

## Original Research Article

# Demographic patterns, acute management, and outcomes of paediatric seizures presenting to the emergency department: a retrospective study

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## ABSTRACT

**Background:** Seizures are among the most common neurological emergencies in paediatric emergency departments (EDs). Presentations range from benign febrile seizures to life-threatening status epilepticus, requiring rapid assessment and evidence-based management.

**Methods:** It was a retrospective case series that used a group of 40 pediatric patients who came to the ED with seizures. The information gathered was the age, sex, the type of seizure, its duration, related fever, laboratory and neuroimaging results, management, disposal and short-term outcome. In known epilepsy, seizures were categorized as simple febrile, complex febrile, focal epilepsy, generalized afebrile seizures, status epilepticus or breakthrough seizures.

**Results:** 50% of the patients were non adults (less than five years old) and the percentage of males was higher (57.5%). The percentage of febrile seizures (simple 32.5, complex 15%) was 47.5. The proportion of focal epilepsy was 22.5, generalized afebrile seizures 17.5, status epilepticus 7.5 and single unprovoked seizures 5. Structural abnormalities were detected in the neuroimaging of select cases of focal epilepsy. 27.5% percent of the patients needed to be admitted to the hospital, and 7.5 percent needed Paediatric Intensive Care Unit (PICU) services. Patients showed positive neurological outcomes at all-time discharge.

**Conclusions:** The range of clinical manifestations of pediatric seizures in the ED is wide, and febrile seizures prevail among younger children. Evidence-based diagnostic and management practices can be achieved on adherence and appropriate resource utilization and positive short-term results. Further focus on the standardized care pathways and parental education is necessary to achieve maximum optimization of pediatric seizure management in the emergency care setting.

**Keywords:** Paediatric seizures, Febrile seizures, Emergency department, Status epilepticus, Focal epilepsy, Neuroimaging, Antiepileptic drugs, Paediatric emergency care

## INTRODUCTION

The most frequent neurological emergency in the pediatric practice and considerable portion of emergency department (ED) visits throughout the globe are seizures. It has also been reported that the lifetime occurrence of at least one childhood seizure is approximately 4-10 per cent and that febrile seizures constitute a large portion of

presentations in children who are below the age of five years.<sup>1,2</sup> Febrile seizure is common in 2-5% of children and in most instances, it is not complicated but it has some complex side that demands further examination in order to exclude underlying disease.<sup>2</sup> Afebrile seizures can be a symptom of first onset epilepsy, structural defects, metabolic disorders, or an infection, and, hence, such children must be reviewed systematically.<sup>3</sup> Status epilepticus is a significant pediatric emergency associated

with increased morbidity especially when there is late treatment.<sup>4</sup> The clinical presentation, demographic profile, and acute management of pediatric seizures in the ED are the determinants of improvement of the care patterns and resource utilization. The case series provides information about 40 children, who came to the clinic with seizures and discusses the demographic characteristics, semiology of seizures, investigations, interventions, and short-term outcomes.

### ***Clinical presentation***

The manifestations of seizures were dependent on age and etiology. In younger children, generalized tonic-clonic seizures that were related to fever were the preeminent ones, lasting anywhere between 2-5 minutes. Simple febrile seizures were short term, generalized and non-repeated over the following 24 hours but complex febrile seizures were focal in onset, lasted longer (>5 minutes) or recurrent over the febrile illness.<sup>2</sup> Older children were more often (with afebrile focal seizures) with unilateral clonic movements, non-awareness, headache, or vomiting.

EEG abnormalities were electroencephalography (EEG) generalized spike-wave discharges and focal temporal spikes in support of the diagnosis of epilepsy in selected cases.<sup>5</sup> The structural etiologies found in focal epilepsy through neuroimaging included cortical dysplasia and mesial temporal sclerosis. Status epilepticus was characterized by prolonged seizure lasting more than 30 minutes or repeated seizures without regaining consciousness which was in line with those definitions.<sup>4</sup>

### ***Prevalence and demographic characteristics***

Out of all of the 40 analyzed pediatric cases, half of them were under the age of five years which indicates the established highest prevalence of febrile seizures during young childhood.<sup>2</sup> It had a slight male bias (57.5), which reflects earlier epidemiological findings in pediatric groups of seizures.<sup>6</sup>

Febrile seizures accounted for the majority of presenting seizures in this pediatric cohort (approximately 45-50%), with simple febrile seizures comprising roughly two-thirds of cases and complex febrile seizures making up a substantial minority; a smaller but notable fraction progressed to focal or generalized afebrile epilepsy, underscoring the ongoing risk of later epilepsy among children with febrile seizures, particularly when family history of epilepsy or complex febrile features are present.<sup>7</sup>

## **METHODS**

### ***Study design***

This was a retrospective observational study conducted to evaluate the patterns, interventions, and outcomes of pediatric patients presenting with seizures to the

emergency department. The study design was in accordance with the approved research proposal.

### ***Study setting and period***

The study was carried out at Saqr Hospital and Fujairah Hospital, both tertiary care government hospitals providing pediatric emergency services. The study included cases presenting between December 1, 2023 and December 1, 2024. Data collection was conducted over six months following ethical approval.

### ***Study population***

The study population comprised pediatric patients aged 2 months to 18 years who presented to the emergency department with seizures during the defined study period. Only patients with complete medical records available for review were included in the final analysis.

### ***Inclusion and exclusion criteria***

Children aged between 2 months and 18 years who presented with seizures during the study period were included. Eligible patients were those admitted between December 1, 2023 and December 1, 2024 and had complete medical documentation available for review.

Patients were excluded if they had experienced a traumatic brain injury within three months prior to presentation, if the presenting episode was determined to be non-epileptic in nature (including syncope, breath-holding spells, movement disorders, or psychogenic non-epileptic events), or if they were younger than two months of age.

### ***Sampling method and sample size***

A total population sampling technique was employed. All cases that met the inclusion criteria during the study period were included. The expected sample size was 40 pediatric cases, based on feasibility and institutional case load.

### ***Data collection procedure***

Data were retrospectively collected from electronic and paper-based medical records, including emergency department notes, admission and progress documentation, laboratory reports, imaging findings, electroencephalography (EEG) records, and discharge summaries. A structured data collection form was used to maintain uniformity and accuracy during data extraction. Demographic variables recorded included age, sex, and nationality. Clinical information comprised seizure type, duration, frequency, associated symptoms, birth and developmental history, family history of seizures, and parental consanguinity.

Diagnostic investigations reviewed included complete blood count, inflammatory markers, CT or MRI findings, lumbar puncture results when indicated, and EEG

findings. Management details, admission status, length of hospital stay, complications, and final outcomes were documented. All data were anonymized and entered into a secure database for statistical analysis.

**Ethical approval**

Ethical approval was obtained from the Human Ethics Committee of RAK Medical and Health Sciences University prior to commencement of the study. As this was a retrospective review of medical records, informed consent was waived. Institutional permission to access patient data was obtained. All patient identifiers were removed, and data were stored on a password-protected system accessible only to the research team.

**Statistical analysis**

Statistical analysis was performed using SPSS for Windows version 20.0 (SPSS Inc., Chicago, IL). Continuous variables were expressed as mean ± standard deviation or median with interquartile range depending on distribution.

Categorical variables were summarized as frequencies and percentages. Associations between categorical variables were analyzed using Pearson’s chi-square test or Fisher’s exact test where appropriate. A P-value of less than 0.05 was considered statistically significant.

**RESULTS**

In this study of 40 pediatric emergency department seizure presentations at Saqr Hospital and Fujairah Hospital in the United Arab Emirates (December 1, 2023-December 1, 2024), half of patients were <5 years old, simple febrile seizures were the most common subtype, 27.5% required admission, and all patients had favorable short-term outcomes.

**Table 1: Demographic characteristics (n=40).**

Variable	N	%
Age <5 years	20	50.0
Age ≥5 years	20	50.0
Male	23	57.5
Female	17	42.5
Febrile presentation	19	47.5
Afebrile presentation	21	52.5

Percentages are calculated using the total cohort as the denominator (n=40).

**Demographic characteristics**

A total of 40 pediatric patients were included. Half of the cohort was younger than five years (50.0%), and males accounted for 57.5% of presentations.

Fever-associated seizures represented 47.5% of cases. A family history of seizures was documented in 5.0% of

patients, and consanguinity was documented in 7.5% (Table 1).

**Seizure types**

Simple febrile seizures comprised 32.5% of presentations and were the most frequent seizure subtype. Focal epilepsy accounted for 22.5% of cases, and generalized afebrile seizures accounted for 17.5%. Status epilepticus occurred in 7.5% of patients, and single unprovoked seizures occurred in 5.0% (Table 2).

**Table 2: Seizure type distribution (n=40).**

Seizure type	N	%
Simple febrile seizure	13	32.5
Complex febrile seizure	6	15.0
Focal epilepsy	9	22.5
Generalized afebrile seizure	7	17.5
Status epilepticus	3	7.5
Single unprovoked seizure	2	5.0

Percentages are calculated using the total cohort as the denominator (n=40).

**Diagnostic findings**

Diagnostic investigations were performed selectively. Neuroimaging (CT and/or MRI) was performed in 15/40 patients (37.5%), with abnormal findings reported in 3/15 cases (20.0%).

EEG was performed in 18/40 patients (45.0%), with abnormal findings reported in 10/18 cases (55.6%). Laboratory abnormalities (CBC and/or CRP) were documented in 14/40 patients (35.0%) (Table 3).

**Table 3: Diagnostic findings with denominators for selective testing.**

Investigation	Performed N (%)	Abnormal N (%)
Neuroimaging (CT/MRI)	15 (37.5)	3 (7.5)
EEG	18 (45.0)	10 (25.0)
Laboratory abnormalities (CBC/CRP)	-	14 (35.0)

NR indicates “not reported” for the number tested beyond cohort-level reporting. Neuroimaging and EEG denominators reflect selective testing subsets; abnormal and normal proportions are calculated using the tested subset as the denominator for those rows.

**Management and outcomes**

Hospital admission occurred in 11/40 patients (27.5%), and 3/40 patients (7.5%) required PICU admission. Antiepileptic medication was initiated or adjusted in 13/40 cases (32.5%). All 40 patients had favorable short-term outcomes at discharge, and no mortality was recorded (Table 4).

**Table 4: Management and outcomes (n=40).**

Variable	N	%
Discharged from ED	29	72.5
Hospital admission	11	27.5
PICU admission	3	7.5
AED initiated/adjusted	13	32.5
Favourable short-term outcome	40	100

PICU admission is a subset of hospital admissions. Percentages are calculated using the total cohort as the denominator (n=40).

**Inferential comparisons between clinical variables**

Inferential analysis demonstrated a significant association between younger age (<5 years) and febrile seizure presentation (p=0.001). Focal seizures were significantly associated with hospital admission (p=0.032). Status epilepticus was strongly associated with PICU admission (p<0.001). No statistically significant association was observed between febrile status and hospital admission (p=0.221) (Table 5).

**Table 5: Inferential comparisons between clinical variables (n=40).**

Comparison	Variable 1 N (%)	Variable 2 N (%)	Test used	P value
Age group vs febrile status	<5 years: 15/20 (75%)	≥5 years: 4/20 (20%)	Chi-square	0.001
Seizure type vs admission	Febrile: 3/19 (15.8%)	Afebrile: 8/21 (38.1%)	Chi-square	0.221
Focal vs generalized vs admission	Focal: 6/9 (66.7%)	Generalized: 5/31 (16.1%)	Chi-square	0.032
Status epilepticus vs PICU	Status epilepticus: 3/3 (100%)	Others: 0/37 (0%)	Fisher's exact	<0.001

**DISCUSSION**

The present case series corroborates well-established epidemiologic and clinical patterns of febrile and other pediatric seizures observed in ED-based cohorts. Febrile seizures remain the most common presentation in young children, with a pronounced predominance in those under 5 years and a modest male bias, aligning with extensive literature that describes febrile seizures as the leading pediatric seizure phenotype in early childhood and reports similar age and sex distributions across diverse populations.<sup>8-11</sup> The observed spectrum of seizure types—in particular, the predominance of simple febrile seizures, followed by complex febrile seizures, focal-onset seizures, and minority of status epilepticus—matches prior multicenter and ED-based studies that document similar proportional hierarchies (simple febrile > complex febrile > focal onset; status epilepticus as a minority but clinically significant subset) and supports generalizability of these patterns to comparable pediatric populations.<sup>8-13</sup> Diagnostic testing in our cohort followed a selective approach, with neuroimaging performed in a minority of cases and yielding abnormalities in a small subset, consistent with the low diagnostic yield reported for routine imaging after a first pediatric seizure and the emphasis on guideline-directed selective imaging rather than universal imaging in first seizures.<sup>14,15</sup> EEG was obtained in roughly half of patients, with abnormalities in about half of those evaluated, a finding that aligns with reported ranges of EEG abnormalities in evaluated children and underscores that EEG should be used selectively rather than systematically in initial evaluations.<sup>12</sup>

Laboratory findings showed non-specific inflammatory markers elevated in a subset of cases, echoing prior

observations that inflammatory indices are often elevated in febrile seizure contexts but are not diagnostic of etiology, thereby supporting a testing strategy that prioritizes clinical context over routine laboratory abnormalities.<sup>8,12,16</sup> Management and short-term outcomes in our series are congruent with multicenter ED data. Hospital admission and ICU utilization fell within commonly reported ranges for pediatric seizure cohorts, and one-third of patients required antiseizure medications during the acute phase, reflecting typical early management patterns that aim to terminate seizures and stabilize the patient while avoiding overtreatment in most children.<sup>12,14,17</sup>

The absence of mortality and the explicit documentation of favorable short-term outcomes align with the broad pediatric literature that emphasizes good prognosis with timely and appropriate management, though it remains necessary to monitor recurrence risk and potential evolution to epilepsy in certain high-risk groups.<sup>18,19</sup> Our study acknowledges several limitations that temper the generalizability of conclusions. The retrospective design and modest sample size from two centers introduce potential selection and information biases, including the possibility that selective imaging and EEG testing influenced observed rates and yields.

The lack of long-term follow-up restricts conclusions to short-term outcomes, and regional variations in testing thresholds and admission practices may limit applicability to other settings. These caveats are consistently highlighted in similar ED-based pediatric seizure studies and reinforce the need for larger, prospective, multicenter research with extended follow-up to validate these patterns and to refine

recommendations for imaging, EEG, and management in diverse health care environments.<sup>8,12,14</sup>

This study is limited by its retrospective design and small sample size at two centers, which may affect generalizability. Data collection was dependent on medical record accuracy, and selective testing (imaging/EEG) may introduce bias. Finally, long-term follow-up was not available, so we assessed only short-term outcomes. Future prospective multicenter studies with larger cohorts and follow-up are needed to validate these findings

## CONCLUSION

Febrile seizures were common in this 40-case pediatric ED cohort, especially among children below the age of five, and this was linked to an excellent short-term outcome. Focal epilepsy and status epilepticus were less common, but needed specific studies and systematic acute treatment. To maximize the outcomes of presenting with seizures among children, it is necessary to use early intervention, evidence-based treatment guidelines, and follow-up.

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