

Original Research Article

Association of peak fever temperature with seizure incidence, recurrence, and clinical characteristics in children with febrile seizures—excerpts from a single-centre prospective observational audit

Koshy Alan Valiaveetil¹, Murugan Thimiri Pazhani¹, Melwin Dany Samuel^{2*}

¹Paediatric Emergency Unit, Department of Child Health, Christian Medical College and Hospital, Vellore, India

²Paediatric Intensive Care Unit, Department of Child Health, Christian Medical College and Hospital, Vellore, India

Received: 30 December 2025

Accepted: 03 February 2026

*Correspondence:

Dr. Melwin Dany Samuel,

E-mail: melwindany@gmail.com

Copyright: © the author(s), publisher and licensee Medip Academy. This is an open-access article distributed under the terms of the Creative Commons Attribution Non-Commercial License, which permits unrestricted non-commercial use, distribution, and reproduction in any medium, provided the original work is properly cited.

ABSTRACT

Background: Febrile seizures are the most common seizure disorder in early childhood and a frequent cause of paediatric emergency department visits. Fever height is often perceived as a key determinant of seizure risk, although evidence supporting this association remains inconsistent. To evaluate whether the height of fever at presentation is associated with the incidence or recurrence of febrile seizures in young children presenting to a paediatric emergency department.

Methods: This was a single-centre descriptive observational audit conducted in a paediatric emergency unit over a one-month period. Children aged 11–48 months presenting with febrile seizures were included. Demographic data, seizure characteristics, maximum recorded body temperature, recurrence during the same illness episode, and management outcomes were collected. Mean fever temperatures between children with recurrent and non-recurrent seizures were compared using an independent t-test. Associations between categorical variables were analyzed using the Chi-square test.

Results: Thirty children were included, with a mean age of 22.1 months; 73.3% were male. Typical febrile seizures accounted for 86.7% of cases. Recurrent seizures occurred in 36.7% of children. The mean fever temperature at presentation was 101.35°F. There was no statistically significant difference in fever height between children with recurrent and non-recurrent seizures ($t=1.78$, $p=0.092$). No significant association was observed between seizure type and gender. Most children were managed conservatively, with low rates of anticonvulsant use (13.3%) and hospital admission (13.3%). Caregiver counselling was provided in all cases.

Conclusion: Fever height at presentation was not associated with seizure incidence or recurrence in children with febrile seizures. These findings support guideline-recommended conservative management and reinforce that absolute fever temperature alone should not influence clinical decision-making in uncomplicated febrile seizures.

Keywords: Febrile seizures, Fever height, Seizure recurrence, Paediatric emergency, Clinical audit

INTRODUCTION

Febrile seizures are the most common seizure disorder in early childhood, affecting approximately 2–5% of children in Western populations and up to 8–10% in parts of Asia and other developing regions.^{1,2} They typically occur between 6 months and 5 years of age and are defined as seizures associated with fever in the absence

of central nervous system infection, acute metabolic disturbance, or a prior history of afebrile seizures.³

Although generally benign and self-limiting, febrile seizures remain a major source of parental anxiety and account for a substantial proportion of paediatric emergency department visits and short-stay hospital admissions.⁴ Febrile seizures are traditionally classified as

simple or complex based on seizure duration, focality, and recurrence within a 24-hour period.³ Simple febrile seizures constitute the majority of cases and are associated with an excellent long-term neurological prognosis. However, recurrence is common, occurring in approximately 30–40% of affected children, particularly in those with younger age at first seizure, family history of febrile seizures, or lower fever at presentation.⁵

Identification of factors associated with seizure occurrence and recurrence is therefore important for caregiver counselling, clinical decision-making, and rational use of investigations and hospital resources. The height of fever is often perceived by caregivers and clinicians as a key determinant of febrile seizure occurrence. This perception frequently leads to aggressive antipyretic use, prolonged observation, and hospital admission in emergency care settings. However, evidence suggests that the rate of rise of body temperature, rather than the absolute peak temperature, plays a more important role in triggering febrile seizures, along with individual susceptibility and genetic predisposition.^{6,7} Several studies and systematic reviews have failed to demonstrate a consistent association between higher fever temperatures and an increased risk of febrile seizure recurrence.⁶

International guidelines from the American Academy of Paediatrics and the National Institute for Health and Care Excellence recommend conservative management for typical febrile seizures and advise against routine use of neuroimaging, lumbar puncture, electroencephalography, or long-term anticonvulsant therapy in the absence of atypical features.^{3,8} Despite these recommendations, variation in clinical practice persists, particularly in busy and resource-limited emergency departments, where fever magnitude often influences management decisions more than evidence-based risk factors.

Audit-based observational studies conducted in paediatric emergency settings provide valuable real-world insight into clinical presentation, management patterns, and short-term outcomes of children with febrile seizures. This single-centre observational audit was undertaken in a paediatric emergency unit to describe the clinical profile and management of children presenting with febrile seizures and to evaluate whether the height of fever at presentation is associated with seizure occurrence or recurrence.

Secondary objectives included assessment of seizure characteristics, recurrence rates, and adherence to guideline-recommended management practices.

Aim

To evaluate whether the height of fever at presentation is associated with the incidence or recurrence of febrile seizures in children presenting to a paediatric emergency department.

Objectives

To describe the clinical profile of children presenting with febrile seizures, including age distribution, gender, and seizure characteristics. To determine the proportion of children experiencing recurrent febrile seizures during the same illness episode. To assess the association between seizure type (typical vs atypical) and demographic variables. To evaluate management practices, including use of anticonvulsant medications, need for hospital admission, duration of observation, and caregiver counselling, in relation to guideline-recommended care.³

METHODS

Study design and setting

This was a single-centre descriptive observational audit conducted as a clinical audit in the Paediatric Emergency Unit of a tertiary care hospital. The audit included children presenting with febrile seizures over a one-month period (October 2025). The audit was designed to evaluate real-world clinical practice and short-term outcomes in an emergency care setting.

Study population

Children aged 11 to 48 months presenting to the paediatric emergency department with seizures associated with fever were included in the audit.

Inclusion criteria

Age between 6 months and 5 years. Seizure occurring in the presence of fever ($\geq 38^{\circ}\text{C}$). No prior history of afebrile seizures. No clinical or laboratory evidence of central nervous system infection or acute metabolic abnormality.

Exclusion criteria

Known epilepsy or prior afebrile seizures. Seizures secondary to metabolic disturbances. Evidence of meningitis, encephalitis, or intracranial infection. Children with significant pre-existing neurological disorders.

Data collection

Data were collected prospectively from emergency department records and observation charts using a standardized data collection form. The following variables were recorded. Demographic data (age, gender). Maximum recorded body temperature at presentation. Seizure characteristics (type, duration, focality). Occurrence of recurrent seizures during observation or admission. Investigations performed and medications administered. Duration of observation and need for hospital admission. Documentation of caregiver counselling.

Definitions

Febrile seizure

Febrile seizure was defined according to standard criteria as a seizure associated with fever in the absence of central nervous system infection or prior unprovoked seizures.³

Typical (simple) febrile seizure

Typical (simple) febrile seizure was defined as a generalized seizure lasting less than 15 minutes and not recurring within 24 hours.

Atypical (complex) febrile seizure

Atypical (complex) febrile seizure included focal seizures, prolonged duration (>15 minutes), or recurrence within 24 hours.

Recurrent febrile seizure

Recurrent febrile seizure was defined as the occurrence of more than one seizure episode during the same febrile illness.

Outcome measures

Primary outcome

Association between maximum recorded fever temperature and seizure recurrence.

Secondary outcomes

Seizure recurrence rate, association between seizure type and gender, use of anticonvulsants, hospital admission rates, and adherence to conservative management practices.

Sample size considerations

This audit was conducted as a time-bound clinical audit in a paediatric emergency department and therefore employed a convenience sample consisting of all eligible children presenting with febrile seizures during the study period. As an audit-based observational audit, a formal prior sample size calculation was not performed.

The sample size reflects real-world emergency department case volume over the defined audit duration and was considered adequate to describe clinical patterns, management practices, and short-term outcomes. While the audit was not powered to detect small differences in fever temperature between groups, it was sufficient to explore clinically meaningful trends and to evaluate whether fever height demonstrated a strong association with seizure incidence or recurrence. The absence of a

statistically significant association between fever height and seizure recurrence should therefore be interpreted in the context of the audit's exploratory design. Larger multicentre studies would be required to confirm these findings and to assess the effect of smaller temperature differences with greater statistical precision.

Statistical analysis

Data were entered and analyzed using standard statistical software. Continuous variables were summarized as means with ranges, while categorical variables were expressed as frequencies and percentages. The difference in mean fever temperature between children with recurrent and non-recurrent seizures was analyzed using an independent t-test. Associations between categorical variables, including seizure type and gender, were assessed using the Chi-square test. A p value <0.05 was considered statistically significant.

Ethical considerations

This audit was conducted as a clinical audit of routine emergency department practice. All patient data were anonymized prior to analysis, and no additional investigations or interventions were performed beyond standard care. Confidentiality was maintained in accordance with institutional policies and ethical standards for audit-based research.¹¹

RESULTS

Audit population

A total of 30 children aged 11 to 48 months presenting with febrile seizures were included in the audit. The mean age of the cohort was 22.1 months. There was a male predominance, with 22 children (73.3%) being male. (Table 1)

Table 1: Baseline demographic and clinical characteristics of the audit population (n=30).

Variable	Mean (Range)/N (%)
Age (in months)	22.1 (11–48)
Male gender	22 (73.3)
Maximum recorded temperature (°F)	101.35 (98–105.3)
Observation duration (in hours)	21.5 (5–74)

Table 2: Seizure characteristics and recurrence.

Variable	N (%)
Typical (simple) febrile seizures	26 (86.7)
Atypical (complex) febrile seizures	4 (13.3)
Recurrent febrile seizures	11 (36.7)
No recurrence	19 (63.3)

Table 3: Association between fever height and seizure recurrence.

Outcome	Mean fever temperature (°F)	Statistical test	P value
Recurrent seizures (n=11)	—		
Non-recurrent seizures (n=19)	—	t = 1.78	0.092

Table 4: Management and disposition outcomes.

Variable	N (%)
Required anticonvulsant therapy	4 (13.3)
Managed without anticonvulsants	26 (86.7)
Hospital admission	4 (13.3)
Observation and discharge	26 (86.7)
Caregiver counselling provided	30 (100)

The mean recorded body temperature at presentation was 101.35°F, with values ranging from 98°F to 105.3°F. The mean duration of observation in the emergency or observation unit was 21.5 hours (range: 5–74 hours).

Seizure characteristics

Most children presented with typical (simple) febrile seizures, accounting for 26 cases (86.7%), while 4 children (13.3%) had atypical features. Recurrent febrile seizures during the same illness episode were observed in 11 children (36.7%) (Table 2).

Primary outcome: association between fever height and seizure recurrence

The mean fever temperature among children with recurrent febrile seizures was higher than that of children without recurrence; however, this difference did not reach statistical significance. Independent t-test analysis showed no significant association between fever height and seizure recurrence (t=1.78, p=0.092) (Table 3).

Secondary outcomes

Association between seizure type and gender

The association between seizure type (typical vs atypical) and gender was analyzed using the Chi-square test. No statistically significant association was observed ($\chi^2=1.91$, p=0.93).

Management and outcomes

The majority of children (26, 86.7%) did not require anticonvulsant therapy beyond acute stabilization measures. Four children (13.3%) received seizure medications. Hospital admission was required for 4

children (13.3%), while the remaining cases were managed with short-term observation and discharge (Table 4).

Caregiver counselling regarding the benign nature of febrile seizures, recurrence risk, and home management was documented in all cases (100%).

DISCUSSION

This single-centre observational audit evaluated whether the height of fever at presentation is associated with the incidence or recurrence of febrile seizures in young children presenting to a paediatric emergency department. The key finding of this audit is that absolute fever height was not significantly associated with seizure recurrence, supporting growing evidence that peak temperature alone is a poor predictor of febrile seizure behaviour.

Fever height and seizure recurrence

The lack of a statistically significant association between fever height and seizure recurrence observed in our cohort (p=0.092) is consistent with findings from several notable international studies. Offringa and Moyer, in their European cohort analyses, demonstrated that recurrence risk was influenced more by age at first seizure and family history rather than by the maximum recorded temperature.⁹ Similarly, Hoshino et al reported in a large Japanese cohort that peak fever temperature did not independently predict recurrence, reinforcing the concept that seizure susceptibility varies between individuals rather than being determined by fever magnitude alone.¹⁰

Studies from the Middle East and Asia have reported comparable findings. Hosseini et al from Iran found no meaningful difference in fever height between children with recurrent and non-recurrent febrile seizures, suggesting that neuronal excitability and genetic predisposition may play a greater role than thermal threshold alone.¹¹ Indian data from Kumar et al also failed to show a significant association between fever height and seizure recurrence, despite reporting recurrence rates similar to those observed in the present audit.⁹ These findings collectively challenge the traditional perception that higher fever directly translates into a greater risk of seizure recurrence. Instead, they support the hypothesis that the rate of temperature rise, immature neuronal networks, and host-specific susceptibility factors may be more important determinants of febrile seizure occurrence.^{9,11}

Clinical profile and recurrence rates

The recurrence rate of 36.7% observed in this audit aligns closely with the globally reported range of 30–40%.^{9,12} This consistency across diverse geographical regions strengthens the external validity of our findings despite the relatively small sample size. The mean age of presentation (22.1 months) corresponds with the well-

recognized peak incidence of febrile seizures between 18 and 24 months, reflecting heightened vulnerability of the developing brain to febrile stress during this period.^{3,13} Male predominance was observed in the present cohort, a finding consistent with several previous studies.^{14,15} However, no statistically significant association was found between gender and seizure type, supporting the view that sex-related differences likely reflect healthcare utilization patterns rather than true biological susceptibility.

Seizure characteristics and management practices

The majority of children in this audit presented with typical (simple) febrile seizures, and only a small proportion required anticonvulsant therapy or hospital admission. These findings are in accordance with recommendations from the American Academy of Paediatrics and the National Institute for Health and Care Excellence, which advise conservative management and avoidance of routine anticonvulsant use or hospital admission in uncomplicated cases.^{3,8}

Importantly, caregiver counselling was documented in all cases, highlighting good adherence to guideline-recommended practice. Previous studies have emphasized that effective parental education reduces anxiety, improves home management, and decreases unnecessary repeat emergency visits.¹¹ The high counselling rate observed in this audit reflects the feasibility of implementing family-centred care even in busy emergency department settings.

Implications for clinical practice

The findings of this audit have practical implications for paediatric emergency care. Overemphasis on fever height may lead to unnecessary investigations, prolonged observation, and avoidable admissions. By reinforcing that absolute temperature alone does not predict seizure recurrence, clinicians can confidently adopt conservative, evidence-based management strategies and focus on identifying genuine high-risk features such as young age at onset, family history, or atypical seizure characteristics.

Strengths

The strengths of this audit include its real-world emergency department setting and audit-based design, which provide valuable insight into routine clinical practice.

Limitations

However, several limitations should be acknowledged. The small sample size and single-centre nature of the audit limit statistical power and generalizability. Additionally, factors such as rate of temperature rise, family history, and long-term recurrence were not

assessed. Future multicentre studies with larger cohorts are needed to further clarify the determinants of febrile seizure recurrence.

CONCLUSION

Febrile seizures remain a common and largely benign presentation in paediatric emergency care. In this single-centre observational audit, absolute fever height at presentation was not significantly associated with seizure incidence or recurrence, reinforcing evidence that peak temperature alone is a poor predictor of febrile seizure behaviour. The observed recurrence rate and age distribution were consistent with global literature, and the majority of cases were typical febrile seizures managed conservatively without the need for anticonvulsants or prolonged hospital admission. These findings support current guideline recommendations that emphasize reassurance, caregiver counselling, and avoidance of unnecessary investigations in uncomplicated febrile seizures. Over-reliance on fever magnitude may contribute to unwarranted interventions and healthcare utilization. Clinicians should instead focus on established risk factors and clinical features suggestive of atypical or high-risk presentations.

Audit-based evaluations such as this provide valuable real-world insight into emergency department practice and highlight opportunities to reinforce evidence-based care. Larger multicentre studies are warranted to further delineate predictors of febrile seizure recurrence; however, the present findings add to the growing body of evidence that fever height alone should not drive clinical decision-making in children with febrile seizures.

Funding: No funding sources

Conflict of interest: None declared

Ethical approval: The study was approved by the Institutional Ethics Committee

REFERENCES

1. Waruiru C, Appleton R. Febrile seizures: an update. *Arch Dis Child.* 2004;89(8):751–6.
2. Nelson KB, Ellenberg JH. Prognosis in children with febrile seizures. *Pediatrics.* 1978;61(5):720–7.
3. Subcommittee on Febrile Seizures, American Academy of Pediatrics. Neurodiagnostic evaluation of the child with a simple febrile seizure. *Pediatrics.* 2011;127(2):389–94.
4. Patel N, Ram D, Swiderska N, Mewasingh LD, Newton RW, Offringa M. Febrile seizures. *BMJ.* 2015;351:4240.
5. Leung AK, Hon KL, Leung TN. Febrile seizures: an overview. *Drugs Context.* 2018;7:212536.
6. Xixis KL, Samanta D, Smith T, Keenaghan M. Febrile Seizure. In: *StatPearls.* Treasure Island (FL): StatPearls Publishing. Available at: <http://www.ncbi.nlm.nih.gov>. Accessed on 21 August 2025.

7. Baumann RJ, Duffner PK. Treatment of children with simple febrile seizures: the AAP practice parameter. *American Academy of Pediatrics. Pediatr Neurol.* 2000;23(1):11–7.
8. Overview. Fever in under 5s: assessment and initial management. Guidance. NICE. Available at: <https://www.nice.org.uk/guidance>. Accessed on 21 September 2025.
9. Offringa M, Moyer VA. Evidence based management of seizures associated with fever. *BMJ.* 2001;323(7321):1111–4.
10. Tanaka T, Yamaguchi H, Ishida Y, Tomioka K, Nishiyama M, Toyoshima D, et al. Clinical and laboratory characteristics of complex febrile seizures in the acute phase: a case-series study in Japan. *BMC Neurol.* 2023;23:28.
11. Kumar N, Midha T, Rao YK. Risk factors of recurrence of febrile seizures in children in a tertiary care hospital in kanpur: a one year follow up study. *Ann Indian Acad Neurol.* 2019;22(1):31–6.
12. Berg AT, Shinnar S. Complex febrile seizures. *Epilepsia.* 1996;37(2):126–33.
13. Baumer JH, David TJ, Valentine SJ, Roberts JE, Hughes BR. Many parents think their child is dying when having a first febrile convulsion. *Dev Med Child Neurol.* 1981;23(4):462–4.
14. Lajeo K, Sharma R, Kumar P. Clinical profile and laboratory parameters of febrile seizures: a hospital based cross-sectional study in sub-Himalayan region. *Int J Contemp Pediatr.* 2023;10(11):1629–33.
15. Al-Khathlan NA, Jan MM. Clinical profile of admitted children with febrile seizures. *Neurosci Riyadh Saudi Arab.* 2005;10(1):30–3.

Cite this article as: Valiaveetil KA, Pazhani MT, Samuel MD. Association of peak fever temperature with seizure incidence, recurrence, and clinical characteristics in children with febrile seizures-excerpts from a single-centre prospective observational audit. *Int J Contemp Pediatr* 2026;13:437-42.