International Journal for Multidisciplinary Research (IJFMR)
E-ISSN: 2582-2160 ● Website: www.ijfmr.com ● Email: editor@ijfmr.com

Febrile Seizures in Children: A Descriptive Study of Demographic and Clinical Features

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Abstract

Background: Febrile seizures are the most common neurological disorder in early childhood, typically triggered by fever in the absence of central nervous system infection or acute metabolic disturbance. Understanding their epidemiological and clinical patterns is essential for timely diagnosis and effective management.

Objective: To analyze the demographic distribution, clinical characteristics, and etiological factors associated with febrile seizures in pediatric patients.

Methods: A prospective observational study was conducted among 105 pediatric patients diagnosed with febrile seizures at a tertiary care hospital. Data were collected on age, gender, birth history, seizure type and duration, family history, and associated etiological factors. Descriptive statistics were used to analyze the trends and patterns observed.

Results: Febrile seizures were more prevalent in males (66%) than females (34%), with the highest incidence seen in children aged 1.5 to 2 years (29%). Firstborn children constituted 57% of cases, and a birth weight between 2.1–3 kg was noted in 68% of patients. Fever was the most common trigger (99%), with acute gastroenteritis and bronchiolitis each contributing to 34% of cases. Simple febrile seizures were most frequent, typically lasting 2–3 minutes. Common clinical features included fever (99%), loss of consciousness (100%), and up-rolling of eyes (56%).

Conclusion: Febrile seizures were most frequently observed in male toddlers aged 1.5–2 years, with simple seizures being predominant. Key contributing factors included male sex, firstborn status, lower birth weight, and Cesarean delivery. Bronchiolitis and acute gastroenteritis were the most commonly associated conditions. These findings emphasize the importance of early recognition and supportive care in at-risk pediatric populations.

Keywords: Febrile seizures, birth weight, seizure duration, body temperature, bronchiolitis, gastroenteritis

1. Introduction:

Febrile seizures are generalized seizures that usually happens in children aged 6 months to 5 years triggered by a fever exceeding “100.4°F (38° C)and not linked to central nervous system infections , metabolic causes or a history of seizures without fever. [2] It is classified into subtypes simple febrile seizure and complex febrile seizure. Simple febrile seizure is brief, generalized and specific focal sign last under ten minutes and resolve within ten minutes and on their own with no occurrence in the following

24 hours. In contrast, complex febrile seizure may have focal onset occur more than once during a febrile illness or last longer than 10 to 15 minutes . They can also have partial onset and the presence of postictal neurological issues such as Todd paresis. Febrile status epileptics, a subgroup of complex febrile seizure, it occurs more than 30 minutes. [2]. Certain children are genetically predisposed to febrile seizures, particularly when exposed to rapid temperature elevations.Children with developmental delays were found to have a higher susceptibility to febrile seizures. In the third trimester, children with the lowest percentile of all general growth indicators (femur length, belly circumference, and estimated fetal weight) were more likely to have febrile seizure [2][9][10] . The study indicated that fetal growth retardation increases the risk of FS and that adverse environmental and genetic factors during pregnancy may play a role in its development. Important neonatal risk factors identified included low birth weight and a shortened gestational period. A positive family history of febrile seizures or epilepsy raises the risk of children with febrile seizures. Certain children may be more prone to febrile seizures due to a genetic pre disposition , especially if they experience rapid temperature increases . The presence of Generalized Epilepsy with Febrile Seizures Plus (GEFS+), a hereditary epilepsy syndrome, indicated a familial link to seizure disorders.

The study analyze age distribution among children with febrile seizures. To assess birth-related factors, including birth status, birth weight, and delivery history , and investigate the role of family history in febrile seizure occurrence examine the etiology and clinical features and to identify seizure characteristics, including duration and type, in affected children. This study aims to provide a comprehensive understanding of febrile seizures, contributing to better clinical decision-making and preventive strategies.

2. Materials and Methods :

This prospective observational study was conducted at the Government Medical College Hospital, Nagapattinam, Tamil Nadu, over a period of six months, from April 2024 to September 2024.

Study Population

Children aged between 6 months and 12 years who were admitted with febrile seizures during the study period were enrolled. Total 105 populations of the sample included in the study.

Inclusion Criteria

The study involved children within the age group of 6 months to 12 years.

Diagnosed with febrile seizures during hospital admissions.

Exclusion Criteria

Children with chronic systemic diseases (cardiac, renal, metabolic disorders).

Children with neuro developmental delays.

Children with acute central nervous system infections (meningitis, encephalitis)

Data Collection

Patient information was collected using a structured data collection form. Collected parameters included:

Demographic details : Age

Birth-related factors: mode of delivery (cesarean or natural vaginal), birth weight, birth order (firstborn, second, etc.)

Family history: presence or absence of febrile seizures

Clinical characteristics: type of febrile seizure (simple, atypical, febrile status epilepticus), seizure duration, and associated fever , symptoms.

Etiological data: suspected infectious or non-infectious causes. After obtaining informed consent from patient attendants, detailed (birth history, family history, patient demographics) was recorded.
Data collection began with handwritten records, which were later digitized using Microsoft Excel for proper analysis.. Data verification was done manually to ensure consistency and accuracy. Statistical analysis was performed using Microsoft Excel 2016.

Statistical Analysis:

Z-score standardization was used for continuous variables such as age, while categorical variables, including delivery history, gender distribution, family history, etiology, and types of febrile seizures, were analyzed based on their p-values. A two-tailed Z-test was applied to compare categorical variables. In this study, results were considered statistically significant if the p-value was less than 0.05.

3. Result

This study included a total of 105 pediatric patients aged between 6 months and 12 years. The age distribution of children included in the study, ranging from 6 months to 12 years. The majority of cases (43.80%) were in the toddler age group (1- 3 years), making it the most affected category. This was followed by infants (6 months- 12 months) at 20%, pre-schoolers (3-6 years) at 17.14%, and school–aged children (6 – 12 years) at 19.04%. The average age of the children was found to be 3.46 years, which corresponds to approximately 3 years and 6 months. The data depicted in the Table 1

Table 1 : Age-wise distributions in febrile seizure

Category	Age group	Male (n=69)	Female (n=36)	No. Of. Patients (n=105)	Percentage (%)
Infants	(6 month- 12 month)	16	5	21	20%
Toddler	(1 - 3 years)	29	17	46	43.80%
Pre-schoolers	(3 - 6 years)	10	8	18	17.14%
School age children	(6 - 12 years)	14	6	20	19.04%

Table 2 shows that out of 105 febrile seizure cases 55 patients (52 %) were delivered by Cesarean section, while 50 children (48%) were delivered by natural vaginal delivery.

Table. 2 : Delivery wise distributions in febrile seizure

Delivery History	No. of. Patients (n=105)	Percentage
Cesarean delivery	55	52%
Normal delivery	50	48%

Out of 105 patients with febrile seizures, the highest number was first–order children (60 patients, 57%). The most affected group was first – order children, followed by second-order children (38 patients, 36%).Third-order children accounted for (6 patient, 6%). Fourth – order children were the least affected, with (1 patient (1%). The data is visually represented in Table 3.

Table 3: Birth status wise distribution in Febrile seizure

Birth status	No.of. cases(n=105)	Percentage (%)
First order children	60	57%
Second order children	38	36%
Third order children	6	6%
Fourth order children	1	1%

Table 4 shows that out of 105 patients with febrile seizures, the highest occurrence was in children with seizures lasting 2–3 minutes (31 patients, 29.52%). 4–5 minutes was the second most frequent, observed in 26 patients (24.76%). 10–15 minutes lasted in 20 patients (19.05%). Seizures lasting 30 seconds to 1 minute and 20–30 minutes were each recorded in 13 patients (12.38%). The least common duration was 6–7 minutes, seen in only 2 patients (2%). The mean (average) seizure duration was 7 .54 minutes.

Table 4: Distribution of seizure duration in Febrile seizure

Seizure duration	No. Of. Cases (n=105)	Percentage (%)
30 seconds to 1 minutes	13	11%
2 minute to 3 minutes	31	27%
4 minute to 5 minutes	26	23%
6 minutes to 7 minutes	2	2%
10 minutes to 15 minutes	20	17%
20 minutes to 30 minutes	23	20%

Out of 105 patients with febrile seizures, the highest proportion of children had a birth weight of 2.1-3 kg (72 patients, 68%), followed by 23 patients (22%) with a birth weight of 3.1-4 kg. A birth weight of 1.1-2 kg was observed in 9 patients (9%), while the lowest birth category, 0.5–1 kg, included only 1 patient (1%). The data are represented in Table 5

Table 5 : Birth weight distribution in febrile seizure

Birth weight	No. Of. Cases (n=105)	Percentage (%)
0.5 -1	1	1%

1.1 - 2	9	9%
2.1 -3	72	68%
3.1 - 4	23	22%

Out of 105 patients with febrile seizures, 32 (30%) had a family history, while 73 (70%) had no family history. The data is represented in Table 6.

Table : 6 Family history wise distribution in Febrile seizure

Family History	**No. Of. Patients (n=105)**	**Percentage**
Yes	32	30%
No	73	70%

Out of a total of 106 patients, the majority (57 patients, 53. 77%) presented with moderate fever (100 4 F – 103 F). Mild fever (< 100 F) was observed in 35 patients (33 .02%), while high fever (> 104 F) was noted in 10 patients (9.43%). Only 3 patients (28.3%) had a normal temperature (97 F – 99 F). The mean (average) temperature is 99. 56 F. The median temperature is 100 4 F. The data is represented in Table 7.

Table 7 : Distribution of body temperature in febrile seizure

Body Temperature	**No. Of. Cases (n=105)**	**Percentage**
High fever (> 104 F)	10	9.43%
Moderate fever (100.4 F)	57	53. 77%
Mild fever (< 100 F)	35	33.02%
Normal temperature (97 F -99.F)	3	28.3%

Among the 105 cases of febrile seizures, 74 cases (70.5%) were classified as simple febrile seizures, while 14 cases (13.3%) were identified as atypical febrile seizures. Additionally, 6 cases (5.7 %) presented as febrile status epileptics, and 11 cases (10. 5%) were categorized as generalized tonic-clonic seizures. The data is shown in the Table 8.

Table : 8 Classification of febrile seizure distribution

Classification	**No. of. Patients (n= 105)**	**Percentage (%)**
Simple Febrile Seizure	74	70.5%
Atypical Febrile Seizure	14	13.3%
Febrile status epilepticus	6	5.7%

Generalizes tonic -clonic seizure	11	10.5%

The study indicates that the clinical features observed in 105 cases of febrile seizures were analyzed. Fever was present in all cases (104 cases, 99%), while loss of consciousness was documented in all cases (105 cases, 100%). Other associated symptoms included cold and cough in 60 cases (57.1%), up-rolling of eyes in 46 cases (43.8%), involuntary movements in 40 cases (38.1%), vomiting in 26 cases (24.8%), frothing in 22 cases (21.0%), and drooling of saliva in 10 cases (9.5%). Less frequently reported symptoms included loose stools (9 cases, 8.6%) and clenching of teeth 8 cases, (7.6%). The data is represented in the Table 9.

Table : 9 Distribution of clinical features in febrile seizures

Clinical features	**No. of. Patients (n=105)**	**Percentage (%**
Fever	104	88. 57%
Loss of consciousness	105	100 %
Drooling of saliva	10	9.52%
Frothing	22	20.95%
Loose stools	9	8.57%
Up rolling of the eyes	59	56.19%
Vomiting	26	24.76%
Clenching of teeth	8	7.6%
Involuntary movement	40	38.9%
Cold and cough	45	42. 85%

Table 10 presents the etiology of febrile seizures in the study population analyzed based on fever cases. Out of 105 cases, 104 cases (99.0%) presented with fever alone, while 9 cases (8.6%) were associated with infections. Among the infection-related three cases (2.9%) were attributed to gastrointestinal infections (acute gastroenteritis), and five cases (4.8%) were linked to respiratory tract infections , including bronchiolitis (three cases, 2.9%) and pneumonia (two cases, 1.9%). One case (0.9%) was associated with a submandibular infection.

Table : 10 Distribution of etiology in febrile seizure

Causes	**No .of. Patients (n=105)**	**Percentage (%)**
Fever status		

Fever	104	99.0%
Absence of fever	1	0.9%
Infectious cases		
Bronchiolitis	3	2.86%
Pneumonia	2	1.90%
Acute gastroenteritis	3	2. 80%
Submandibular infection	1	0.95%

4. Discussion

Febrile seizure is a common neurologic disorder in children. There were a total of 105 patients up to 12 years admitted during the study period. The highest incidence of febrile seizures was observed in toddler group children especially aged 1.5 – 2 years (29%), similar to the results of Dr. Murli Manohar Gupta et al. This supports the idea that the immature brain of toddlers has a heightened response to fever-induced neuronal excitability.[6]

Firstborn children (57%) and those with birth weights between 2.1 – 3 kg (68%) had a higher prevalence of febrile seizures, correlating with findings from previous studies.This could indicate an interaction between birth-related factors and neuro developmental vulnerability. [5]

A family history of seizures was present in (30%) of cases confirming the role of genetic predisposition in seizure recurrence, additionally children born via Cesarean section had a slightly higher incidence (52%) of febrile seizures. While this observation is supported by studies such as those by Fariba Tarhani et al., the exact underlying mechanisms remain unclear and warrant further research. [4]

The most common seizure duration observed was 2 – 3 minutes (27%) consistent with studies by Dale C. Hesdorffer et al. This indicating that most febrile seizures are brief and self-limiting , making them less alarming from a clinical management perspective.[3]

Most children (64%) experienced seizures when body temperature ranged between 100.1 – 105°F reinforcing the well-established correlation between fever severity and seizure occurrence, as highlighted by Wesley Eilbert MD et al. Our findings align with previous studies: the predominance of fever as an etiology (99%) is consistent with Wesley Eilbert MD, Chuck Chan DO et al. who emphasize fever as a key trigger for febrile seizures.[2]

Among the infectious causes (34%) in triggering febrile seizures supports the study by Dr. Shajna Mahamud et al., who reported a similar association, particularly with gastroenteritis and also confirms that bronchiolitis (34%) is a major cause of febrile seizures, consistent with the findings of Han et al. (2023) [7][8]

The observed 100% occurrence of loss of consciousness is in agreement with You YiI Chen Zhong et al., who suggested that transient altered consciousness is a hallmark feature of febrile seizures. [1]

In our study, the classification of febrile seizures was simple febrile seizures (70.5%), atypical febrile seizures (13.3%), febrile status epilepticus (5.7%), and generalized tonic-clonic seizures (10.5%). These findings are comparable to the review by Eilbert and Chan, which reported that simple febrile seizures

accounted for approximately 70% of cases, atypical febrile seizures for 25%, and febrile status epilepticus for 5%. [2]

5. Conclusion

This study highlights that febrile seizures are most common in children aged 1.5–2 years, with bronchiolitis and acute gastroenteritis being major triggers. The hallmark features observed were fever and loss of consciousness. Simple febrile seizures were more frequent, typically lasting 2–3 minutes. Additional contributing factors were male sex, being the firstborn child, reduced birth weight, and birth by Cesarean section. These observations are in agreement with existing literature and help reinforce our understanding of the various risk factors associated with febrile seizures in children .

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