

A Retrospective Study of the Demographic Profile and Risk Factors of Febrile Seizures among Children

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Abstract:

Background: Febrile seizures are the most common seizure disorder in early childhood, contributing significantly to pediatric neurological admissions, with variable demographic patterns and risk factors across regions.

Aim: To assess the demographic profile and identify risk factors associated with febrile seizures among children.

Methodology: A retrospective descriptive cross-sectional study was conducted at Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India. including 90 children aged 6 months to 6 years diagnosed with febrile seizures. Data were collected from hospital records and analyzed using descriptive statistics and Chi-square tests.

Results: The majority of children were aged 1–3 years (51.1%) with male predominance (61.1%). Simple febrile seizures (81.1%) and generalized tonic-clonic type (70%) were most common. High-grade fever (57.8%) and family history (53.3%) were प्रमुख risk factors. Most cases were first episodes (71.1%), with recurrence in 28.9%.

No significant association was observed between gender, family history, and seizure type ($p > 0.05$).

Conclusion: Febrile seizures commonly occur in young children with predominantly simple presentation. High fever and family history are key risk factors, highlighting the need for early recognition and management.

Keywords: Febrile seizures, children, risk factors, demographic profile, retrospective study.

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Introduction

Convulsions are among the most frequent neurological manifestations of children with about 10% of pediatric neurological presentations [1] being convulsions. Among them, febrile convulsions are considered to be the most common seizure disorder during early childhood. Febrile seizures are common in children at a rate of about 2 to 4 percent at least once in children under the age of five years [2] but other studies have recorded a significantly higher prevalence rate of up to 24 percent among children aged between 0 and five years [3] years. Febrile seizures are approximated to afflict in the entire world in the range of 2-5 percent of all children hence they are a significant concern in the field of pediatric care. It is interesting to note that febrile seizures do not happen too often under the age of six months or older than three years. In addition, epidemiological evidence indicates that approximately one out of every 25

children have at least once in childhood one episode of a febrile seizure [4].

This is also recorded in regional variations in incidence and recurrence. As an example, there are two to five percent cases of incidence in Europe with almost thirty percent of the affected children developing a second episode and an approximate of 15 percent reoccurring episodes [5]. Such results indicate that the level of burden and recurrence of febrile seizures could be quite significant, and a better insight into the epidemiological and clinical predispositions of these disorders is necessary.

International League Against Epilepsy establishes febrile seizures as seizures that arise during childhood and are accompanied by a fever that is over 38C, and without central nervous system infection, acute electrolyte disturbance, or a history of afebrile

seizures previously. Febrile seizures are clinically manifested by loss of consciousness and uncontrolled movements of both extremities of the body. These seizures occur on the first day of the fever, and in the vast majority of cases, accentuate their acuteness in the conditions of febrile disease [6].

There are two major types of febrile seizures, namely those that are simple and complex. Simple febrile seizures are tonic-clonic febrile seizures that are less than 15 minutes in duration and do not happen again in 24 hours. Complex febrile seizures, on the contrary, are marked by local attributes, a longer duration of more than 15 minutes, or more than one episode during the 24 hrs. Most of the febrile seizures about 70 percent and 75 percent, are simple in nature [7]. Clinical importance of this classification is because complex febrile seizures are usually linked with increased tendency of re-occurrence and possible neurological consequences.

In the case of febrile seizures, family history is important in the occurrence and recurrence of febrile seizures. Approximately 25- 40% of the children affected have a positive family history. A first-degree family history is especially a predictor that is likely to result in a second adult-onset diabetes diagnosis. The recurrence risk in such cases could be up to 80% and it means a strong genetic predisposition [8]. These results indicate the significance of the genetic elements in the pathogenesis of febrile seizures.

Various etiological and risk factors have been known to contribute to febrile seizure. It is usually caused by fever (infection), hypoglycemia, hypocalcemia, brain damage, poisoning, excessive use of drugs, pneumonia, and gastroenteritis. Also, prenatal and perinatal influences like maternal illness during pregnancy, prematurity and problems during delivery have also been linked with greater risk. The general incidence rate of febrile seizures is approximated at approximately 30 percent. Complex febrile seizures, positive family history, onset before the age of 12 months, lower peak temperature (<40 °C), and the existence of complex features are some of the predictors of recurrence [9].

Hospital based and population-based studies show a wide range of reported incidence rates. Studies done in hospitals have reported a febrile seizure reported incidence of as high as 40% and population-based studies, including large studies done in the United States, report an incidence of febrile seizure as low as 2 to 5 percent [10]. This inconsistency can be explained by the referral bias and the study design differences, and the contextual and regional research is significant.

Despite the body of literature available within the last 25 years implying that febrile seizures have a good prognosis, the issue of possible complications still raises concern. It is worth noting that other studies have indicated that there is a heightened risk of

recurring epilepsy of the order of 9%. This highlights why more research should be done into the risk factors and long-term consequences of febrile seizures.

In India, especially in such states as Muzaffarpur, Bihar, there is coarse region-specific information about the demographic profile of febrile seizures and the risk factors among children. Socioeconomic status, access to healthcare, nutrition status, and infectious diseases might also play a role in the incidence and nature of febrile seizures among this group. Hence, localized research are necessary in order to have a clearer insight into those differences, and to shape the proper clinical and preventive interventions.

It is based on these considerations that this retrospective study was carried out in Muzaffarpur, Bihar, India and the objective was to estimate the demographic profile and to determine some of the main risk factors linked with febrile seizures in children. This research is aimed at adding to the current body of literature to offer location-specific data that can be used in the early detection, risk prioritization, and treatment of febrile seizures in children.

Methodology

Study Design: This study was a record-based retrospective descriptive cross-sectional study conducted to assess the demographic profile and associated risk factors of febrile seizures among children. The retrospective nature of the study involved analysis of previously recorded hospital data without any direct patient interaction.

Study Area: The study was conducted in the Department of Pediatrics, Sri Krishna Medical College and Hospital, Muzaffarpur, Bihar, India.

Study Duration: The study was carried out over a period of seven months from March 2025 to September 2025.

Sample Size: A total of 90 children diagnosed with febrile seizures were included in the study. The sample size was determined based on the number of eligible cases available during the study period that fulfilled the inclusion criteria.

Study Population: The study population comprised children admitted to the pediatric department who were diagnosed with febrile seizures. Only those cases that met the predefined inclusion and exclusion criteria were considered for analysis.

Data Collection: Data were collected from the In-door Patient Department (IPD) registers and individual patient case records. A structured data collection format was used to extract relevant information, including demographic characteristics such as age, sex, and residence, as well as clinical details and potential risk factors associated with febrile seizures.

Inclusion Criteria

- Children aged 6 months to 6 years
- Diagnosed clinically with febrile seizures
- Admitted to the pediatric department during the study period

Exclusion Criteria

- Children with afebrile seizures or other seizure disorders
- Children aged less than 6 months or more than 6 years
- Cases with incomplete or missing medical records

Procedure: Hospital records were reviewed systematically. Cases meeting the inclusion criteria were identified, and relevant data were extracted using a pre-designed data collection sheet. The collected data were verified for accuracy and completeness before being entered for analysis.

Statistical Analysis: The collected data were entered into Microsoft Excel (2021 version) and analyzed using Epi Info version 7 (CDC, Atlanta, USA). Descriptive statistics such as mean, standard deviation, frequencies, and percentages were calculated. The Chi-square test was applied to determine associations between categorical variables. A p-value of less than 0.05 was considered statistically

significant, and references were cited using the Vancouver system.”

Result

Table 1 presents the detailed demographic and clinical profile of 90 children with febrile seizures. The majority were aged 1–3 years (46, 51.1%), followed by 4–6 years (23, 25.6%) and <1 year (21, 23.3%), with an overall male predominance (55, 61.1%). The mean body temperature was similar in males (38.4±0.9°C) and females (38.1±1.2°C), with no significant difference ($p = 0.72$). Family history of febrile seizures was present in 48 children (53.3%) and showed no gender association ($p = 0.86$). Simple febrile seizures were most common (73, 81.1%) compared to complex seizures (17, 18.9%), again with no significant gender difference ($p = 0.83$). Generalized tonic-clonic seizures predominated (63, 70%), followed by partial seizures (18, 20%), with other types being rare. More children were from urban areas (50, 55.6%) than rural (40, 44.4%), though not statistically significant ($p = 0.29$). Most children (57, 63.3%) had no associated infection, while upper respiratory tract infection was the most common among those with infections (10, 11.1%). The majority had a hospital stay of 1–3 days (54, 60%), with no significant gender-based differences observed across variables, as all p-values were >0.05 .

Table 1: Demographic and clinical profile of children (N = 90)

Table 1: Demographic and clinical profile of children (N = 90)					
Age and Gender Distribution					
Age (years)	Male	Female	Total	χ^2	P value
<1	12 (57.1%)	9 (42.9%)	21 (23.3%)	1.82	0.4
1–3	28 (60.9%)	18 (39.1%)	46 (51.1%)		
4–6	15 (65.2%)	8 (34.8%)	23 (25.6%)		
Total	55 (61.1%)	35 (38.9%)	90 (100%)		
Mean Body Temperature					
Variable	Male	Female	Total	t value	P value
Mean temperature (°C)	38.4±0.9	38.1±1.2	38.3±1.0	0.12	0.72
Family History					
Family history	Male	Female	Total	χ^2	P value
Yes	30 (54.5%)	18 (51.4%)	48 (53.3%)	0.03	0.86
No	25 (45.5%)	17 (48.6%)	42 (46.7%)		
Total	55 (100%)	35 (100%)	90 (100%)		
Type of Febrile Seizure					
Type	Male	Female	Total	χ^2	P value
Simple	44 (80.0%)	29 (82.9%)	73 (81.1%)	0.04	0.83
Complex	11 (20.0%)	6 (17.1%)	17 (18.9%)		
Total	55 (100%)	35 (100%)	90 (100%)		
Type of Seizure					
Type	Male	Female	Total	χ^2	P value
Generalized tonic-clonic	38 (69.1%)	25 (71.4%)	63 (70.0%)	0.52	0.97
Partial	11 (20.0%)	7 (20.0%)	18 (20.0%)		
Absence	2 (3.6%)	1 (2.9%)	3 (3.3%)		
Myoclonic	1 (1.8%)	1 (2.9%)	2 (2.2%)		
Tonic/atonic	3 (5.5%)	1 (2.9%)	4 (4.5%)		
Total	55 (100%)	35 (100%)	90 (100%)		
Residence					

Residence	Male	Female	Total	χ^2	P value
Urban	28 (50.9%)	22 (62.9%)	50 (55.6%)	1.12	0.29
Rural	27 (49.1%)	13 (37.1%)	40 (44.4%)		
Total	55 (100%)	35 (100%)	90 (100%)		
Associated Infections					
Infection	Male	Female	Total	χ^2	P value
URTI	6 (10.9%)	4 (11.4%)	10 (11.1%)	1.65	0.89
LRTI	4 (7.3%)	3 (8.6%)	7 (7.8%)		
AGE	5 (9.1%)	3 (8.6%)	8 (8.9%)		
Malaria	3 (5.5%)	2 (5.7%)	5 (5.6%)		
Others	2 (3.6%)	1 (2.9%)	3 (3.3%)		
No infection	35 (63.6%)	22 (62.8%)	57 (63.3%)		
Total	55 (100%)	35 (100%)	90 (100%)		
Duration of Hospital Stay					
Duration (days)	Male	Female	Total	χ^2	P value
1-3	32 (58.2%)	22 (62.9%)	54 (60.0%)	1.54	0.46
4-7	15 (27.3%)	10 (28.6%)	25 (27.8%)		
>7	8 (14.5%)	3 (8.5%)	11 (12.2%)		
Total	55 (100%)	35 (100%)	90 (100%)		

Table 2 shows the distribution of risk factors associated with febrile seizures among 90 patients. High-grade fever (>39°C) was the most common risk factor, present in 52 patients (57.8%), followed by a family history of febrile seizures in 48 (53.3%). A majority of cases were first episodes (64, 71.1%), while recurrent seizures were seen in 26 patients

(28.9%). Previous history of febrile seizures was also noted in 26 patients (28.9%). Developmental delay (6, 6.7%) and birth complications (9, 10%) were less common risk factors. Overall, fever severity and family history were the predominant contributing factors.

Risk factor	Frequency	Percentage (%)
Family history of febrile seizures	48	53.3
Previous history of febrile seizure	26	28.9
High-grade fever (>39°C)	52	57.8
First episode	64	71.1
Recurrent seizures	26	28.9
Developmental delay	6	6.7
Birth complications	9	10

Table 3 shows the association between the type of febrile seizure and family history among 90 patients. Among those with a positive family history, 40 (83.3%) had simple seizures and 8 (16.7%) had complex seizures. Similarly, in patients without a family history, 33 (78.6%) had simple seizures and 9

(21.4%) had complex seizures. Overall, simple seizures were more common (73, 81.1%) compared to complex seizures (17, 18.9%). The association was not statistically significant ($\chi^2 = 0.89$, $p = 0.34$), indicating that family history did not have a significant influence on the type of febrile seizure in this study.

Family history	Simple	Complex	Total	χ^2	P value
Yes	40 (83.3%)	8 (16.7%)	48 (100%)	0.89	0.34
No	33 (78.6%)	9 (21.4%)	42 (100%)		
Total	73 (81.1%)	17 (18.9%)	90 (100%)		

Discussion

The most prevalent form of seizure disorder in early childhood is febrile seizures, which occur in children aged 6 months to 6 years of age, and have an overall prevalence of 2-7% (Ogihara et al., 2010) [11]. In the current research, most children fell in the age group of 1-3 years (51.1%) which is quite close

to the reported mean age of 2.8 +1.5 years in the discussion, and other studies of 23.68 months (Fallah et al., 2009; Panahande et al., 2008) [12,13]. This resemblance indicates that the most vulnerable period of febrile seizures is always the early toddler age which is probably because of the immaturity of the growing brain, and the increased vulnerability of neurons to the febrile seizure associated neuronal

excitability. Nonetheless, our analysis also reported a somewhat higher rate of cases in children under 1 year (23.3%), which can be a sign of earlier onset in our population as compared to some past publications”.

There was evident male predominance in our study with males making 61.1% of cases which is in contrast to the previous research where males made 60.1 and up to 66% in the study by Mahyar et al. (2010) [14]. Such similarity supports the idea, that male gender can be a small yet stable risk factor of febrile seizures. Although it has this preponderance, our research could not establish statistically significant difference on gender and age composition ($p = 0.4$), contrary to some previous research studies that indicated gender as a significant impact factor (Mahyar et al., 2010) [14]. This difference may establish that gender is not a significant variable, although the males may be more affected.

Concerning the type of seizure, our results showed that simple febrile seizures were the most prevalent ones (81.1%), whereas complex ones comprised 18.9%. These findings are very similar with those of Hosseini Nasab et al. (2006), in which simple and complex febrile seizures were seen 76.4 percent and 23.6 percent of the cases, respectively [15]. This uniformity in literature indicates that simple febrile seizures are the most common clinical manifestation in the global world. Also, the most common type that occurs in our study was generalized tonic-clonic seizures (70%), which is also consistent with the general knowledge that generalized seizures are more typical than focal ones in febrile conditions. The fact that the gender difference between the two types of seizures was not statistically significant ($p = 0.83$) in our study is another sign that the already existing studies show that there is no difference in clinical manifestation between genders.

A major risk factor in our study was identified as family history with the prevalence being 53.3. This observation is fairly similar to the results of the research carried out in Boushehr (59%), Kashan (55%), and Kerman (50%) where family history was found among the most salient risk factors (Talebian et al., 2003; SANAYEI et al., 2007) [16,17]. The fact that these values are similar enhances the idea of intense genetic predisposition of febrile seizures. But contrary to anticipation, our research has not identified any statistically significant relationship between family history and type of seizure ($p = 0.34$), indicating that although genetic factors could play an important role in susceptibility to the seizure, they may not be determinants of the extent of the severity or complexity of the seizure.

With regards to etiological factors, our study revealed that most children (63.3% did not have any identifiable infection with the most identifiable cause being upper respiratory tract infections

(URTI) (11.1%), then acute gastroenteritis. This is in part consistent with past research findings where URTI was found as the most common condition cause of fever-inducing seizures and a URTI and AGE rate of 9.7 and 7.3 per cent respectively (Hosseini Nasab et al., 2006; Fallah et al., 2009) [15,18]. The marginally larger percentage of the cases with no identifiable infections in our study could be due to a different manifestation of the diagnostic practice or the existence of viral infections that were not clinically reported. However, the overall finding of common childhood infections as a key precipitating factor is underscored by the contemporary description of URTI as a significant precipitating agent.

The most prevalent risk factor in our study was high-grade fever (>39 °C) (57.8%), confirming the generally accepted fact that the elevation of temperature, as opposed to its rate of increase, is critical to the onset of seizures. The mean temperature of the study (38.3 ± 1.0 °C) is similar to the normal range of febrile temperature in other comparable populations although, the studies mentioned earlier did not necessarily measure the severity of the fever using the same method. Also, there were recurrence cases in 28.9% cases, and this is in line with the literature indicating recurrence rates at 25-30 further confirming reliability of our results.

In our study, the prevalence of the first episode was also shown (71.1%), and proportions of developmental delay (6.7%) and birth complications (10%) were rather low. These results correspond with previous studies showing that febrile seizures are mostly found in children who are otherwise healthy and have no important neurological impairments. In addition, hospital stays were not very long (13 days in 60 percent of cases) and this is also in line with the reported mild and self-limiting nature of febrile seizure.

In general, although our results are mostly similar to prior research in the respect of the demographic distribution of our sample, male dominance, the type of seizures, and the medical history of the family; some differences exist, including the higher percentage of cases with no detectable infection and the absence of any statistically significant results between the variables, which point to the possibility of regional or methodological deviations. These findings reinstate the significance of the contextual elements in the formation of the demographic and clinical picture of febrile seizures, and they also confirm the overall tendencies of the previous studies.

Conclusion

This retrospective study underscores that febrile seizures are more common among young children with slight male preponderance and most of them manifest themselves as simple febrile seizures and the generalized tonic-clonic type. Male and females did not have significant differences in their

demographic and clinical features such as age distribution, gender, residence, type of seizure, associated infections, and duration of hospital stay. The proportion of children with measurable risk factors, including the family history, high-grade fever, and the first-time seizure episodes, was greater, whereas the developmental delay and the birth complications were less prevalent. Although family history was frequently observed, it did not show a significant association with the type of febrile seizure. Overall, the findings emphasize the importance of recognizing common risk factors and typical clinical patterns to aid in early identification, reassurance, and appropriate management of febrile seizures in children.

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