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ORIGINAL STUDY

Effect of Harassment, Stereotypes, and Distractions on Female Driving Behavior in Egypt

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Abstract

Men and women are different in their driving behavior. The reasons for these differences vary from neurochemical structures, hormonal processes, to physical abilities for long driving hours or stress coming from accompanying children while driving. In Egypt and Middle East, female drivers face a diversity of challenges such as the stereotype that women are poor drivers. Moreover, there have been incidents when female drivers faced road harassments from other drivers, which may lead to accidents. In this research, data was collected from 1038 Egyptian female drivers in the age of 16–75 years old. The risk factors that play a significant role in their exposure to accidents are investigated. Among the investigated risk factors are road harassment from other drivers, stereotype to the psychological burden of accompanying children in the car, aggressive behavior and distraction activities shared with their opponent male drivers. The results show that 87% of female drivers experienced some form of road harassment. About 69% of these women were exposed to accidents due to this, and their driving behavior changed consequently. The results also show that there is an evident stereotype threat from the common thought that women are poor drivers. The effect of this stereotype is represented by higher odds ratio for the occurrence of accidents for women who sometimes/often are stereotyped by getting blamed in traffic incidents with odds ratio of 1.206/1.887 respectively with respect to women who were never stereotyped.

Keywords: Driver's behavior, Female drivers, Sex equity, Questionnaire, Road harassment, Stereotype

1. Introduction

Women constitute about half the population in any country. Hence, they are a great working force that the world is trying to invest in by promoting sex equity especially in workplaces and in transportation. Sexual harassment in transportation is a daily event for women and girls around the world. This reality is increasingly recognized as a serious worldwide issue because it hinders women's and girls' freedom of movement (Ceccato, 2017). It obstructs their ability to an effective participation in school, work, and public life. In Bangladesh, 94% of the women using public transportation have experienced sexual harassment at some time (Andaleeb, 2018). A study by the Asian Development Bank (ADB) in three cities (Baku-Azerbaijan, Karachi-Pakistan and Tbilisi-Georgia),

showed that 69% of the women who responded to the study had experienced such harassment while using public transportation (Bank, 2015). In recognition of the sex-based difference in needs, many governments have taken initiatives to promote the sex issues in transport (Rivera, 2007). Many countries have placed women-only train/underground carriages and pink taxis for women-only transport (Sanghani, 2015). However, the world is still lagging in many countries to achieve this equity due to the fact that there is a disconnection between the sex enabling environment and the transport sector (Gutierrez, 2003).

Although many studies assessed sexual harassment in public transportation, road harassment or harassment experienced by female drivers from other drivers on the road, remains a largely neglected issue that did not receive the needed attention from

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researchers. Some of these harassments are only reported by the victims themselves. For example, a female Egyptian biker experienced near death sexual harassment incident (Abdel, 2018), and an Afghani woman faced a similar incident in Kabul (Agence France-Presse, 2015). An initiative was raised by a woman about the legal process after being harassed while driving (Raina, 2013). Articles have been written (Javed, 2012) and online webpages advising women have been established (Alive, 2018), yet there is no procedure to protect women from this road harassment which might cause severe losses. One other influencing factor on women driving behavior is the stereotyping of women's driving. Stereotype threat indicates the negative effect of a stereotype about a group on this group's performance in fields related to the stereotype (Skorich et al., 2013). The existence of sex stereotypes associated with driving from the earlier period of adolescence was confirmed in a study by. Automobile accidents represent a context in which the stereotype that women are poor drivers might have extensive consequences (Granié and Papafava, 2011; Skinner et al., 2015) The most potent strategy to heal this disconnection and secure female drivers is to understand the differences between male and female road users and how women are affected in several ways.

2. Literature review

Many research efforts have demonstrated behavior differences between male and female drivers. The proportion of male drivers in the United States has gradually decreased from 60.4% in 1963 to 49.7% in 2005 (Sivak, 2013). A consideration of both the percentage of drivers by sex and the average annual miles driven by sex revealed that currently, females with driver's licenses are slightly outnumbering males. However, because female drivers are less than males, the overall likelihood that a given driver on the road today is a female is still less than 50% (Sivak, 2013). A study conducted at several Traffic Analysis Zones (TAZ) in Flanders, Belgium showed that the income level of a TAZ resident is a significant predictor of male car driver injury crashes while it does not significantly contribute to the prediction of female car driver injury crashes (Pirdavani et al., 2017). In a simulated driving environment, 48 people (aged 18–20) drove an advanced driving simulator with a friend as a passenger. The results showed that those who had a relationship that aroused enjoyment, amusement, and excitement were more likely to drive safely than those who did not have this type of relationship.

This effect was particularly pronounced for female drivers (Zhang et al., 2018). Another study surveyed 578 Czech and Slovak drivers, 37.2% of them were female drivers. The study showed that self-reported aggressive behavior on the road was associated with higher dysfunctional impulsivity and lower forgiveness. Negative affect (being angry, hostile, nervous, and upset) was positively associated with aggressive driving (Kováčsová et al., 2016).

A study analyzed crash data between 1998 and 2008 in the US, to investigate the odds for a belt-restrained female driver to sustain severe injuries compared to male drivers. The study results showed that female motor vehicle drivers may not be as safe as their male counterparts. The relative higher vulnerability of female drivers is approximately 50% or higher odds of sustaining injuries due to their relatively short stature, preferred seating posture, and a combination of these factors yielding lower safety protection from the standard restraint devices (Bose et al., 2011). Sixteen years-old people in Connecticut who were involved in nonfatal crashes during the first 8 months of licensure participated in a study which showed that, male drivers were significantly more likely than female drivers to speed or lose control of their vehicles or slide. Female drivers were significantly more likely to violate the right-of-way than male drivers because they failed to detect another vehicle or traffic control (Braitman et al., 2008).

Factors which affect driving behavior and accident rates in women (aged 18–23 and 45–50 years) in Australia were examined (Dobson et al., 1999). Results showed that the accident rate of younger female drivers was three times higher than that for the mid-age women. Scores for errors and violations for the young women were higher than that for the mid-age group. Riskier driving behavior among young women was associated with stress and habitual alcohol consumption. In the mid-age group, poorer driver behavior scores were related to higher levels of education, feeling rushed, higher habitual alcohol consumption and lower life satisfaction scores (Dobson et al., 1999). A field study showed that Swedish male and female drivers differed only marginally in their speed and headway driving behavior (Aronsson and Bang, 2006). A review of the evidence of crash risk in young drivers accompanied by passengers, compared with solo driving, showed increased risk for fatal crashes and for combined or nonfatal crashes with male versus female passengers and for younger versus older drivers (Ouimet et al., 2015). A study was implemented using driver behavior questionnaire to

investigate the relationship between driving skills, driving behavior and driving aggressiveness showed that female drivers can control their emotions better while driving and limit committing aggressive driving behaviors (Yang et al., 2022). In rural Bangladesh, Road Traffic Injury (RTI) and mortality rates were significantly higher among males compared to females. This is probably because men in Bangladesh have more exposure and movement on the road more than women (UI Baset et al., 2017).

An Australian study surveyed 673 current and 53 former female drivers aged 60 years or older and identified many factors that increase crash risk (Oxley et al., 2010). These factors include functional performance factors, physical frailty, consequences of lack of up-to-date driving experience, lack of confidence and the avoidance of difficult driving situations. Interestingly in Alabama, the proportion of crashes involving speeding increased with age for young males and decreased with age for young females. In general, younger female drivers (15–18 years) were more likely to be involved in speed and aggressive driving related fatal crashes than their male counterparts (Adanu et al., 2018). A study was conducted to measure sex identification in relation to driving ability self-enhancement, proved that strong driving skill self-enhancement bias exhibited by men and the relationship between sex identification and risky driving is evident (Sibley and Harré, 2009).

Stereotype threat, or the belief that one may be the target of demeaning stereotypes, may lead to driving performance disruptions. Women who were reminded of the stereotype that females are poor drivers were more than twice as likely to collide with jaywalking pedestrians as women who were not reminded of this stereotype (Yeung and von Hippel, 2008). Experiment also revealed that the magnitude of this effect was equivalent to that produced by a secondary task, suggesting that stereotype threat might diminish driving performance via a disruptive mental load (Yeung and von Hippel, 2008). This finding builds on the literature that has found that stereotype-based influences cannot simply be understood in terms of performance outcomes alone and may be relevant to factors affected by confidence such as driving cessation decisions (Chapman et al., 2016). Stereotype threat has clear consequences on human performance in a common real-world task—driving—that is critical to public safety (Lambert et al., 2016). The stereotype effect is evident in different groups of drivers. Older adults in the stereotype threat condition made more driving mistakes and showed worse performance

than those in a control group (Joanisse et al., 2013). The stereotype affects women's willingness to drive in India where only 11% of those behind the wheel are women (Ram and Dhawan, 2018). These stereotypes can even be confirmed through patriarchal care. An explicit example of this parental care is the oversized women-only parking spaces in many cities in South Korea and China. These oversized parking places for women confirm the stereotype that women cannot park properly (Adam, 2014; Li and Luo, 2020). Another study about older women who might seem immune to stereotyping showed that there is a lack of comparative studies in this area (Gaymard et al., 2023).

As can be seen from the above literature, many research papers investigated the differences between male and female driving behavior. Moreover, some of these papers studied certain extra circumstances that women may face in public transportation such as harassments, which many governments took initiatives to protect women from these harassments. However, the authors could not find any Egyptian studies that investigated road harassments against female drivers, and their effect on accident exposure as well as female drivers' safety on the road. In addition to this, females represent a fairly large group of Egyptian drivers society. Another serious problem that women face particularly in Egypt and the Middle East is the stereotype effect on women's confidence and consequently driving performance in addition to the psychological burden of children in the car. Thus, the main purpose of the current research is to study the effect of different risk factors on female driver's behavior and accident exposure in Egypt especially road harassment, stereotype effect, and family stress resulting from accompanying children in the car. In order to achieve these objectives, relevant data was collected through a Driver Behavior Questionnaire (DBQ) which was distributed to female drivers to address the effect of road harassment, stereotyping, family stress on women. Another questionnaire was distributed to male drivers to collect data about their insight of women driving. The questionnaire results were collected organized in Excel sheets for further analysis and then analyzed using the statistical package for social sciences (SPSS) program (Verma, 2012).

3. Data collection

3.1. Driver behavior questionnaires (DBQs)

A Driver Behavior Questionnaire (DBQ) was designed based on discussions and interviews with

female drivers about the problems that face them while driving, and factors affecting behavior of female drivers. Based on the studied literature and keeping in mind the Egyptian culture and habits, a DBQ was used to collect all important data needed to assess and evaluate the relationship between different risk factors, female drivers' behavior, and traffic accident occurrence. A total of 63 different questions were included in the DBQ and arranged in six different sections. The covered sections are as follows:

- (1) **Demographic characteristics**, such as: age, educational level, marital status, working status, income, and driving experience.
- (2) **Accompanying children in the car and related responsibilities and distraction activities**, such as: use of children allocated seat, allowing children movement, feeding or holding children while driving, and carefulness and securing doors and windows.
- (3) **Road harassment**, such as: type of harassment, its effect on women driving behavior and whether this harassment caused an accident or not.
- (4) **Distraction activities**, related to mobile phone calls, texting, eating, watching TV, watching store fronts, or looking for personal belongings in hand purse.
- (5) **Aggressive driving behavior**, such as: speeding, racing, aggressive overtaking, reverse direction drive, and short gaps.
- (6) **Accident exposure**, such as: number of accidents, causes of accidents, injuries, severity of injuries and fatalities.

Some questionnaire forms were distributed in different places such as social clubs and universities,

and other forms were posted using Google forms and Facebook. In order to capture the stereotype effect, some questions of the female DBQ were used in addition to a smaller questionnaire for male drivers about their opinion on women driving. The male DBQ consisted of 14 questions representing two sections:

- (1) **Demographic characteristics** such as age, educational level, marital status, income, and driving experience.
- (2) **Opinion in women driving** such as blaming women in combined incidents, exposure to traffic accidents caused by women, their opinion in stereotype sentences about women driving.

3.2. Participants and demographic data

The sample size is estimated from the following equation, this formula for unknown or very large populations.

$$\text{sample size} = \frac{Z^2 * p * (1 - p)}{e^2}$$

where,

Z = z-score (1.96),

e = margin of safety (0.05, with confidence interval 95%),

P = standard of deviation (0.5).

The required sample size according to the previous equation is 385 questionnaires. The total sample size of this study consisted of 1038 female drivers. However, the analysis was conducted based on 935 responses after excluding 103 participants (9.8%) from the analysis for failing to answer some of the questions. Female participants were selected to contain all

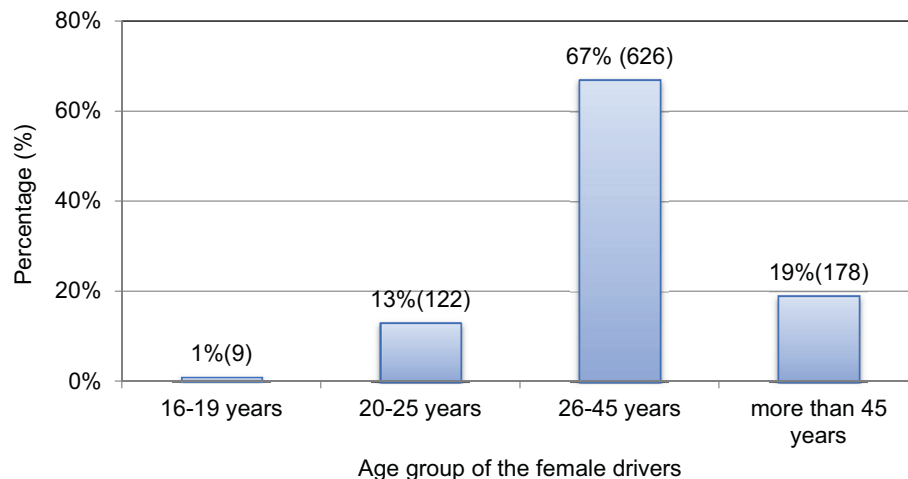


Fig. 1. Female drivers age groups.

age categories, but the majority was from 26 to 45 years old as shown in Fig. 1. As can be seen from Fig. 1, 1% of participants were teen drivers (16–19 years), 13% were young adults drivers (20–25 years), 67% were adult drivers (26–45 years) and 19% were experienced drivers (more than 45 years).

The educational level of the women varied between middle education (2.7%), university degree (66.3%), and higher studies (30.6%). Despite the possibility that the sample might seem biased, the fact that for women to drive in Egypt, they or their family must own a car retorts this allegation. Car ownership is not a requirement since women in Egypt rarely practice car driving jobs. Consequently, only families with relatively high income include female drivers, which have increased opportunities to education.

The number of participants to the male questionnaire was 184 participants, 21 of them were excluded for incomplete answers thus the analysis was performed on the complete 163 questionnaire responses. About 3% of the male DBQ were teen drivers (less than 20 years), 61% were young adults (20–25 years), 27% were adult drivers (26–45 years) and 9% were experienced drivers (more than 45 years). The educational level of the male participants is high with 75.4% have a college degree, while 22.6% have a higher degree. Nevertheless, their opinions in women driving were biased and stereotyped as will be seen in the analysis section.

4. Analysis and discussion

4.1. Odds ratio analysis

The odds ratio (OR) is a widely used statistic in traffic safety studies for comparing whether the probability of a certain event is the same for two groups (Mosteller, 1968). Binary logistic regression can be employed in calculating ORs, to measure the

strength of the association between the variables. Several researches applied this statistics method in traffic safety (Bates and Blakely, 1999; Li et al., 2012; Mock et al., 2002). For example, Klauer et al. utilized a mixed-effects logistic-regression analysis to determine odds ratios for a crash or near-crash associated with each category of distracting activities (Siebe, 2014). Another study conducted by Dingus al. applied odd ratio analysis to assess driver crash risk factors using naturalistic driving data (Dingus et al., 2016). The odds ratio is the ratio of the odd of an event occurring in one group to the odd of it occurring in another group. If the probabilities of the event in each of the groups are p_1 (Female drivers who sometimes drive on the form of sutures) and p_2 (drivers who never drive on the form of sutures), then the odds ratio is (Edwards, 1963):

$$\text{Odds ratio} = \frac{p_1 / (1 - p_1)}{p_2 / (1 - p_2)} \quad (1)$$

where:

p_1 = The probability of the event occurrence in group 1.

p_2 = The probability of the event occurrence in group 2.

An odds ratio of 1 indicates that the condition or event under study is equally likely to occur in both groups. An odds ratio greater than 1 indicates that the condition or event is more likely to occur in the first group. Moreover, an odds ratio less than 1 indicates that the condition or event is less likely to occur in the first group.

Table 1 shows a comparison of the OR's of the risky driving behavior related to accident occurrence for female drivers. For example, with respect to exceeding the speed limit while driving, the odds ratio of female drivers who sometimes exceed the

Table 1. Comparison among risky driving behavior related to accident occurrence by odds ratio values.

Odds ratio for exposure to traffic accident for aggressive driving	Value	95% Confidence Interval	
		Lower	Upper
Exceeding the speed limit	(Sometimes/Not at all)	1.817	2.387
	(Often/Not at all)	2.817	4.661
Racing with neighboring cars	(Sometimes/Not at all)	1.256	1.740
	(Often/Not at all)	1.956	4.958
Driving on the form of sutures	(Sometimes/Not at all)	1.412	1.903
	(Often/Not at all)	1.699	3.472
Driving in the opposite direction of travel (wrong way drive)	(Sometimes/Not at all)	1.099	1.691
	(Often/Not at all)	3.022	29.165
Wearing a seat belt while driving	(Sometimes/Not at all)	0.588	0.901
	(Often/Not at all)	0.760	1.121
Overtaking	(Sometimes/Not at all)	1.739	2.304
	(Often/Not at all)	2.177	4.793

Table 2. Comparison among distraction activities while driving related to accident occurrence by odds ratio values.

Odds ratio for exposure to traffic accident for distraction activities while driving		Value	95% Confidence Interval	
			Lower	Upper
Eating or drinking	(Sometimes/Not at all)	1.50	1.16	1.96
	(Often/Not at all)	1.52	0.78	2.97
Listening to radio or MP3	(Sometimes/Not at all)	1.46	0.80	2.68
	(Often/Not at all)	1.68	0.93	3.01
Mobile phone usage	(Sometimes/Not at all)	1.61	1.17	2.22
	(Often/Not at all)	1.90	1.26	2.85
Texting, Facebook, or Twitter	(Sometimes/Not at all)	1.34	0.98	1.82
	(Often/Not at all)	1.25	0.57	2.73
Personal care (make-up, hair) while driving	(Sometimes/Not at all)	1.42	0.97	2.08
	(Often/Not at all)	1.19	0.43	3.32
Looking at store fronts or reading the ads while driving	(Sometimes/Not at all)	1.03	0.79	1.34
	(Often/Not at all)	1.63	0.73	3.67
Looking for the personal belongings in the handbag while driving	(Sometimes/Not at all)	1.61	1.24	2.10
	(Often/Not at all)	1.24	0.61	2.55

speed limit is more likely to be involved in traffic accidents with respect to female drivers who never exceed the speed limit with odds ratio of 1.817. The odds ratio analysis for risky driving behavior suggests that the more women are involved in aggressive driving behavior or distraction activities, the more likely the occurrence of an accident which is rational. It can also be noticed that the most risky behavior among the investigated behaviors is driving in the reverse direction. This can be evident from an odd ratio value of 3.022 in comparison with women who do not do this behavior.

Table 2 shows the OR's results of the distraction activities in connection with accident occurrence for female drivers. OR's results with all values more than 1.0 show that the more women are involved in distraction activities, the more likely they are exposed to an accident.

The Odds ratio values were also calculated for the activities related to the presence of kids in the car. The odds ratios in Table 3 show that distraction activities related to the children such as accepting the movement of children from the back seat to the front seat, holding the children in the lap while driving, and feeding the kids while driving, which are all practiced in Egypt due to weak traffic laws enforcement, had odds ratio more than one. These values suggest that females who get distracted by the presence of children in the car are more likely to be exposed to accidents compared to females who do not commit these activities. However, females with cautious behavior like using seats allocated for young children, paying attention to children in the back seat, securing doors and windows when children are in the car, or driving more cautiously when children are in the car had odds ratio less than 1.

Table 3. Comparison among taking kids in the car related to accident occurrence by odds ratio values.

Odds ratio for exposure to traffic accident for accompanying kids in the car		95% Confidence Interval		
		Value	Lower	Upper
Do you take your kids in the car while driving?	(Yes/No)	0.78	0.59	1.04
Do you use the seat allocated for children?	(Sometimes/Not at all)	0.66	0.41	1.04
	(Often/Not at all)	0.95	0.66	1.38
Are you paying attention to the kids in the back seat while driving?	(Sometimes/Not at all)	0.83	0.59	1.16
	(Often/Not at all)	0.64	0.38	1.09
Do you allow the movement of children from the back seat to the front seat?	(Sometimes/Not at all)	1.59	1.12	2.27
	(Often/Not at all)	1.07	0.40	2.81
Do you hold children in your lap during driving the car?	(Sometimes/Not at all)	1.22	0.68	2.19
	(Often/Not at all)	1.08	0.15	7.72
Do you drive more cautiously when you have kids in the car?	(Sometimes/Not at all)	0.97	0.46	2.03
	(Often/Not at all)	0.69	0.35	1.36
Do you secure the doors and windows when you have kids in the car?	(Sometimes/Not at all)	0.69	0.12	3.94
	(Often/Not at all)	0.35	0.07	1.84
Do you feed the kids while they are with you in the car while driving?	(Sometimes/Not at all)	1.33	0.88	2.01
	(Often/Not at all)	NA	NA	NA

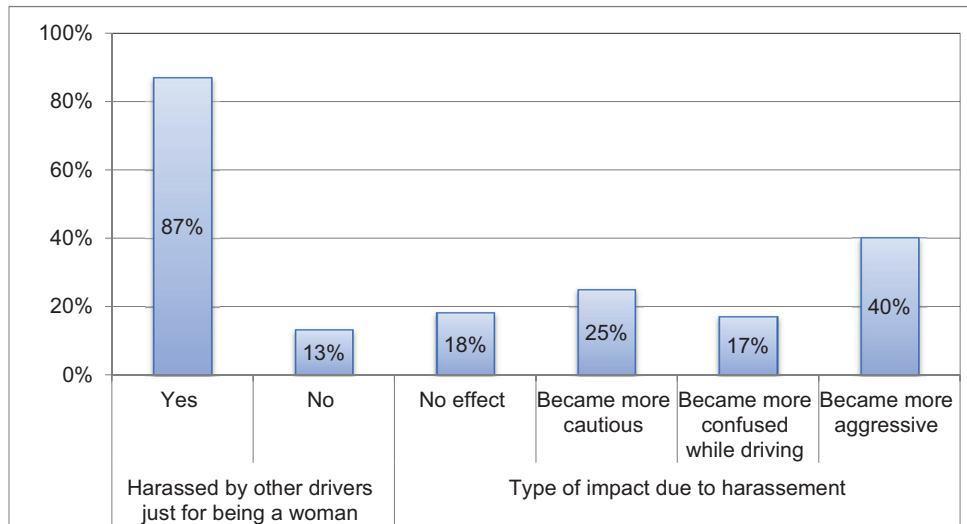


Fig. 2. Harassment by other drivers and its impact on female drivers' behavior.

This suggests that they are less likely to be exposed to accidents compared with women who are less cautious. There are many reasons for this, but one important element is perhaps that women tend to adapt their behavior to avoid risks. Thus, even though these results are logical, nevertheless they are very important to be put in front of decision makers. Such results though shed the light on the importance of traffic laws enforcement.

4.2. Harassment by other drivers

Participants were asked a question about road harassment. Results showed that 87% were harassed by male drivers just for being a woman. Women who were subjected to road harassment were asked three questions, one about the general effect of harassment on their behavior, and the second was about if they were subjected to accidents due to harassment. The third question was about the damage caused by this accident. Fig. 2 reveals that 87% of female drivers were subjected to harassment by other drivers. It also presents the effect of the harassments on their behaviors. These harassments had a negative impact on

their behavior, 40% of these female drivers stated that they became more aggressive, and 17% became more confused while driving compared to only 25% of these drivers who became more cautious. 69% of harassed female drivers stated they were exposed to traffic accidents. As a result of these accidents, 38% of female drivers who were harassed, were exposed to psychic loss and 55% to damage in their cars.

Regarding the odds ratio values related to road harassment shown in Table 4, it can be seen that female drivers who were sometimes harassed by other drivers on the road were more likely to be involved in traffic accidents with respect to female drivers who were never harassed with odds ratio of 1.131. The odds ratio analysis for road harassment also suggests that women who often get harassed on the road are more likely to be involved in an accident with odds ratio of 1.171.

Based on the data acquired from this survey, there is also a stereotype effect that influences women's driving behavior and can increase their exposure to accidents. The authors tried to capture the effect of this stereotype on women's exposure to accidents. A question in the female DBQ was asked about

Table 4. Comparison among harassment and stereotype effect related to accident occurrence by odds ratio values.

Harassment and stereotype odds ratio for exposure to traffic accident	Value	95% Confidence Interval		
		Lower	Upper	
Have you ever been harassed by other drivers only for being a woman?	(Sometimes/Not at all)	1.131	1.061	1.206
	(Often/Not at all)	1.171	1.066	1.286
If there is a traffic problem or a congestion that you are involved in, are you the party to be blamed?	(Sometimes/Not at all)	1.206	1.101	1.321
	(Often/Not at all)	1.887	1.524	2.336

Table 5. Survey results of male drivers opinion in women's driving behavior.

	Often, she is	Sometimes she is	No, she is not	
If there is a problem on the road, in which a woman is involved, is she usually the reason of the problem?	39.3%	53.4%	7.3%	
What do you think of this statement?	Completely True	Often true	Relatively true	Not true
'Women can't drive'	13.5%	18.4%	39.9%	28.2%
'Women can't park properly'	23.9%	24.5%	40.5%	11.1%
'Women should be prohibited to drive'	57.0% some of them		12.9% all of them	

whether the woman gets blamed for any traffic problem or congestion she is involved in? 71% of female drivers stated that they were the party to be blamed. The odds ratio in Table 4 shows that women who often get blamed are more likely to be exposed to accidents than women who never get blamed with odds ratio of 1.206. The results also show that women who often get blamed on the road are more likely to be involved in an accident with odds ratio of 1.887.

There is a general impression between men in the Middle East and Egypt, that women are poor drivers. The authors conducted a small survey of 14 questions on 163 male drivers about their opinion in women driving skills. A question about, if there is a problem during driving (a congestion or an accident) in which a woman was involved, was she usually the reason of the problem? The results showed that 39.3% said often she is, 53.4% said sometimes she is, while only 7.3% said she is not. A question about the phrase 'Women can't drive' responses were 13.5% completely true, 18.4% often true, 39.9% relatively true, and only 28.2% of males thought it is not true. Another question about the phrase 'Women can't park properly' responses were 23.9% completely true, 24.5% often true, 40.5% relatively true, and only 11.1% of males thought it is not true. Actually 57% of male drivers think that some women should be prevented from driving at all, while 12.9% think that all women should be prevented from driving. The aforementioned questionnaire results show that there is an obvious stereotyping for women drivers in Egypt. Table 5 shows these results which represent a stereotype threat to women's self-confidence and driving behavior.

5. Summary and conclusions

Road safety management faces many challenges in Egypt since there is insufficient personnel for the enforcement of road traffic laws, nor an adequate automated system to handle this insufficiency (ElMoghazi, 2019). This paper investigated the risk factors influencing accident exposure, particularly for women in Egypt. The authors studied the regular distraction activities and the risky driving behavior of female drivers. The authors also investigated the effect of road harassment, and stereotype effect on

accident exposure, in addition to the family stress exemplified in the presence of children in the car. The following conclusions can be drawn:

- (1) The odds ratio shows evidently that risky driving female behavior is more likely to be associated with accident occurrence, while cautious behavior is less likely to be associated with accidents. The driving in reverse direction sowed the highest odd ratio value of 3.022,
- (2) Women who get distracted by different activities, like; eating, drinking, listening to DVDs, mobile distractions, texting, social media, personal care, store fronts, and personal belongings are more likely to be involved in accidents than women who ignore such distractions. Mobile phone usage exerted the highest likelihood of accidents with odd ratio of 1.9.
- (3) The presence of children in the car can represent an increase in accidents likelihood for female drivers who perform careless behaviors like accepting the movement of children from the back seat to the front seat, holding children in their lap, and feeding kids while driving. However, cautious behavior such as using seats allocated for young children, paying attention to children in the back seat, securing doors and windows when children are in the car, or driving more cautiously when children are in the car, are less likely to be associated with accidents.
- (4) About 87% of female drivers have been harassed on the road. Almost 69% of harassed women were exposed to an accident due to this harassment. The driving behavior of harassed women changed significantly after harassment, 40% became more aggressive and 17% became more confused while driving compared to only 25% who became more cautious.
- (5) Female drivers who often get harassed by other drivers on the road were 1.17 times more likely to be involved in traffic accidents with respect to female drivers who were never harassed.
- (6) In Egypt, men's opinion of women's driving represents a stereotype threat that has a negative effect on women's exposure to accidents.

(7) Female drivers, who get stereotyped by getting blamed for any traffic problem they were involved in, are 1.887 more likely to be involved in traffic accidents compared to female drivers who were never blamed for such incidents.

The results of this study demonstrate the importance of the strict enforcement of traffic laws to promote traffic safety.

Author contributions

The authors confirm contribution to the paper as follows: study conception and design: Ragaa Abd El-Hakim and Sherif El-Badawy; data collection: Ragaa Abd El-Hakim and Eman Kamel, analysis and interpretation of results: Ragaa Abd El-Hakim, Eman Kamel and Sherif El-Badawy; draft manuscript preparation: Ragaa Abd El-Hakim and Eman Kamel. All authors reviewed the results and approved the final version of the manuscript.

Conflict of interest

The authors declare that there are no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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