Clinical Characteristics and Outcomes of Seizure Presentations in the Emergency Department: Insights from the First Cohort Study in Oman

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Received: 24 July 2025

Accepted: 4 February 2026

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DOI 10.5001/omj.2026.50

Abstract

Objectives: Seizures are a frequent cause of emergency department (ED) visits, with presentations varying in severity. Our objective was to analyze clinical features, investigations, and management of seizure patients in the ED.

Methods: This retrospective cohort study included seizure (≥13 years) cases at a tertiary hospital in Muscat, Oman, from March 2020 to February 2025. Logistic regression identified admission predictors.

Results: A total of 995 patients were analysed (mean age 33.35 ± 17.54 years), of whom 57.7% were male. Seizure-related ED visits peaked in June (n = 105) and March (n = 100), with lows in September (n = 57) and November (n = 66). A seizure history was present in 55.5%, and 55.6% reported prior AED use—most commonly levetiracetam (19.3%), sodium valproate (9.2%), and carbamazepine (8.0%). Generalized tonic-clonic seizures accounted for 76.1% of presentations. New-onset seizures (26.3%) were significantly associated with admission (aOR 2.32, 95% CI 1.32–4.1; p = 0.003); prior seizures and active seizures on arrival were not. Tachycardia (34.8%) and tachypnea (45.7%) were significant predictors (p < 0.001), as was GCS < 9 (aOR 3.37, 95% CI 1.69–6.72; p < 0.001). Acute imaging findings (4.1%) predicted admission (aOR 3.33, 95% CI 1.04–10.65; p = 0.042). Elevated CRP (12.8%), leukocytosis (33.5%), leukopenia (11.1%), and hyponatremia (14.1%) were all significant (p < 0.001). Internal medicine (n=317; 31.9%, aOR 87.41) and neurology (n=374; 37.6%, aOR 28.32) referrals strongly predicted admission (n=309; 31.1%) both p < 0.001. Seven patients died in hospital.

Conclusion: New-onset seizures, abnormal vitals, low GCS, lab derangements, and referrals significantly influence ED admission decisions. Findings can guide triage and support ED decision tools.

Keywords: Seizure; Epilepsy; Emergency Department; Acute Seizure; Seizure Presentation; First Seizure; Breakthrough Seizure; Seizure Management.

Introduction

Epileptic seizures are a significant and frequent cause of emergency department visits, representing about 1–2% of all presentations in the United States and worldwide. Globally, in 2021, nearly 52 million people were living with active epilepsy (24 million idiopathic and 28 million secondary), with a prevalence of 658 per 100,000. Although age-standardised deaths and DALY rates for idiopathic epilepsy have declined since 1990, overall prevalence rose by 10.8%, largely driven by secondary epilepsy. More than 80% of the global burden—including incidence, prevalence, deaths, and DALYs—occurs in low- and middle-income countries, underscoring the urgent need for improved treatment, prevention, surveillance, and efforts to reduce stigma.[1,2]

The clinical spectrum is broad, ranging from brief, self-limited episodes to life-threatening conditions such as status epilepticus (SE), and seizure-related emergencies contribute substantially to patient morbidity and mortality.[3-5] Patients presenting with seizures represent diverse clinical scenarios, including new-onset seizures, breakthrough seizures in known epileptics, alcohol-related seizures—particularly withdrawal seizures—and SE.[1,5] Withdrawal seizures, especially those linked to abrupt cessation of alcohol or certain medications, are an underrecognized yet important subset that often presents suddenly and with serious consequences.[6] These types of seizures may be overlooked or misattributed, leading to delays in appropriate care.[2,6] Breakthrough seizures, often due to poor adherence to antiepileptic drug (AED) regimens, also make up a substantial proportion of ED visits and signal a need for better long-term epilepsy management.[7] SE, defined as a seizure lasting longer than five minutes or multiple seizures without return to baseline, remains a critical medical emergency with outcomes closely tied to the timeliness of intervention.[5]

Seizures are a common cause of ED presentations, yet standardized admission guidelines are lacking, particularly for breakthrough and withdrawal seizures. Accurate distinction from mimics and early identification of causes remain crucial for management, with current protocols emphasizing rapid stabilization, targeted investigations, and stepwise pharmacologic therapy.[2,8,9] Disposition decisions are influenced by neurological recovery, comorbidities, and specialist input. With no prior local data and a heavy burden on emergency services, this research was essential. It strengthens our understanding of seizure care in Oman and supports global efforts to build evidence-based emergency protocols that improve patient outcomes.

Methods

This retrospective observational cohort study was conducted in the ED of a high-volume tertiary academic hospital in Muscat, Sultanate of Oman. The center manages approximately 70,000 patient visits annually, covering a wide range of medical and surgical emergencies. We included all consecutive patients aged 13 years and older who presented to the ED with seizures or SE between 1 March 2020 and 28 February 2025. Patients were excluded if their seizure-like presentations were attributable to specific underlying causes. These included toxicologic causes such as antidepressant or sympathomimetic overdose; withdrawal syndromes including alcohol and benzodiazepine withdrawal; and central nervous system infections, hypoxic or traumatic brain injury, and ischemic or hemorrhagic stroke. Patients with seizures due to neoplastic or autoimmune conditions—such as lupus cerebritis or anti-NMDA receptor encephalitis—or external triggers like fever or sleep deprivation were also excluded. Individuals under 13 years of age, who are typically managed in the pediatric ED, were not included. Charts with missing data were also excluded.

Data were collected using a structured Microsoft Excel form. Variables recorded included demographic data (age and gender), past medical history, presenting complaints, use of prior anti-epileptic drugs, vital signs at presentation (including Glasgow Coma Scale score), laboratory investigations, brain CT findings, and EEG results when available. Imaging and EEG data were handled using complete-case analysis. Information on ED interventions, referrals to inpatient specialties and final ED disposition—whether admission, discharge, death, or leaving against medical advice—was also documented. All data were analysed using IBM Statistical Package for Social Sciences (SPSS) Statistics (version 23.0, Armonk, NY, USA). Categorical variables were described using frequencies and percentages, while continuous variables were presented as means with standard deviations. Univariate and multivariate logistic regression analyses were used to evaluate the relationships between various clinical factors and in-hospital admission, with statistical significance defined as a p-value less than 0.05. Predictors of in-hospital admission were explored in relation to presenting complaints, vital signs at arrival, sensorium, interventions performed in the ED, and in patient referral,

Ethical approval for this study was granted by the Sultan Qaboos University Hospital, University Medical City Ethics Committee (Ref. No. SQU-EC/030/2024, MREC #3244), dated 21 March 2024. All data were anonymized prior to analysis to ensure patient confidentiality.

Results

A total of 995 patients met the inclusion criteria and were analysed. The mean age was 33.35 (SD ±17.54) years, with a male predominance (574 patients, 57.7%). The highest number of seizure-related ED visits occurred in June (n = 105), followed by March (n = 100). A noticeable dip was observed in August (n = 70), September (n = 57), October (n = 74), and November (n = 66). (Figure 1) Over half of the patients (55.5%, n = 552) had a known history of epilepsy or seizure disorder. Psychiatric conditions were reported in 8.9% (n = 88), and 6.2% (n = 62) had underlying childhood neurological or genetic conditions such as cerebral palsy. Prior anti-epileptic drug (AED) use was reported by 55.6% (n = 446), most commonly levetiracetam (19.3%), sodium valproate

(9.2%), and carbamazepine (8.0%). Monotherapy was used in 37.9% (n = 379), while 5.4% (n = 54) were on dual therapy. (Table 1)

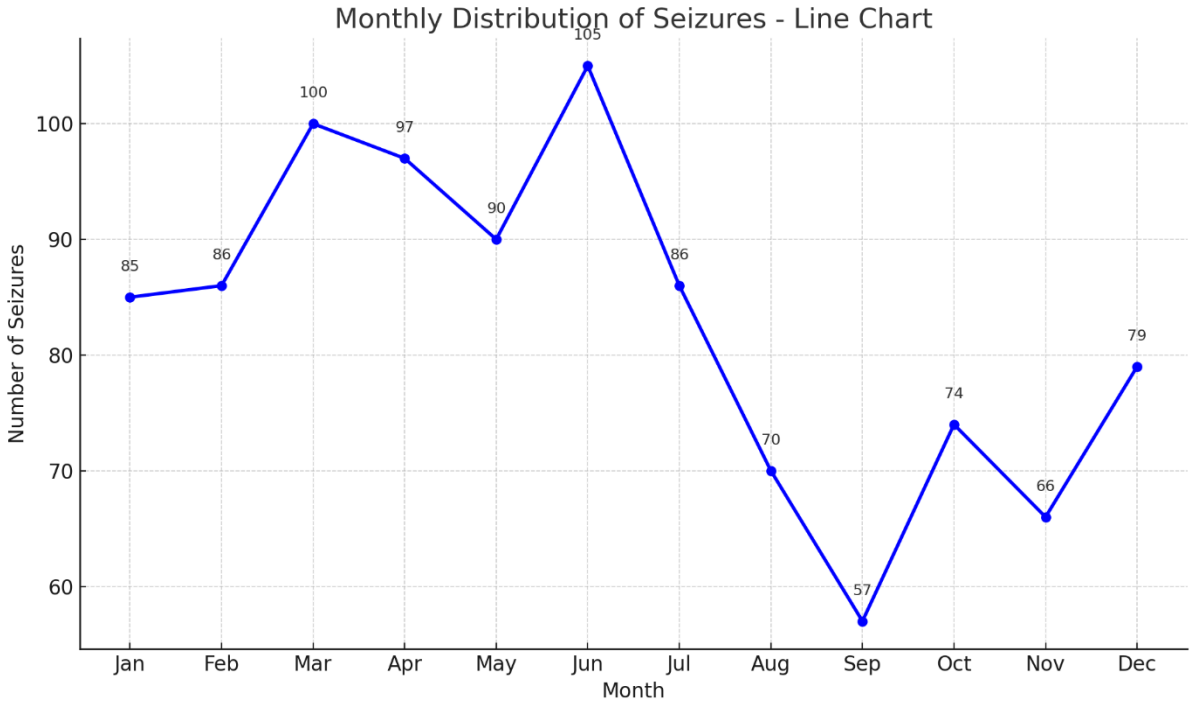

Figure 1: Monthly and Seasonal Distribution of Seizure Events.

Table 1: Demographic Characteristics, Medical History, and Prior Medication Use (Anti-epileptic Drugs).

Variables	**Frequency 995 (%)**
Age (SD) years	33.35 (17.54)
Male	574 (57.7)
Female	421 (42.3)
Past Medical History (one or more)	
Epilepsy/ Seizure disorder	552 (55.5)
Psychiatry disorder	88 (8.9)
Childhood Genetic Disorder/ Cerebral palsy	62 (6.2)
Diabetes Mellitus	58 (5.8)
Hypertension	56 (5.6)
Past Cerebrovascular Event (Ischemic/Hemorrhagic)	56 (5.6)
History of traumatic head injury	53 (5.3)
Heart disease	33 (3.3)
Chronic kidney disease	20 (2.0)
Brain Metastasis or malignancy	17 (1.7)
Antepartum Seizure Episode	12 (1.2)
Past Central Nervous System Infection (Encephalitis/Meningitis)	11 (1.1)
Migraine	5 (0.5)
Others**	75 (7.5)
Prior Medication Use (Anti-epileptic Drugs) – one or more	
Compliance on anti-epileptic drug(s)	446 (55.6)
Levetiracetam	192 (19.3)
Sodium Valproate	92 (9.2)
Carbamazepine	80 (8.0)
Lamotrigine	41 (4.1)
Topiramate	35 (3.5)
Clonazepam	34 (3.4)
Phenytoin	31 (3.1)
Lacosamide	9 (0.9)
Clobazam	7 (0.7)
Carbamazepine	7 (0.7)

Phenobarbital	4 (0.4)
Oxcarbazepine	2 (0.2)
Single anti-epileptic drug use	379 (37.9)
Two anti-epileptic drugs use (polytherapy)	54 (5.4)
Three anti-epileptic drugs use (polytherapy)	10 (1.0)
Four anti-epileptic drugs use (polytherapy)	3 (0.3)

Others: Dyslipidemia, Behçet's Disease, Autoimmune Encephalopathy, Congenital Arteriovenous Fistula, Familial Cerebral Cavernous Malformation, Demyelinating Disease, Glucose-6-Phosphate Dehydrogenase Deficiency, Hypothyroidism, Intracranial Benign Space-Occupying Lesion, Leigh Disease, Sickle Cell Disease, Myasthenia Gravis, Antiphospholipid Antibody Syndrome, Lupus Nephritis, Thalassemia, Ulcerative Colitis, Congenital Adrenal Hyperplasia, Hydrocephalus, Marfan's Syndrome, Reactive Airway Disease, Chronic Liver Disease*

**Since the past medical history variable includes multiple medical conditions for certain patients, and all patients in the dataset have a history of seizures, it is not feasible to calculate p-values for each individual medical condition.

The most common presenting symptom was a generalized tonic-clonic seizure (76.1%, n = 757). New-onset seizures occurred in 26.3% (n = 262) and were significantly associated with in-hospital admission (adjusted odds ratio [aOR] 2.32, 95% CI 1.32–4.1; p = 0.003). Similar prior seizures (51.9%, n = 516) did not show a significant association (unadjusted odds ratio [uaOR] 0.76, 95% CI 0.25–2.36; p = 0.640). Active seizures on arrival (17.6%, n = 175) did not correlate significantly with admission (uaOR non-significant). (Table 2) Among vital signs, tachycardia (34.8%) and tachypnea (45.7%) were both significantly associated with admission (p < 0.001). Temperature ≥37.2°C (16.3%) was not a significant predictor after adjustment (aOR 1.45, 95% CI 0.78–2.70; p = 0.238). A Glasgow Coma Scale score <9 (4.4%) was a strong independent predictor (aOR 3.37, 95% CI 1.69–6.72; p < 0.001). (Table 2) The most frequently administered AED in the ED was levetiracetam (56.4%), followed by phenytoin (20.6%) and sodium valproate (13.8%). Sedatives were also used: diazepam in 18.1% and midazolam in 2.8%. (Table 3)

Table 2: Presenting Complaints and Vital Signs at Presentation to the Emergency Department (ED).

Variables	**Frequency 995 (%)**	**Unadjusted Odd's ratio (95% CI)**	***p*-value**	**Adjusted Odd's ratio (95% CI)**	***p*-value**
Presenting complains to the ED (Predictors of *in hospital admission)					
Active seizure	175 (17.6)	4.30×10^{8} (-)	0.998	-	-
Similar seizure before	516 (51.9)	0.76 (0.25 – 2.36)	0.640	-	-
New onset seizure	*262 (26.3)*	*6.8×10^{7} (3.1×10^{7}- 1.5×10^{8})*	*0.001*	*2.32 (1.32- 4.1)*	*0.003*
Patient experienced generalized tonic-clonic seizures.	757 (76.1)	3.512×10^{-6} (-)	0.992	-	-
Patient experienced focal seizure	111 (11.2)	4.15×10^{7} (-)	0.997	-	-
Postictal State	503 (50.6)	1.20×10^{-6} (-)	0.995	-	-
Psychogenic non-epileptic seizure (PNES)	89 (8.9)	1.9×10^{5} (-)	0.994	-	-
Delirium Tremens episode	14 (1.4)	1.89×10^{8}	0.982	-	-
Tongue bite	158 (15.9)	5.52×10^{-10} (1.84×10^{-10} - 1.65×10^{-9})	0.001	1.17 (0.62- 2.22)	0.622
Poor Sensorium	148 (14.8)	5.1×10^{-9} (1.12×10^{-8} – 1.75×10^{-9})	0.458	-	-

Nausea/vomiting	103 (10.4)	3.4×10^{7} (-)	0.997	-	-
Generalized weakness and reduced oral intake	91 (9.1)	9.71×10^{4} (-)	0.994	-	-
History of fever	81 (8.1)	4.62×10^{-11} (-)	0.998	-	-
Vital Signs at Presentation to the ED (Predictors of *in hospital admission)					
Tachycardia (heart rate ≥ 100 beats/ min	347 (34.8)	1.33 (1.004 – 1.76)	<0.001	1.25 (0.74 –2.11)	0.405
Tachypnea (respiratory rate ≥ 20/min)	455 (45.7)	1.75×10^{-8} (7.81×10^{-9}– 3.93×10^{-8})	<0.001	1.09 (0.65 –1.82)	0.749
Oxygen Saturation in room air ($SpO_2 \leq 94\%$ room air)	33 (3.3)	4.97×10^{-8} (-)	0.999	-	-
Systolic blood pressure (≤ 90mmHg)	14 (1.4)	5.32×10^{6} (-)	0.998	-	-
Systolic blood pressure (≥ 140mmHg)	268 (26.9)	6.1×10^{7} (2.4×10^{7}- 1.6×10^{8})	0.001	1.16 (0.68 –1.98)	0.592
Temperature (≥ 37.2^{0} Celsius)	163 (16.3)	1.9×10^{7} (6.8×10^{6}- 5.3×10^{8})	<0.001	1.45 (0.78 –2.70)	0.238
Random blood sugar level (≤ 4mmol/L)	6 (0.6)	5.83×10^{5}	0.998	-	-
Random blood sugar level (≥ 7.8 mmol/L)	*175 (17.6)*	*6.9×10^{7} (2.2×10^{7}- 2.1×10^{8})*	*<0.001*	*2.39 (1.38 –4.13)*	*0.002*
Normal sensorium	737 (74.1)	2.97×10^{8} (-)	0.436	-	-
Confused or drowsy, but responsive (GCS: 13-15)	143 (14.4)	1.762 (0.38-7.99)	0.463	-	-
Confused, disoriented, limited response (GCS: 9-12)	71 (7.1)	4.79×10^{-9} (1.37×10^{0}– 1.68×10^{-8})	0.002	1.40 (0.56 –3.51)	0.472
Little to no response, critical state (GCS: < 9)	*44 (4.4)*	*1.22×10^{-8} (4.11×10^{0}– 3.60×10^{-8})*	*<0.001*	*3.37 (1.69 –6.72)*	*<0.001*

Table 3: Anti-Epileptic Medications, Sedatives, and Other Interventions Used in the Emergency Department (ED).

Variables	**Frequency 995 (%)**
Anti-Epileptic Medications used in ED	
Levetiracetam	562 (56.4)
Phenytoin	205 (20.6)
Sodium Valproate	137 (13.8)
Carbamazepine	4 (0.4)
Lacosamide	1 (0.1)
Topiramate	1 (0.1)
Levetiracetam, Phenytoin	18 (1.8)
Levetiracetam, Sodium Valproate	17 (1.7)
Levetiracetam, Carbamazepine	1 (0.1)
Phenytoin, Sodium Valproate	2 (0.2)
Levetiracetam, Phenytoin, Sodium Valproate	1 (0.1)
Sedatives used in the ED for patients with or following seizures.	
Diazepam	181 (18.1)
Midazolam	28 (2.8)
Lorazepam	21 (2.1)

Clonazepam	1 (0.1)
Haloperidol	7 (0.7)
Midazolam, Diazepam	18 (1.8)
Lorazepam, Diazepam	8 (0.8)
Lorazepam, Midazolam, Diazepam	2 (0.2)
Other medications used in ED	
Thiamine	11 (1.1)
Paracetamol	149 (14.9)
Steroids	4 (0.4)
Antibiotics	17 (1.7)

Acute findings on brain imaging (4.1%) were independently associated with admission (aOR 3.33, 95% CI 1.042–10.65; p = 0.042). EEG performed in the ED (3.8%) did not retain significance in multivariate analysis (aOR 2.21, 95% CI 0.61–8.00; p = 0.229). (Table 4) Inflammatory markers and lab abnormalities also played a role. Elevated CRP (>6 mg/L) was seen in 12.8%, leukocytosis (>11,000 WBCs/μL) in 33.5%, and leukopenia (<4.5 WBCs/μL) in 11.1% — all showing significant associations with admission on univariate analysis (all p < 0.001). Hyponatremia (<135 mmol/L) was present in 14.1% and was also significantly associated (p = 0.001). Referral to inpatient teams was strongly predictive of admission. Referral to internal medicine (31.9%) had an aOR of 87.41 (95% CI 20.19–378.37; p < 0.001), while neurology referrals (37.6%) had an aOR of 28.32 (95% CI 6.62–121.15; p < 0.001). One patient presented to the ED in SE and was bradycardic on arrival; resuscitation was unsuccessful. Among six other patients admitted with seizures, three were found to have acute brain insults (two with large intracerebral hemorrhages, one with massive bilateral cerebellar infarcts) and three developed pneumonia and sepsis. All seven patients succumbed during hospitalization.

Table 4: Details of Emergency Department Referral System, Disposition, and Hospital Outcomes

Variables	**Frequency 995 (%)**	**Unadjusted Odd's ratio (95% CI)**	***p*-value**	**Adjusted Odd's ratio (95% CI)**	***p*-value**
*Intervention in ED (Predictors of *in hospital admission)*					
Intubated in Emergency Department	47 (4.7)	50.44 (6.75 – 376.79)	<0.001	-	0.998
Acute finding in brain imaging (n-441)	41 (4.1)	12.12 (5.31 – 27.66)	<0.001	3.33 (1.042 – 10.65)	0.042
Electroencephalogram done from ED	38 (3.8)	2.32 (1.21 – 4.45)	0.011	2.21 (0.61 – 8.001)	0.229
*Laboratory results and (Predictors of *in hospital admission)*					
Hyponatremia < 135	141 (14.1)	1.33×10^{-7} (-)	0.001	2.15 (1.10 – 4.20)	0.025
Hypernatremia > 145	23 (2.3)	1.49×10^{-7} (-)	0.998		
C- Reactive Protein > 6	128 (12.8)	3.92×10^{-8} (2.54×10^{-8}-6.03×10^{-8})	<0.001	1.60 (0.91 – 2.80)	0.103
WBC > 11,000 WBCs per microliter	332 (33.5)	8.89×10^{7} (3.47×10^{7}– 2.28×10^{8})	<0.001	2.05 (1.22 – 3.46)	0.007
WBC < 4.5	111 (11.1)	6.00×10^{-8} ($1.89 – 1.90 \times 10^{-7}$)	<0.001	2.38 (0.78 – 7.25)	0.130
*(Predictors of *in hospital admission)*					
Referral to Medicine Team	317 (31.9)	1.88×10^{-8} (6.16×10^{-9}– 5.75×10^{-8})	<0.001	87.41 (20.19 – 378.37)	<0.001
Referral to Neurology Team	374 (37.6)	5.3×10^{7} (1.7×10^{7}- 1.6×10^{8})	<0.001	28.32 (6.62 – 121.15)	<0.001
Referral to Medical Oncology Team	23 (2.3)	2.05×10^{-8} (0.24 – 17.46)	0.421	-	-
No consultation	281 (28.3)	-	-	-	-
ED Disposition					
Discharged stable	653 (65.6)	-	-	-	-

Left Against Medical Advice	33 (3.2)	-	-	-	-
Admitted in hospital	309 (31.1)	-	-	-	-
Died in ED	1 (0.1)	-	-	-	-
Admitted in hospital					
High Dependency Unit	46 (14.6)	-	-	-	-
Intensive Care Unit	30 (9.6)	-	-	-	-
General ward	236 (75.8)	-	-	-	-
Hospital outcome (with presenting complaints)					
Discharged stable	282 (91.3)	-	-	-	-
Left Against Medical Advice	21 (6.8)	-	-	-	-
Died in hospital	6 (1.9)	-	-	-	-

Discussion

Seizures are a common neurological emergency and a frequent cause of ED visits, presenting across a wide clinical spectrum—from isolated first-time events to life-threatening SE.[2,5,8,9] In this cohort, the mean patient age was 33.3 years, with a male predominance (57.7%). Generalized tonic-clonic seizures were the most common presentation (76.1%). New-onset seizures accounted for 26.3% of presentations and were significantly associated with hospital admission (aOR 2.32, 95% CI 1.32–4.1). Although up to 45% of first seizures remain idiopathic, many are provoked by serious underlying conditions such as stroke, CNS infections, head trauma, or metabolic imbalances. A noticeable rise in medication non-adherence was observed in June (n = 105), followed by March (n = 100), coinciding with school holidays. Among adolescents, disrupted routines, increased social and recreational activities, and travel may contribute to missed doses, while irregular sleep and meal patterns further reduce adherence. These factors may partly explain seasonal declines in medication adherence, though this remains speculative and warrants further study.

Early ED evaluation is crucial to confirm the diagnosis and guide investigations. Breakthrough seizures—those occurring in patients with known epilepsy despite antiepileptic drug (AED) therapy—represented a substantial portion of cases.[10-13] In this study, 55.5% of patients had a prior seizure disorder, and 55.6% reported previous AED use. Non-adherence, estimated in 40–60% of cases, remains a leading contributor. These findings highlight the persistent challenge of seizure control and underscore the importance of individualized medication review. Alcohol-related seizures, particularly those occurring during withdrawal (typically within 6 to 48 hours of cessation), are another important differential. While not explicitly detailed in this study, they remain relevant in ED seizure evaluation.[14] SE, defined as seizures lasting ≥5 minutes or recurring without return to baseline consciousness, is a critical emergency. Both convulsive and non-convulsive forms require early recognition, though non-convulsive SE (NCSE) may go underdiagnosed due to subtle presentations.[4,5,15] A Glasgow Coma Scale (GCS) score <9—found in 4.4% of patients—was an independent predictor of admission (aOR 3.37, 95% CI 1.69–6.72), reinforcing the need for vigilance in patients with altered mental status.

Levetiracetam (56.4%) was the most commonly administered AED in the ED, followed by phenytoin (20.6%) and sodium valproate (13.8%), reflecting current global practice trends.[9,16] Levetiracetam is favoured for its efficacy, ease of titration, broad-spectrum activity, and favorable safety profile.[16] It can be safely used in the ED without prior drug level confirmation due to its wide therapeutic index and the impracticality of rapid level testing.16 In benzodiazepine-resistant SE, the ESETT trial demonstrated comparable efficacy among levetiracetam, fosphenytoin, and valproate, each achieving seizure cessation in about half of patients regardless of age or prior AED use.[17-19] Levetiracetam was used at 60 mg/kg (up to 4500 mg) in the study.[16] Phenytoin, while effective, carries risks such as hypotension and extravasation injury, prompting preference for fosphenytoin due to improved solubility and lower pH.[20] Valproic acid (20–30 mg/kg, up to 45 mg/kg) is another important second-line agent with a strong safety profile, except in patients with hepatic dysfunction.[21] Benzodiazepines—including diazepam (18.1%) and midazolam (2.8%)—were used as first-line agents, in line with current recommendations.[8,9] Intravenous lorazepam is typically preferred for seizure cessation and recurrence prevention, while intramuscular midazolam offers a practical alternative in prehospital or IV-limited

settings.[22] Underdosing of benzodiazepines, however, remains common and may reduce therapeutic effectiveness.

Disposition decisions were strongly linked to clinical severity and referral patterns. Internal medicine (31.9%) and neurology (37.6%) referrals were both powerful predictors of hospital admission (aOR 87.41 and 28.32, respectively). This reflects the complexity of cases requiring multidisciplinary input—particularly for new-onset or breakthrough seizures where AED titration, etiological clarification, and follow-up planning are essential.[8,23] Previous research, including the "Breakthrough-Seizures-in-the-Emergency-Department" study, similarly found that most patients with breakthrough seizures were admitted and that treatment with lorazepam or midazolam was strongly associated with admission.[13]

Brain CT revealed acute abnormalities in 4.1% of cases and was significantly associated with admission (aOR 3.33). CT is a frontline imaging modality in seizure evaluation due to its availability and ability to detect urgent pathology, especially in new-onset seizures, focal deficits, or suspected trauma—even though MRI offers better sensitivity for subtle findings.[24–26] Laboratory investigations further aided in risk stratification. Elevated CRP (12.8%), leukocytosis (33.5%), leukopenia (11.1%), and hyponatremia (14.1%) were all significantly associated with hospital admission. While some abnormalities may be transient postictal responses, persistent lab derangements—particularly signs of infection or metabolic triggers like hyponatremia and hypoglycemia—require close attention and often justify inpatient monitoring.[27,28] Electroencephalography (EEG) was performed in 3.8% of cases but did not retain significance as an admission predictor on multivariate analysis. EEG remains essential for suspected NCSE or diagnostic uncertainty but is often limited in the acute ED setting by logistical constraints.[29,30] Nevertheless, early EEG (within 12–24 hours) can increase diagnostic yield and help guide long-term management.[30]

Limitations of the study: This study has several limitations inherent to its retrospective design. Important clinical details, such as patients' genetic predispositions and family history of seizures, were frequently missing or inconsistently recorded. Many patients did not undergo key investigations like EEGs or neuroimaging, which limited the ability to confirm or classify seizure types accurately. Additionally, data on treatment adherence were often absent, making it difficult to assess the impact of medication compliance on outcomes. There was no structured follow-up, so long-term seizure control and recurrence rates could not be evaluated. Finally, since patients were from a limited geographic area, the findings may not be generalizable to broader or more diverse populations.

Conclusion

This study from Oman highlights key predictors of seizure-related admissions in a high-volume emergency department, including new-onset seizures, altered consciousness, abnormal vital signs, and acute neuroimaging findings. It also reflects changing pharmacologic trends, notably the use of levetiracetam, and underscores the role of specialist referrals in guiding disposition. These findings support a structured, multidisciplinary approach to ED seizure care, while future work should aim to develop risk stratification tools to improve early decision-making and outcomes.

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