



## Knowledge and Adherence to Traffic Regulations and Their Impact Among Female Drivers in Saudi Arabia

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### Abstract

**Background:** Road traffic crashes are a real public health problem. It is the leading cause of mortality among young adults, causing the deaths of 1.35 million people. Females in Saudi are novice in vehicle driving exposing them to the road traffic crashes.

**Aim:** This study aims to assess the knowledge and adherence of female drivers in Saudi Arabia regarding the traffic regulations, and the impact of road traffic crashes.

**Methods:** This is a cross-sectional study design, analytic type. The sample size is calculated to be 384 female drivers. The convenient sampling technique is used to recruit the female drivers. The study was conducted from October to April 2022. Data were collected using a questionnaire designed and validated by the researchers.

**Results:** Knowledge and adherence questions were coded then categorized into good and poor. Only 32.1% of the females were found to have good knowledge of traffic regulations, while 60.1% of the females had good adherence.

**Conclusion:** This study revealed most of the participants have poor knowledge, while most of them have good adherence to traffic regulations that they know.

**Keywords:** Knowledge; Adherence; Road Traffic Regulations Impact; Traffic Regulations; Female Driver

### Introduction

Every year, around 1.3 million people's lives are cut short as a result of road traffic crashes (RTC) [1]. A road traffic crash is defined as a "collision between two or more vehicles, between vehicles and pedestrians, between vehicles and animals, or between vehicles and fixed obstacles" [2].

Individuals, their families, and nations suffer significant economic losses as a result of road traffic injuries. The majority

of countries lose 3% of their gross domestic product due to road crashes [1]. A contribution to the worldwide burden of illnesses, road traffic injuries are expected to climb from the tenth place in 2002 to eighth place by 2030, if no serious actions are taken [3].

In Saudi Arabia, road traffic crashes are a real public health problem. According to the World Health Organization's (WHO) 2018 report on road safety, Saudi Arabia has the world's highest number of deaths from road traffic crashes per capita, which

accounts for 4.7 percent of all deaths [4]. Also, it is the leading cause of mortality among young adults and caused the deaths of 9000 people in 2016 [5].

According to the Saudi Ministry of Health (MOH) from 2018 to 2020, the most affected age group by road traffic crashes is 19-30 years old [6]. The Department of Motor Vehicles in Saudi Arabia has many laws and legislations. Traffic regulations apply to all vehicles and pedestrians on the roads. Driver's tiredness, cell phone usage while driving, or poor vision may cause road traffic crashes [7].

In September 2017, the legal ban on women driving in Saudi Arabia was lifted, enabling women to practice driving across the nation [8]. The start of driving exposes the females in Saudi Arabia to the risks of road traffic crashes, particularly the novice ones. This study aims to assess the knowledge and adherence of female drivers in Saudi Arabia regarding the driving regulations.

## Methodology

### Study design

This is an analytical cross-sectional study design that was conducted on female drivers in Saudi Arabia to describe knowledge and adherence to traffic regulations and their impact. Because the study design is a cross-sectional one, and the target population is more than ten thousand, the infinite population proportion is chosen which gives a sample size of 384 female drivers. The study was conducted from Sept. 2021 to April 2022. Non probability, convenient sampling technique was used to recruit the participants.

Study participants included all female drivers of any nationality in Saudi Arabia, who were present inside Saudi Arabia at the time of the study.

Data collection was done using a questionnaire that was designed by the researchers using the traffic regulations of the Saudi Ministry of Interior [10] in addition to a validated questionnaire developed by Abdulrahman, *et al.* to assess RTCs in Saudi Arabia [11]. The research questionnaire was developed using google forms and distributed via social media (whats app, twitter, snap chat, and telegram) in Arabic language.

The study questionnaire was validated using two techniques: 1) review by three experts in the health education program, college

of health and rehabilitation and 2) conducting a pilot study on 20 participants from college of health and rehabilitation. All recommended changes from the experts and the pilot population were done. Reliability test were done using Cronpach alpha test and it was unacceptable, which may be due to 1) few number of questions 2) Alpha has very strict assumptions 3) may be Cronpach alpha is not always the best choice to estimate the reliability [12,13].

The questionnaire components included five parts, including sociodemographic data, the basic driving data, knowledge of driving regulations (choices scale: yes, I know, scored to be 1; No, scored to be 0; I do not know, scored to be 0) with total score of 10. It is considered that those who have at least 75% of traffic regulation knowledge will be categorized as having good knowledge. The fourth part of the questionnaire was about adherence to traffic regulations (multiple-choices, scored as follows: yes, I know scored to be 1; yes sometimes, scored to be 1; no, scored to be 0). There are six questions scored reversely as the high score is corresponding to the poor adherence (yes, I know scored to be 0; yes sometimes, scored to be 0; no, scored to be 1). The total score of adherence questions was 12. It is considered that those who are at least 75% adherent to traffic regulations will be categorized as they are good adherence to traffic regulations. The last part of the questionnaire was about the impact of RTCs (multiple-choices of: got a fine, had crash, driver's car/cars around were damaged, driver/passengers injured, people injured in the road or in other cars, public property damaged on the road).

Statistical analysis was done using the software JMP version 16 [14] to perform the descriptive and analytic statistics. P value of less than 0.05 is considered to be statistically significant.

### Ethical consideration

The study was carried out after the institutional review board (IRB) approval at Princess Nourah Bint Abdulrahman University. Furthermore, all participants gave their informed consent for joining the study. The voluntary participation, and withdrawal from the study, the anonymity of collected data was be maintained.

### Results

More than half of participants (207, 53%.9) were aged 19-30, while participants (26, 6.8%) were at the age of 18 years or less. Most of the sample participants were single (222, 57.8%) (Table 1).

Personal characteristics	No. (%)
Age group (years)	
< = 18	26 (6.8%)
19-30	207 (53.9%)
31+	151 (39.3%)
Marital status	
Single	222 (57.8%)
Married	162 (42.2%)
Having kids (N = 177) *	
No	29 (16.4%)
Yes	148 (83.6%)
Nationality	
Saudi	377 (98.2%)
Non-Saudi	7 (1.8%)
Educational level	
Less than high school	6 (1.6%)
High school or diploma	89 (23.1%)
Bachelor’s degree or higher	289 (75.3%)
Work outside the home	
No	187 (48.7%)
Yes	197 (51.3%)

**Table 1:** Socio-demographic characteristics for study participants (N = 384).

\*N = separated mothers with kids.

Most of the study participants were Saudi (377, 98.2%) and had a bachelor’s degree or higher (289, 75.3%). More than half of the sample (197, 51.3%) were working outside the home.

Most of the study participants (214, 55.7%) were driving for more than one year, and were driving the family car (203, 52.8%). The average driving duration per day was mostly one to two hours (168, 43.8%). The majority of the participants reported having a driving license (288, 75.0%) and insurance (353, 91.9%), which was mostly of the comprehensive type (222, 61.0%) (Table 2).

59 participants (15.4%) do not have knowledge about the legal age for obtaining a driving license. 28 (7.3%) of the participants did not have knowledge about driving without a license. Regrettably,

Driving data	No. (%)
Duration of driving	
< one year	170 (44.3%)
> one year	214 (55.7%)
Ownership of the car	
Owned by the family	203 (52.8%)
Owned by the participant	168 (43.8%)
Rented	13 (3.4%)
Hours of driving per day	
< one hour	98 (25.5%)
1-2 hours	168 (43.8%)
> = 3 hours	118 (30.7%)
Have driving license	
Yes	288 (75.0%)
No	96 (25.0%)
Have driving insurance	
Yes	353 (91.9%)
No	31 (8.1%)
Type of driving insurance (N = 353) *	
Comprehensive	222 (61.0%)
Only against the mistakes of others	101 (27.8%)
Only against driver’s mistakes	41 (11.2%)

**Table 2:** Driving data of the study participants (N = 384).

\*N = participants only have driving insurance.

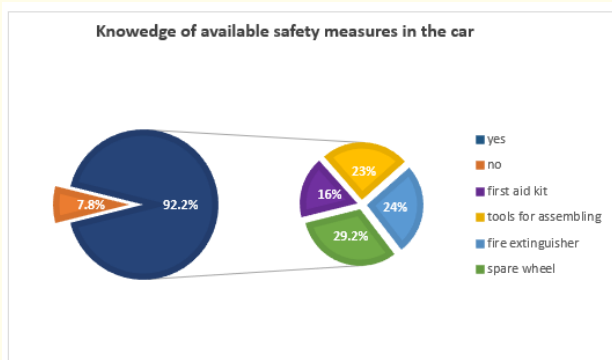
(72, 18.8%) of the study participants did not have knowledge about fines for driving at night with lights off. 367 participants (95.6%) had high knowledge about fines for not fastening the seat belts. 78 (20.3%) of the participants did not know about not placing a child’s seat fine (Table 3).

Questions	No. (%)		
	Yes, there is	No, there is not	I do not know
Legal age for obtaining a driver’s license	325 (84.6%)	59(15.4%)	--
There is a fine for driving without a license	356 (92.7%)	--	28 (7.3%)

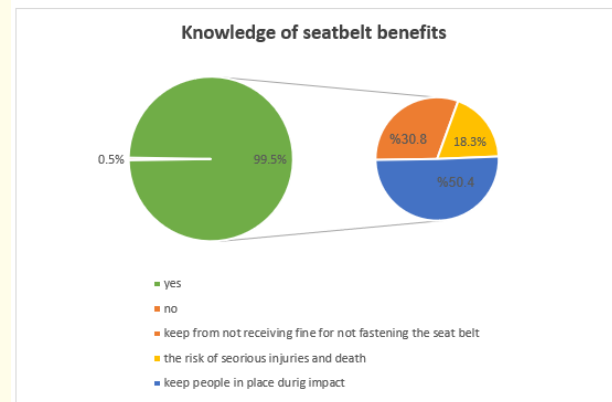
There is a fine for using a mobile while driving	377 (98.2%)	--	7 (1.8%)
There is a fine for driving at night with the lights off	312 (81.2%)	--	72 (18.8%)
There is a fine for not fastening the seat belt	367 (95.6%)	12 (3.1%)	5 (1.3%)
There is a fine for the passenger who is not using the seat belt	363 (94.5%)	--	21 (5.5%)
The safe distance between cars	332 (86.5%)	42 (10.9%)	10 (2.6%)
There is a fine for not placing a child's seat in the car	264 (68.8%)	42 (10.9%)	78 (20.3%)

**Table 3:** Knowledge of traffic regulations among participants (N = 384).

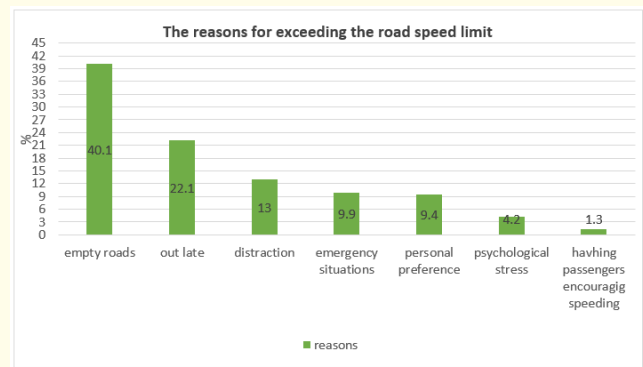
Only (30, 7.8%) of the participants have reported not knowing the available safety measures in their cars (Figure 1), while 382 participants (99.5%) know about the mentioned benefits of using the seatbelt. Most of them (192, 50.4%) reported that fastening the seat belts is important to keep them in place during impact (Figure 2). Regarding the reasons for exceeding the road speed limit, 37 (22.1%) of the reported risky reasons were being out late, distractions (22, 13.0%), personal preference (16, 9.4%) (Figure 3).



**Figure 1:** Knowledge of the available safety measures in the car (N = 384).



**Figure 2:** Knowledge of seatbelt benefits (N = 384).

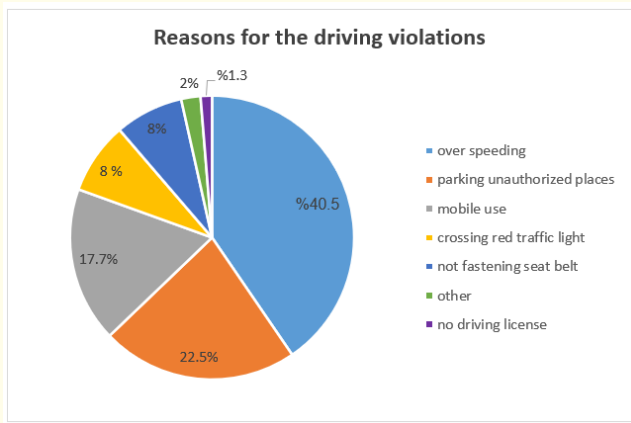


**Figure 3:** The reasons for exceeding the road speed limit (N = 169)\*.

\*N = participants who exceeded road speed limit.

For impact of traffic violations, it was a good indicator that most of the participants never got a fine (233, 60.7%). 138 (35.9%) of the participants were involved in a traffic crash and out of them (79, 57.2%) reported the crash was because of others (Table 5). The most frequent reason for traffic violations among the participants was over speeding (61, 40.5%). Mobile use and crossing red traffic lights constituted 27 (17.7%) and 12 (8.0%) respectively. Only 2 (<1%) of the reasons were due to driving without a license (Figure 4).

Studying the outcome of car crashes among participants, it was found that the driver's car/cars around were damaged (92, 67.0%) was the highest. 3 (<1%) of the participants were injured,



**Figure 4:** Reasons for the driving violations (N = 151)\*. \*N = participants who got a fine.

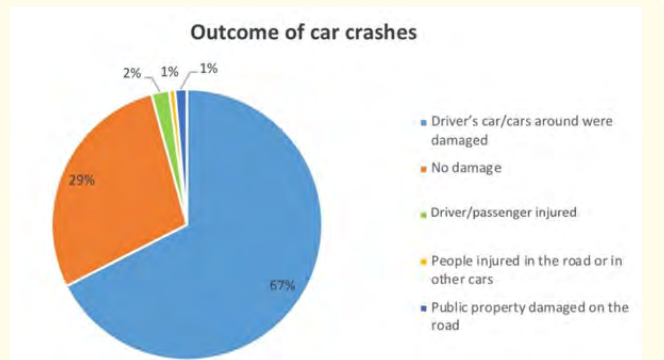
Impacts	No. (%)
Traffic violations fine	
Never got a fine	233 (60.7%)
1-3	111 (28.9%)
> 3	40 (10.4%)
Having road traffic crash	
No	246 (64.1%)
Yes	138 (35.9%)
Whose crash fault (N = 138)*	
The participant	59 (42.8%)
Others	79 (57.2%)

**Table 5:** Impacts of traffic violations (N = 384). \*N = participants involved in road traffic crash.

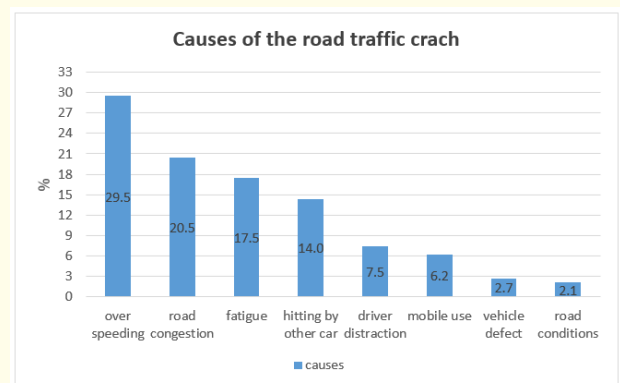
Regulations	No. (%)		
	Yes		No
	Always	Sometimes	
Wearing the seat belt	370 (96.3%)	14 (3.7%)	--
Commitment to the speed limit of the road	303 (78.9%)	78 (20.3%)	3 (0.8%)
Ever exceeding the allowed road speed	169 (44.0%)	--	215 (56.0%)
Mobile use while driving	7 (1.8%)	129 (33.6%)	248 (64.6%)
Using high lights to alert others	100 (26.0%)	206 (53.7%)	78 (20.3%)
Follow a safe driving distance	305 (79.4%)	75 (19.5%)	4 (1.1%)
Periodic maintenance of the car	218 (56.8%)	136 (35.4%)	30 (7.8%)
Use car signals as needed	328 (85.4%)	52 (13.5%)	4 (1.0%)
Turn off the car lights while driving at night	11 (2.9%)	11 (2.9%)	362 (94.2%)
Driving in the opposite direction of the road	2 (0.5%)	41 (10.7%)	341 (88.8%)
Driving in zig zag between vehicles	4 (1.0%)	69 (18.0%)	311 (81.0%)

**Table 4:** Adherence to traffic regulations among the study participants (N = 384).

while (1, <1%) pedestrians were injured. Also, public property was damaged in (2, <1%) cases (Figure 5). The highest cause for car crashes was the over speeding (41, 29.5%), while the lowest cause was for road conditions (3, 2.1%) (Figure 6).



**Figure 5:** Outcome of car crashes (N = 138)\*. \*N = participants who involved in road traffic crash.



**Figure 6:** Causes of the road traffic crash (N = 138)\*. \*N = participants who involved in road traffic crash.

Studying the relationship between participants level of knowledge and road traffic crashes has found that 94 participants (68.1%) who have poor knowledge of traffic regulations were exposed to road traffic crashes which was not a statistically significant association ( $p > 0.05$ ) (Table 6). Regarding the association

between the participants' adherence to traffic regulations and road traffic crashes, it was found that most of the study participants (64.3%) who had good adherence to traffic regulations were not involved in road traffic crashes and this association was statistically significant ( $P < 0.05$ ) (Table 7).

Having knowledge about traffic regulations	Outcome		Total	Chi square test = 0.004 P = 0.9978
	No crash N (%)	Crash N (%)		
Good knowledge	79 (32.1%)	44 (31.9%)	123 (32.1%)	
Poor knowledge	167 (67.9%)	94 (68.1%)	261 (67.9%)	
Total	246 (100%)	138 (100%)	384 (100%)	

**Table 6:** The relationship between participants level of knowledge and road traffic crashes.

Adherence to traffic regulations	Outcome		Total	Chi square test = 6.191 P = 0.0452*
	No crash N (%)	Crash N (%)		
Good adherence	158 (64.3%)	73 (52.9%)	231 (60.1%)	
Poor adherence	88 (35.7%)	65 (47.1%)	153 (39.9%)	
Total	246 (100%)	138 (100%)	384 (100%)	

**Table 7:** The relationship between participants adherence and having road traffic crashes.

\*Statistically significant ( $p < 0.05$ ).

	Good	Poor
Knowledge	123 (32.1%)	261 (67.9%)
Adherence	231 (60.1%)	153 (39.9%)
Impact	Yes	No
Road traffic crashes	138 (35.9%)	246 (64.1%)
Traffic violations fine	151 (39.3%)	233 (60.7%)

**Table 8:** Knowledge and adherence to traffic regulations among participants and their impact.

### Discussion

The current study is conducted on 384 female drivers in Saudi Arabia to describe their knowledge regarding traffic regulation and adherence to them. Also, important impacts of road traffic crashes were encountered. In this research 67.9% of participants have poor knowledge of traffic regulations. Which is not similar to study conducted in Taif (2014) majority of participants have good

knowledge of traffic regulations [15]. This can be explained by females are novice and males are more knowledgeable because of the duration of driving.

A study conducted in Kusmasi, Ghana (2013) was reported female more complying with traffic law. Similarly, with study finding 60% of participants have good adherence [16]. That could be explained by females being more compliant because males are more risk takers than females, and females naturally are more conscious. In the current study (15.4%) of the participants do not have knowledge about legal age for obtaining driving license. Which is less than study conducted in Chennai (2014) to assess the knowledge, attitude and practice towards road safety rules and regulations among higher secondary school student that majority of participants know the legal age to get a valid driving license was 18 years [17]. This might be due to the majority of females in our study have misconception about temporary driving license and the legal age for obtaining driving license.

This research has revealed, that 20% of the participants do not know that there is a violation fine for not placing a child's seat. A study was conducted in Unaizah (2019) about parent's knowledge, attitude, and practice about children car seats and illustrated that the majority of the participants had poor knowledge [18]. The results in our study could be lower but this legislation is just in act only in Nov.2021. When asked about the importance of seatbelts, the majority of participants strongly agreed that they are important, and the majority of participants believe that seat belts have the ability to reduce complications from road traffic crashes. According to a study conducted in Taif (2014) was finding the majority of the participants believe that seatbelts have the ability to reduce complications from road traffic crashes [15]. Similarly to the current study most of the participants (50.4%) believe that fastening the seatbelt is critical to keeping them in place during accident. It is possible that this is due to a government interest in promoting awareness about the importance of wearing seat belts; for example, Saudi Arabia's seat-belt program. The results in this study showed that the majority of the participants (96.3%) were wearing the seatbelt which is expected to be due to the enforced regulation by the traffic system in Saudi Arabia. This is compatible to study conducted in Riyadh about the effectiveness of introducing surveillance cameras to show compliance with seatbelt laws which revealed that seatbelt adherence increased significantly from 33.9% to 75.8% [19].

In this study, 44.0% had previously exceeded the speed limit on the road. That is less than a previous study conducted in Majmaah (2015) about risky health behaviors among Majmaah University students, which found that (60.9%) were speeders [20]. That could be male young age driver are more prone to accepted speeding and females are more considered about the risk [21]. This study found that 35.4% of study participants were using their phones while driving, which less than study conducted in Qatar (2010) on mobile phone use and the risk of motor vehicle crashes, which found that 73.2% of drivers were using their phones [22]. This could be related to the fines imposed by the government for using a phone while driving, which range from 150 to 300 Saudi Riyals [23]. Also, the surveillance cameras. The current study demonstrated 22.1% of the participants reported being late was the reason for exceeding the road speed limit. Some reason was reported in the study that was conducted in Amman, Jordan (2020) stated that the main reason for speeding was the feeling of being late to work and other

destinations [24]. Due to the fact that catching an appointment on time is more important to them than exceeding the speed limit – they are worried about missing it if they do not arrive on time [25]. As shown in a study conducted in Riyadh (2021) on female driver's attitudes and behavior regarding traffic regulations, 56.4% of female drivers have never gotten a traffic violation ticket [11]. Similarly, to the findings of the current study 60.6 % never received a fine. That is may be an indicator of the government's active engagement, which is one of the responsibilities of the general department of traffic is develop a program that help the public know and follow traffic regulations [23].

In this study, 35.9% of the participants were involved in a traffic crash. Consistent with study conducted in Malaysia (2010), (35.7%) students involved in one or more road traffic crashes [26]. Could be considered a high percentage in this study; this is related to a lack of driving experience, which could be attributable to the fact that driving privileges were only granted for a brief time and females need to be more educated on traffic laws and adhere to them to minimize road traffic crash [11]. This study showed that 17.7% of participants reported that mobile use is the reason for driving violations, which less than study conducted in Jeddah, Saudi Arabia (2018) stated that the majority of the respondents (90%) use a mobile phone while driving [27]. The reason behind that might be that people are addicted to their phones and underestimates the risk of using mobile while driving, but still camera and big fines have controlled this problem. Study showed that the highest cause of road traffic crashes is speeding (29.5%). However, this was similar to a study conducted in Qassim Region, Saudi Arabia (2018), which indicated that excessive speeding is the main cause of road crashes [28]. This may be attributed to the fact that they can save time by increasing the speed [29], also people like to speed particularly within new car models.

In the current study non-adherents are significantly more likely to be involved in crashes, according to a study conducted in the Taif region (2010), which found that drivers' noncompliance with traffic regulations and rules was the leading cause of road traffic crashes. This can be explained by participants' risk to adherence and so higher exposure to RTC. Study conducted in Iran (2014) find high knowledge significantly associated with decreased road crashes, that is not consistent with this research finding were no significant association between who have good knowledge of

traffic regulations and exposed to road traffic crashes. This may be because the only source of information is driving schools in Saudi Arabia and driving schools in Saudi Arabia are few [30].

### Limitations

Although the sample size was reached, it is not representative of the female drivers in Saudi Arabia because it is a convenient sample. Therefore, caution should be exercised in generalizing our findings.

### Conclusion and Recommendations

This study showed that most of female drivers have poor knowledge but their compliance to traffic regulations is relatively good. Thus, more educational programs should be lunched to educate the female drivers regrading road traffic regulations and motivate them to be adherents to traffic regulations. Further studies should be done using health education theories and probability sample.

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