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Original Research Article

Risk Factors and Clinical Outcomes of Febrile Seizures in Children: A Retrospective Analysis

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Abstract:

Background: Febrile seizures are the most common convulsive events in children, often associated with fever and generally considered benign; however, certain risk factors may predispose to recurrence and adverse outcomes.

Objective: To evaluate the risk factors and clinical outcomes of febrile seizures in children.

Study Design: This retrospective study

Place and Duration of Study: Mayo Hospital Lahore from 23 Sep 2025 to 23 Nov 2025.

Methodology: A total of 265 children aged 6 months to 5 years presenting with febrile seizures. Data were collected from medical records, including demographic characteristics, clinical features, family history, laboratory parameters, and outcomes. Febrile seizures were classified as simple or complex.

Results: The mean age was 2.4 ± 1.3 years, with males 152 (57.4%) and females 113 (42.6%). Simple febrile seizures were observed in 189 (71.3%) patients, while 76 (28.7%) had complex seizures. Upper respiratory tract infections were the most common cause of fever 118 (44.5%). Recurrence was noted in 84 (31.7%) patients, ICU admission in 21 (7.9%), and subsequent epilepsy in 11 (4.2%). Significant associations were found between recurrence and younger age, positive family history, and complex seizure type ($p < 0.05$).

Conclusion: Febrile seizures are predominantly simple with favorable outcomes; however, risk factors such as younger age, family history, and complex features increase the likelihood of recurrence and adverse outcomes.

Keywords: Febrile seizures, children, risk factors, recurrence, epilepsy, clinical outcomes, pediatric neurology.

INTRODUCTION

The most frequent form of convulsions during childhood is febrile seizures, which usually are experienced in children between the age of six months and five years old, and are accompanied by fever, but with no signs of intracranial infection or metabolic imbalances [1]. Febrile seizures are usually harmless, but they are the primary cause of parental and caregiver anxiety and cause a large proportion of emergency visits by children [2]. They are generally categorized as simple febrile seizures that are generalized, short-lasting and non-recurring within 24 hours and complex febrile seizures that can be focal, long-lasting or recurring [3]. Febrile seizures are common in all parts of the world, ranging between 2 to 5 percent among children though the prevalence has been reported to be high in some regions because of genetic, environmental and socioeconomic factors. In the developing nations, such a burden might be more substantial because of the increased prevalence of infectious diseases and the lack of access to healthcare services [4]. Although they have

a good prognosis in general, febrile seizures may cause important psychological and social consequences to families, resulting in frequent hospital admissions and unnecessary research [5]. Febrile seizures have a multifactorial etiology, and the etiology comprises a combination of genetic predisposition, environmental precipitants, as well as infectious etiologies [6]. One of the most consistently reported risk factors is strong family history of febrile seizures or epilepsy, indicating a genetic element. Moreover, some viral infections like influenza, adenovirus and human herpesvirus-6 have been strongly linked with febrile seizures. In many cases, the rapid increase in body temperature and not the absolute peak temperature is also taken to be a trigger [7].

Perinatal complications like prematurity, low birth weight, and neonatal intensive care admission are other possible risk factors. It has also been associated with nutritional influences, especially iron deficiency anemia and micronutrient deficiencies like zinc and magnesium, to predispose to febrile seizures [8].

There are also environmental and socioeconomic causes such as inadequate access to healthcare and late treatment of febrile conditions that could also be causing the risk [9]. Febrile seizures are characterized clinically by generalized tonic-clonic motions and are also accompanied by fever and most episodes' end in spontaneous resolution, with no long-term effects [10]. Nonetheless, complex febrile seizures can have focal manifestations, a longer duration, or recurrent episodes in a short time, which raises the possibility of underlying neurological pathology. The differentiation between simple and complex febrile seizures is crucial, as it guides management decisions and prognostic counselling [11].

Even though the majority of children who experience febrile seizures get well, the possibility of recurrence is a frequent issue since it occurs in about 3040 percent of affected individuals [12]. Children who had early age of onset, positive family history, low-grade fever at the time of seizure, and a brief period between the onset of fever and the seizure had a higher risk of recurrence. Moreover, a low percentage of children, especially those with complex febrile seizures, can be at a higher risk of developing epilepsy in later adulthood, but the risk is nonetheless low [13].

Objective

To evaluate the risk factors and clinical outcomes of febrile seizures in children.

METHODOLOGY:

This was a retrospective observational study conducted at Mayo Hospital Lahore from 23 Sep 2025 to 23 Nov 2025. A total of 265 pediatric patients diagnosed with febrile seizures were included in the study. Non-probability consecutive sampling was used, and all eligible cases meeting the inclusion criteria. Children aged 6 months to 5 years presenting with febrile seizures were included. Febrile seizures were defined as seizures occurring in association with fever (temperature ≥38°C) in the absence of central nervous system infection, metabolic imbalance, or prior afebrile seizures. Patients who have a history of epilepsy, intracranial infections, neurodevelopmental disorders or incomplete medical records were excluded. Hospital medical records of pediatric patients with febrile seizures were accessed to retrieve data. Data gathered consisted of demographic factors (age, sex), clinical data (type of febrile seizure, duration, recurrence), family history of febrile seizures or epilepsy, related symptoms, and cause of fever. Where possible, laboratory parameters like hemoglobin, white blood cell count, and other pertinent tests were also documented. The classification of febrile seizures was made into simple and complex according to the conventional clinical guidelines. Clinical outcomes such as recurrence during hospital stay, complications and admission to intensive care were recorded. All the data were entered in a structured data collection proforma. Statistical analysis was performed using SPSS version 26.0. Continuous variables such as age and laboratory parameters were expressed as mean ± standard deviation or median (interquartile range), as appropriate. Categorical variables including gender, seizure type, risk factors, and clinical outcomes were presented as frequencies and percentages. A p-value ≤ 0.05 was considered statistically significant.

RESULTS

Data were collected from 265 patients, with a mean age of 2.4 ± 1.3 years. Males constituted 152 (57.4%) and females 113 (42.6%). Most patients were aged 1–3 years 146 (55.1%), followed by >3 years 71 (26.8%) and <1 year 48 (18.1%). Simple febrile seizures were more common, observed in 189 (71.3%) patients, while 76 (28.7%) had complex seizures. Most seizures lasted less than 5 minutes 173 (65.3%), with 44 (16.6%) lasting 5–15 minutes and 48 (18.1%) exceeding 15 minutes. Recurrence within 24 hours occurred in 59 (22.3%) cases. A family history of febrile seizures was present in 68 (25.7%) patients and epilepsy in 34 (12.8%). Anemia was observed in 97 (36.6%) and elevated WBC in 143 (54.0%) patients. The most common etiology of fever was upper respiratory tract infection 118 (44.5%), followed by gastrointestinal infection 72 (27.2%) and other causes 75 (28.3%).

Table 1 Baseline Demographic and Clinical Characteristics Including Etiology of Fever (n = 265)

Variable	Category	n (%) / Mean ± SD
Age (years)	—	2.4 ± 1.3
Gender	Male	152 (57.4)
	Female	113 (42.6)
Age Group	<1 year	48 (18.1)
	1–3 years	146 (55.1)
	>3 years	71 (26.8)

Type of Febrile Seizure	Simple	189 (71.3)
	Complex	76 (28.7)
Duration of Seizure	<5 min	173 (65.3)
	5–15 min	44 (16.6)
	>15 min	48 (18.1)
Recurrence (within 24 hours)	Yes	59 (22.3)
	No	206 (77.7)
Family History (Febrile Seizure)	Yes	68 (25.7)
	No	197 (74.3)
Family History (Epilepsy)	Yes	34 (12.8)
	No	231 (87.2)
Anemia	Yes	97 (36.6)
	No	168 (63.4)
Elevated WBC	Yes	143 (54.0)
	No	122 (46.0)
Etiology of Fever	Upper Respiratory Tract Infection	118 (44.5)
	Gastrointestinal Infection	72 (27.2)
	Other Causes	75 (28.3)

Younger age was significantly associated with complex seizures, with 22/48 (45.8%) children under one year developing complex seizures compared to 34/146 (23.3%) in the 1–3 years' group (p = 0.03). A positive family history of febrile seizures was also significantly associated with complex seizures, seen in 30/68 (44.1%) compared to 46/197 (23.4%) in those without such history (p = 0.02).

Table 2. Association of Risk Factors with Type of Febrile Seizure

Variable	Category	Simple n (%)	Complex n (%)	p-value
Age Group	<1 year	26 (54.2)	22 (45.8)	0.03
	1–3 years	112 (76.7)	34 (23.3)	
	>3 years	51 (71.8)	20 (28.2)	
Family History (FS)	Yes	38 (55.9)	30 (44.1)	0.02
	No	151 (76.6)	46 (23.4)	
Elevated WBC	Yes	95 (66.4)	48 (33.6)	0.04
	No	94 (77.0)	28 (23.0)	

Regarding clinical outcomes, recurrence during follow-up was observed in 84 (31.7%) patients, while 181 (68.3%) had no recurrence. ICU admission was required in 21 (7.9%) cases. Development of epilepsy was noted in 11 (4.2%) patients, indicating a relatively low but clinically important risk.

Table 3. Clinical Outcomes (n = 265)

Outcome	Category	n (%)
Recurrence (Follow-up)	Yes	84 (31.7)
	No	181 (68.3)
ICU Admission	Yes	21 (7.9)
	No	244 (92.1)
Development of Epilepsy	Yes	11 (4.2)
	No	254 (95.8)

Children aged less than 2 years had a higher recurrence rate 58/154 (69.0%) compared to older children 26/111 (31.0%) (p = 0.01). A positive family history was strongly associated with recurrence, observed in 39/68 (46.4%) versus 45/197 (22.8%) in those without family history (p < 0.001). Additionally, complex seizures were significantly associated with recurrence, with 41/76 (48.8%) experiencing recurrence compared to 43/189 (22.8%) in simple seizures (p < 0.001).

Table 4 Association of Risk Factors with Recurrence of Febrile Seizures

Variable	Category	Recurrence n (%)	No Recurrence n (%)	p-value
Age <2 years	Yes	58 (69.0)	96 (53.0)	0.01
	No	26 (31.0)	85 (47.0)	
Family History	Yes	39 (46.4)	29 (16.0)	<0.001
	No	45 (53.6)	152 (84.0)	
Complex Seizure	Yes	41 (48.8)	35 (19.3)	<0.001
	No	43 (51.2)	146 (80.7)	

DISCUSSION

The risk factors and clinical outcomes of febrile seizures were assessed in a cohort of 265 children and the most frequent conditions were the simple febrile seizures with a generally favorable outcome. The fact that simple febrile seizures (189 [71.3%]) predominated over complex ones (76 [28.7]) is in line with the available literature indicating that the majority of febrile seizures are harmless and never last long. The average

age of presentation (2.4 ± 1.3 years old) and the increased prevalence in children between 1 and 3 years old further support the fact that the incidence of febrile seizures peaks in early childhood. In this study, the prevalent underlying cause of fever was upper respiratory tract infections (118 [44.5%]) and then gastrointestinal infections (72 [27.2%]). This is an indication of the contribution of common viral diseases as a leading cause of febrile seizures. Vomiting (87 [58.0%]) and anorexia (86 [57.3%]) were common clinical manifestations, underscoring the lack of specificity of systemic manifestations of febrile diseases in children [14].

An interesting conclusion of this study was that there was a strong correlation between some risk factors and complex febrile seizures. Children with complex seizures more often had younger age, positive family history of febrile seizures, and increased the number of WBCs, which may indicate genetic predisposition and increased inflammatory reaction. These results are similar to earlier studies, which have found family history and age of onset to be influential predictors of more severe patterns of seizures [15]. Epileptic febrile seizure reoccurrence was seen in 84 (31.7) patients, which is like the reported recurrence values of between 30-40 in the past. It was also shown that younger age, family history, and complex type of seizure were significantly correlated with recurrence. These results highlight the need to early detect high-risk patients to counsel and follow them adequately. Moreover, the prevalence of subsequent epilepsy in a small percentage of children (11 [4.2%]) is consistent with the available evidence on the presence of a low but significant risk especially in children with complex febrile seizures [16,17].

Despite the positive clinical course of most patients, a group of patients had to be admitted to the intensive care unit (21 [7.9%]) mainly because of the long or recurring seizures [18,19]. This underscores the fact that although febrile seizures are usually harmless, they may sometimes manifest complications that need more attention and care [20].

Limitations

There are a number of limitations to this study. To start with, its retrospective nature is based on medical record data, which can be flawed or biased in documentation. Second, the study is a single-center study and thus might not be generalizable to other populations. Third, non-probability sampling can lead to selection bias. Fourth, genetic markers, detailed viral etiologies, and micronutrient levels, which might have been important risk factors, were not always available and thus were not analyzed. Moreover, the period of follow up was different in patients, and this can influence the outcome measures of recurrence and epilepsy. Lastly, the analysis mainly relied on rudimentary statistical techniques as opposed to multivariate modeling, restricting the chances of determining independent predictors of adverse outcomes.

CONCLUSION:

The conclusion is that febrile seizures in children are mostly simple, and associated with a good clinical prognosis, but a considerable percentage is linked to recurrence and, less frequently, to the development of epilepsy. Earlier age of onset, positive family history, and complex seizure characteristics are risk factors that mean that the likelihood of recurrence and adverse outcomes is high. Most of the cases are self-limiting, but high-risk children should be properly counseled, monitored, and managed by identifying them at an early age.

REFERENCES:

1. Sawires R, Buttery J and Fahey M (2022) A Review of Febrile Seizures: Recent Advances in Understanding of Febrile Seizure Pathophysiology and Commonly Implicated Viral Triggers. Front. Pediatr. 9:801321. doi: 10.3389/fped.2021.801321
2. Yalçın, G., Yıldırım, R., Unal, E., Cebeci, D., Ersen, A., Özyılmaz, B., Tekeş, S., Anıl, M., & Gürbay, A. (2025). A Comprehensive Perspective on Febrile Seizures in Children: A Prospective Cohort Study with Evaluation of Clinical, Laboratory, and Genetic Features. Journal of Clinical Medicine, 14(22), 7918. https://doi.org/10.3390/jcm14227918
3. CLINICAL OUTCOMES OF FEBRILE SEIZURES IN CHILDREN UNDER FIVE YEARS OF AGE. (2024). Lex Localis - Journal of Local Self-Government, 137-143. https://doi.org/10.52152/6dd2sq40
4. Abbari I, Gueddari W, Bousfiha AA. an overview of risk factors in children with febrile seizures. Tunis Med. 2024 Mar 5;102(3):129-133. English. doi: 10.62438/tunismed.v102i3.4474. PMID: 38545706; PMCID: PMC11358785.
5. Muniz MCR, Lima RV, Maia VQCC, Bezerra AM, Freire IF, Lima MCC, Matos YMT, Pontes LP, Cavalcante ANM. The protective effect of breastfeeding on febrile seizures: a systematic review with meta-analysis. Eur J Pediatr. 2024 May;183(5):2049-2058. doi: 10.1007/s00431-024-05501-x. Epub 2024 Mar 8. PMID: 38456990.
6. Canpolat M, Per H, Gumus H, Elmali F, Kumandas S. Investigating the prevalence of febrile convulsion in Kayseri, Turkey: assessment of risk factors for recurrence and development of epilepsy. Seizure. 2018;55:36–47.
7. Han JY, Han SB. Pathogenetic and etiologic considerations of febrile seizures. Clin Exp Pediatr. 2023;66:46–53.
8. Gould L, Delavale V, Plovnick C, Wisniewski T, Devinsky O. Are brief febrile seizures benign? A systematic review and narrative synthesis. Epilepsia. 2023;64:2539–2549.
9. Dreier JW, Pedersen CB, Cotsapas C, Christensen J. Childhood seizures and risk of psychiatric disorders in adolescence and early adulthood: a Danish nationwide cohort study. Lancet Child Adolesc Health. 2019;3:99–108.

10. Berg AT, Shinnar S, Shapiro ED, Salomon ME, Crain EF, Hauser WA. Risk factors for a first febrile seizure: a matched case-control study. Epilepsia. 1995;36:334–341.
11. Heydarian F, Bakhtiari E, Bay M. Risk factors of seizure and complex seizure in febrile children: a clinical study. BMC Pediatr. 2024;24:725.
12. Miyagi Y, Sasano T, Kato H, Kin K. Hyponatremia and recurrent febrile seizures during febrile episodes: a meta-analysis. Cureus. 2022;14:e24398.
13. Kwak BO, Kim K, Kim SN, Lee R. Relationship between iron deficiency anemia and febrile seizures in children: a systematic review and meta-analysis. Seizure. 2017;52:27–34.
14. Sharif MR, Kheirkhah D, Madani M, Kashani HH. Relationship between iron deficiency and febrile convulsion: a case-control study. Glob J Health Sci. 2015;8:185–189.
15. Cetin ID, Cetin O. Association between prognostic nutritional index and neutrophil-to-lymphocyte ratio with nutritional status and inflammation in febrile children's susceptibility to seizures. Rev Assoc Med Bras (1992). 2024;70:e20240166.
16. Han JY, Lee IG, Shin S, Park J. Seizure duration may increase thyroid-stimulating hormone levels in children experiencing a seizure. J Int Med Res. 2020;48:300060519888401.
17. Bhat JA, Bhat TA, Sheikh SA, Wani ZA, Ara R. Status of 25-hydroxy vitamin D level in simple febrile seizures and its correlation with recurrence. Avicenna J Med. 2020;10:6–9.
18. Heydarian F, Nakhaei AA, Majd HM, Bakhtiari E. Zinc deficiency and febrile seizure: a systematic review and meta-analysis. Turk J Pediatr. 2020;62:347–358.
19. Abbasi H, Khoshdooz S, Abbasi MM, Pasand M, Eslamian G. Serum trace elements in febrile seizure: a systematic review and meta-analysis. Biol Trace Elem Res. 2025;203:729–744.
20. Cigri E, Inan FC. Comparison of serum selenium, homocysteine, zinc, and vitamin D levels in febrile children with and without febrile seizures: a prospective study. Children (Basel). 2023;10:528.