



Impact of Medical Conditions and Medications on Road Traffic Safety

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ABSTRACT

Objectives: Many medical conditions and medicines with therapeutic importance have been shown to impair driving skills, causing road traffic accidents, which leads to great human and economic suffering in Oman. The primary purpose of this study was to assess retrospectively the extent of medical conditions and medications influencing road traffic safety among drivers involved in road accidents. **Methods:** We conducted a retrospective study among 951 injured or non-injured drivers who reported to Khoula and Nizwa hospitals. We used the Al-Shifa database to find the drivers and contacted randomly selected patients over phone. **Results:** The majority of victims were male (72.0%), involving personal cars, and reported at Khoula Hospital. The results show that 7.6% of the victimized drivers had a history of medical conditions with diabetes and hypertension (36.1% each) the most common. About 4.0% of victims were on medications of which insulin was the most common (9.4%). Loss of control was contributed to 38.5% of cases followed by dizziness (25.6%), sleep amnesia (10.3%), and blurred vision (7.7%). Other effects blamed by victimized drivers include vertigo, phonophobia, photophobia, back pain, loss of sensation, and headache accounting for 17.9% of cases. **Conclusion:** Medical conditions and medications influence road traffic safety to some extent in Oman.

Road traffic accidents are considered the ninth leading cause of death and account for 2.2% of all deaths globally. Approximately, 1.3 million people die in road traffic accidents each year an average of 3287 deaths/day. It is one of the leading cause of death among young people aged 15–29. In addition, 20–50 million people are injured or disabled. Road traffic accidents cost USD\$518 billion globally, costing individual countries from 1–2% of their annual gross domestic product.¹

The World Health Organization (WHO) ranked Oman at fourth in the Arabian Gulf Co-operation Council (GCC) states and 57th worldwide as far as the occurrence of traffic accidents, injuries, and deaths.^{2–4} Oman has the most number of road accidents in the Gulf region. According to 2016 statistics at the GCC secretariat information office based in Muscat, Oman led the way with 4721 accidents followed by Saudi Arabia with 4609, and Qatar with 4322. The number of accidents in Oman was 8.89 per 100 000 people in 2016 compared to 8.71 per 100 000 people in 2015.^{2–4}

In 2010, 820 men, women, and children were killed (30.4 deaths per 100 000 population) due to serious injuries in 50–74% of patients even after transporting by ambulance.⁴ There have been nearly 45 000 injured since 2000. The more alarming issue is that the ratio of deaths in a road accident to permanent disability in young people is 2:3.⁴ Traffic accidents cause great human and economic suffering in Oman putting an immense burden on hospitals and health systems.⁵ Therefore, prevention of road traffic accidents and associated injuries as well as fatalities has long been a priority issue.⁵ The Royal Oman Police has engaged in educating the public by organizing GCC traffic week, traffic safety contests, a traffic safety expo, and visiting schools to raise awareness among the people of Oman to drive safely. Accidents rates dropped to 32.8%, from 6279 in 2015 to 4721 in 2016. However, compared to the 675 people who lost their life in road accidents in 2015, 692 died in 2016. However, the number injured fell by 19.2%, from 3624 in 2015 to 2929 in 2016.⁶ The National Centre for Statistics and

Information, reported that the number of road accidents in Oman during the first three months of 2017 declined by 28.8% to 895 from 1257 during the same period in 2016. The number of deaths stood at 150, which is a decrease of 6.3% compared to the same period last year. In March, the governorate of Muscat recorded the highest number of road accidents (27.6%) followed by the governorate of South Al Batinah (20.3%). The governorates of A'Dhahirah and South A'Sharqiyah recorded 11.7% of the total road accidents in Oman.⁶

The risk factors majorly blamed for road traffic accidents includes high speed, alcohol, talking on cell phones, rash driving, and poor road infrastructures.^{7,8} However, studies in Oman on the impact of medical conditions and medications on the road traffic safety are limited. This is due to the fact that not all medical conditions increase the risk for road accidents to the same extent and vice versa. The severity of the condition and other characteristics of the disorder are likely to be important determinants of crash risk.⁷⁻⁹ Driving a car under the influence of medication can be unsafe not only for the driver, but also passengers and others who share the road. The coordination, judgment, reaction time, attention, and perception of the driver may be disturbed depending on how specific drugs act on the brain.^{10,11} About 10% of all people killed or injured in traffic accidents take some type of medicinal agent. However, there is still little evidence that medicinal drugs are causally related to traffic accidents; the percentage of drivers killed and have traces of medicinal drugs in their systems has stayed at about 5%.¹²

The use of antidepressants, anxiolytics, hypnotics, and psychotropic medications affects the central nervous system and drivers on these medications are at a higher risk for traffic accidents.¹³ A French study reported that drivers using medications to manage their disabilities increased the risk of compromising traffic safety by 27%.¹⁴ A study carried out in West Virginia, USA among elderly drivers showed that the safe driving skills of more than 30% of drivers were effected driving under the influence of medications (such as analgesics and drugs acting on cardiovascular and gastrointestinal systems).¹⁵ A registry based cohort study among Norwegians concluded that the risk of road traffic accidents was increased in medication users the first seven days after dispensing.¹⁶ A study carried out on prescription medication usage and their influence on

road traffic accidents noticed that drivers who used centrally acting drugs had 2.16-times increased risk of accidents.¹⁷ Similarly, driving skills are compromised in drivers with chronic medical conditions.¹⁸

It is hypothesized that there is an increase in the number of road accidents due to uncontrolled medical conditions and inappropriate medication use. The primary purpose of this study was to retrospectively assess the extent of medical conditions and medications influencing road traffic safety among drivers involved in road accidents who reported to Khoula and Nizwa hospitals, Oman.

METHODS

We conducted a hospital-based retrospective study among Omani drivers (injured or non-injured) who reported to the Khoula and Nizwa hospitals following an accident. Information on past medical conditions and medications used by patients before the accident was recorded. All participants aged over 18-years were included in the study. We excluded patients who had an accident due to consumption of alcohol or marijuana as these are not legal medications in Oman.

Information was collected from 951 traffic incident victims admitted from November 2016 to June 2017 (i.e., a period of eight months including the holy month of Ramadan) using the Al-Shifa database available at Accident and Emergency Departments of the selected hospitals. We collected information on the patient's medication, medical conditions, and other demographics. About 2% of randomly selected patients were contacted over the phone to confirm their health state and what medications were taken before the accident.

The study was initiated after getting the permission from the Ministry of Health Oman Ethics Committee, and the ethical committees of Khoula Hospital, Nizwa Hospital, and Oman Medical College. The identity of the participants and findings were treated with the highest possible degree of confidentiality and privacy.

The data was collected on monthly basis and each case was given a number when it was entered into the Excel sheet. Statistical analyses of data were performed using SPSS (Statistics IBM Corp. Released 2015. IBM SPSS Statistics for Windows, Version 23.0. Armonk, NY: IBM Corp). Distribution of medical conditions and medications in patients involved in

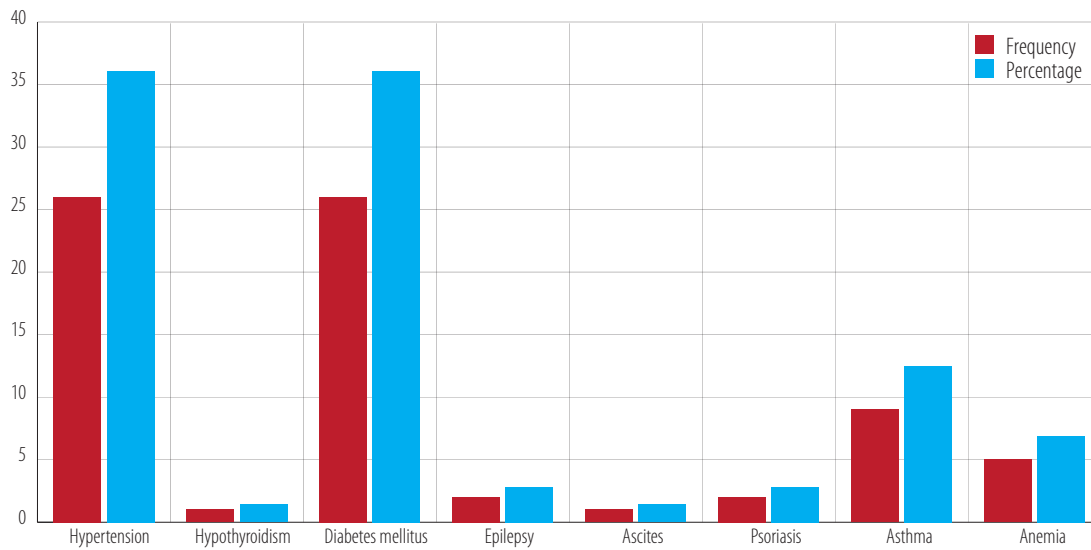


Figure 1: Frequency of medical condition associated with road traffic accident victims.

traffic accidents were determined. The correlation of these factors with the traffic accident was also determined. The frequency and percent of data was computed and presented in the form of tables and charts.

RESULTS

The majority of victims in the study population were from Khoula Hospital (78.0%) while 22.0% were from Nizwa Hospital. Accident cases were greater in Khoula Hospital because it is located in the capital of Oman where the population is larger compared to Nizwa. In addition, the study period in Khoula Hospital was eight months and in Nizwa Hospital was only five months due to transportation difficulties. The majority (72.0%) of the study population was male while 28.0% were female. The majority (95.6%) of accidents were recorded in car drivers, and 4.3% in commercial motor vehicles.

The study results show that 92.4% of the victims had no any prior medical conditions; 7.6% of the victimized drivers had a history of medical conditions. Hypertension and diabetes mellitus were equally counting for 72.2% of total cases followed by asthma (12.5%) and anemia (6.9%). Hypertension and diabetes mellitus (lifestyle diseases) are known to be the most threatening diseases in Oman [Figure 1].

The study population was divided into four age groups. The total cases were correlated to the medical conditions with respect to age groups. The

percentage of total medical conditions in young drivers (18–29 years) was 2.9%. The 30–39 year age group showed a percentage of 2.8%. The drivers who belonging to the 40–49 year age group accounted for 15.7% of cases. Older victimized drivers (≥ 50 years) showed the highest percentage of the medical conditions (45.1%) with a correlation found between this age group and road traffic accidents. Diabetes mellitus (46.9%) and hypertension (40.6%) were the most common medical conditions in this age group [Table 1]. Overall, 96% of victimized drivers were reported to take no prior medications. The remaining 4% were on medications; insulin (9.4%) and metoclopramide, thyroxine, and amlodipine (6.3% each). Other medications (not specified due to the lack of information on Al-Shifa database) contributed to 40.6% of cases, and medications such

Table 1: Relative risk in study group.

Age, years	Medical condition-total cases correlation
18–29	$15/510 \times 100 = 2.9\%$
30–39	$7/246 \times 100 = 2.8\%$
40–49	$18/115 \times 100 = 15.7\%$
> 50	$32/71 \times 100 = 45.1\%$
Medical conditions	% Correlation to RTA in ≥ 50 year age group
Hypertension	$13/32 \times 100 = 40.6\%$
Diabetes mellitus	$15/32 \times 100 = 46.9\%$
Epilepsy	$1/32 \times 100 = 3.1\%$
Asthma	$1/32 \times 100 = 3.1\%$

RTA: road traffic accidents.

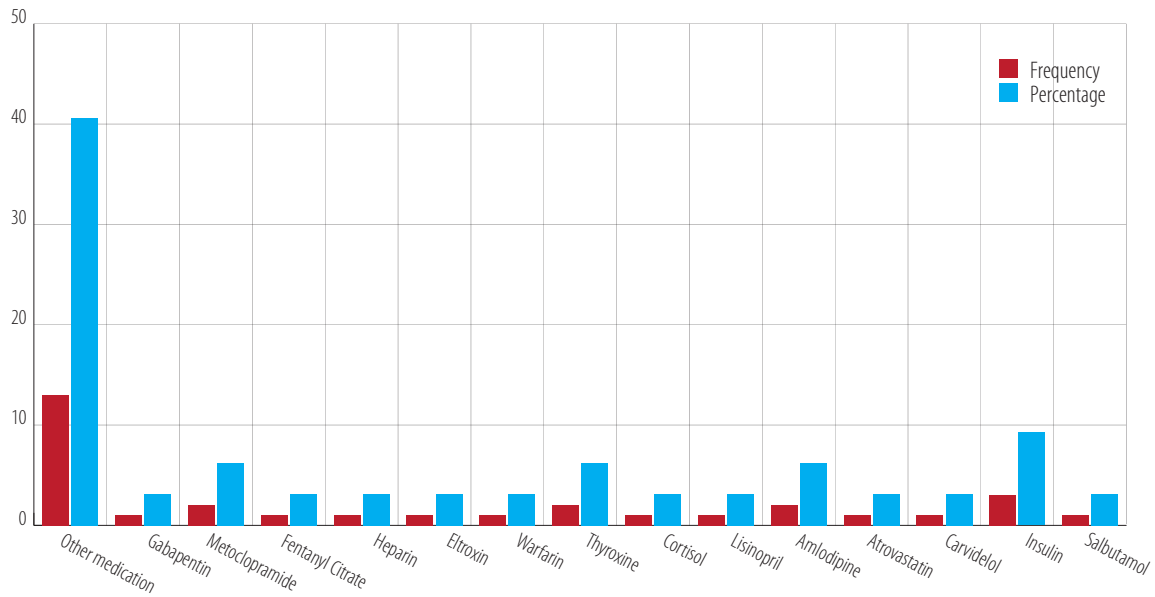


Figure 2: Frequency and percentage of medications taken by road accident victims.

as gabapentin, fentanyl, heparin, eltroxin, warfarin, cortisol, lisinopril, atorvastatin, carvedilol, and salbutamol were 3.1% each [Figure 2].

In 4.1% of cases symptoms were felt by the drivers prior to the accident; loss of control was the major symptom (38.5%) followed by dizziness (25.6%), sleep amnesia (10.3%), and blurred vision (7.7%). Other effects blamed by drivers include vertigo, phonophobia, photophobia, back pain, loss of sensation, and headache accounting for 17.9% of cases. Loss of control and dizziness could be related to unmanaged or uncontrolled diabetes mellitus. Hypertension

can be linked to migraine-like attack (photophobia, phonophobia, headache, and vertigo) [Figure 3].

DISCUSSION

The objective of this study was to know the influence of medications and medical conditions among victimized drivers. However, further extension of this study involving more cases, prospectively and retrospectively, will provide concrete evidence on the impact of medical conditions and medications on road traffic safety. The present study is an extension of

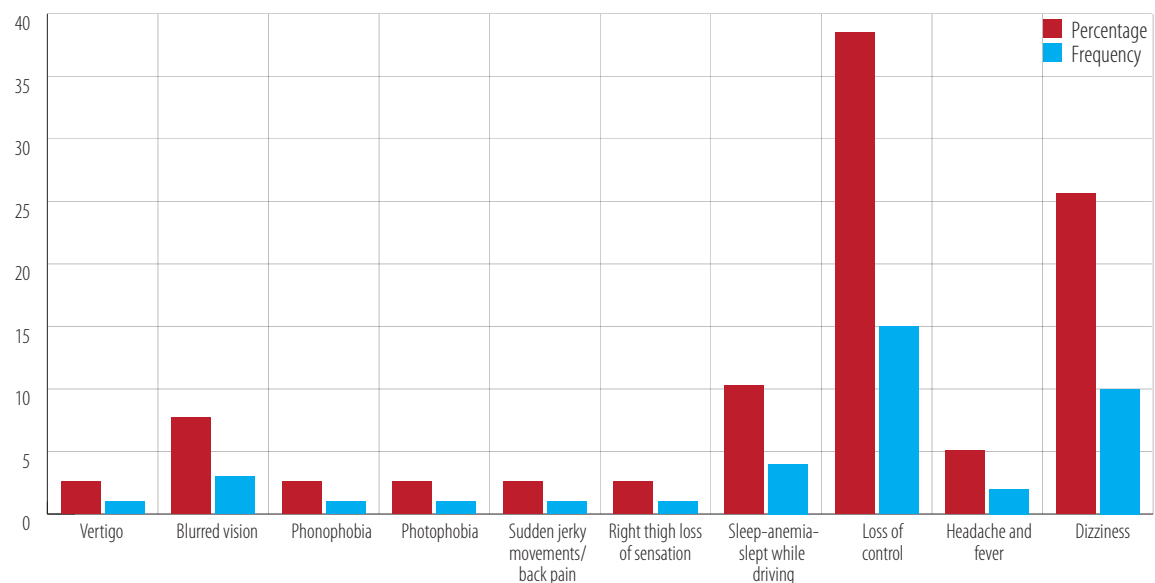


Figure 3: Frequency of symptoms reported by drivers involved in road accidents.

previous studies carried out in Oman to understand the pattern, type, and severity of accident injuries and utilization of medicines among patients with road traffic accident injuries.¹⁹⁻²¹

Most of the study population reported to Khoula Hospital (78%), which is likely due to the fact that accident cases are greater in the capital. Results show that 72.0% of the study population were males, similar to the numbers reported in earlier studies.²² The majority (95.6%) of accidents were recorded in car drivers as cars are the preferred mode of transportation in Oman.²³

There is a concern on growing incidence of road traffic accidents due to medical diseases and disorders.²⁴ In a US study, 8% of the study population was reported to have prior medical conditions whereas 92% had no prior medical conditions. These results support a Canadian study, which reported that an increasing trend in the incidence of chronic medical conditions, their combinations, and severity will compromise road traffic safety.²⁵

A study carried out in Finland revealed a higher incidence of road traffic accidents among drivers with a history of arterial hypertension.²⁵ Multiple studies have shown an increase in the risk of road traffic accidents in drivers with a history of diabetes and its complications.^{26,27} The chronicity of diabetes is known to be associated with retinopathy, neuropathy, hypoglycemia, hyperglycemia, cataract, and cardiovascular complications, which affect driving skills.^{28,29} In our study, 2% of the study population had a history of hypertension and 3% had a history of diabetes mellitus followed by asthma supporting earlier studies^{30,31} correlating the medical conditions to road traffic accidents in the > 50 age group. The effect of these medical conditions on driving could be due to their complications such as fatigue, visual problems, or numbness in the extremities.^{28,32}

Another important part of the study was to investigate the influence of medications on driving skills and road traffic safety. Only 4% of drivers were on medications. The most common medication was insulin followed by antihypertensives. Other medications were thyroxin, atorvastatin, asthma inhalers, anticoagulants, metoclopramide, cortisol, fentanyl citrate, and gabapentin. A study carried out in Norway reported an increase in risk of road traffic accident due to use of insulin.³³ The risk of insulin use in relation to its influence on road traffic safety is thought to be due to hypoglycemic side effects.²⁶

Road accident drivers have reported symptoms prior to accidents such as loss of control, dizziness, migraine-like attack, and sleep amnesia. Loss of control, dizziness, and sleep amnesia could be related to unmanaged or uncontrolled diabetes. Hypertension could be linked to onset of a migraine-like attack (photophobia, phonophobia, headache, and vertigo) and headache affecting driving skills. These results substantiate earlier studies^{28-29,32-34} and supports educating drivers to the risks of taking medications before dispensing them and using appropriate labeling.^{34,35} The relative risk analysis among the population indicates that the drivers in the 40-49 year age group³⁶ make up 15.6% of the medical condition cases, and those \geq 50 years old have the highest percentage of medical conditions (45%).

There are some limitations that should be considered with this study: the study was carried out over different time periods (over a short period) in selected study centers; the study was retrospective; data was analyzed by correlation analysis (which does not establish causal relationships); cases were reported at selected hospitals not the nearest residential health institute; limited number of cases considered; and we were missing large amount of data on medication use.

CONCLUSION

Diabetes and hypertension were the most common medical conditions, and insulin and antihypertensives were the most common category of medications influencing safe driving skills of Omani drivers. Possibly due to loss of control, dizziness, migraine-like attack, and sleep amnesia as the symptoms of medical conditions and/or side effects of medications use.

Disclosure

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