

# Epilepsy and driving in Saudi Arabia

## *A pilot study*

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### ABSTRACT

**Objectives:** There is paucity of information on the driving pattern of epileptic patients in Saudi Arabia. The purpose of this study was to document the frequency of epileptic patients that drive and the factors associated with this.

**Methods:** A Hospital-based study with structured interviews of consecutively recruited patients who gave prior consent. Seizure types, extent of control and factors presumed to be associated with driving were documented.

**Results:** One hundred and thirty eight male epileptics (mean age: 32.7 years) were studied. Only 15 patients (11%) were not driving. There was no difference in the mean ages of those who drove and those who did not ( $t = 0.69$ ,  $p = 0.49$ ); but the former group had a significantly higher proportion of subjects with uncontrolled seizures ( $z = 2.52$ ,  $p < 0.01$ ). Overall, 108 subjects (78%) were

educated about the risks associated with driving. The major reason for driving was seizure control with no fear of accidents. The other reasons were: lack of money to employ drivers and non availability of other people to drive. On multivariate analysis, seizure control and negative history of attack while driving were the factors significantly associated with driving.

**Conclusion:** The study showed a very high frequency of epileptic drivers whose decision to drive appeared to be associated with good seizure control and lack of attacks while driving. Health education about the risk of driving should continue especially for patients with uncontrolled attacks and generalized seizures.

**Keywords:** Epilepsy, driving, education.

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Epilepsy is one of the most common chronic neurological disorders worldwide and the pattern of this symptom complex in the Kingdom of Saudi Arabia is no different from the rest of the world.<sup>1</sup> Apart from the stigma associated with the disorder, it imposes some restraints on the sufferer because of the unpredictability of the attacks and the likely risk of accidents which can endanger the lives of both the sufferer and innocent people around at the time of such a mishap.<sup>2,3</sup> This is particularly important with respect to driving and certain occupations involving climbing heights or manipulation of heavy machinery. Based on concerns for safety, when licenses for driving became obligatory, individuals with epilepsy were generally refused a license.<sup>4</sup> The

possible statutory ban to driving threatens employment for professional drivers and those who require transport to work without the means of employing their own drivers. This constraint affects social activities as well, and adds to the misery of the epileptic. Various restrictions are imposed on the sufferers in different countries including withholding of driving license for various periods which may reach up to 5 years until the attacks are controlled and the epileptic is considered to be at less risk of accidents.<sup>5</sup> By the early 1970s, precedent was well established in the United States, Britain, and other countries that individuals with epilepsy could drive legally if their seizures were adequately controlled.<sup>6</sup> In Saudi Arabia, there are no formal restrictions from

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driving to the epileptic patient as far as the author is aware. This study was carried out to document the driving practice of Saudi epileptic patients, the reasons adduced for driving and ultimately, to initiate the formulation of policy guidelines for restrictions on driving so as to reduce the risk of automobile accidents in the Kingdom.<sup>5</sup>

**Methods.** The study was undertaken at the King Khalid University and Security Forces Hospitals in Riyadh, the capital city. Other hospitals in Riyadh were not involved because of difficulty in collecting the needed information for the study by the investigator. Both hospitals are modern, well-equipped with well trained personnel in neuroscience and have facilities for neuroimaging. King Khalid University Hospital is the largest teaching hospital in the Kingdom with about 650 beds while the second hospital provides secondary and tertiary care for Ministry of Interior employees and their dependents. The study took place between November 1997 and April 1998. One hundred and thirty eight newly-referred male epileptics seen in both hospitals were consecutively interviewed about their driving habits after informed consent had been obtained. This small number does not reflect the whole population but it gives an idea about the size of the problem. Females were excluded because they are traditionally forbidden from driving. The subjects must have had at least 2 episodes of stereotyped attacks which could present as alteration of consciousness, perception or sensation, convulsions not precipitated by acute neurological insult or drug ingestion, both attacks occurring within a 24-hour period and the episodes were presumed to result from abnormal, excessive electrical discharge of the cerebral neurons. Corroboration of ictal details by an eye-witness was essential for inclusion in the study. The seizure types were classified on the basis of clinical features and inter-ictal electroencephalographic findings according to the International League Against Epilepsy criteria.<sup>7</sup> A structured questionnaire was completed per subject by the treating neurologist. Information was obtained on the seizure type, duration of epilepsy, whether they had prior information about the risk associated with epileptics driving, drug therapy, attacks while driving and traffic offenses committed. The subjects were also asked why they continued to drive or where applicable, why they stopped driving. Their responses were recorded as either positive or negative. Frequency counts were used for all the variables and cross tabulations were used for comparing subjects who drove and those who did not. Statistical association was determined using the test of proportions, z statistics, Pearson's correlation coefficient matrix and logistic regression for dichotomous variables as indicated. Probability

values less than 0.05 were regarded as significant.

**Results.** The ages of the 138 male subjects ranged between 12 to 80 years with a mean of 32.7 years (SD = 11.2). The distribution of the age-groups was as follows: 7 (6%) were less than 20 years, 44 (36%) were aged between 20 and 29 years, 42 (34%) between 30 and 39 years, 21 (17%) between 40 and 49 years while the rest were older than 50 years. The mean age when they started driving was 17.8 years (SD = 3.0). There were 55 (31%) professionals including security personnel and 30 were schooling. The remaining subjects included 19 businessmen, 17 artisans and the rest did not specify their occupation. Table 1 shows the various type of seizure in both driving and non driving groups. Partial seizures secondarily generalized constituted the commonest seizure type and it was encountered in 63 (46%) subjects. Forty-five (33%) subjects had generalized tonic-clonic seizures, juvenile myoclonic epilepsy was diagnosed in 17 (12%) and 10 (7%) had complex partial seizures. The seizures of the remaining 3 subject were unclassifiable. Overall, 131 (95%) subjects suffered from altered consciousness during their attacks. Fifteen (11%) subjects did not drive and these included 4 subjects who stopped because of previous accidents and 3 who had attacks while driving. Their mean age was 34.6 years (SD = 18.1). The frequencies of the seizure types in these categories of seizures were: 9 partial seizures secondarily generalized, 4 unclassified seizures and one each of generalized tonic-clonic and complex partial seizures. Fourteen of them admitted previous episodes of impairment or loss of consciousness and decided to stop driving because of fear of accidents. Eleven of them were educated about the dangers of driving, through their doctors or by self reading, which contributed to their deciding to stop. Eight of them reported uncontrolled seizures. The mean age of the 123 (89%) subjects that drove was 32.5 years (SD = 10.0) and it was not significantly different from the mean age of those not driving (Student's t

**Table 1** - Various types of seizures in driving and non-driving groups.

Seizure type	Groups	
	Driving (%)	Non driving (%)
- Primary generalized seizure	45 (33)	1 (7)
- Complex partial	10 (7)	1 (7)
- Partial seizure secondarily generalized	63 (46)	9 (60)
- Myoclonic	17 (12)	0 (0)
- Unclassified	3 (2)	4 (26)
<b>TOTAL</b>	138 (100)	15 (100)

test = 0.69,  $p = 0.49$ ). They included 117 subjects whose seizures were associated with loss of consciousness. Twenty five of them had attacks while driving which resulted in 21 accidents. Ninety seven of this category of subjects had prior information about the dangers of driving. However, 82 of them were reported controlled of their seizures before being engaged in driving and overall, 102 of them reported complete control of their seizures. The proportion of subjects whose seizures were controlled was significantly higher than the corresponding proportion in those not driving ( $z = 2.52$ ,  $p < 0.01$ ). The frequency of subjects who had prior information was not significantly different between the 2 groups ( $z = 0.47$ ,  $p < 0.10$ ). The majority were doing both long distance and intra-city driving while only 22 confined their driving to within the city. The reasons for driving were as follows: no fear of accident (86 subjects), 19 had no money to employ private drivers and 5 drove because no other person was available to drive. Twelve subjects continued to drive although they were afraid of accidents and one subject did not give any reason. The only factor positively correlated with current driving was seizure control ( $r = -0.18$ ,  $p = 0.033$ ) while the following were inversely correlated: accident ( $r = -0.68$ ,  $p < 0.001$ ); attack during driving ( $r = -0.72$ ,  $p < 0.001$ ); control before driving ( $r = -0.40$ ,  $p < 0.001$ ) and loss of consciousness ( $r = -0.25$ ,  $p = 0.003$ ). On multivariate analysis, the factors associated with current driving (and coefficients) were: seizure control (2.58) and attack while driving (-0.69), the coefficient for the constant was 5.69.

**Discussion.** The Kingdom of Saudi Arabia has enjoyed economic prosperity in the last 3 decades as a result of revenue derived from petroleum exploration. This has been associated with changing lifestyles, increased family fortunes and purchase of automobiles to facilitate mobility and business activities. The vastness of the Kingdom necessitates travel either by air, which may be expensive and congested at certain periods like during holy pilgrimage, or the by road. The fact that females do not drive also puts the burden on males to do the driving or to employ non-Saudi indigenes. It is gratifying that about 80% of the subjects were educated about the risks associated with driving. In spite of this, the frequency of epileptic drivers was so high (almost 90%). This frequency appeared higher than reported from other countries. However, in a French study, the driving frequency was 74%.<sup>2,8</sup> The majority of the subjects studied were in the economically active stage of life (between ages 20 and 49 years) and this included students, professionals and businessmen who need to move around in pursuit of their studies and business. This high percentage of epileptic drivers will increase the risk of road traffic accidents. Hormia reported a

Finnish epileptic population with an accident rate between 1.3 and twice that of matched controls.<sup>9</sup> Crancer and McMurray noted an increased risk in a population of epileptic drivers in Washington State.<sup>10</sup> The recent report from Taylor and his group estimated a higher risk for accidents producing injury of 1.57.<sup>11</sup> The seizure types encountered with preponderance of partial seizures secondarily generalized is similar to the pattern reported in many studies.<sup>1,3</sup> Seizures associated with loss of consciousness predominated probably because the 2 hospitals are referral centers and patients with severe attacks could have been especially referred there thus suggesting possible referral bias. The fifteen subjects who did not drive had cogent reasons not to because more than half of them had uncontrolled attacks, 4 had previous accidents and 3 had attacks while driving. An attack while driving is a scary event which would deter further driving. Gastaut and Zifkin showed that 55% of attacks while driving actually led to accidents and the crude accident rate was 17% which was more often associated with complex partial seizures.<sup>8</sup> The group that drove had a significantly higher proportion of subjects with controlled attacks which would appear to justify their driving. However, they could still be at risk because of the remote possibility of attacks. The reasons adduced for driving of mainly controlled seizures and lack of funds to employ drivers are reasonable. The most important in predicting the occurrence of seizure in patients in remission of epilepsy - whether or not antiepileptic drugs are discontinued - is the period of time since the last seizure (the longer the remission, the less the risk of seizure).<sup>12</sup> The licensing of drivers with a history of epilepsy will have to remain dependence on this factor. In conformity with standards in other countries, it would be safer if the attacks are controlled for about one year before unrestricted permission for driving should be granted.<sup>8</sup> The results confirmed the association of current driving practice mainly with seizure control as well as inverse association with attacks while driving.

In conclusion, the results revealed a high frequency of epileptic drivers who had been educated about the risks of driving. This habit was associated with seizure control and absence of attacks while driving. Due to the unpredictability of attacks, it would be advisable for the attacks to be controlled for at least one year before epileptics in Saudi Arabia should be given unrestricted permission to drive in agreement with many other countries.

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