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# Clinical Spectrum and Outcomes of Febrile Seizures in Children: A Retrospective Study

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***Abstract:*** **Background:** Febrile seizures are the most common seizure disorder in children, typically presenting between 6 months and 5 years of age. **Objective:** To assess the clinical spectrum, associated factors, and outcomes of febrile seizures in children. **Methodology:** This was a hospital-based retrospective analytical study conducted at Paediatrics Department of Shahida Islam Teaching Hospital Lodhran from June, 2025 to September, 2025, including 255 pediatric patients who presented with febrile seizures. **Results:** The mean age was 24.6 ± 13.2 months, with complex febrile seizures occurring at a younger age (19.8 ± 12.7 vs 26.8 ± 12.9 months, p = 0.002). Complex seizures were associated with longer duration (15.6 ± 7.8 vs 4.2 ± 2.1 minutes), higher frequency of multiple episodes (59.7% vs 15.7%), and increased focal features (48.1% vs 6.7%) (p <0.001). Family history of febrile seizures (46.8% vs 23.6%) and epilepsy (20.8% vs 9.0%) were significantly higher in complex cases. Recurrence was observed in 32.2% of patients and was more frequent in patients with complex seizures (49.4% vs 24.7%, p < 0.001). Development of epilepsy occurred in 7.1% of cases, predominantly in complex febrile seizures (15.6% vs 3.4%). Longer hospital stay (3.8 ± 1.6 vs 2.1 ± 1.0 days), increased ICU admissions (13.0% vs 2.2%), and neurological deficits (6.5% vs 0.6%) were also associated with complex seizures. **Conclusion**: Febrile seizures generally have a favorable prognosis; however, complex febrile seizures are associated with higher recurrence, increased risk of epilepsy, and greater healthcare burden. Early identification of high-risk factors is essential for improved management and counseling.

***Keywords:*** Febrile seizures, Pediatric seizures, Recurrence, Epilepsy, Clinical spectrum, Risk factors.

## INTRODUCTION

The most prevalent type of seizure disorder during childhood is febrile seizures, which usually take place between 6 months and 5 years of age in relation to fever and without any indication of intracranial infection or metabolic imbalance [1]. They present a large share of visits to pediatric emergency and cause much anxiety to the caregivers despite their relatively harmless nature [2]. There are simple and complex febrile seizures, which are clinically differentiated. Simple febrile seizures are generalized and short-lived or occur once per 24 hours, whereas complex febrile seizures can be either focal or prolonged and repeated

throughout the same febrile episode [3]. This differentiation is significant since complex febrile seizures are also linked to the increased probability of relapse and future epilepsy [4]. Pathophysiology is multifactorial, based on genetic predisposition, insufficient neuron networks, and elevated neuron excitability caused by fever [5]. The most common precipitating factors include viral infections like upper respiratory tract infections and gastroenteritis, among others [6]. It is also thought that inflammatory cytokines produced during febrile illness decrease the seizure threshold [7].

Febrile seizures are self-limiting and however, they recur in one in three children. Risk factors include younger age at onset, a positive family history, and lower peak fever [8]. A small percentage of patients, especially with complicated febrile seizures, can subsequently develop epilepsy [9]. The main focus of the clinical assessment is to rule out severe pathologies, including meningitis or encephalitis [10]. In uncomplicated cases, no neuroimaging or electroencephalography is necessary, but they may be performed in unusual presentations [11]. Reassurance, antipyretics, and treatment of the underlying cause are primarily interventions in management [12]. Although the overall outlook is positive, there is still variation in clinical manifestations and outcomes across populations. These differences can be understood to enhance management approaches and caregiver counseling [13]. The tendency towards differences in seizure patterns and risk factors has been identified in previous studies [14], which have highlighted the necessity of population-specific data.

### Objective

To assess the clinical spectrum, associated factors, and outcomes of febrile seizures in children.

## METHODOLOGY

This retrospective analytical study conducted at Paediatrics Department of Shahida Islam Teaching Hospital Lodhran from June, 2025 to September, 2025, including 255 pediatric patients who presented with febrile seizures.

### Inclusion Criteria

- Children aged 6 months to 5 years presenting with seizures associated with fever.
- Patients diagnosed with febrile seizures based on clinical evaluation.
- Patients with complete medical records including clinical presentation and follow-up details.
- Children whose caregivers provided consent for use of clinical data.

### Exclusion Criteria

- Children with afebrile seizures or diagnosed epilepsy.
- Patients with central nervous system infections such as meningitis or encephalitis.
- Children with metabolic abnormalities or electrolyte imbalances causing seizures.
- Patients with incomplete medical records or missing follow-up data.

### Data Collection

Data were collected retrospectively from hospital records using a structured proforma. Demographic details including age and gender were recorded. Clinical variables included type of febrile seizure (simple or complex), duration of seizure, number of seizure episodes, peak temperature at presentation, and associated symptoms. Information regarding possible etiologies such as upper respiratory tract infection, gastroenteritis, or other febrile illnesses was documented. Family history of febrile seizures and epilepsy was also noted. Laboratory investigations, where available, were reviewed. Patients were followed for outcomes including recurrence of febrile seizures, development of epilepsy, duration of hospital stay, and any neurological complications. Based on clinical features, patients were categorized into simple and complex febrile seizure groups for comparative analysis.

### Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 26. Continuous variables were expressed as mean ± standard deviation, while categorical variables were presented as frequency and percentage. Associations between clinical variables and outcomes were analyzed using the chi-square test and the independent t-test where appropriate. A p-value $<0.05$ was considered statistically significant.

## RESULTS

A total of 255 children were included with a mean age of 24.6 ± 13.2 months. Children with complex febrile seizures were younger (19.8 ± 12.7 months) compared to simple febrile seizures (26.8 ± 12.9 months, $p = 0.002$). Most patients were aged 13–36 months (50.2%). Males predominated (58.0%), with no significant gender difference ($p = 0.36$). Family history of febrile seizures was more common in complex cases (46.8% vs 23.6%, $p <0.001$), as was family history of epilepsy (20.8% vs 9.0%, $p = 0.01$). Mean peak temperature was lower in complex seizures (38.6 ± 0.7°C vs 39.1 ± 0.6°C, $p = 0.01$).

**Table 1: Demographic and Baseline Characteristics**

| Variable | Category | Total (n=255) | Simple FS (n=178) | Complex FS (n=77) |
|---|---|---|---|---|
| Age (months) | Mean ± SD | 24.6 ± 13.2 | 26.8 ± 12.9 | 19.8 ± 12.7 |
| | 6–12 months | 62 (24.3%) | 32 (18.0%) | 30 (39.0%) |
| | 13–36 months | 128 (50.2%) | 94 (52.8%) | 34 (44.2%) |
| | 37–60 months | 65 (25.5%) | 52 (29.2%) | 13 (16.9%) |
| Gender | Male | 148 (58.0%) | 100 (56.2%) | 48 (62.3%) |
| | Female | 107 (42.0%) | 78 (43.8%) | 29 (37.7%) |
| Family History (FS) | Yes | 78 (30.6%) | 42 (23.6%) | 36 (46.8%) |
| | No | 177 (69.4%) | 136 (76.4%) | 41 (53.2%) |
| Family History (Epilepsy) | Yes | 32 (12.5%) | 16 (9.0%) | 16 (20.8%) |
| | No | 223 (87.5%) | 162 (91.0%) | 61 (79.2%) |
| Peak Temperature (°C) | Mean ± SD | 38.9 ± 0.7 | 39.1 ± 0.6 | 38.6 ± 0.7 |

The mean seizure duration was 7.8 ± 6.4 minutes, significantly longer in complex seizures (15.6 ± 7.8 minutes) compared to simple seizures (4.2 ± 2.1 minutes, $p < 0.001$). Most simple seizures lasted <5 minutes (84.3%), whereas prolonged seizures (>15 minutes) were mainly seen in complex cases (36.4%). Multiple seizure episodes were more frequent in complex seizures (59.7% vs 15.7%, $p < 0.001$). Focal seizures were also significantly higher in complex cases (48.1% vs 6.7%, $p < 0.001$). Postictal drowsiness was more common in complex seizures (72.7% vs 46.1%, $p < 0.001$).

**Table 2: Clinical Spectrum of Febrile Seizures**

| Variable | Category | Total (n=255) | Simple FS (n=178) | Complex FS (n=77) | p-value |
|---|---|---|---|---|---|
| Seizure Duration | Mean ± SD (min) | 7.8 ± 6.4 | 4.2 ± 2.1 | 15.6 ± 7.8 | <0.001 |
| | <5 min | 162 (63.5%) | 150 (84.3%) | 12 (15.6%) | |
| | 5–15 min | 61 (23.9%) | 24 (13.5%) | 37 (48.1%) | |
| | >15 min | 32 (12.5%) | 4 (2.2%) | 28 (36.4%) | |
| Number of Episodes | Single | 181 (71.0%) | 150 (84.3%) | 31 (40.3%) | <0.001 |
| | Multiple | 74 (29.0%) | 28 (15.7%) | 46 (59.7%) | |
| Seizure Type | Generalized | 206 (80.8%) | 166 (93.3%) | 40 (51.9%) | <0.001 |
| | Focal | 49 (19.2%) | 12 (6.7%) | 37 (48.1%) | |
| Postictal Drowsiness | Yes | 138 (54.1%) | 82 (46.1%) | 56 (72.7%) | <0.001 |

Upper respiratory tract infections were the most common cause of fever (40.8%), followed by gastroenteritis (24.3%), with no significant difference between simple and complex groups ($p = 0.21$). However, recent vaccination was more frequent in complex seizures (15.6% vs 7.9%, $p = 0.04$). Anemia (39.0% vs 24.7%, $p = 0.02$) and leukocytosis (44.2% vs 30.3%, $p = 0.03$) were also significantly more common in complex febrile seizures.

**Table 3: Etiological Factors and Associated Conditions**

| Variable | Category | Total (n=255) | Simple FS | Complex FS | p-value |
|---|---|---|---|---|---|
| Cause of Fever | URTI | 104 (40.8%) | 76 (42.7%) | 28 (36.4%) | 0.21 |
| | Gastroenteritis | 62 (24.3%) | 40 (22.5%) | 22 (28.6%) | |
| | Otitis Media | 38 (14.9%) | 28 (15.7%) | 10 (13.0%) | |
| | Pneumonia | 29 (11.4%) | 18 (10.1%) | 11 (14.3%) | |
| | Others | 22 (8.6%) | 16 (9.0%) | 6 (7.8%) | |
| Recent Vaccination | Yes | 26 (10.2%) | 14 (7.9%) | 12 (15.6%) | 0.04 |
| Anemia | Yes | 74 (29.0%) | 44 (24.7%) | 30 (39.0%) | 0.02 |
| Leukocytosis | Yes | 88 (34.5%) | 54 (30.3%) | 34 (44.2%) | 0.03 |

Recurrence occurred in 82 patients (32.2%) and was significantly higher in complex seizures (49.4% vs 24.7%, $p < 0.001$). Development of epilepsy was observed in 18 patients (7.1%), more commonly in complex cases (15.6% vs 3.4%, $p < 0.001$). The mean hospital stay was longer in patients with complex seizures (3.8 ± 1.6 days vs 2.1 ± 1.0 days, $p < 0.001$). Neurological deficits (6.5% vs 0.6%, $p = 0.01$) and ICU admissions (13.0% vs 2.2%, $p = 0.002$) were also significantly higher in complex cases.

**Table 4: Outcomes and Prognosis**

| Variable | Category | Total (n=255) | Simple FS | Complex FS | p-value |
|---|---|---|---|---|---|
| Recurrence | Yes | 82 (32.2%) | 44 (24.7%) | 38 (49.4%) | <0.001 |
| Development of Epilepsy | Yes | 18 (7.1%) | 6 (3.4%) | 12 (15.6%) | <0.001 |
| Hospital Stay (days) | Mean ± SD | 2.6 ± 1.4 | 2.1 ± 1.0 | 3.8 ± 1.6 | <0.001 |
| Neurological Deficit | Yes | 6 (2.4%) | 1 (0.6%) | 5 (6.5%) | 0.01 |
| ICU Admission | Yes | 14 (5.5%) | 4 (2.2%) | 10 (13.0%) | 0.002 |

Patients with recurrence had a lower mean age at first seizure (14.1 ± 7.8 months) compared to those without recurrence (20.3 ± 10.2 months, p <0.001). Recurrence was more common in children with complex seizures (49.4% vs 24.7%, p <0.001) and those with a positive family history of febrile seizures (51.3% vs 23.7%, p <0.001). Additionally, lower peak temperature was associated with recurrence (38.5 ± 0.6°C vs 39.1 ± 0.7°C, p = 0.01).

**Table 5: Predictors of Recurrence of Febrile Seizures**

| Variable | Category | Total (n=255) | Recurrence (n=82) | No Recurrence (n=173) | p-value |
|---|---|---|---|---|---|
| Age at First Seizure (months) | Mean ± SD | 18.2 ± 9.6 | 14.1 ± 7.8 | 20.3 ± 10.2 | <0.001 |
| | <12 months | 62 (24.3%) | 36 (58.1%) | 26 (41.9%) | |
| | ≥12 months | 193 (75.7%) | 46 (23.8%) | 147 (76.2%) | |
| Type of Seizure | Simple | 178 (69.8%) | 44 (24.7%) | 134 (75.3%) | <0.001 |
| | Complex | 77 (30.2%) | 38 (49.4%) | 39 (50.6%) | |
| Family History (FS) | Yes | 78 (30.6%) | 40 (51.3%) | 38 (48.7%) | <0.001 |
| | No | 177 (69.4%) | 42 (23.7%) | 135 (76.3%) | |
| Peak Temperature (°C) | Mean ± SD | 38.9 ± 0.7 | 38.5 ± 0.6 | 39.1 ± 0.7 | 0.01 |

## DISCUSSION

Febrile seizures represent a widely prevalent pediatric neurological disorder, the prognosis of which is usually positive, but there is great variation in the clinical manifestation and prognosis. The average age in this study was 24.6±13.2 months, and younger children were more prone to complex febrile seizures (19.8±12.7 months vs. 26.8±12.9 months, p=0.002). This observation is in line with previous studies, which have established that a young age of onset is associated with the severity and complexity of febrile seizures because neuronal excitability in the immature brain is higher [15]. There were evident variations between simple and complex febrile seizures in the clinical spectrum. Significantly longer duration (15.6 ± 7.8 minutes vs 4.2 ± 2.1 minutes), more multiple episodes (59.7% vs 15.7%), and more focal features (48.1% vs 6.7%), demonstrated significantly later and was significant (p <0.001). The same trends have been recorded in the prior studies wherein the distinguishing characteristic of complex febrile seizures has been seen to be the length and focality, and the precursors of poor outcome [16]. The family history became a key contributory factor. Complex febrile seizures were significantly related to a positive family history of febrile seizures (46.8% vs 23.6, p =0.001) and epilepsy (20.8% vs 9.0, p = 0.01). This is consistent with other earlier studies, which emphasize the importance of genetic predisposition in the pathogenesis and recurrence of febrile seizure [17][18]. In terms of etiological factors, upper respiratory tract infection was most often associated with fever (40.8%), consistent with earlier studies suggesting viral infections as the ultimate trigger. The overall distribution of the causes was not significantly different across groups (p = 0.21), but such factors as recent vaccination (15.6% vs 7.9%, p = 0.04), anemia (39.0% vs 24.7%, p = 0.02), and leukocytosis (44.2% vs 30.3%, p = 0.03) were more common in complex febrile seizures. Other studies have also documented links between systemic inflammation, hematological abnormalities, and severity of seizures [19].

The results of the outcome examination showed that the recurrence rate was 32.2 percent in all patients and higher in patients with complex seizures (49.4 percent vs. 24.7 percent, p < 0.001). It was seen that 7.1% developed epilepsy and more frequently in complex febrile seizures (15.6% vs 3.4%, p <0.001). These are consistent with prior studies, which have demonstrated that every time more risks of recurrence and epilepsy among children having complex febrile seizures [20]. Complex febrile seizures were also linked with longer hospital stays (3.8 ± 1.6 days vs 2.1 ± 1.0 days), greater neurological deficit (6.5% vs 0.6%), and more ICU admissions (13.0% vs 2.2%), demonstrating a higher burden of illness. The same tendencies have been observed in prior studies, with more rigorous monitoring and management of complex seizures being necessary [21]. The recurrence predictors identified in this study were younger age at initial seizure (14.1 ± 7.8 months vs 20.3 ± 10.2 months), complex seizure type, positive family history, and lower peak temperature (38.5 ± 0.6 C vs 39.1 ± 0.7 C), all of which were significant. These

results are in line with other studies that have stressed that early onset, hereditary factors, and a reduced fever threshold predispose to recurrence. Comprehensively, this paper confirms that even though febrile seizures are typically harmless, complex febrile seizures are a high-risk group with a higher recurrence, prolonged hospitalization, and probability of developing epilepsy. Such results, which are not new and are supported by the earlier studies, emphasize the need to stratify risks, identify high-risk patients early, and counsel caregivers accordingly.

## CONCLUSION

It is concluded that febrile seizures are a common pediatric condition with generally favorable outcomes; however, complex febrile seizures are associated with increased severity and poorer outcomes. Younger age at onset, positive family history, longer seizure duration, and lower peak temperature were significant predictors of recurrence. Complex febrile seizures showed higher rates of recurrence, longer hospital stay, increased ICU admissions, and greater risk of developing epilepsy. Early identification of high-risk patients and appropriate monitoring are essential to improve outcomes and guide parental counseling.

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