The Netherlands. Clin Infect Dis. 2021 Sep 7;73(5):e1099–107. DOI
6. Guarnera A, Moltoni G, Dellepiane F, Lucignani G, Rossi-Espagnet MC, Campi F, et al. Bacterial Meningoencephalitis in Newborns. Biomedicines. 2024 Oct 30;12(11):2490. DOI
7. Armon K, Stephenson T, MacFaul R, Hemingway P, Werneke U, Smith S. An evidence and consensus based guideline for the management of a child after a seizure. Emerg Med J. 2003 Jan;20(1):13–20. DOI
8. Fitzwater SP, Ramachandran P, Kahn GD, Nedunchelian K, Suresh S, Santosham M, et al. Impact of the introduction of the Haemophilus influenzae type b conjugate vaccine in an urban setting in southern India. Vaccine. 2019 Mar 14;37(12):1608–13. DOI
9. Watemberg N, Sarouk I, Fainmesser P. Acute meningitis among infants and toddlers with febrile seizures: time for a reappraisal of the value of a lumbar puncture. Isr Med Assoc J. 2012 Sep;14(9):547–9. PubMed
10. Najaf-Zadeh A, Dubos F, Hue V, Pruvost I, Bennour A, Martinot A. Risk of bacterial meningitis in young children with a first seizure in the context of fever: a systematic review and meta-analysis. PLoS One. 2013;8(1):e55270. DOI
11. Kim YZ, Jung HW, Lee EH. Clinical Significance of Lumbar Puncture in Children with First Febrile Seizures. Iran J Child Neurol. 2024;18(4):23-32. DOI
12. Kimia A, Ben-Joseph EP, Rudloe T, Capraro A, Sarco D, Hummel D, et al. Yield of lumbar puncture among children who present with their first complex febrile seizure. Pediatrics. 2010 Jul;126(1):62–9. DOI
13. Jaber L, Levy C, Ouldali N, Varon E, Taha MK, Bonacorsi S, et al. Acute bacterial meningitis without cerebrospinal fluid pleocytosis in children: results from a nationwide prospective surveillance system between 2001 and 2022. Int J Infect Dis. 2024 Dec;149:107256. DOI
14. Davis S, Feikin D, Johnson HL. The effect of Haemophilus influenzae type B and pneumococcal conjugate vaccines on childhood meningitis mortality: a systematic review. BMC Public Health. 2013 Sep 17;13(3):S21. DOI
15. Gilsdorf JR. Hib Vaccines: Their Impact on Haemophilus influenzae Type b Disease. J Infect Dis. 2021 Sep 30;224(12 Suppl 2):S321-S330. DOI
16. Raghavan VR, Porter JJ, Neuman MI, Lyons TW. Trends in Management of Simple Febrile Seizures at US Children's Hospitals. Pediatrics. 2021 Nov;148(5):e2021051517. DOI
17. Kannikeswaran N, Sivaswamy L, Farooqi A, Sethuraman U. Children With Complex Febrile Seizures: Is Hospital Admission Necessary? Clin Pediatr (Phila). 2021 Jul;60(8):363–9. DOI
18. Lemmens EMP, Lubbers T, Schijns OEMG, Beuls EAM, Hoogland G. Gender differences in febrile seizure-induced proliferation and survival in the rat dentate gyrus. Epilepsia. 2005 Oct;46(10):1603–12. DOI
19. Leung AK, Hon KL, Leung TN. Febrile seizures: an overview. Drugs Context. 2018 Jul 16;7:212536. DOI