



CODEN [USA]: IAJPBB

ISSN : 2349-7750

**INDO AMERICAN JOURNAL OF  
PHARMACEUTICAL SCIENCES**

SJIF Impact Factor: 7.187

<https://doi.org/10.5281/zenodo.14062831>Available online at: <http://www.iajps.com>

Research Article

**PREVALENCE OF SEIZURES OCCURRING WHILE DRIVING  
IN PATIENTS WITH THE DIAGNOSIS OF EPILEPSY IN TAIF  
CITY, SAUDI ARABIA**

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**Abstract:**

**Background:** It has been well documented that despite their receiving appropriate treatment, a considerable proportion of epileptic patients still experience seizures. Although those patients are restricted from driving by laws and regulations, some of them drive and might induce potential risks to themselves and others.

**Objectives:** to explore the prevalence and determinants of seizures while driving among epileptic patients.

**Patients and methods:** A cross-sectional study was conducted at Al-Hada Armed Forces Hospital, Taif City among a sample of registered adult epileptic patients throughout the period between January 1<sup>st</sup>, 2021 and May 31<sup>st</sup>, 2024. A telephone interview questionnaire was utilized for data collection. It comprises three main sections: demographic characteristics of the patients, epilepsy-related characteristics and a history of the patient's experience with seizures while driving.

**Results:** The study included 249 epileptic patients. Those aged between 18 and 30 years constituted 34.1% of the participants while females represented 58.2% of them. The commonest type of epileptic seizure was generalized tonic-clonic (79.1%). Almost half of the patients (49.8%) were taking a combination of new and old antiepileptic drugs. The prevalence of seizures while driving among epileptic patients was 5.6%. Out of this, 78.6% reported a history of motor traffic accidents because of seizures while driving. Seizures (while driving) were more significantly reported in male than female patients; being 12.5% and 0.7%, respectively ( $p < 0.001$ ). Similarly, they were more significantly reported in employed than unemployed patients; being 15.6% and 3.4%, respectively ( $p < 0.001$ ).

**Conclusions:** Seizures among epileptic patients while driving were not uncommon, particularly among male and employed patients. Most of them reported motor traffic accidents.

**Keywords:** Prevalence, seizures, Driving, Epilepsy, Motor traffic accidents

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Please cite this article in press Naif Edah Alomairi ., *Prevalence Of Seizures Occurring While Driving In Patients With The Diagnosis Of Epilepsy In Taif City, Saudi Arabia.*, Indo Am. J. P. Sci, 2024; 11 (11).

## INTRODUCTION:

It has been well documented that despite their receiving appropriate treatment, almost a third of epileptic patients still experience seizures and are considered inadequately controlled [1]. In a study conducted in the United States, about 30% of uncontrolled epileptic patients continue to drive despite legal restrictions [2].

Driving restriction is applied by laws and regulations in many countries all around the world to help epileptic patients overcome the risks that they might induce to themselves and others [3].

The association between the existence of seizures while driving and motor traffic accidents has been investigated extensively [4–8].

In a recent study conducted in Saudi Arabia, over 95% of epileptic patients (95.7) got a driving license and drove a car, claiming that nobody asked them about their epileptic status when they were issued a driver's license and were never informed to avoid driving after their diagnosis with epilepsy. Furthermore, the majority of them (92.7%) reported driving both inside and outside the city [4].

There is a lack of data concerning the prevalence of seizures while driving among epileptic patients in Saudi Arabia, particularly in Taif City. Additionally, the guidelines for driving practices of those patients are not clearly defined and applied. Thus, this study was conducted to investigate the prevalence and determinants of seizures while driving among epileptic patients.

## PATIENTS AND METHODS:

A cross-sectional study was conducted at the Neurology Department, Al-Hada Armed Forces Hospital, Taif City, which lies in the western region of Saudi Arabia and has an estimated population of approximately 717 thousand.

The target population constituted all registered epileptic patients, throughout the period January 1st, 2021 and May 31st, 2024, and who fulfilled the eligibility criteria (aged above 18 years, both genders, all nationalities and diagnosed with epilepsy for more than 6 months) constituted the target population. Newly diagnosed patients (<6 months) and those with severe physical and/or mental disabilities were excluded from the study.

The sample size was calculated using online Rao soft sample size calculator software with the assumptions

of a marginal error of 2%, total number of epileptic patients registered at the Neurology Department, Al-Hada Armed Forces Hospital throughout the period January 1<sup>st</sup>, 2021 and May 31<sup>st</sup>, 2024 as nearly 3000 patients, confidence interval of 95% and prevalence of seizures while driving as 2.9%. However, according to a study carried out previously in Japan [4], the minimum required sample size was only 249 patients. A simple random sample technique was utilized using the online random number generator to select the required number of cases from mobile numbers.

A telephone interview questionnaire was employed for data collection. It was composed of three main sections: demographic characteristics of the patients (age, gender, marital status, nationality, educational level, job status and place of residence), epilepsy-related characteristics (duration of epilepsy, type of anti-epileptic medication) and history of patient's experience with seizures while driving, type of seizures, a history of motor traffic accidents because of seizures while driving. The questionnaire was adopted from a similar study conducted recently in Jeddah, Saudi Arabia [4]. However, little modifications have been made to suit our objective. Permission to use the questionnaire was requested from the corresponding author of the study through personal communication.

Data analysis was performed using Statistical Package for Social Sciences (SPSS) version 28 software. Numbers and percentages were used to describe categorical variables. Chi-square and Fisher's Exact tests were used to compare categorical variables between two groups, the p-value of <0.05 was used for statistical significance.

The approval of the local Research and Ethics Committee at Al-Hada Armed Forces Hospital, Taif City, was requested before commencing data collection (No. REC. 2024-9-949, Date: 9/9/2024). Accepting to participate by filling up the questionnaire through telephone interview was considered consent.

## RESULTS:

The study included 249 epileptic patients. Patients aged between 18 and 30 years constituted 34.1% of the participants while females represented 58.2% of them. Almost all (99.6%) were Saudis, and the majority of patients (87.1%) lived in urban areas. About two-thirds (67.1%) were married, 35.4% were university/above, and 81.8% were unemployed. Table 1

Epilepsy-related history is summarized in Table 2. Most of the patients (61.8%) exceeded ten years of disease duration. The commonest type of epileptic seizure was generalized tonic-clonic (79.1%). Patients were almost equally distributed between monotherapy and polytherapy. Almost half of patients (49.8%) were taking a combination of new and old antiepileptic drugs.

The prevalence of seizures while driving among epileptic patients was 5.6%, as illustrated in Figure 1. Out of them, 78.6% reported a history of motor traffic accidents because of seizures while driving. Figure 2

Seizures (while driving) were more significantly reported in male than female patients; being 12.5% and 0.7%, respectively ( $p < 0.001$ ). Similarly, they were more significantly reported in employed rather than unemployed patients; being 15.6% and 3.4%, respectively ( $p < 0.001$ ). Table 3

## DISCUSSION:

The safety of driving with epilepsy is questionable as it depends on many factors, such as seizure type and the frequency of the seizures [10].

In the current study, the prevalence of seizures while driving among epileptic patients was 5.6%. Little is known in this regard on a global level. In a study conducted in Japan, the rate of seizures while driving was 2.3% among epileptic patients [11]. In a similar study conducted in Canada, seizures while driving were observed among 8.2% of epileptic patients who were presented with first seizures [12]. In a study carried out in the United States (2006), approximately one-fifth of epileptic patients continued to drive despite their poorly controlled seizures and factors associated with driving among those patients included having less frequent seizures, not receiving disability benefits, and receiving fewer antiepileptic drugs. Furthermore, there were determinants for driving among patients with poorly controlled seizures, being employed, higher annual household income and absence of convulsions[1].

In the present study, seizures while driving were more reported among male than female epileptic patients. However, this should be considered in light that we were informed that only 82 patients in the present study had driving licenses (65 males “79.3%: and 17 females “20.7 %”). Among those who had driving licenses, 16.9% of males compared to 5.9% of females reported seizures while driving, and this difference was not statistically significant.

Similarly, seizures while driving were more reported among employed than unemployed epileptic patients. However, this should be considered in light of being informed that only 82 had driving licenses (61 were unemployed “74.39%: and 21 were employed “25.61%)

Among those who had driving licenses, 11.8% of them were unemployed compared to 19.4% of employed patients who reported seizures while driving, and this difference was not statistically significant.

This study revealed that most of the patients (78.6%), who reported developing seizures while driving, had a history of motor traffic accidents. In a study conducted in Japan, a higher rate was reported (84%). However, some of the cases were not epileptic patients [11]. The high rate of motor traffic accidents in epileptic patients who experienced seizures while driving could be induced by loss of consciousness [13]. However, Naik et al. concluded that there was no difference between driving with epilepsy and the general population in the rate of motor vehicle accidents rates [14].

Some other two important factors could induce the occurrence of seizures while driving, resulting in subsequent impacts. The first factor was the duration of the seizure-free interval, which was found to be the strongest determinant of the risk of seizure-related motor traffic accidents [15]. The second was the type of antiepileptic drugs which have adverse side effects that could affect driving and lead to the high possibility of accidents caused by problems related to vision, memory, balance, reaction time and attention [16].

Some important limitations of the present study should be addressed. First, it was a single-center study, so the generalizability of its findings over other healthcare centers is questionable. Additionally, being a cross-sectional study didn't allow it to ascertain the temporal relationship between independent and dependent variables. Lastly, information on seizures while driving was obtained from the patients themselves; thus, there is the possibility that patients might deny seizures while driving for fear of losing their driving licenses. Despite those limitations, the study had enough sample size and tackled an important issue, never discussed before in Saudi Arabia, to the best of our knowledge; thus, it could be of value to decision-makers.

In conclusion, seizures while driving among epileptic patients were not uncommon; particularly among male and employed patients. Most of them reported motor

traffic accidents. It is recommended to investigate epileptic patients before issuing them driving licenses and that they are to be seen on an annual basis by neurologists to ensure that their seizures interfere with motor control and are preceded by auras or only occur at certain times. Further multi-centeric study is warranted including all factors that could affect seizures while driving among epileptic patients.

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*Table 1: Demographic characteristics of the participants (n=249)*

Variables	Number	Percentage
<b>Age (years)</b>		
18-30	85	34.1
31-40	65	26.1
41-50	46	18.5
51-60	40	16.1
>60	13	5.2
<b>Sex</b>		
Male	104	41.8
Female	145	58.2
<b>Nationality</b>		
Saudi	248	99.6
Non-Saudi	1	0.4
<b>Residency</b>		
Urban	217	87.1
Rural	32	12.9
<b>Marital status</b>		
Single	69	27.7
Married	167	67.1
Divorced	13	5.2
<b>Educational level</b>		
Illiterate	45	18.1
Primary	16	6.4
Intermediate	29	11.6
Secondary	71	28.5
University/above	88	35.4
<b>Employment status</b>		
Not employed	204	81.9
Employed	45	18.1

*Table 2: Epilepsy-related characteristics of the patients (n=249)*

Variables	Frequency	Percentage
<b>Duration of epilepsy ( years)</b>		
<5	42	16.9
5-10	53	21.3
>10	154	61.8
<b>Type of epileptic therapy</b>		
Monotherapy	123	49.4
Polytherapy	126	50.6
<b>Type of seizures</b>		
Generalized tonic -colonic	197	79.1
Focal	47	18.9
Absence seizure	5	2.0
<b>Type of antiepileptic drug</b>		
New	70	28.1
Old	55	22.1
Combination	124	49.8

Table 3: Factors associated with seizures while driving among epileptic patients

	<i>Seizures while driving</i>		<i>p-value</i>
	<i>No</i> N=235 N (%)	<i>Yes</i> N=14 N (%)	
<b>Age (years)</b>			
18-30 (n=85)	83 (97.6)	2 (2.4)	
31-40 (n=65)	58 (89.2)	7 (10.8)	
41-50 (n=46)	43 (93.5)	3 (6.5)	
51-60 (n=40)	38 (95.0)	2 (5.0)	
>60 (n=13)	13 (100)	0 (0.0)	0.212*
<b>Sex</b>			
Male (n=104)	91 (87.5)	13 (12.5)	
Female (n=145)	144 (99.3)	1 (0.7)	<0.001°
<b>Nationality</b>			
Saudi (n=248)	234 (94.4)	14 (5.6)	
Non-Saudi (n=1)	1 (100)	0 (0.0)	0.944°
<b>Residency</b>			
Urban (n=217)	203 (93.5)	14 (6.0)	
Rural (n=32)	32 (100)	0 (0.0)	0.138°
<b>Marital status</b>			
Single (n=69)	65 (94.2)	4 (5.8)	
Married (n=167)	159 (95.2)	8 (4.8)	
Divorced (n=13)	11 (84.6)	2 (15.4)	0.279*
<b>Educational level</b>			
Illiterate (n=45)	45 (100)	0 (0.0)	
Primary (n=16)	16 (100)	0 (0.0)	
Intermediate (n=29)	27 (93.1)	2 (6.9)	
Secondary (n=71)	66 (93.0)	5 (7.0)	
University/above (n=88)	81 (92.0)	7 (8.0)	0.298*
<b>Employment status</b>			
Not employed (n=204)	197 (96.6)	7 (3.4)	
Employed (n=45)	38 (84.4)	7 (15.6)	0.001*
<b>Duration of epilepsy ( years)</b>			
<5 (n=42)	39 (92.9)	3 (7.1)	
5-10 (n=53)	51 (96.2)	2 (3.8)	
>10 (n=154)	145 (94.2)	9 (5.8)	0.764*
<b>Type of epileptic therapy</b>			
Monotherapy (n=123)	116 (94.3)	7 (5.7)	
Polytherapy (n=126)	119 (94.4)	7 (5.6)	0.963*
<b>Type of seizures</b>			
Generalized tonic- colonic (n=197)	186 (94.4)	11 (5.6)	
Focal (n=47)	45 (95.7)	2 (4.3)	
Absence seizure (n=5)	4 (80.0)	1 (20.0)	0.348*
<b>Type of antiepileptic drug</b>			
New (n=70)	66 (94.3)	4 (5.7)	
Old (n=55)	52 (94.5)	3 (5.5)	
Combination (n=124)	117 (94.4)	7 (5.6)	0.998*

\*Chi-square test

°Fisher's Exact test

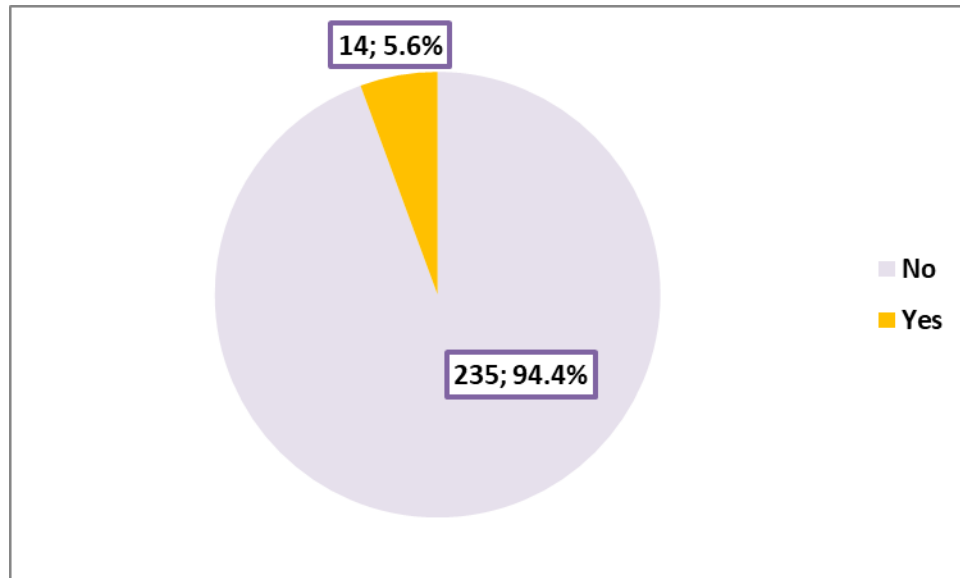


Figure 1: Prevalence of seizures while driving among epileptic patients.

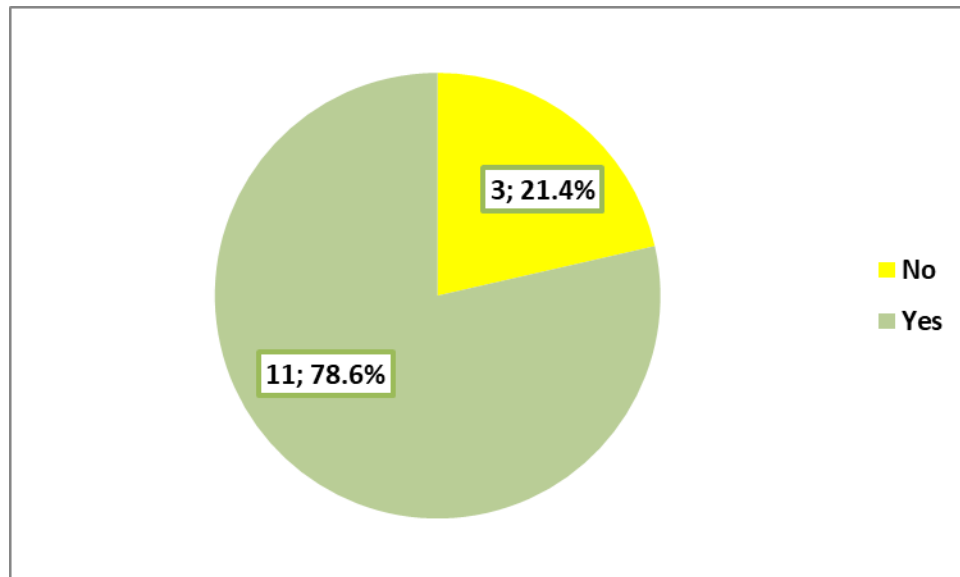


Figure 2: History of motor traffic accidents because of seizures while driving among epileptic patients