Since 2002

OPEN ACCESS

Assessment of Aggressive Behavior, Traffic Safety Rules and Regulation of Female Drivers in the Capital City Riyadh, Saudi Arabia: A Comprehensive Study

Ali Shariq[1], Zafar Rasheed[1], Abdulaziz M. Alharbi[2], Abdulrahman AAB. Wahaq[3], Fawaz S. Alharbi[4], Ahmed Alsolai[1], Yunes A. Alothaim[1], Hasan HH. Alsughayer[1], Hamad Alamer[1], Mohammed A. Alnassar[1], Thamer SS. Al-Enez[5], Waleed Al Abdulmonem[1]*

[1]Department of Pathology, College of Medicine, Qassim University, Buraidah, Saudi Arabia; [2]Department of Public Health, Directorate of Health Affairs in Al-Qassim, Buraidah, Saudi Arabia; [3]Riyadh Second Health Cluster, Department of Public Health, Al-Kahleej 1 Primary Healthcare Centre, Riyadh, Saudi Arabia; [4]AKU Department, Riyadh Alkhabra Hospital, Riyadh, Saudi Arabia; [5]Specialized Comprehensive Clinics for Security Forces, Council of Ministers, Hafar Al-Batin, Saudi Arabia

Abstract

BACKGROUND: Road traffic injuries is a vital concern in developed, undeveloped and developing countries. In Saudi Arabia, the death rate from traffic accidents is approximately 28.8/100,000 people. In the year 2018, the Kingdom of Saudi Arabia finally set an end to its legal ban on car driving for women, providing the way for millions of new drivers to steer across the country. Conversely, gender has a statistically momentous impact on driving behavior.

AIM: This study was aimed to assess the aggressive behavior, traffic safety rules and regulation in female drivers from the capital city Riyadh, Saudi Arabia.

METHODS: A cross-sectional study was performed on 407 female drivers, randomly selected from Riyadh region of Saudi Arabia. A validated questionnaire, the "dula dangerous driving index (DDDI)" was used to collect data and to identify the aggressive behavior, knowledge of traffic safety rule and regulations of the female drivers.

RESULTS: Using DDDI, we found that aggressive and dangerous driving behavior was not common among female drivers in Riyadh City ($p > 0.05$). However, aggressive behavior was found three times more among employees as compared with students ($p < 0.05$). The majority of female drivers (97.3%) showed good speed attitude when driving on highways or outside the cities. Whereas, 86.0% female drivers showed good speed tendency when driving inside the cities. Moreover, 52.3% female drivers have not reported any accidents in the last 2 years.

CONCLUSION: This study revealed that the women who reside in Riyadh city are well-educated about the traffic laws, and the rate of aggressive, dangerous driving behavior was uncommon among them. Further studies are required to augment knowledge and condense the hazardous driving behaviors in Saudi Arabia.

Introduction

Road accident is most unwanted thing to happen to a road user, though they happen quite often. The most unfortunate thing is that most of the drivers have not learned from their mistakes on road and it is always important for the road users that they should be well aware of the general rules and safety measures, while using roads [1]. Main cause of accidents and crashes are due to human errors. We are elaborating some of the common behavior of humans which results in accident. The World Health Organization ranked road traffic injury (RTI) as the 10th cause of death worldwide [1], [2]. Numerous reasons are responsible for

these accidents like surpassing the speed limit, lethargy, dizziness, cell phone use, and vehicle condition [2], [3]. Reckless car driving can also be a threat to the people walking on footpaths resulting in significant fraction of all deaths including child pedestrians as well as cyclists, and motorcyclists [4], [5], [6]. Several steps have been undertaken to minimize the tragic RTIs, such as seatbelt legislation abridged the injuries due to roads and transport authority (RTA) by a quarter [7]. In 2015, a sustainable development goal (SDG) agenda was established by 195 nations along with the United Nations for transportation system for road safety, reachable, reasonable, and defensibility [8], [9]. Distraction during driving is also a main factor that leads to RTAs. There are nine people killed, and more than 1000 injured every

day in the United States due to accidents happened by distraction during vehicle driving [10], [11], [12]. Risky and aggressive driving behaviors are much higher in the regions where traffic enforcement is breached. Otherwise, there is no significant difference between both sexes in attitudes towards traffic regulations [1], [13]. In Saudi Arabia, the RTIs are considered the third leading cause of death [14], [15], [16], [17]. Recently, it was investigated that the drivers' behaviors showed 86.1% of drivers are engaged in at least one risky behavior while driving [18]. Majority of accidents in Saudi Arabia occur because of over speeding [19]. The factors which predispose in severe injuries caused by RTAs are mainly due to not wearing a seat belt and using mobile phones while driving [20], [21], [22]. Road traffic deaths have become a public health crisis in Saudi Arabia, representing death's primary cause in young adults [23]. Drivers who are <30 years are involved in about sixty percent of all accidents [24]. In June 2018, the Saudi Arabia allowed women to drive, opening the way for millions of new drivers to steer across a country. A recent study found that various different combinations, including gender, pointedly effect in receiving driving tickets. However, gender has a statistically significant impact on aggressive driving behavior, particularly [25]. Evidences show that women drive at slower speeds and operate vehicles less aggressively than men, particularly in middle eastern countries such as Jordan and the United Arab Emirates [26], [27]. In view of these, this study was hypothesized that female drivers in capital city Riyadh of Saudi Arabia follow the traffic safety rule and guidelines. To test this hypothesis, 407 female drivers were randomly selected from Riyadh and their knowledge toward the traffic safety rules and guidelines were evaluated.

Methods

Study design

It is a cross-sectional study conducted on female drivers residing in Riyadh City, Saudi Arabia. This study performed in two steps. Initially, a pilot study was undertaken among the female drivers and non-drivers of 5% from the total study sample size to validate the study questionnaire. The original tool, the Dula Dangerous Driving Index (DDDI) [28] was translated from English to Arabic and then implemented on the female drivers. Inclusion criteria was Arabic-speaking female drivers or non-drivers, whose age were 15 years and above and lived in Riyadh city during collection. Whereas, exclusion criteria were Arabic-speaking female drivers or non-drivers who are <15-years-old; non-Arabic speaking female drivers or non-drivers (for getting difficulties in understanding the Arabic version questionnaire); any participant from outside Riyadh city.

Sample size

The sample size of the study was calculated to be 50% prevalence rate using Cochrane's equations (1977), confidence interval (CI) = 95%, and margin of error = 5%. The calculated sample size was 389. However, the additional calculation was to estimate non-response or lack of completion, and the total number of sample size collected was 407, all of them are Arabic speaking female drivers, or non-drivers, whose age were 15 years old and above and lived in Riyadh city at the time of this research was implemented.

Sampling technique

This study was implemented through an electronic survey to prevent COVID-19 spread, focusing on female drivers or non-drivers in Riyadh City and their age above 15. To enroll the participants from different places in Riyadh City random sample technique was the solution. All participants asked to be voluntarily joining the survey; they had the full authority to accept or reject their participation.

Data collection methods, instruments used, measurements

The instrument used to collect the data was comprised of demographic characteristics (age, education level, economic status, and others defined in the questionnaire); driving experience; speed behavior and accident experience; cell phone use; perceptions, knowledge, and attitude about speed and seat belt cameras, and the best way to reduce speeding. The DDDI index was applied and its first five parts were from new version to use minimum questions to respond to the elements in this study's designed objectives. Conveniently selected questions taken from previous surveys from either the 2011 National survey of speeding, attitudes and behaviors of the 2012 National Survey on Distracted Driving Attitudes and Behaviors implemented by the National Highway Traffic Safety Administration USA (NHTSA). The sixth part questionnaire is based on the DDDI to assess perceptions, attitudes, dangerous behaviors, driver aggression, and negative emotions related to driving. However, this questionnaire was validated elsewhere [29]. This tool has been translated into the Arabic language then backward translated to the English language using expert bilingual translators. Piloting the questionnaire applied for testing 20 Female drivers for measuring the consistency, persistence, and validation of the Arabic version contents. However, some questions were excluded from the original instrument when it showed irrelevance.

Data management and analysis

Experienced bilingual person performed translation and backward translation of the

tool-Statistical Package for Social Sciences (SPSS-US Ver. 20) used for the statistical analysis. The descriptive statistic used to describe the sample in terms of demographic characteristics and behavior. The average of the Likert scale scoring findings used to measure the participants' answers (ranged from: never, rarely, sometimes, often, and always). The percentage below 60% used as an indicator of poor perception or attitude. Multiple Regression Analyses defined the statistically significant p < 0.05, which produced from previously analyzed variables in this study after adjusting some confounding factors such as the age cohorts, driving exposure, and dangerous driving. p < 0.05 value was considered statistically significant.

Table 1: Sociodemographic characteristics of the female participants (n=407)

Variables	Categories	n (%)
Age categories (years)	30 and less	181 (44.5)
	31–40	171 (42.0)
	41 and more	55 (13.5)
Marital status	Singles/divorced	163 (40.0)
	Married	223 (54.8)
	Widow	21 (5.2)
Educational level	Secondary and below	104 (25.6)
	Diploma or bachelor	182 (44.7)
	Postgraduate	121 (29.7)
House owner	Personal property	258 (64.1)
	Rent	149 (35.9)
Employment	Student	55 (13.5)
	Employee	259 (63.6)
	Retired	72 (17.7)
	Freelance	21 (5.2)
Monthly income	<5000 Riyals	111 (27.3)
	Between 5000 and 9999 Saudi Riyals	84 (20.6)
	Between 10,000 and 15,000 Saudi Riyals	131 (32.2)
	>15,000 Saudi Riyals	81 (19.9)

Results

The female participants' sociodemographic characteristics were explained in this table (Table 1), such as age, marital status, education level, house owner, employment, and monthly income. All participants in our sample (407 participants) were female. The majority of them were at age group less than 30 years (44.5%), married (54.8%), at university (44.7%), house owners with personal property (64.1%), employee (63.6%), and with monthly income ranged from 10,000 to 15,000 Riyals (32.2%). The mean age of the female participants was 33 years (±SD 7.8) years. Driving abilities and other different participants information about their experience with their cars are explained in Table 2. In Table 3, all participants asked "if they can drive a car or not," and the findings tested for association with sociodemographic characteristics: Age, marital status, education level, house owners, employment, and monthly income. In general, all the mentioned characteristics were firmly statistically significant with car driving (p < 0.001) except the house owner. The majority of participants who can drive was 47.4% their age was between 31 and 40 years, 41.8% at university, 50.2% singles/divorced/widow, 64.1% living in personal property, 73.9% employee, 35.5% their monthly income is between 10,000 and 15,000 Riyals. On the

other hand, the majority of participants who cannot drive were 45.8% their age is 30 years old and less, 51.7% at university, 65.8% singles/divorced/widow, 61.7% living in their personal property, 39.2% employee, 47.5% their monthly income is <5,000 Riyals.

Table 2: Driving abilities and other driving experience (n=407)

Variables	Categories	n (%)
Do you have a car	Yes	269 (66.1)
	No	138 (33.9)
Car owner	Family property	107 (26.3)
	My own car	162 (39.8)
	Rented	38 (9.3)
	I do not have a car	100 (24.6)
Can you drive	Yes, I can drive	287 (70.5)
	No, I can't drive	120 (29.5)
When you drive?	Daily	197 (48.5)
	I do not drive	145 (35.7)
	Irregular	64 (15.8)
Years of driving	Not diving	110 (27.0)
	1 year	159 (39.1)
	2 years	64 (15.7)
	≥3 years	74 (18.2)
How many hours do you drive your car per day?	I never drive	143 (35.1)
	1 h	124 (30.5)
	2 or more h	140 (34.4)
Do you have insurance on your car?	Yes, I have it	281 (69.0)
	I don't need it	19 (4.7)
	I don't have	107 (26.3)
What type of insurance do you have?	Insurance against other	104 (25.6)
	Full insurance	187 (45.9)
	No insurance	116 (28.5)

Table 3: Sociodemographic characteristics based on "Can you Drive" question to all participants (n=407)

Variables	Categories	Yes, driving, n (%)	Not driving, n (%)	p
Age (years)	30 and less	126 (43.9)	55 (45.8)	<0.001
	31–40 years	136 (47.4)	35 (29.2)	
	41 and more	25 (8.7)	30 (25.0)	
Educational level	Secondary and below	61 (21.3)	43 (35.8)	<0.001
	Diploma or bachelor	120 (41.8)	62 (51.7)	
	Postgraduate	106 (36.9)	15 (12.5)	
Marital status	Singles/divorced/widow	144 (50.2)	79 (65.8)	0.004
	Married	143 (49.8)	41 (34.2)	
House owner	Personal property	184 (64.1)	74 (61.7)	0.641
	Rent	103 (35.9)	46 (38.3)	
Employment	Student	34 (11.8)	21 (17.5)	<0.001
	Employee	212 (73.9)	47 (39.2)	
	Unemployed/retired	41 (14.3)	52 (43.3)	
Monthly income	<5000 Saudi Riyals	54 (18.8)	57 (47.5)	<0.001
	5000–9999 Saudi Riyals	61 (21.3)	23 (19.2)	
	10,000–15,000 Saudi Riyals	102 (35.5)	29 (24.2)	
	>15,000 Saudi Riyals	70 (24.4)	11 (9.2)	

In Table 4, we used the Dula Dangerous Driving Index (DDDI), and we can easily see the comparison of overall scores on aggressive drive subgroups among our sample. We divided the overall results into Not-adequate and Adequate. The terms that have been used frequently in this table were negative cognitive/emotional driving subscale (NCE), aggressive driving subscale (AD), and risky driving subscale (RD). We found that the overall prevalence of all participants who had not-adequate index were 48.4% (NCE), 42.3% (AD), and 48.2% (RD), while the overall prevalence of all participants who had adequate index was 51.6% (NCE), 57.7% (AD), and 51.8% (RD).

Table 4: Overall Dula dangerous driving index for female drivers (n=407)

Parameters	Adequate/Not adequate	n (%)
Overall NCE	Not adequate	197 (48.4)
	Adequate	210 (51.6)
AD	Not adequate	172 (42.3)
	Adequate	235 (57.7)
RD	Not adequate	196 (48.2)
	Adequate	211 (51.8)

NCE: Negative cognitive/emotional driving subscale, AD: Aggressive driving subscale, RD: Risky driving subscale.

Table 5: Overall negative cognitive/emotional driving subscale in all participants (407)

Variables	Categories	Yes, n (%)	No, n (%)	p
Age (years)	30 and less	94 (47.7)	87 (41.4)	0.282
	31–40	81 (41.1)	90 (42.9)	
	41 and more	22 (11.2)	33 (15.7)	
Educational level	Secondary and below	32 (16.2)	72 (34.3)	<0.001
	Diploma or bachelor	88 (44.7)	94 (44.8)	
	Postgraduate	77 (39.1)	44 (21.0)	
Marital status	Singles/divorced/widow	97 (49.2)	126 (60.00)	0.029
	Married	100 (50.8)	84 (40.0)	
House owner	Personal property	135 (68.5)	123 (58.6)	0.037
	Rent	62 (31.5)	87 (41.4)	
Employment	Student	30 (15.2)	25 (11.9)	0.054
	Employee	132 (67.0)	127 (60.5)	
	Unemployed/retired	35 (17.8)	58 (27.6)	
Monthly income	<5000 Saudi Riyals	44 (22.3)	67 (31.9)	0.049
	5000–9999 Saudi Riyals	37 (18.8)	47 (22.4)	
	10,000–15,000 Saudi Riyals	74 (37.6)	57 (27.1)	
	>15,000 Saudi Riyals	42 (21.3)	39 (18.6)	

In Table 5, female participants were asked to see if they have or have not the NCE. The findings tested for association with sociodemographic characteristics: Age, marital status, education level, house owners, employment, and monthly income. In general, all the mentioned characteristics were firmly statistically significant with (NCE) ($p < 0.049$) except the age and employment. The majority of participants who have (NCE) were 47.7% their age is 30 years and less, 44.7% at University, 50.8% Married, 68.5% living in their property, 67.0% employee, and 37.6% their monthly income is between 10,000 and 15,000 Riyals. On the other hand, the majority of participants who do not have (NCE) were 42.9% in age between 31 and 40 years, 44.8% at university, 60.0% singles/divorced/widow, 58.6% living in personal property, 60.5% employee, and 31.9% their monthly income is <5,000 Riyals. In Table 6, all participants asked to see if they have or have not the AD.

Table 6: Overall aggressive driving subscale in participants (n=407)

Variables	Categories	Yes, n (%)	No, n (%)	p
Age (years)	30 and less	72 (41.9)	109 (46.4)	0.227
	31–40	71 (41.3)	100 (42.6)	
	41 and more	29 (16.9)	26 (11.1)	
Educational level	Secondary and below	35 (20.3)	69 (29.4)	0.027
	Diploma or bachelor	75 (43.6)	107 (45.5)	
	Postgraduate	62 (36.0)	59 (25.1)	
Marital status	Singles/divorced/widow	86 (50.0)	137 (58.3)	0.097
	Married	86 (50.0)	98 (41.7)	
House owner	Personal property	113 (65.7)	145 (61.7)	0.408
	Rent	59 (34.3)	90 (38.3)	
Employment	Student	23 (13.4)	32 (13.6)	0.986
	Employee	109 (63.4)	150 (63.8)	
	Unemployed/retired	40 (23.3)	53 (22.6)	
Monthly income	< 5000 Riyals	38 (22.1)	73 (31.1)	0.049
	5000–9999 Riyals	34 (19.8)	50 (21.3)	
	10,000–15,000 Riyals	56 (32.6)	75 (31.9)	
	> 15,000 Riyals	44 (25.6)	37 (15.7)	

The findings tested for association with sociodemographic characteristics: Age, marital status, education level, house owner, employment, and monthly income. In general, all the mentioned characteristics were not statistically significant with (AD) ($p > 0.05$) except educational level and monthly income and rest of the information are summarized in Table 6. In Table 7, all participants asked to see if they have or have not RD; the findings were tested for association with sociodemographic characteristics: marital status, education level, house owner, employment, and monthly income. In general, all the mentioned characteristics were redundant statistically significant with (RD)

Table 7: Overall risky driving subscale in participants (n=407)

Variables	Categories	Yes, n (%)	No, n (%)	p
Age (years)	30 and less	89 (45.4)	92 (43.6)	0.894
	31–40	80 (40.8)	91 (43.1)	
	41 and more	27 (13.8)	28 (13.3)	
Educational level	Secondary and below	62 (31.6)	42 (19.9)	0.011
	Diploma or bachelor	75 (38.3)	107 (50.7)	
	Postgraduate	59 (30.1)	62 (29.4)	
Marital status	Singles/divorced/widow	92 (46.9)	131 (62.1)	0.002
	Married	104 (53.1)	80 (37.9)	
House owner	Personal property	114 (58.2)	144 (68.2)	0.035
	Rent	82 (41.8)	67 (31.8)	
Employment	Student	30 (15.3)	25 (11.8)	0.029
	Employee	112 (57.1)	147 (69.7)	
	Unemployed/retired	54 (27.6)	39 (18.5)	
Monthly income	<5000 Riyals	61 (31.1)	50 (23.7)	0.081
	5000–9999 Riyals	45 (23.0)	39 (18.5)	
	10,000–15,000 Riyals	59 (30.1)	72 (34.1)	
	>15,000 Riyals	31 (15.8)	50 (23.7)	

($p < 0.05$) except age and monthly income. The majority of participants who have (RD) were 45.4% at the age of 30 years and less, 38.3% at university, 53.1% married, 58.2% living in their property, 57.1% employee, and 31.1% their monthly income is <5,000 Riyals. On the other hand, the majority of participants who do not have (RD) were 43.6% in age 30 years and less, 50.7% at university, 62.1% Singles/Divorced/Widow, 68.2% living in personal property, 69.7% employee, and 34.1% their monthly income is between 10,000 and 15,000 Riyals.

Table 8: Speed tendency in female participants (n=407)

Speed	Speed driving	n (%)
Speed on highways	High tendency speed drive	11 (2.7)
	Less tendency speed driving	396 (97.3)
Speed outside the city	High tendency speed drive	11 (2.7)
	Less tendency speed driving	396 (97.3)
Speed inside the city	High tendency speed drive	57 (14.0)
	Less tendency speed driving	350 (86.0)

Table 8 shows the level of tendency or the attitude of getting high-speed among participants when driving in on highways, outside the cities, and inside the city. All participants in this study had less tendency speed driving on highways, outside and inside the city with a prevalence of (97.3%), (97.3%), and (86.0%), respectively.

Table 9 shows participants' attitudes about the laws that are put in place to limit over speed based on their monthly income, and at the same time, it shows the reflection of these attitudes on the behaviors of drivers. About half of this study participants did not have an accident and did not cause an accident in the last 2 years. At the same time, about half of the participants did not have an accident in the last 2 years; besides, they committed to the speed limit.

Table 10 identifies the association of mobile usage and the Number of Mobile Violations "traffic tickets" in the last 2 years.

Table 11 shows different reviews of various situations based on marital status; those situations mainly based on attitudes measurement in order to answer the first part of our research question, which is to determine the principal attitudes of female drivers.

Different reviews of various situations are show in Table 12. They based on marital status and behaviors measurement to answer the second part of our research question.

Table 9: Attitude toward speed lows in all female participants (n=407)

Attitude toward speed lows	Response	Monthly income				Mean (%)
		<5000 Riyals, n (%)	Between 5000 Riyals and 9999 Riyals, n (%)	Between 10,000 Riyals and 15,000 Riyals, n (%)	>15,000 Riyals, n (%)	
What do you think of the laws that are put in place to limit over speed?	Very important. And there should be new laws	60 (54.1)	42 (50.0)	81 (61.8)	54 (66.7)	58.15
	Important	47 (42.3)	39 (46.4)	45 (34.4)	23 (28.4)	
	I do not know	1 (0.9)	2 (2.4)	3 (2.3)	4 (4.9)	
	Not important	3 (2.7)	1 (1.2)	1 (0.8)	0	
	Not definitively important. And there are not necessarily new laws	0	0	1 (0.8)	0	
In the last 2 years, have you had at least one traffic accident, or have you almost caused at least one traffic accident?	Yes, I had an accident, and I was over speeding	4 (3.6)	9 (10.7)	16 (12.2)	15 (18.5)	52.35
	Yes, I had an accident, and I was not over speeding	16 (14.4)	10 (11.9)	25 (19.1)	10 (12.3)	
	I do not remember	22 (19.8)	10 (11.9)	25 (19.1)	8 (9.9)	
	I had no accident, despite my constant neglect of speed	5 (4.5)	7 (8.3)	9 (6.9)	6 (7.4)	
	No. I had no accident and did not cause an accident	64 (57.7)	48 (57.1)	56 (42.7)	42 (51.9)	
If you had a traffic accident in the last two years. Were you already overtaking legal speed?	Yes, I had an accident, and I was over speeding	1 (0.9)	5 (6.0)	8 (6.1)	11 (13.6)	51.7
	Yes, I had an accident, and I was not over speeding	14 (12.6)	12 (14.3)	33 (25.2)	10 (12.3)	
	I do not remember	31 (27.9)	17 (20.2)	24 (18.3)	10 (12.3)	
	I had no accident, despite my constant neglect of speed	4 (3.6)	4 (4.8)	10 (7.6)	6 (7.4)	
	No, I had no accident, and I am always committed to speed	61 (55.0)	46 (54.8)	56 (42.7)	44 (54.3)	

Table 13 shows the findings from the regression analysis of the overall AD adjusted based on the demographic characteristics. In general, no possible association between the different variables related to the participants and the aggressive driving except among employee as a category in comparison to others either students or non-employee, which showed that employee was around three times likely to behave aggressively when driving than students (OR = 2.563; 95% CI = 1.238–5.305; p = 0.011); however, it was not sustained when adjusting the different variables. On the other hand, in Table 14 we showed overall RD adjusted to the demographic variables related to the participants, those with the educational level of diploma/bachelor, Singles/Divorced/Widow, and those employees were more likely associated with the behaviors of risky driving than their counterpart (adjusted odds ratio [AOR] = 1.675, 95% CI = 1.025–2.736, p = 0.040; AOR = 1.990, 95% CI = 1.314–3.014, p = 0.001; and AOR = 1.987, 95% CI = 1.179–3.349, p = 0.010, respectively).

Discussion

In our study using Dula Dangerous Driving Index, we revealed out that the "Adequate Index" for all participants tested by DDDI in this study, such as NCE, AD, and RD as shown in Table 4 was more significant than the "Not-Adequate Index." Based on this result, aggressive, dangerous driving behavior is not common among female drivers, which may have happened due to the influence of country's traffic regulations, which is trying very hard to reduce road accidents and their consequences. By comparison, a study in Mexico City used DDDI show that women express their anger more constructively during driving [30], [31] Another study shows a significant impact on the aggressive and speedy driving on accident involvement. While, the attitude of drivers has no direct or indirect impact on accident involvement [32]. Another study agrees with the previous one, which found that dangerous driving behavior

Table 10: Mobile usage and reflect on number of mobile violations in all studied all female derivers (n=407)

Mobile usage and reflect on number of mobile violations	Response	Number of mobile violations in past 2 years			
		I don't get any violation, n (%)	p	I get one violation or more, n (%)	p
Do you make calls while driving?	Always	61 (17.7)	0.005	20 (32.3)	0.008
	frequently	55 (15.9)		13 (21.0)	
	Sometimes	57 (16.5)		12 (19.4)	
	Scarcely	74 (21.4)		10 (16.1)	
	Never	98 (28.4)		7 (11.3)	
Do you receive calls while you are driving?	Always	65 (18.8)	0.003	26 (41.9)	<0.001
	frequently	69 (20.0)		12 (19.4)	
	Sometimes	69 (20.0)		10 (16.1)	
	Scarcely	78 (22.6)		12 (19.4)	
	Never	64 (18.6)		2 (3.2)	
When I receive a call while driving, I do the following	I answer the call and keep driving	135 (39.1)	0.006	41 (66.1)	0.<0.001
	I answer the call and try to stop in a safe place	69 (20.0)		9 (14.5)	
	Send him a quick message, (I'll call you back)	38 (11.0)		7 (11.3)	
	I stop in a safe place and then call the caller	30 (8.7)		1 (1.6)	
	I don't answer the call, and I keep driving	73 (21.2)		4 (6.5)	
Did you receive calls while driving?	Always	146 (42.3)		36 (58.1)	0.022
	frequently	45 (13.0)		9 (14.5)	
	Sometimes	48 (13.9)		8 (12.9)	
	Scarcely	37 (10.7)		4 (6.5)	
	Never	69 (20.0)		5 (8.1)	

Table 11: Attitude measurements among all participants (n=407)

Attitudes measurements	Response	Marital status		p
		Singles, n (%)	Married, n (%)	
When I am under stress, I feel comfortable driving a car	Always	18 (9.8)	8 (3.6)	<0.001
	Frequently	20 (10.9)	26 (11.7)	
	Sometimes	62 (33.7)	43 (19.3)	
	Scarcely	29 (15.8)	57 (25.6)	
	Never	55 (29.9)	89 (39.9)	
I become more nervous while driving	Always	4 (2.2)	0	0.004
	Frequently	14 (7.6)	6 (2.7)	
	Sometimes	45 (24.5)	39 (17.5)	
	Scarcely	53 (28.8)	71 (31.8)	
	Never	68 (37.0)	107 (48.0)	
I see the behavior of other drivers is inappropriate or "stupid"	Always	59 (32.1)	60 (26.9)	0.327
	Frequently	60 (32.6)	64 (28.7)	
	Sometimes	50 (27.2)	80 (35.9)	
	Scarcely	8 (4.3)	13 (5.8)	
	Never	7 (3.8)	6 (2.7)	
I become angry when I see the car in front of me slowing down without reason	Always	40 (21.7)	39 (17.5)	0.146
	Frequently	27 (14.7)	44 (19.7)	
	Sometimes	56 (30.4)	55 (24.7)	
	Scarcely	18 (9.8)	36 (16.1)	
	Never	43 (23.4)	49 (22.0)	
I feel that passive drivers must learn to drive well or leave it	Always	90 (48.9)	118 (52.9)	0.212
	Frequently	39 (21.2)	54 (24.2)	
	Sometimes	25 (13.6)	32 (14.3)	
	Scarcely	14 (7.6)	9 (4.0)	
	Never	16 (8.7)	10 (4.5)	
I feel it is my right to speedy drive anywhere I want	Always	3 (1.6)	1 (0.4)	0.003
	Frequently	10 (5.4)	8 (3.6)	
	Sometimes	40 (21.7)	24 (10.8)	
	Scarcely	33 (17.9)	31 (13.9)	
	Never	98 (53.3)	159 (71.3)	
I become very nervous when I get stuck in a traffic jam	Always	16 (8.7)	16 (7.2)	0.783
	Frequently	33 (17.90)	33 (14.8)	
	Sometimes	67 (36.4)	84 (37.7)	
	Scarcely	37 (20.1)	54 (24.2)	
	Never	31 (16.8)	36 (16.1)	
I consider myself an enterprising driver	Always	3 (1.6)	1 (0.4)	0.009
	Frequently	6 (3.3)	6 (2.7)	
	Sometimes	28 (15.2)	15 (6.7)	
	Scarcely	37 (20.1)	33 (14.8)	
	Never	110 (59.8)	168 (75.3)	
I find myself an aggressive driver	Always	1 (0.5)	0	0.139
	Frequently	4 (2.2)	3 (1.3)	
	Sometimes	13 (7.1)	6 (2.7)	
	Scarcely	23 (12.5)	23 (10.3)	
	Never	143 (77.7)	191 (85.7)	
While driving, my passengers ask me to stay calm	Always	5 (2.7)	8 (3.6)	0.058
	Frequently	7 (3.8)	5 (2.2)	
	Sometimes	32 (17.4)	20 (9.0)	
	Scarcely	39 (21.2)	42 (18.8)	
	Never	101 (54.9)	148 (66.4)	

Table 12: Behavior's measurement of female drivers (n=407)

Behavior's measurements	Response	Marital status		p
		Single, n (%)	Married, n (%)	
I feel that I have the right to take revenge in some way, to respond to another driver who was hostile to me	Always	8 (4.3)	4 (1.8)	0.439
	Frequently	5 (2.7)	6 (2.7)	
	Sometimes	24 (13.0)	23 (10.3)	
	Scarcely	31 (16.8)	34 (15.2)	
	Never	116 (63.0)	156 (70.0)	
I will chase the car of someone who annoys me without leaving a distance between me and him	Always	0	2 (0.9)	0.264
	Frequently	3 (1.6)	1 (0.4)	
	Sometimes	14 (7.6)	12 (5.4)	
	Scarcely	26 (14.1)	24 (10.8)	
	Never	141 (76.6)	184 (82.5)	
I challenge other drivers at traffic lights to be ahead	Always (1)	6 (3.3)	0	0.014
	Frequently	0	2 (0.9)	
	Sometimes	6 (3.3)	2 (0.9)	
	Scarcely	22 (12.0)	23 (10.3)	
	Never	150 (81.5)	196 (87.9)	
I skip the car, which is running very slowly in an irregular way	Always (1)	5 (2.7)	1 (0.4)	0.344
	Frequently	5 (2.7)	5 (2.2)	
	Sometimes	16 (8.7)	16 (7.2)	
	Scarcely	29 (15.8)	32 (14.3)	
	Never	129 (70.1)	169 (75.8)	
Drivers who follow me without leaving a distance between them and I intend to close the path on them	Always	5 (2.7)	2 (0.9)	0.179
	frequently	7 (3.8)	5 (2.2)	
	Sometimes	25 (13.6)	20 (9.0)	
	Scarcely	36 (19.6)	40 (17.9)	
	Never	111 (60.3)	156 (70.0)	
I verbally attack the one who harasses me from the drivers, and I raise my hand in an inappropriate movement	Always	0	0	0.021
	Frequently	2 (1.1)	0	
	Sometimes	16 (8.7)	6 (2.7)	
	Scarcely	25 (13.6)	34 (15.2)	
	Never	141 (76.6)	183 (82.1)	
I adhere to the path I take during crowding	Always (5)	57 (31.0)	100 (44.8)	0.062
	Frequently	61 (33.2)	62 (27.8)	
	Sometimes	37 (20.1)	36 (16.1)	
	Scarcely	10 (5.4)	11 (4.9)	
	Never	19 (10.3)	14 (6.3)	
I cross the double yellow lines on both sides of the road to see why those cars are moving slowly	Always	4 (2.2)	1 (0.4)	0.155
	Frequently	3 (1.6)	4 (1.8)	
	Sometimes	2 (14.7)	23 (10.3)	
	Scarcely	47 (25.5)	47 (21.1)	
	Never	103 (56.0)	148 (66.4)	
I Keep some self-defense tools in the car, such as: (stick, cleaver, weapon, etc.)	Always	7 (3.8)	6 (2.7)	0.079
	Frequently	17 (9.2)	9 (4.0)	
	Sometimes	15 (8.2)	14 (6.3)	
	Scarcely	25 (13.6)	22 (9.9)	
	Never	120 (65.2)	172 (77.1)	

directly affected the crash risk probability and the rash driving latent variables [11], [12], [33]. Our study shows with a statistically significant (p < 0.05) that both singles and married females who can drive do not challenge other drivers at traffic lights ahead [13], [34], [35]. Most of them do not verbally attack any other driver and do not raise their hand in an inappropriate movement. However, a study agrees with this point, where they found that aggressive and risky driving behaviors level were much higher in the region without traffic enforcement [34], [35]. On the other hand, a study that tests aggressive driving shows a strong linear association between congestion and the frequency of aggressive behaviors, but it was due to the number of drivers on the road [33]. However, a recent study found that some demographic variables like gender and driving anger were significantly related to aggressive and risky driving. A recent study also shows that aggressive driving behaviors and risky driving attitudes have significantly related to gender and other demographic characteristics [13], [34], [35], [26]. On the other hand, a recent study found that some different combinations, including gender, significantly influence getting driving

tickets. However, gender has a statistically significant impact on aggressive driving behavior, particularly [25]. Another study also agreed with our findings; their results showed that sociodemographic characteristics, including "gender," absolutely affect aggressive driving behavior with a directional effect [36]. Our finding shows that a working employee was around three times likely to behave in an aggressive way than students and the data also showed that participants with the educational level of diploma/bachelor, singles/divorced/widows, and those who are employees were more likely associated with the behaviors of risky driving than their counterpart that may be due to the working stress the employee can get from their work [37], [38]. The previous result may happen due to the sense of responsibility the married had; however, married drivers mostly have children, so they almost will drive safely than singles for their family's sake [39], [40]. Simultaneously, normally married women are older than single women, so by default, considering a self-as enterprising driver will be less among older female drives [39], [41], [42]. On the contrary, a finding from a study done previously indicated that adolescent and young adult females are involved in risky driving behavior because they are often supposed to be prone to traffic violations [37]. The age of drivers is another important factor that can affect involvement in risky driving behaviors [42], [43].

Table 13: Regression analysis of the overall aggressive driving subscale and the demographic variables

Variables	Categories	OR	95% CI	p	AOR	95% CI	p
Age (years)	30 and less	0.893	0.378–2.107	0.796	-	-	-
	31–40	1.066	0.455–2.497	0.883	-	-	-
	41 and more	-	-	-	-	-	-
Educational level	Secondary and below	1.266	0.508–3.151	0.613	-	-	-
	Diploma or bachelor	1.045	0.539–2.028	0.896	-	-	-
	Postgraduate	-	-	-	-	-	-
Marital status	Singles/divorced/widow	1.688	0.995–2.864	0.052	1.584	0.945–2.654	0.081
	Married	-	-	-	-	-	-
House owner	Personal property	0.670	0.375–1.197	0.176	0.598	0.341–1.046	0.072
	Rent	-	-	-	-	-	-
Employment	Student	2.617	0.987–6.941	0.053	2.343	0.945–5.807	0.066
	Employee	2.563	1.238–5.305	0.011	1.795	1.000–3.222	0.050
	Unemployed/retired	-	-	-	-	-	-
Monthly income	<5000 Saudi Riyals	2.062	0.743–5.721	0.165	-	-	-
	5000–9999 Saudi Riyals	1.222	0.495–3.017	0.663	-	-	-
	10,000–15,000 Saudi Riyals	1.274	0.610–2.662	0.519	-	-	-
	>15,000 Saudi Riyals	-	-	-	-	-	-

OR: Odds ratio, CI: Confidence interval, AOR: Adjusted OR.

Table 14: Regression analysis of the overall Risky Driving Subscale and the demographic variables

Variables	Categories	OR	95% CI	p	AOR	95% CI	p
Age (years)	30 and less	1.032	0.519–2.052	0.928	-	-	-
	31–40	1.010	0.512–1.991	0.978	-	-	-
	41 and more	-	-	-	-	-	-
Educational level	Secondary and below	1.153	0.572–2.324	0.691	0.917	0.516–1.628	0.766
	Diploma or bachelor	1.948	1.129–3.361	0.017	1.675	1.025–2.736	0.040
	Postgraduate	-	-	-	-	-	-
Marital status	Singles/divorced/widow	2.043	1.336–3.124	0.001	1.990	1.314–3.014	0.001
	Married	-	-	-	-	-	-
House owner	Personal property	1.486	0.960–2.301	0.075	1.535	1.001–2.356	0.050
	Rent	-	-	-	-	-	-
Employment	Student	1.611	0.759–3.419	0.215	1.426	0.701–2.899	0.327
	Employee	2.203	1.1994.047	0.011	1.987	1.179–3.349	0.010
	Unemployed/retired	-	-	-	-	-	-
Monthly income	<5000 Saudi Riyals	0.789	0.345–1.802	0.574	-	-	-
	5000–9999 Saudi Riyals	0.511	0.243–1.075	0.077	-	-	-
	10,000–15,000 Saudi Riyals	0.795	0.428–1.475	0.467	-	-	-
	>15,000 Saudi Riyals	-	-	-	-	-	-

OR: Odds ratio, CI: Confidence interval, AOR: Adjusted OR.

The majority of participants have a good speed attitude when driving on highways and outside the cities, with a 97.3% prevalence. However, the prevalence of driving inside the cities is also having a good speed tendency (86.0%) as shown in Table 8. Besides, about half of all participants (51.7%) show that they are committed to the speeding limit while another half is not. Also, more than half of the participants (52.35%) did not have any accidents in the past 2 years and did not cause any accidents at all since they have started driving. A study agreed with our findings that women are less likely to be driven at very high speeds, and they are not interested in speedy driving [8]. Our study spectacles with a statistically significant (p < 0.05) that participants who "Always" make and receive calls during driving and use their mobile phone itself for calling are more likely to get more mobile violations than their peers. Distraction with the mobile while driving can be one of the most critical factors that affect and disrupt women during the car's drive. A report in 2017 suggests that smartphone addiction was significantly associated with the accident, falling/slipping, and bumps/collisions [37]. Moreover, another study tested the impact of distracted driving on safety and traffic flow, shows that distraction, in most cases, text messaging has a significant association with a traffic accident [37]. Although driving and speaking or writing messages using a cell phone while driving is considered a pleasure, a study proves that driving by itself without using the cell phone is enjoyable and brings self-confidence, experience, and subjective happiness [38].

Conclusions

Aggressive driving behavior is not common among female drivers. Generally, all females participated in this study, having reasonably good knowledge of traffic rules and regulations. Most importantly, this study also determined that the Dula Dangerous Driving Index is a useful tool for testing of dangerous driving and we recommend this tool should be used in research analyzing driving skill. This research is essential for decision-makers to formulate and to set their priorities.

Acknowledgments

References

1. Soori H, Khorasani-Zavareh D. Road traffic injuries measures in the Eastern Mediterranean Region: Findings from the Global Status Report on Road Safety-2015. J Inj Violence Res. 2019;11(2):149-58. https://doi.org/10.5249/jivr.v11i2.1122
   PMid:31101799

2. Petridou E, Moustaki M. Human factors in the causation of road traffic crashes. Eur J Epidemiol. 2000;16(9):819-26. https://doi.org/10.1023/a:1007649804201
   PMid:11297224.

3. Stewart BT, Yankson IK, Afukaar F, Medina MC, Cuong PV, Mock C. Road traffic and other unintentional injuries among travelers to developing countries. Med Clin North Am. 2016;100(2):331-43. https://doi.org/10.1016/j.mcna.2015.07.011
   PMid:26900117

4. Fridman L, Pitt T, Rothman L, Howard A, Hagel B. Driver and road characteristics associated with child pedestrian injuries. Accid Anal Prev. 2019;131:248-53. https://doi.org/10.1016/j.aap.2019.07.007
   PMid:31336312

5. Khalaf MK, Rosen HE, Mitra S, Neki K, Mbugua LW, Hyder AA, *et al*. Estimating the burden of disability from road traffic injuries in 5 Low-and middle-income countries: Protocol for a prospective observational study. JMIR Res Protoc. 2023;12:e40985. https://doi.org/10.2196/40985
   PMid:36723997

6. Toroyan T, Peden MM, Iaych K. WHO launches second global status report on road safety. Inj Prev. 2013;19(2):150. https://doi.org/10.1136/injuryprev-2013-040775
   PMid:23513037

7. Masudi T, McMahon HC, Scott JL, Lockey AS. Seat belt-related injuries: A surgical perspective. J Emerg Trauma Shock. 2017;10(2):70-3. https://doi.org/10.4103/0974-2700.201590
   PMid:28367011

8. Sugiawan Y, Kurniawan R, Managi S. Assessing the United Nations sustainable development goals from the inclusive wealth perspective. Sci Rep. 2023;13(1):1601. https://doi.org/10.1038/s41598-023-28540-0
   PMid:36709239

9. Yang T, Zeng H, Yang X, Kong J, Chen X, Zhou N, *et al*. Characteristics of road traffic accident types and casualties in Guangzhou, China, from 2007 to 2020: A retrospective cohort study based on the general population. Heliyon. 2023;9(1):e12822. https://doi.org/10.1016/j.heliyon.2023.e12822
   PMid:36704281

10. Moradi-Lakeh M, El Bcheraoui C, Tuffaha M, Daoud F, Al Saeedi M, Basulaiman M, *et al*. The health of Saudi youths: Current challenges and future opportunities. BMC Fam Pract. 2016;17:26. https://doi.org/10.1186/s12875-016-0425-z
   PMid:26946327

11. Shaaban K, Gaweesh S, Ahmed MM. Investigating in-vehicle distracting activities and crash risks for young drivers using structural equation modeling. PLoS One. 2020;15(7):e0235325. https://doi.org/10.1371/journal.pone.0235325
   PMid:32614872

12. Stanojević P, Sullman MJ, Jovanović D, Stanojević D. The impact of police presence on angry and aggressive driving. Accid Anal Prev. 2018;110:93-100. https://doi.org/10.1016/j.aap.2017.11.003
   PMid:29126022

13. Alonso F, Useche SA, Gene-Morales J, Esteban C. Compliance, practices, and attitudes towards VTIs (Vehicle Technical Inspections) in Spain: What prevents Spanish drivers from checking up their cars? PLoS One. 2021;16(7):e0254823. https://doi.org/10.1371/journal.pone.0254823
   PMid:34280232

14. Mansuri FA, Al-Zalabani AH, Zalat MM, Qabshawi RI. Road safety and road traffic accidents in Saudi Arabia. A systematic review of existing evidence. Saudi Med J. 2015;36(4):418-24. https://doi.org/10.15537/smj.2015.4.10003
   PMid:25828277

15. Ansari S, Akhdar F, Mandoorah M, Moutaery K. Causes and effects of road traffic accidents in Saudi Arabia. Public Health. 2000;114(1):37-9. https://doi.org/10.1038/sj.ph.1900610
   PMid:10787024

16. Alghnam S, Towhari J, Alkelya M, Alsaif A, Alrowaily M, Alrabeeah F, *et al*. The Association between mobile phone use and severe traffic injuries: A case-control study from Saudi Arabia. Int J Environ Res Public Health. 2019;16(15):2706. https://doi.org/10.3390/ijerph16152706
   PMid:31362446

17. El Bcheraoui C, Basulaiman M, Tuffaha M, Daoud F, Robinson M, Jaber S, *et al*. Get a license, buckle up, and slow down: Risky driving patterns among Saudis. Traffic Inj Prev. 2015;16(6):587-92. https://doi.org/10.1080/15389588.2014.990090
   PMid:25551701

18. Al Turki YA. How can Saudi Arabia use the decade of action for road safety to catalyse road traffic injury prevention policy and interventions? Int J Inj Contr Saf Promot. 2014;21(4):397-402. https://doi.org/10.1080/17457300.2013.833943
   PMid:24047249

19. Ramisetty-Mikler S, Almakadma A. Attitudes and behaviors towards risky driving among adolescents in Saudi Arabia. Int J Pediatr Adolesc Med. 2016;3(2):55-63. https://doi.org/10.1016/j.ijpam.2016.03.003
   PMid:30805469

20. Alghnam S, Alrowaily M, Alkelya M, Alsaif A, Almoaiqel F, Aldegheishem A. The prevalence of seatbelt and mobile phone use among drivers in Riyadh, Saudi Arabia: An observational study. J Safety Res. 2018;66:33-7. https://doi.org/10.1016/j.jsr.2018.05.001
   PMid:30121109

21. AlEissa S, AlAssiri SS, AlJehani RM, Konbaz FM, AlSalman MJ, Abaalkhail M, *et al*. Neurological disability among adults following traumatic spinal fractures in Saudi Arabia: A retrospective single-center medical record review. Ann Saudi Med. 2019;39(1):8-12. https://doi.org/10.5144/0256-4947.2019.8
   PMid:30712045

22. AlSallum GA, Alwassel AA, Alshushan AM, Abaalkhail AK, Alhasoon MA, Aldamigh AS. Parent's knowledge, attitude, and practice about children car seats at Unaizah city, KSA. J Family Med Prim Care. 2019;8(3):805-11. https://doi.org/10.4103/jfmpc.jfmpc_75_19
   PMid:31041205

23. Boissin C, Al Maniri AA, Al-Azri AS, Hasselberg M, Laflamme L. Determinants of speeding among new generations of car drivers from the Arabian Peninsula. An investigation based among Omani drivers using the theory of planned behaviour. PLoS One. 2019;14(12):e0226441. https://doi.org/10.1371/journal.pone.0226441
   PMid:31841565

24. Bamney A, Pantangi SS, Jashami H, Savolainen P. How do the type and duration of distraction affect speed selection and crash risk? An evaluation using naturalistic driving data. Accid Anal Prev. 2022;178:106854. https://doi.org/10.1016/j.

aap.2022.106854.

PMid:36252466

25. Vanlaar W, Simpson H, Mayhew D, Robertson R. Aggressive driving: A survey of attitudes, opinions and behaviors. J Safety Res. 2008;39(4):375-81. https://doi.org/10.1016/j.jsr.2008.05.005

     PMid:18786424

26. Boo Y, Choi Y. Comparison of prediction models for mortality related to injuries from road traffic accidents after correcting for under sampling. Int J Environ Res Public Health. 2021;18(11):5604. https://doi.org/10.3390/ijerph18115604

     PMid:34073920

27. Men Cause 9 Out of 10 Accidents in Dubai Transport-Gulf News; 2020. Available from: https://gulfnews.com/uae/transport/men-cause-9-out-of-10-accidents-in-dubai-1.1911936 [Last accessed on 2023 Feb 06].

28. Dula CS, Ballard ME. Development and evaluation of a measure of dangerous, aggressive, negative emotional, and risky driving. J Appl Soc Psy. 2003;33:263-82.

29. Willemsen J, Dula CS, Declercq F, Verhaeghe P. The Dula dangerous driving index: An investigation of reliability and validity across cultures. Accid Anal Prev. 2008;40(2):798-806. https://doi.org/10.1016/j.aap.2007.09.019

     PMid:18329435

30. Lee SM, Al-Mansour AI. Development of a new traffic safety education material for the future drivers in the Kingdom of Saudi Arabia. J King Saudi Univ Eng Sci. 2020;32(1):19-26. https://doi./org/10.1016/j.jksues.2018.11.003

31. Feng Z, Chu C, Zhu D, Ji N, Cui J, Huang Z. Investigation of intervention methods based on different leading roles in family regarding child road safety education: An experimental study. Accid Anal Prev. 2022;178:106874. https://doi.org/10.1016/j.aap.2022.106874

     PMid:36341892

32. Trifunović A, Pešić D, Čičević S, Antić B. The importance of spatial orientation and knowledge of traffic signs for children's traffic safety. Accid Anal Prev. 2017;102:81-92. https://doi.org/10.1016/j.aap.2017.02.019

     PMid:28273551

33. Al-Hanawi MK, Khan SA, Al-Borie HM. Healthcare human resource development in Saudi Arabia: Emerging challenges and opportunities-a critical review. Public Health Rev. 2019;40:1. https://doi.org/10.1186/s40985-019-0112-4

     PMid:30858991

34. Rhodes N, Pivik K. Age and gender differences in risky driving: The roles of positive affect and risk perception. Accid Anal Prev.

2011;43(3):923-31. https://doi.org/10.1016/j.aap.2010.11.015

     PMid:21376884

35. Sheriff RJ, Forbes HJ, Wessely SC, Greenberg N, Jones N, Fertout M, *et al*. Risky driving among UK regular armed forces personnel: Changes over time. BMJ Open. 2015;5(9):e008434. https://doi.org/10.1136/bmjopen-2015-008434

     PMid:26399573

36. Al-Ghalib SJ, Salim AY, Al-Khalifah S, Dahlawi RA. Perceptions of women's driving in Saudi Arabia: Relationship with openness to experience and happiness. Middle East J Positive Psychol 2018;4:102-25.

37. Oviedo-Trespalacios O, Haque MM, King M, Washington S. Effects of road infrastructure and traffic complexity in speed adaptation behaviour of distracted drivers. Accid Anal Prev. 2017;101:67-77. https://doi.org/10.1016/j.aap.2017.01.018

     PMid:28189943

38. Issa Y. Effect of driver's personal characteristics on traffic accidents in Tabuk city in Saudi Arabia. J Transport Lit. 2016;10(3):25-9.

39. Afghari AP, Hezaveh AM, Haque MM, Cherry C. A home-based approach to understanding seatbelt use in single-occupant vehicles in Tennessee: Application of a latent class binary logit model. Accid Anal Prev. 2020;146:105743. https://doi.org/10.1016/j.aap.2020.105743

     PMid:32866770

40. Hill LL, Lauzon VL, Winbrock EL, Li G, Chihuri S, Lee KC. Depression, antidepressants and driving safety. Inj Epidemiol. 2017;4(1):10. https://doi.org/10.1186/s40621-017-0107-x

     PMid:28367591

41. Hernández-Hernández AM, Siqueiros-García JM, Robles-Belmont E, Gershenson C. Anger while driving in Mexico City. PLoS One. 2019;14(9):e0223048. https://doi.org/10.1371/journal.pone.0223048

     PMid:31568529

42. De La Vega R, Anabalon H, Tannion K, Purto H, Jara DC. Gender differences in professional drivers' fatigue level measured with BAlert mobile app: A psychophysiological, time efficient, accessible, and innovative approach to fatigue management. Front Psychol. 2022;13:953959. https://doi.org/10.3389/fpsyg.2022.953959

     PMid:35978790

43. Wong JT, Chung YS, Huang SH. Determinants behind young motorcyclists' risky riding behavior. Accid Anal Prev. 2010;42(1):275-81. https://doi.org/10.1016/j.aap.2009.08.004

     PMid:19887168