

Characteristics of the patients who admitted to the emergency department with seizures and the factors affecting the frequency of admission

Gülten Bozali, MD, Ataman Kose, MD, Seyran B. Babus, MD, Sükrü H. Kaleağası, MD, Gülhan O. Temel, PhD,

ABSTRACT

الأهداف: تحديد سمات المرضى القادمين إلى قسم الطوارئ (ED) ويعانون من النوبات والعوامل التي تؤثر على وتيرة الدخول.

المنهجية: صممت هذه الدراسة على أنها دراسة مقطعية بأثر رجعي. تم تحليل الخصائص الديموغرافية والسريرية، وتكرار الدخول، والاختبارات التشخيصية (اختبارات المختبر والتصوير) للمرضى الذين تزيد أعمارهم عن 18 عاماً والذين تم قبولهم في ED خلال الفترة من يناير 2014م ويناير 2017م ويعانون من النوبات.

النتائج: شملت الدراسة 867 مريضاً يعانون من نوبات صرع. كشفت مقارنة عدد الدخول حسب الجنس دلالة إحصائية ($p=0.007$). تمت مقارنة عدد حالات الدخول وعدد النوبات حتى وقت القبول ووجدت دلالة إحصائية ($p=0.002$). في تحليل الانحدار اللوجستي للعوامل التي تؤثر على تكرار الدخول بمستوى ثقة قدره 95% كانت عوامل خطر لحالات الدخول للمرضى القادمين إلى قسم الطوارئ مع النوبات، نوع الصرع (نسبة الأرجحية= 4.404، فترة الثقة: 1.761-11.015)، الأمراض المصاحبة (نسبة الأرجحية= 2.021، فترة الثقة: 1.407-2.904)، دخول المستشفى (نسبة الأرجحية= 1.893، فترة الثقة: 1.259-2.847)، إصابة مصاحبة (نسبة الأرجحية= 2.013، فترة الثقة: 1.016-3.988)، استخدام الأدوية ($p<0.001$)، والأمراض الدماغية الوعائية المحتملة (نسبة الأرجحية= 2.763، فترة الثقة: 1.327-5.752) $p=0.007$.

الخلاصة: إن طبيعة النوبة (النوبة الأولى والمعروفة)، والأمراض المصاحبة، ودخول المستشفى، والإصابة المصاحبة، واستخدام الأدوية المضادة للصرع، ومسببات الأمراض القلبية الوعائية المحتملة هي عوامل خطر تؤثر على وتيرة الدخول مع النوبة.

Objectives: To determine the features of patients applying to the emergency department (ED) with seizures and the factors affecting the frequency of admission.

Methods: This study was designed as a retrospective, cross-sectional study. The demographic and clinical

characteristics, admission frequencies, diagnostic tests (laboratory and imaging methods) of the patients who were older than 18 years old and admitted to the ED between January 1, 2014 and January 1, 2017 with seizures were analyzed.

Results: The study included 867 patients with seizures. A comparison of the number of admissions by gender revealed a statistical significance ($p=0.007$). The number of admissions and the number of seizures until the time of admission were compared and found a statistical significance ($p=0.002$). In the logistic regression analysis of the factors affecting the frequency of admissions, seizure character [OR: 4.404 (95% CI: 1.761-11.015), $p=0.002$], comorbidity [OR: 2.021 (95% CI: 1.407-2.904), $p<0.001$], hospitalization [OR: 1.893 (95% CI: 1.259-2.847), $p=0.002$], concomitant injury [OR: 2.013 (95% CI: 1.016-3.988), $p=0.045$], drug use ($p<0.001$), and possible etiology cerebrovascular disease (CVD) [OR: 2.763 (95% CI: 1.327-5.752), $p=0.007$] were risk factors for frequent admission of patients applying to ED with seizures.

Conclusion: Seizure character (first and known seizure), comorbidity status, hospitalization, concomitant injury, anti-epileptic drugs use, and possible etiology CVD are risk factors affecting the frequency of admission with seizure.

Neurosciences 2021; Vol. 26 (2): 163-170
doi: 10.17712/nsj.2021.2.20200092

From the Emergency Service (Bozali), Mersin City Hospital, Department of Emergency Medicine (Kose, Babus), Department of Biostatistics and Medical Informatics (Temel), Department of Neurology (Kaleağası), Faculty of Medicine, Mersin University, Mersin, Turkey

Received 1st June 2020. Accepted 4th November 2020.

Address correspondence and reprint request to: Dr. Ataman Kose, Department of Emergency Medicine, Faculty of Medicine, Mersin University, Mersin, Turkey. E-mail: ataberke76@yahoo.com.tr
ORCID ID: <https://orcid.org/0000-0002-3856-6582>

Patients who apply to the emergency department (ED) with seizures are in the group of patients that need to be evaluated quickly and accurately, which are challenging and open to errors. In the management of these patients in the ED, patient characteristics should be determined well. Although the patients' complaints about having seizures are frequently seen in the ED, they vary widely in terms of frequency, severity, and prognostic significance.^{1,2} Seizure constitutes 1% of annual emergency admissions in the USA.³ It has been reported that 28% of patients with epilepsy admit to EDs for treatment purposes every year.⁴ Examination of the reasons for admission, proper treatment, and orientation of patients who apply with a seizure complaint are factors that will reduce the re-admissions. The overall risk of recurrence after a first generalized tonic-clonic seizure is approximately 30% at 5 years. If the seizure is idiopathic, only 17% had a recurrence at 20 months.⁵ The first two years risk of recurrence rate in patients ranges from 21-45%.⁶ For this reason, knowing the reasons for the re-admission of patients and measures for this will also reduce the workload in EDs. Admissions show a broad spectrum from benign febrile seizures to status epilepticus (SE). Convulsive seizures occur in 0.53% to 7.6% of patients applying to ED.^{1,7} While 40-45% of patients presenting with seizure have no identified cause, seizures induced by metabolic or toxicological reason have a lower chance of becoming epilepsy (lower than 3%).⁸⁻⁹ This study was conducted to determine the frequency of seizure patients in the ED patient population and possible seizure etiologies, seizure type (focal, generalized, etc.), admission seizure type (first single seizure, known seizure-remote, active seizure, SE), characteristics of diagnostic activities (laboratory and imaging tools), anti-epileptics used, patient termination methods (discharge from the ED, hospitalization). There are not many studies revealing the frequency and reasons for admission of patients who applied to EDs with a complaint of seizures. Thus, the factors affecting the frequency of admission of patients will be determined with this study.

Methods. Study design. This was a retrospective cross-sectional study. In our descriptive study, patients over 18 years of age who admitted to the ED between

January 1, 2014 and January 1, 2017 and were consulted to the neurology department (ND) and whose patients files were accessible were examined. Before the study, an approval from the Clinical Research Ethics Committee dated 10.06.2019 and numbered 2019/242 was obtained. The study was in accordance with the principles of Helsinki Declaration. Considering the nature of this study, informed consent was not required. Our study was conducted by scanning patient data according to the ICD-10 diagnostic codes via Nucleus, the hospital electronic information operating system. All data were analyzed retrospectively. Standard data collection form was created in our study. Demographic characteristics, clinical characteristics, laboratory data, and imaging findings of the patients were entered into the data collection form. We tried to obtain information about patient data retrospectively from patient observation forms and electronic medical records. All data were independently made from national administrative database that contains the records of all visits to our hospital at the patient-level.

Our centre is a large, multidisciplinary, academic university hospital in the Mediterranean region of Turkey and a large tertiary referral center in an urban area. The hospital has approximately 700 inpatient beds and 145 intensive care unit (ICU) beds. Our emergency department is a tertiary care, level one trauma center with presented approximately 110,000 adult patients annually. In our hospital, there is an ED and emergency medical education is given and patient care is provided by ED assistants in the ED. In accordance with the agreement we made with the department of neurology in the institution we work in, most of the seizure patients admitted to the emergency department are consulted to the neurology clinic. Patients were initially evaluated by emergency physicians and, were mostly consulted to the neurology clinic.

Study parameters. In the data collection process, age, gender, number of seizures, seizure type, seizure characteristics, additional disease history, and number of seizures during the period of admission were reviewed. Laboratory values (white blood cell count, aspartate aminotransferase (AST), alanine aminotransferase (ALT), urea, creatinine, sodium, potassium, calcium) and full urine analysis were evaluated. Information about whether cranial CT imaging was performed, whether the patient was using anti-epileptic drugs (AED), AED level, discharge, and hospitalization status, accompanying injury status, possible seizure were recorded on the study form.

For the analysis of the data, the patients were divided into 4 groups with the groups of 18-29, 30-45 years

Disclosure. Authors have no conflict of interests, and the work was not supported or funded by any drug company.

Table 1 - The relationship between the clinical parameters of the seizure patients admitted to the ED with the frequency of admission.

Variables	All Patients	Single admission (n= 585; 67.5%)	Frequent admission (n=282, 32.5%)	P-value
Age	43.8±19.50	44.77±20.27	41.64±17.66	0.021
Gender				
Female	432 (49.8)	275 (47)	160 (56.7)	0.007
Male	435 (50.2)	310 (53)	122 (43.3)	
Age group				
18-29	266 (30.7)	178 (30.4)	88 (31.2)	0.061
30-45	239 (27.6)	148 (25.3)	91 (32.3)	
46-65	197 (22.7)	136 (23.2)	61 (21.6)	
≥65	165 (19)	123 (21)	42 (14.9)	
Number of seizures until the admission	1.44±1.06	1.36±0.93	1.59±1.26	0.009
Number of seizures until the admission				
No recurrent seizures (1)	686 (79.1)	480 (82.1)	206 (73)	0.002
Recurrent seizure (≥2)	181 (20.9)	105 (17.9)	76 (27)	
Seizure character				
First Seizure	215 (24.8)	203 (34.7)	12 (4.3%)	<0.001
Known old seizure (remote)	652 (75.2)	382 (65.3)	270 (95.7)	
Type of seizure				
Generalized	731 (86.4)	498 (87.4)	233 (84.4)	0.319
Focal	94 (11.1)	57 (10)	37 (13.4)	
Indefinite	21 (2.4)	15 (2.6)	6 (2.2)	
Status Epilepticus	46 (24.8)	25 (4.3)	21 ± 7.4	0.051
Known Epilepsy	373 (43)	252 (43.1)	121 (42.9)	0.962
Liver function tests				
Normal	805 (93)	540 (92.3)	265 (94)	0.417
Abnormal	61 (7)	44 (7.5)	17 (6)	
Renal function tests				
Normal	784 (90.5)	526 (89.9)	258 (91.5)	0.503
Abnormal	82 (6.7)	58 (9.9)	24 (8.5)	
Electrolyte Abnormality				0.203
Normal	806 (93.1)	548 (93.7)	258 (91.5)	
Abnormal	60 (6.9)	36 (6.1)	24 (8.5%)	
Infection				0.002
Yes	167 (19.3)	96 (16.4)	71 (25.2)	
No	700 (80.7)	489 (83.6)	211 (74.8)	
Cranial tomography				<0.001
Performed	545 (62.7)	397 (67.9)	148 (52.5)	
Not performed	322 (37.1)	188 (32.1)	134 (47.5)	
Accompanying Injury				0.011
Yes	69 (8)	56 (9.6)	13 (4.6)	
No	798 (92)	529 (90.4)	269 (95.4)	
AED Use				
No	245 (28.3)	229 (39.1)	16 (5.7)	<0.001
Regular	328 (37.8)	164 (28)	164 (58.2)	
Irregular	294 (33.9)	192 (32.8)	102 (36.2)	
AED Blood level				<0.001
No	512 (59.1)	381 (65.1)	131 (46.5)	
Sufficient	140 (16.1)	66 (11.3)	74 (26.2)	
Low	188 (21.7)	120 (20.5)	68 (24.1)	
High	27 (3.1)	18 (3.1)	9 (3.2)	

AED - anti-epileptic drugs

Table 2 - The relationship between the comorbid diseases and possible causes of the seizure patients admitted to the ED with the frequency of admission.

Variables	All Patients	Single admission (n= 585; 67.5%)	Frequent admission (n=282, 32.5%)	P-value
Comorbid status	417 (48.1)	263 (45)	154 (54.6)	0.008
<i>Comorbid diseases</i>				
HT	12 (1.4)	8 (1.4)	4 (1.4)	0.952
CKF	12 (1.4)	10 (1.7)	2 (0.7)	0.211
DM	26 (3)	18 (3.1)	8 (2.8)	0.846
CAD	23 (2.7)	20 (3.4)	3 (1.1)	0.043
Malignancy	122 (14.1)	76 (13)	46 (16.3)	0.188
Mental Retardation	52 (6)	31 (5.3)	21 ± 7.4	0.212
CVD	149 (17.2)	94 (16.1)	55 (19.5)	0.209
<i>Possible causes of seizures</i>				
Mental Retardation	24 (2.8)	14 (2.4)	10 (3.5)	0.332
Irregular drug use	301 (34.7)	203 (34.7)	98 (34.8)	0.998
Malignancy-Metastasis	73 (8.4)	48 (8.2)	25 (8.9)	0.748
Psychogenic trigger/stressor	57 (6.6)	40 (6.8)	17 (6)	0.652
Trauma	24 (2.8)	17 (2.9)	7 (2.5)	0.722
Metabolic/electrolyte abnormality	60 (6.9)	41 (7)	19 (6.7)	0.883
Infection	65 (7.5)	30 (5.1)	35 (12.4)	<0.001
Alcohol	10 (1.2)	8 (1.4)	2 (0.7)	0.375
Medication Change	10 (1.2)	6 (1)	4 (1.4)	0.618
Cerebrovascular disease	82 (9.5)	68 (11.6)	14(5)	0.002
CNS infection	16 (1.8)	10 (1.7)	6 (2.1)	0.668
Unknown causes	145 (16.7)	100 (17.1)	45 (16)	0.674
<i>Outcome</i>				
Discharged	661 (76.2)	460 (78.6)	201 (71.3)	0.017
Hospitalization	206 (23.8)	125 (21.4)	81 (28.7)	

CVD - cerebrovascular disease, AED - anti-epileptic drugs, CNS - central nervous system HT - hypertension, CKF - chronic Kidney Failure, DM - diabetes mellitus, CAD - coronary artery disease

old, 46- 65 years old, and over 65 years old. Patients were divided into 2 groups: Patients with the number of admissions of 1 were classified into one group (one admission), and those with 2 and more admissions were grouped as one (frequent admission). Seizure frequency or frequency of admission was indicated as the frequency of seizures during the retrospective screening year. Groups were compared by the number of admissions to determine the factors affecting frequent admission. The number of seizures experienced until the time of admission was defined as relapse of the seizure during the first 24 hours and the frequency of 2 or more seizures was defined as recurrent seizures. The seizure type was defined as generalized, focal, and unidentified seizure according to The International League Against Epilepsy (ILAE) classification. Seizure characteristic was divided into 2 groups according to the first seizure

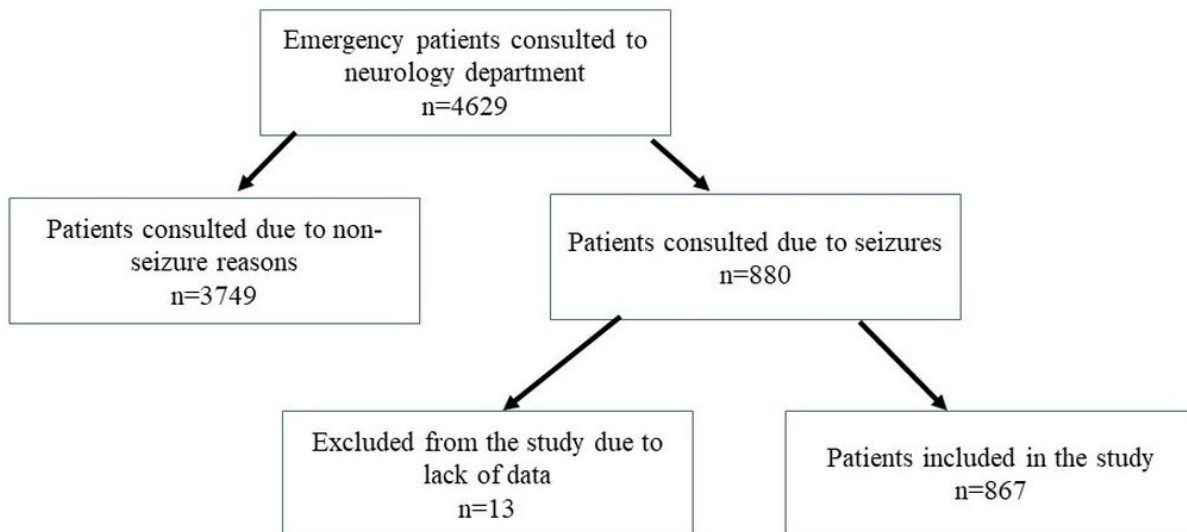
(acute symptomatic seizure) and known seizure (remote non-provoked seizure). Existing additional diseases of the patients were recorded.

Considering the laboratory reference values of our hospital, the lab values above AST 32 U/L, ALT 55 U/L were grouped as abnormal and the values below were grouped as normal. For kidney function, value ranges of 13-45 mg/dl for urea and 0.5-0.9 mg/dl for creatinine were taken as reference. Sodium, potassium, calcium values; 135-148 mEq/L range for sodium, 3.5-5.5 mEq/L range for potassium, 8.5-10.5 mg/dl range for calcium were considered normal, and the values outside these ranges were considered as abnormal and divided into 2 groups. The patients were divided according to the presence of infection based on laboratory, imaging, urinalysis results, and clinical. According to regular AED use; patients were divided into three groups as regular

Table 3 - Risk factors affecting the frequency of admission in logistic regression analysis.

Variables	B	Wald	OR (95% confidence interval)	P-value
Age	0.002	0.191	1.002 [0.992- 1.012]	0.662
Gender	0.130	0.595	1.139 [0.819-1.583]	0.440
Recurrent seizure	0.193	0.986	1.213 [0.829-1.775]	0.321
Seizure character	1.482	10.044	4.404 [1.761-11.015]	0.002
Comorbid status	0.704	14.489	2.021 [1.407-2.904]	<0.001
CAD	0.156	0.043	1.168 [0.267-5.113]	0.836
Infection	0.333	2.525	1.396 [0.925-2.106]	0.112
Hospitalization	0.638	9.400	1.893 [1.259-2.847]	0.002
Accompanying Injury	0.699	4.019	2.013 [1.016-3.988]	0.045
<i>AED Use</i>		16.253		<0.001
Regular	1.623	15.215	6.068 [2.242-11.457]	<0.001
Irregular	1.281	8.960	3.601 [1.556-8.332]	0.003
Blood AED level Sufficient	0.391	4.058		0.255
Insufficient	0.772	0.751	1.479 [0.610-3.583]	0.386
High	0.381	2.599	2.164 [0.847-5.532]	0.107
Possible etiology infection	0.022	2.599	1.022 [0.307-3.405]	0.971
Possible etiology CVD	1.016	0.689	2.763 [1.327-5.752]	0.007

CVD - cerebrovascular disease, AED - anti-epileptic drugs, CAD - Coronary artery disease

**Figure 1** - Study population.

use, irregular use, and not using at all. According to the level of AED in the blood, patients were divided into 4 groups as adequate, insufficient, high, and not using. Possible causes of seizures were recorded.

Patients whose file information was not available and patients under 18 were not included. The primary outcome of the study was to determine the factors

affecting the frequency of admission of patients who present to the ED with seizures.

Statistical analysis. Statistical analyses were performed using IBM SPSS Statistics for Windows, Demo version 22 (IBM Corp., Armonk, N.Y., USA). Shapiro Wilk test was used to check the conformity to normal distribution of continuous parameters. Data are

presented as mean±standard deviation for parametric continuous variables, numerical and percentage for categorical variables. Two group comparisons were carried out with chi-square and Fisher's exact test for categorical variables. Logistic regression analysis was used to determine the risk factors affecting frequent admissions.

Wald test statistics were given to check the significance of the coefficients of the risk factors in the model. Selection of candidate variables during the creation of the multivariate logistic regression model, was made using the backward screening method (backward LR elimination method) based on likelihood ratio test statistics, one of the stepwise selection methods. Results were presented as 95% confidence interval with odds ratio. *P*-values less than 0.05 was considered significant.

Results. The files of 4629 patients who admitted to the ED and consulted to the ND were accessed. 880 of 4629 patients were patients consulted to the ND due to seizures. 13 of these 880 patients were excluded from the study due to lack of data and a total of 867 patients were included in the study (Figure 1).

Risk factors related to the frequency of admission were determined (Table 1). The mean age of the patients was higher in patients with single admissions ($p=0.021$). It was observed that female patients had more frequent admissions ($p=0.007$). In patients with frequent admissions, the average number of seizures was higher until the time of admission ($p=0.009$). It was observed that 18% ($n=105$) of 585 patients who had a single admission had two or more seizures in the period until the time of ED admission. It was found that 27% of them admitted to the ED after having 2 or more seizures ($p=0.002$). It was found that patients with known seizures (95.7%) admitted to ED more frequently than patients who admitted with the first seizure (4.3%) ($p<0.001$) (Table 1). While there was a comorbid condition in 45% of patients who admitted once, a comorbid condition was found in 54.6% of the patients who admitted for two or more. The distribution between patient admissions and their comorbidities was statistically significant ($p<0.008$). Although mostly malignancy and cerebrovascular disease (CVD) in both groups among the comorbid diseases, no relationship was found between other comorbid diseases and the frequency of admission ($p>0.05$), except for coronary artery disease (CAD) ($p=0.043$) (Table 2). It was determined that 16.4% of 167 patients who had infection admitted once, and 25.2% had 2 or more admissions. This situation was found statistically significant ($p=0.002$). It was determined that more accompanying injuries ($p=0.011$)

and more cranial CTs were taken ($p<0.001$) in patients with a single admission. When the relationship between admission frequency and AED use is evaluated, it was observed that 245 patients did not use any drugs. It was found that 192 (65.3%) of 294 patients using AED irregularly admitted once and 102 (34.7%) had 2 or more admissions. This situation was found statistically significant ($p<0.001$). It was found that the blood AED levels were low in 24.1% of patients with frequent admission and 20.5% of patients with single admission ($p<0.001$) (Table 1). The most common causes of seizures were irregular drug use, malignancy, and CVD. While the presence of infection was significant in patients admitted frequently ($p<0.001$), the presence of CVD ($p=0.002$) in seizure patients with a single admission was statistically significant. It was determined that 23.8% ($n=206$) of 867 patients who were evaluated for seizures were hospitalized. It was observed that most of the patients with single admission were discharged (78.6%) and patients with frequent admissions were hospitalized longer (28.7%) ($p=0.017$) (Table 2). Also, no relationship was found between the number of admissions and age groups, seizure type, SE, known epilepsy, electrolyte disorder, liver function tests, renal function tests abnormality ($p>0.05$) (Table 1).

According to the logistic regression model, the accuracy rate of the model was calculated as 67.6%. All significant predictive factors in the univariate analysis were recorded in multivariate logistic regression analysis. In the logistic regression analysis of the factors affecting the frequency of admissions, seizure character [OR: 4.404 (%95 CI:1.761-11.015)], comorbidity [OR: 2.021 (%95 CI:1.407-2.904)], hospitalization [OR:1.893 (%95 CI: 1.259-2.847)], concomitant injury [OR: 2.013 (%95 CI: 1.016-3.988)], drug use, and possible etiology CVD [OR: 2.763 (%95 CI: 1.327-5.752)] were risk factors for frequent admission (Table 3).

Discussion. In this study that examined patients who applied to ED with seizures, the effects of laboratory tests and radiological imaging used in diagnosis and monitoring of patients, concomitant diseases, injuries, past seizure history, and seizure numbers on patients' admission numbers were analyzed.

In the literature, the frequency of seizures was found to be higher in the male population, regardless of age group. In a study by Pallin et al¹⁰ conducted in the USA, the number of male patients was 1.4 times the number of female patients who admitted to ED with seizures, and this ratio in the study by Choquet et al¹¹ was 2.8 times. According to the number of patients, female

patients had a higher number of admission than male patients. In a study by Pallin et al¹⁰ in which patients who admitted to ED with seizures were examined, patients were found to have a bimodal age distribution. It was found to be higher in infants and the age group of 75 and above and lower in the age range of 25 to 34. In our study, the mean age of 867 patients was 43.8 years and the maximum number of admissions was 30-45 years. In multi-center studies, different results can be obtained as in the literature. This difference was thought to be due to the change in the age group classification in our study and the rate of the young population in our country to be higher than the other countries.

In various prevalence studies, it was observed that focal seizures ranged between 33-65% and generalized seizures ranged between 17-60%.¹² In a study by Noble et al¹³ was reported that 15% to 35% of the patients admitted to the ED for seizures related known epileptic patients. In our study, the common seizure type was generalized tonic-clonic seizures. In the USA, approximately 1,500,000 adult patients apply to ED with the first seizure every year.¹⁴ In our study, the ratio of patients who admitted with the first seizure to all applicants was 24.8% and the rate of patients with known seizures was found to be 75.2%. In a study conducted by Choquet et al¹¹ the number of seizures that patients had before the ED admission was found to be 1.1 ± 0.4 . In our study, it was found that the number of patients who had one seizure before the ED admission was fewer. It was found that as the number of seizures experienced by the patients increased before ED admission, the frequent admission rates increased. In a cohort study by St Germaine-Smith and his colleagues published in 2011, the comorbidity prevalence of the patients were: depression (28.7%), chronic respiratory system diseases (20.3%), hypertension (HT) (19.6%), CVD (13.7%), trauma (12.1%), and alcohol abuse (10.1%), respectively.¹⁵ In the literature, it is stated that ischemic or hemorrhagic strokes are an important factor in the development of new seizures in patients with advanced age and CVD.¹⁶ In our study, although there were malignancy and CVD the most in both groups among comorbid diseases, no relationship was found between other comorbid diseases other than CAD ($p=0.043$). 8.9% of patients without any comorbid conditions were identified.

In the ED evaluation of the adult patient with presents with a first-time seizure, physical examination in 23% of patients, complete blood count in 8%, calcium values in 1%, cranial tomography in 41%, and lumbar puncture in 8% was used as part of the evaluation.¹⁷ In our study, it was found that

electrolyte, renal function tests, and liver function tests abnormalities were not effective among patients who admitted frequently, only the presence of infection was significant. In the study of Huff et al¹⁸ it was found that 83% of the seizure patients who admitted to ED had a laboratory test performed, 35% had cranial CT, 1% had cerebral magnetic resonance imaging and 3% had elektroensefalografi (EEG).¹⁸ More CT performance indication was established in patients with a single referral. In a study by Toledo et al¹⁹ was found retention rates of only 60%–80% at one-year follow-up for the various AEDs prescribed. In a study carried out by Senol et al in Turkey, the regular use of AEDs was determined to be 72.7%.²⁰ In our study, since all patient groups with and without epilepsy were evaluated, the rate of regular AED use was found to be 37.9% in patients presenting with seizure different from the literature. It has been observed that patients with regular medication admit more than those who use irregularly. Among patients with irregular drug use, the rate of admissions to those with 2 or more admissions was found to be 1.9. It was determined that the level of AED in the blood was related to the frequency of admissions.

In the literature, predictive indicators that are effective in monitoring and repeating seizures in ED include age at the first seizure, underlying etiological factors, EEG, and CT findings.^{21,22} In a study conducted in France related to the causes of recurrent seizures in the early period, it was observed that 40% of the new-onset seizures were alcohol-dependent. Among other causes, 22% of neurological lesions, and 3% metabolic abnormalities were detected.¹¹ In our study, the most common causes of seizures were irregular use of AED with 34.7%, unknown causes with 16.7%, and CVD with 9.5%. CVD and infection were among the possible seizures affecting the frequency of admission. The person's age, seizure frequency brain damage, changes in the AED use, incompatibility of drug use, number of antiepileptic drugs currently used, systemic diseases, infection, insomnia, emotional stress, and stimulating environmental may play a role as risk factors for the seizure.²³⁻²⁵ Also, in the study of Huff et al¹ the most common factors of recurrent seizures were alcohol use, alcohol withdrawal, and low AED levels. Other causes of seizures were sepsis, central nervous system (CNS) malignancy, hyponatremia, and idiopathic epilepsy.¹ In our study, the seizure character, comorbidity, hospitalization, concomitant injury, drug use, and possible etiology CVD were risk factors for the frequency of seizure admission.

Our study had some limitations. one of our main limitations is that the study is retrospective and single-

centered. Factors such as the physical examination findings of the patients included in our study, the information in the anamnesis received, and the lack of medical treatment data they use are other limitations of our study. Patient referral states and deaths were not analyzed. Seizure frequency or frequency of admission was indicated as the frequency of seizures during the retrospective screening year. This is also a limitation of ours.

In conclusion, as a result; the number of applicants decreases as the mean age of the patient increases. Regardless of the number of admissions, the most common seizure type is generalized tonic seizures and the reason for the seizure is irregular AED use. Patients with frequent admissions have higher comorbid conditions, the number of seizures until the time of admission, and early recurrent seizure rates. The presence of infection in patients increases the frequency of admission. Regular use of AED and discharge-hospitalization status affect the number of admissions. Patients who are hospitalized have a higher percentage of frequent admissions to ED. The number of patients with a single admission who were discharged from the ED was higher. We believe that our findings can help healthcare professionals in approaching patients who admit to the ED with seizures. Nevertheless, more comprehensive and forward-looking studies are needed on this topic.

References

- Huff JS, Morris DL, Kothari RU, Gibbs MA, Emergency Medicine Seizure Study Group. Emergency department management of patients with seizures: a multicenter study. *Acad Emerg Med* 2001; 8: 622-628.
- Tobochnik S, Gutierrez C, Jacobson MP. Characteristics and acute outcomes of ICU patients with initial presentation of seizure. *Seizure* 2015; 26: 94-97.
- Gaitatzis A, Sander JW. The long-term safety of antiepileptic drugs. *CNS Drugs* 2013; 27: 435-455.
- Harden CL, Huff JS, Schwartz TH, Dubinsky RM, Zimmerman RD, Weinstein S, et al. Reassessment: neuroimaging in the emergency patient presenting with seizure: report of the Therapeutics and Technology Assessment Subcommittee of the American Academy of Neurology. *Neurology* 2007; 69: 1772-1780.
- Rizvi S, Ladino LD, Hernandez-Ronquillo L, Téllez-Zenteno JF. Epidemiology of early stages of epilepsy: Risk of seizure recurrence after a first seizure. *Seizure* 2017; 49: 46-53.
- Gloss DS, Krumholz A. Managing an unprovoked first seizure in adults. *CNS Drugs* 2016; 30: 179-183.
- Kadambi P, Hart KW, Adeoye OM, Lindsell CJ, Knight WA 4th. Electroencephalography findings in patients presenting to the ED for evaluations of seizures. *Am J Emerg Med* 2015; 33: 100-103.
- Hirsch LJ, Gaspard N. Status epilepticus. *Continuum (Minneapolis)* 2013; 19(3 Epilepsy):767-94.
- Assarzadegan F, Tabesh H, Hesami O, Derakhshanfar H, Beladi Moghadam N, Shoghli A, Beale AD, Hosseini-Zijoud SM. The role of antiepileptic treatment in the recurrence rate of seizures after first attack: A randomized clinical trial. *Iran J Child Neurol* 2015; 9: 46-52.
- Pallin DJ, Goldstein JN, Moussally JS, Pelletier AJ, Green AR, Camargo CA Jr. Seizure visits in US emergency departments: epidemiology and potential disparities in care. *Int J Emerg Med* 2008; 1: 97-105.
- Choquet C, Vassal J, Doumenc B, Sarnel S, Casalino E. Predictors of early seizure recurrence in patients admitted for seizures in the Emergency Department. *Eur J Emerg Med* 2008; 15: 261-267.
- Forsgren L, Beghi E, Oun A, Sillanpää M. The epidemiology of epilepsy in Europe-a systematic review. *Eur J Neurol* 2005; 12: 245-253.
- Noble AJ, Goldstein LH, Seed P, Glucksman E, Ridsdale L. Characteristics of people with epilepsy who attend emergency departments: prospective study of metropolitan hospital attendees. *Epilepsia* 2012; 53: 1820-1828.
- Huff JS, Melnick ER, Tomaszewski CA, Thiessen ME, Jagoda AS, Fesmire FM, et al. Clinical policy: critical issues in the evaluation and management of adult patients presenting to the emergency department with seizures. *Ann Emerg Med* 2014; 63: 437-447.
- St Germaine -Smith C, Liu M, Quan H, Wiebe S, Jette N. Development of an epilepsy-specific risk adjustment comorbidity index. *Epilepsia* 2011; 52: 2161-2167.
- Tanaka T, Yamagami H, Ihara M, Motoyama R, Fukuma K, Miyagi T, et al. Seizure outcomes and predictors of recurrent post-stroke seizure. A retrospective observational cohort study. *PLOS One* 2015; 10: e0136200.
- Jagoda A, Gupta K. The emergency department evaluation of the adult patient who presents with a first-time seizure. *Emerg Med Clin North Am* 2011; 29: 41-49.
- Huff JS, Fountain N. Pathophysiology and definitions of seizures and status epilepticus. *Emerg Med Clin North Am* 2011; 29: 1-13.
- Toledo M, Fonseca E, Olivé M, Requena M, Quintana M, Abaira-Del-Fresno L, et al. Long-term retention rates of antiepileptic drugs used in acute seizures. *Seizure* 2018; 61: 78-82.
- Senol M, Togrol E, Olgun N, Saracoğlu M. Evaluation of patients with epilepsy conform to antiepileptic medication. *Düzce medical faculty journal* 2009; 11: 21-31.
- Krumholz A, Wiebe S, Gronseth GS, Gloss DS, Sánchez AM, Kabir AA, et al. Evidence-based guideline: management of an unprovoked first seizure in adults: Report of the Guideline Development Subcommittee of the American Academy of Neurology and the American Epilepsy Society. *Neurology* 2015; 84: 1705-1713.
- Sathirapanya P, Praipanapong A, Kongkamol C, Chongphattarot P. Predictors of early recurrent seizure after first seizure presentation to an emergency service: A retrospective cohort study. *Seizure* 2020; 78: 1-6.
- Mehvari Habibabadi J, Zare M, Naghibi SN, Afzali M, Adibi I, Tabrizi N, et al. Frequency of seizure clusters and their associated risk factors in adult patients with epilepsy referred to epilepsy center of Kashani Hospital in Isfahan from 2011 to 2016. *Int J Prev Med* 2020; 11: 19.
- Kumar S, Sarangi SC, Tripathi M, Ramanujam B, Gupta YK. Seizure recurrence risk in persons with epilepsy undergoing antiepileptic drug tapering. *Acta Neurol Scand* 2020; 141: 65-76.
- Berg AT. Risk of recurrence after a first unprovoked seizure. *Epilepsia* 2008; 49: 13-18.