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ORIGINAL ARTICLE

Are cardiac patients in Saudi Arabia provided adequate instructions when they should not drive?

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ABSTRACT

Objective: Driving capability can be significantly affected by different heath disorders; cardiovascular diseases (CVDs) should be considered when assessing patients for medical fitness to drive (MFTD). The aim of this study was to evaluate the awareness of Saudi patients about driving recommendations and to assess the incidence of motor vehicle accidents (MVAs) among cardiac patients. **Materials and Methods:** We conducted a cross-sectional survey-based study. Male patients diagnosed with CVDs and who were visiting outpatient departments were invited to complete a questionnaire regarding their awareness of driving recommendations. Patients' demographics, clinical diagnosis, echocardiography parameters, and time-to-CVD diagnosis were all obtained from the patients' medical records. Women were excluded because it was illegal for women to drive in Saudi Arabia during the study period. **Results:** In total, 800 men were included, with a mean age of 54 ± 12 years. Driving counseling had been provided to 241 participants (30%). Of these, 207 (25%) were advised not to drive for a period of between one week and six months. Five percent of the patients had a history of MVAs during the follow-up period of 6.2 ± 4 years. We found that the presence of a dyspnea ≥2, according to the New York Heart Association (NYHA), and a history of loss of consciousness (syncope/pre-syncope) were significantly associated with accidents (46% vs. 20%, $P < 0.0001$ and 41% vs. 10%, $P < 0.0001$, respectively). **Conclusion:** Patient–physician discussion about MFTD was only performed with 30% of the patients with CVDs in Saudi Arabia. Dyspnea NYHA class ≥2 or a prior history of syncope were significantly associated with the incidence of MVAs.

Key words: Cardiovascular diseases, medical fitness to drive, motor vehicle accidents, Saudi Arabia

INTRODUCTION

The driving of vehicles is considered an important mode of transportation, public, and private worldwide. In order to drive safely, drivers should have average motor, visual, and cognitive functions.[1] Multiple heath disorders can affect driving capacity and the ability to drive safely. In particular, cardiovascular diseases (CVDs) can result in impairment/loss of consciousness because of syncope, pre-syncope,

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and faintness, which have a remarkable impact on medical fitness to drive (MFTD) and should be carefully taken into account when assessing the capability of cardiac patients to drive vehicles.[2,3] Importantly, a temporary or permanent driving restriction should be considered in all symptomatic patients with CVD based on the severity of their symptoms and the reversibility of the condition.[4,5] Most western countries have regulatory bodies that are responsible for providing regulations to health-care workers and to set proper guidelines for assessment of MFTD, cessation periods, and the requirements for resuming driving;[6-8] enforcement of these guidelines has been shown to result in a 45% reduction in motor vehicle accidents (MVAs) related to drivers with medical conditions.[9]

MVAs account for 11.7% of the total mortalities in Saudi Arabia and were consistently reported as the third leading cause of death between 2005 and 2010.[10] Several studies worldwide have shown that patients with CVD are at a higher risk for MVA that put them, their families, and the public in great danger.[11-13] As similar studies have not been conducted in the Kingdom of Saudi Arabia, the aim of this study was to evaluate the awareness of such patients about the driving recommendations and regulations, in particular those related to CVDs, and to assess the incidence of MVA among patients with CVD in Saudi Arabia.

The primary objective of this study is to evaluate the adherence to driving restriction guidelines of patients visiting a tertiary cardiac care center in the central province of Saudi Arabia.

MATERIALS AND METHODS

This is a cross-sectional observational descriptive study, based on a survey administered between February and April 2018, and the data were collected primarily by a questionnaire. After providing written consent, all male patients who were older than 18 years, who had been diagnosed as having a CVD, and who were visiting an outpatient department during the study period were included and were invited to complete the study questionnaire, which contains 12 questions regarding driving caution. In addition, we specifically asked the participants if they had received any recommendations regarding MFTD based on their diseases by their treating physicians.

The participants' demographics, drug history, and clinical diagnosis were all obtained from the patients' medical records, and included any history of coronary artery disease, revascularization, cardiomyopathy, arrhythmias, device implantation, and echocardiography parameters (ejection fraction and the presence of significant valvular heart disease); in addition, we reported cardiac symptoms such as chest pain, palpitation, syncope (loss of consciousness), pre-syncope (impairment of consciousness), and dyspnea New York Heart Association (NYHA) class (Class I, no shortness of breath with ordinary physical activity; Class II, mild dyspnea with ordinary physical activity; and Classes III and IV, dyspnea with minimal physical activities and at rest, respectively). Women were excluded because it was illegal for women to drive in Saudi Arabia during the study period; additionally, those patients who refused to sign the study's informed consent form were excluded. The study protocol had been approved by the regional and institutional ethical committees.

Survey questions

The survey questions are all in Arabic and were translated into English for the sake of the publication process. The responses were obtained and documented by trained physicians. Validation of the questionnaire had been constructed in five phases:

Phase I: Diseases and symptoms that increase the risk of MVAs were put together based on international driving guidelines.[1]
Phase II: Questions were selected by expert cardiologists to detect whether the accidents resulted from symptoms related to CVD while driving the vehicles.
Phase III: Contents were validated through a pilot test among a group of experts.
Phase IV: Contents were validated through a pilot test among a group of participants.
Phase V: Reliability was tested using Cronbach's α coefficient.

Survey validation

For Phases I and II, an extensive literature review was conducted on driving-related causality and international guidelines. The appropriate items were prepared for the questionnaire and included the risk factors. A group of experts conducted these phases, including three cardiologists, a clinical pharmacist, a nurse, and a socialist. All questionnaire items were amended accordingly to be short and focused on MVAs related to cardiac events. The first part of the survey asked about socio-demographics, and the second part was for the patients. For Phases III and IV, the survey was tested with eight health-care providers (four cardiologists and four cardiac care unit nurses) and 15 patients with CVDs to assess the content validity. The entire pilot study was met with positive responses, and participants expressed that the survey questions were easy

to understand. Five patients requested that the language in questions 4 and 5 be amended so that it could be more easily understood; those questions were edited accordingly. In Phase V, the amended survey was administered to 50 patients, and showed a good internal consistency with a Cronbach's α of 0.75–0.85.

Statistical analysis

Quantitative variables were expressed as means ± standard deviations, and categorical variables were expressed as frequencies. A two-sample *t*-test was used for normally distributed continuous variables, and a chi-squared test was run for categorical variables. A value of $P < 0.05$ was considered statistically significant. All statistical analyses were performed using Statistical Package for the Social Sciences software for Windows (version 19.0; SPSS, Chicago, IL).

RESULTS

Baseline characteristics

A total of 800 men participated in this study. The majority of the participants were Saudi (95%), and the mean age was 54 ± 12 years. We found that 221 (27.6%) of the participants had ejection fraction <40%. Of the total, 526 (66%) had a history of a previous hospitalization. The most common CVDs across the study population were chronic stable angina (371 [46%]) followed by a history of acute coronary syndrome (338 [42%]). Other CVD distributions are presented in Table 1.

Table 1: Disease distribution among our patients

Baseline characteristics	
Diagnosis	Number (%)
Diabetes mellitus, *n* (%)	392 (54)
Hypertension, *n* (%)	526 (69)
Family history of coronary artery disease, *n* (%)	80 (11)
Smoking, *n* (%)	150 (22)
Dyslipidemia, *n* (%)	379 (54)
Left bundle branch block, *n* (%)	27 (3)
EF% (mean ± SD)	(45 ± 13)
NYHA Class I	138 (20)
NYHA Class II	82 (10)
NYHA Class III	58 (7)
NYHA Class IV	30 (5)
Cardiovascular diseases	
Diagnosis	Number (%)
Chronic stable angina	371 (46)
History unstable angina/non-ST-segment elevation myocardial infarction	177 (22)
History of ST-segment elevation myocardial infarction	161 (20)
Ischemic cardiomyopathy	183 (23)
Non-ischemic cardiomyopathy	38 (6)
Previous percutaneous coronary intervention	274 (39)
Previous coronary artery bypass grafting	83 (12)
Atrial fibrillation	59 (7)
Supraventricular tachycardia	10 (1)
Ventricular tachycardia	4 (0.5)
Other arrhythmias	4 (0.5)
Implanted cardioversion defibrillator	8 (1)
Permanent pacemaker	5 (0.5)
Congenital heart disease	12 (2)
Hypertrophic cardiomyopathy	13 (2)
Previous history of catheter ablation	7 (1)
Complete heart block	5 (0.5)
Aortic aneurysm	3 (0.5)
History of aortic dissection	2 (0.25)
Wolff–Parkinson–White syndrome	1 (0.1)
Long QT syndrome	1 (0.1)

Survey responses

We found that 95% of the patients were non-commercial car drivers, and 5% were drivers of large cars such as trucks. The mean time between disease diagnosis and conducting the survey was about 6.2 ± 4 years. The majority of patients, 70%, denied having received any counseling or taking part in any discussions about driving during the hospitalization period or clinic follow-ups. However, driving counseling had been provided to 241 participants (30%), of which 207 (25%) were advised not to drive for a period of between one week and six months. Three patients had been permanently forbidden to drive (two patients by ophthalmologists and one by a cardiologist). The details of participant responses to the survey questions are listed in Table 2.

Vehicle accidents

We found that 39 of 800 (5% of the patients) had a history of car accidents during the follow-up period. Twenty of those 39 (51%) were preceded by cardiac symptoms (nine [23%] patients had experienced syncope and/or pre-syncope, six [15.5%] patients had chest pain, four [10%] patients had palpitations, and one [2.5%] patient had dyspnea). We found that the presence of a dyspnea NYHA class ≥2 and a history of syncope/pre-syncope were significantly associated with accidents (46% vs. 20%, $P < 0.0001$ and 41% vs. 10%, $P < 0.0001$, respectively) [Figure 1 and Table 3].

DISCUSSION

In this study, we investigated the degree of awareness to MFTD recommendations in patients with CVDs and how often they were counseled in this regard by cardiologists; we found that 70% of patients denied being asked about MFTD during hospitalization and/or outpatient clinic follow-ups. Furthermore, we found that MVAs were significantly more common in patients who had dyspnea NYHA class ≥2 or a prior history of syncope.

MVAs have been reported as the third leading cause of death and account for 11.7% of the total mortalities in Saudi Arabia.[10] In addition, a report from the World Health Organization (WHO) in 2013 stated that Saudi Arabia had the highest MVA fatality rate among countries

Table 2: Survey responses

Question	Number of answers (%)
What is the vehicle type?	Small car: 95 Large vehicle: 5
Where you instructed about driving by your physician in the hospital or the clinic?	Yes: 235 (29)
Were you instructed by your cardiologist not to drive?	Yes: 207 (25)
For how long?	Period: days to months
Were you instructed not to drive by any other physician?	Yes: 6 (1)
For how long?	Period: days to months
What is the specialty of the physician who instructed you?	Neurologists: 1 patient Endocrinologists: 1 patient Ophthalmologists: 3 patients Others: Orthopedics: 1 patient
Were you instructed never to drive again?	Yes: 3 (0.5)
Did you ever lose consciousness, or nearly lose consciousness, after being diagnosed with a cardiac disease?	Yes: 91 (11)
Did you ever have an accident while driving after being diagnosed with a cardiac disease?	Yes: 39 (5)
If you had an accident, did you lose or nearly lose your consciousness immediately preceding the collision?	Yes: 9 (1.1)
If you had an accident, did you experience chest pain immediately preceding the collision?	Yes: 6 (15.5)
If you had an accident, did you experience palpitation immediately preceding the collision?	Yes: 4 (10)
If you had an accident, did you experience dyspnea immediately preceding the collision?	Yes: 1 (2.5)

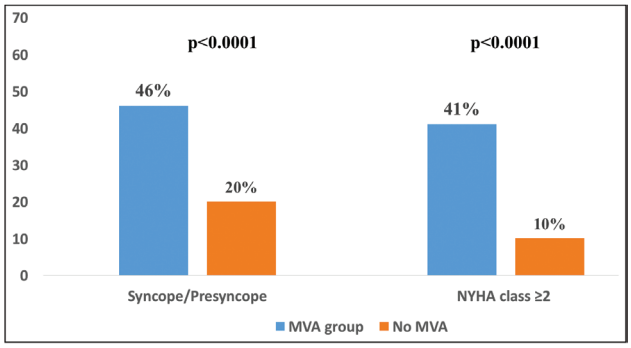

Figure 1: Comparison between patients with and without motor vehicle accident (MVA) regarding symptoms preceding the accident

with high incomes,[14] reaching 24 fatalities per 100,000 people, 2.4 times higher than the rate in the United States.[15] Importantly, there are five road safety pillars identified by the WHO: road infrastructure, road safety policy, safe vehicles, post-crash care, and road users' safe behavior. Of note, road users' poor behavior has a detrimental impact on the incidence and fatality rate of MVAs, and it has been reported as the most common cause of MVAs in different regions across Saudi Arabia.[16] Other road user–related factors that influence MVAs are health abnormalities affecting cognitive, vision, or motor functions; of particular interest for this study are neurological and CVDs that result in impairment of consciousness levels due to drowsiness, syncope, or pre-syncope.

Our 2019 survey of cardiologists' awareness of the international driving guidelines showed that 70% were aware of them [17]; however, in this study, only 30% of the patients were counseled by their cardiologists about MFTD. This contradiction reflects an insufficiency in patient–physician communications and a low level of discussion regarding MFTD. Thus, further efforts should be undertaken to transmit physicians' knowledge and information to patients through efficient discussion about MFTD, risks, and driving cessation periods; in this regards, we suggest providing a checklist of discharge recommendations that includes counseling about driving, cessation periods, and the need for any further testing before providing patients with permission to drive.

A recent study conducted by Alkharboush *et al.*[4] in Saudi Arabia showed similar results to ours, in which only 15% of primary care physicians had questioned their patients about MFTD, whereas the rest believed that this is a responsibility belonging either to the patients or the local traffic authorities.

The existing international driving agencies and the published guidelines recommend risk assessment for patients with diabetes mellitus and the possibilities of developing hypoglycemic or hyperglycemic attacks, which require MFTD advice; of note, our study population also has a high prevalence of diabetes (54%). Nevertheless, less than 1% of the study cohort had been educated regarding MFTD by either endocrinologists or general practitioners, which highlights the need for further studies to assess the MFTD awareness among health-care providers of different medical specialties.

It is interesting to note that accident rates and consequences (such as property damage, public injuries, and fatality rate) are significantly higher in male drivers compared with women[18]; however, no women were included in our study, as it was illegal for women to drive in Saudi Arabia during the study period. However, with the recent legislation

Table 3: Comparison between patients with and without motor vehicle accidents

	Patients with MVA *n* (%)	Patients with no MVA *n* (%)	*P*-value
Number (%)	39 (5%)	761 (95%)	
Years	52 years ± 14	55 years ± 11	0.1
Diabetes mellitus	21 (54%)	371 (49%)	0.055
Hypertension	27 (69%)	499 (66%)	0.7
Previous percutaneous coronary intervention	17 (44%)	257 (34%)	0.2
Previous coronary artery bypass graft surgery	3 (8%)	80 (11%)	0.7
Atrial fibrillation	3 (8%)	56 (7%)	0.8
Supraventricular tachycardia	1 (3%)	9 (1%)	0.4
Ventricular tachycardia	0 (0%)	4 (0.5%)	0.8
Ejection fraction < 40%	21 (21%)	213 (28%)	0.3
NYHA ≥ 2	18 (46%)	152 (20%)	<0.0001
Previous history of syncope	16 (41%)	75 (10%)	<0.0001

MVA, motor vehicle accident; NYHA, New York Heart Association

allowing women to drive, further studies that include women should be conducted.

Our study is important in that it targeted road users, investigating their perception about the effect of their CVDs on performing safe vehicle driving; in addition, it highlights the importance of the formulation and implementing of strict guidelines about MFTD in Saudi Arabia through collaboration between the Ministry of Health, the Saudi Commission for Health Specialties, the Saudi Heart Association, and the national traffic authorities. This would be similar to the current guidelines in Canada.[19]

Our study has many limitations: it is a single-center analysis, only patients engaging in follow-ups at a cardiology clinic were included, whereas no other medical specialties (such as neurology or endocrinology) were included, it only included men, and MVAs in our study may not be fully represented because accidents that resulted in death or serious damage would not be reported because of missed clinic follow-ups.

CONCLUSION

We found that only 30% of the patients with CVDs had been counseled by physicians about MFTD, and MVAs were significantly more common in patients who had dyspnea NYHA class ≥2 or a prior history of syncope. Legislation and clinical implementation of MFTD guidelines is warranted in Saudi Arabia.

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Nil.

Conflicts of interest

There are no conflicts of interest.

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