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Patterns of risky driving behaviors among Preventive Medicine Residents in the Kingdom of Saudi Arabia, 2023

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ABSTRACT

Introduction: Risky driving behavior is a significant public health problem that is responsible for the majority of fatal traffic accidents. This study evaluated the prevalence of risky driving behaviors among Preventive Medicine Residents across Saudi Arabia. *Subjects and Methods:* A cross-sectional study targeted a sample of 276 preventive medicine residents of all 10 programs in Saudi Arabia cities. A self-reported Manchester Driver Behavior Questionnaire reflecting risky driving behavior was used. *Main Results:* A total of 276 participants were included, with (60.9%) being male, almost half of the participants were within the 26-30 age group (47.8%). Regarding driving experience, the majority of participants (53.6%) had been driving for more than 9 years since obtaining their driving license. Of all participants, 14.5% reported racing for a one-car gap and 4.3% engaged in unofficial races and exhibited risky driving behaviors, 84.1% never participated in unofficial races and 43.5% never disregarded speed limits. The distance driven per day (RR=1.02, 95% CI: 1.01-1.03, p<0.001), males (RR=4.1, 95% CI: 3.1-, p<0.001), residency level (R1, R2, R3) (RR=0.7, 95% CI: 0.6-0.8, p<0.001), and years of driving experience (RR=1.8, 95% CI: 1.4-2.3, p=0.018) significantly contribute to the occurrence of dangerous driving. *Conclusion and Recommendations:* A substantial proportion of study participants admitted engaging in risky driving behaviors indicating a propensity for dangerous driving habits. Implementing effective strategies can improve road safety and reduce the incidence of risky driving behaviors among medical residents and the general public.

Keywords: Risky driving, risky behaviors, preventive medicine, medical residents

1. INTRODUCTION

Risky driving behavior is an important public health problem responsible for most fatal traffic accidents on the roads. Globally, road traffic accident is among the top ten causes of death, accounting for 90% of disability-adjusted life years lost (DALY) (Nantulya and Reich, 2002). Students in medicine and

residents are usually young adults who have been going through a stage of rapid growth with significant social and psychological development. WHO, (2007) considers this stage an important developmental trait concerning physical growth, mental development, and conversion from socioeconomic dependence being economically and socially independent.

Several factors can both improve or disturb the behavior of young adults. Globally, many studies reported the engagement of medical or university students in various risky behavior, including drinking alcohol, drug abuse, sexual activity, unhealthy dietary habits, and sedentary lifestyles (Keller et al., 2008; Laska et al., 2009). There is evidence that medical students and trainees are at high risk of poor academic achievement, social difficulties, poor psychological and emotional status, and substance abuse, which may lead to risky behavior, such as unsafe driving, which may have serious consequences (Dyrbye et al., 2006).

The most common cause of distraction in risky driving is practicing a secondary activity while driving, and about 11% of fatal traffic accidents were related to distracted driving behavior (Qin et al., 2019). A study conducted among Albanian youth found that 72.4% of participants aged 18-22 reported engaging in risky driving behavior (Melonashi and Shkembi, 2015). Youth has a higher tendency to use mobile phones while driving and not wearing seatbelts (Ramisetty-Mikler and Almakadma, 2016). Driving under the effect of alcohol or other psychoactive substances has a higher incidence rate among young adults than among older age groups; drinking had a significant moderate correlation with unsafe driving behavior (Oviedo-Trespalacios et al., 2017).

Moreover, calling and receiving calls while driving was common but perceived as less dangerous than texting. Another study showed that only 29.8% of college students reported using hands-free devices during calling (Terry and Terry, 2015). Distracted driving includes blasting music, texting, eating and other unusual behavior, such as changing clothes while driving (Alosco et al., 2012; Watters and Beck, 2016). A Nigerian study showed that 10.7% of university students reported a 12-month occurrence of drinking while driving (Abayomi et al., 2015). In Canada, the prevalence of driving after using cannabis doubled in 2004 compared to 1988 (Richer and Bergeron, 2009).

A study among Chinese drivers found that anger and sensation-seeking characteristics had a multiplicative effect on unsafe driving behavior (Yang et al., 2013). A study predicting risky driving based on gender found that males are more likely to race another driver, not stop at a stop sign, and drive under alcohol effects than females (Lonczak et al., 2007). In Saudi Arabia, about 4.7% of the deaths due to road traffic accidents are in the age group of teenagers and young adults (< 30 years old), and 5% of all causes of deaths in Saudi Arabia, with more than 130 thousand annual deaths, are attributed to road traffic accidents (Al-Wathinani et al., 2021). It was found that the majority of Saudi university students who reported texting while driving were from medical engineering and social sciences faculties (Baig et al., 2018).

Other behaviors of risky driving, including overspeeding and eating while driving, were also reported. Although road traffic accidents are a major health problem in Saudi Arabia, there are limited data about risky driving behaviors. Thus, an investigation of these behavior among young adults in Saudi Arabia is necessary to guide interventions designed to reduce the deaths from road traffic accidents. Therefore, this study aimed to investigate behaviors and determinants that affect risky driving among medical residents in preventive medicine board in Saudi Arabia.

2. MATERIALS AND METHODS

Study Design

A cross-sectional analytical study was conducted from 1st of October 2022 to 27th of June 2023, the study focused on all preventive medicine residents in all 10 preventive medicine programs across Saudi Arabia. The total number of residents was 368, with exclusion of 92 residents who do not drive, the study sample size was 276 residents, the study utilized an online form of a validated questionnaire and was sent to the mobile phones of medical residents.

Data collection tool (instrument)

We used a validated short version of the Manchester Driver Behavior Questionnaire, a self-report questionnaire developed by previous study as a measure of driving behaviors, validated by Sucha et al., (2014). The questionnaire investigates drivers' aberrations, as respondents should rate their experience of risky driving behavior types on a six-point scale (from 1 = never to 6 = nearly all the time). The questionnaire primarily distingushes two main types of risky driving behaviors considering the degree of conscious drinking decisions made to identify them as "errors" or "violations").

Data entry and analysis

The collected data were coded, and analyzed using Statistical Package for Social Sciences (SPSS) version 26. The continuous variables were presented as mean and standard deviation, while categorical variables were presented as frequency distribution and

percentages. The Chi-squared test was applied to evaluate the association between the determinants and the outcome variables, while the risky behaviors scores were compared using T-test. The correlation was used to describe the linear relationship between exposure and outcome. A confidence level of 95% (CI 95%) was adopted throughout the study, risk ratios (RR) were calculated and a p-value less than 0.05 was considered a significance level.

3. RESULTS

The study included a total of 276 participants both male and female different age groups. Their driving experience was categorized by years of driving since obtaining their licenses. Moreover, the study included all residency-level years, but the majority were level 4 as in (Table 1). The participants came from different 10 cities.

Table 1 Demographic and Residency Characteristics of the Residents (n=276)

Characteristics	Frequency	Percent (%)
Gender		
Male	168	60.9
Female	108	39.1
Age		
18-25	8	2.9
26-30	132	47.8
31-35	80	29.0
36-40	44	15.9
>40	12	4.3
Marital status		
Single	120	43.5
Married	152	55.1
Divorced	4	1.4
Residency level		
R1	24	8.7
R2	36	13.0
R3	60	21.7
R4	132	47.8
Graduated	24	8.7
Driving experience since getting a driving license		
< one year	28	10.1
1-4 years	80	29.0
5-9 years	20	7.2
>9 years	148	53.6
City of Residency program		
Jeddah	84	30.4
Makkah	16	5.8
Taif	28	10.1
Al-Madinah	24	8.7
Tabuk	24	8.7
Riyadh	28	10.1
Al-Ahsaa	24	8.7
Abha	24	8.7
Jazan	12	4.3
Khamis Mushait	12	4.3

The patterns of risky driving behavior related to dangerous violations shed light on the prevalence of various risky driving behaviors among the participants. Firstly, it is noteworthy that a substantial proportion of participants reported engaging in certain risky behaviors. For instance, a considerable number of residents admitted to quite often or frequently "racing" oncoming vehicles for a one-car gap on narrow or obstructed roads (14.5%) (Figure 1) and getting involved in unofficial "races" with other drivers (4.3%). Participants who expressed frustration-induced risky overtaking on two-lane highways were (30.4%), or driving too closely or flashing lights to signal the car in front to go faster or move aside were (34.8%). These behaviors indicate a propensity for aggressive and impatient driving habits, which can significantly increase the risk of accidents and endanger road safety.

On the positive side, it is encouraging that most participants reported never or rarely engaging in some of the more dangerous driving behaviors. For instance, the majority of residents claimed to never participate in unofficial races (84.1%), deliberately disregard speed limits late at night or early in the morning (43.5%), or overtake slow-moving vehicles in prohibited areas (34.8%). These findings suggest a responsible approach to driving among a substantial portion of the medical residents surveyed, highlighting the importance of promoting safe driving practices and maintaining compliance with traffic regulations.

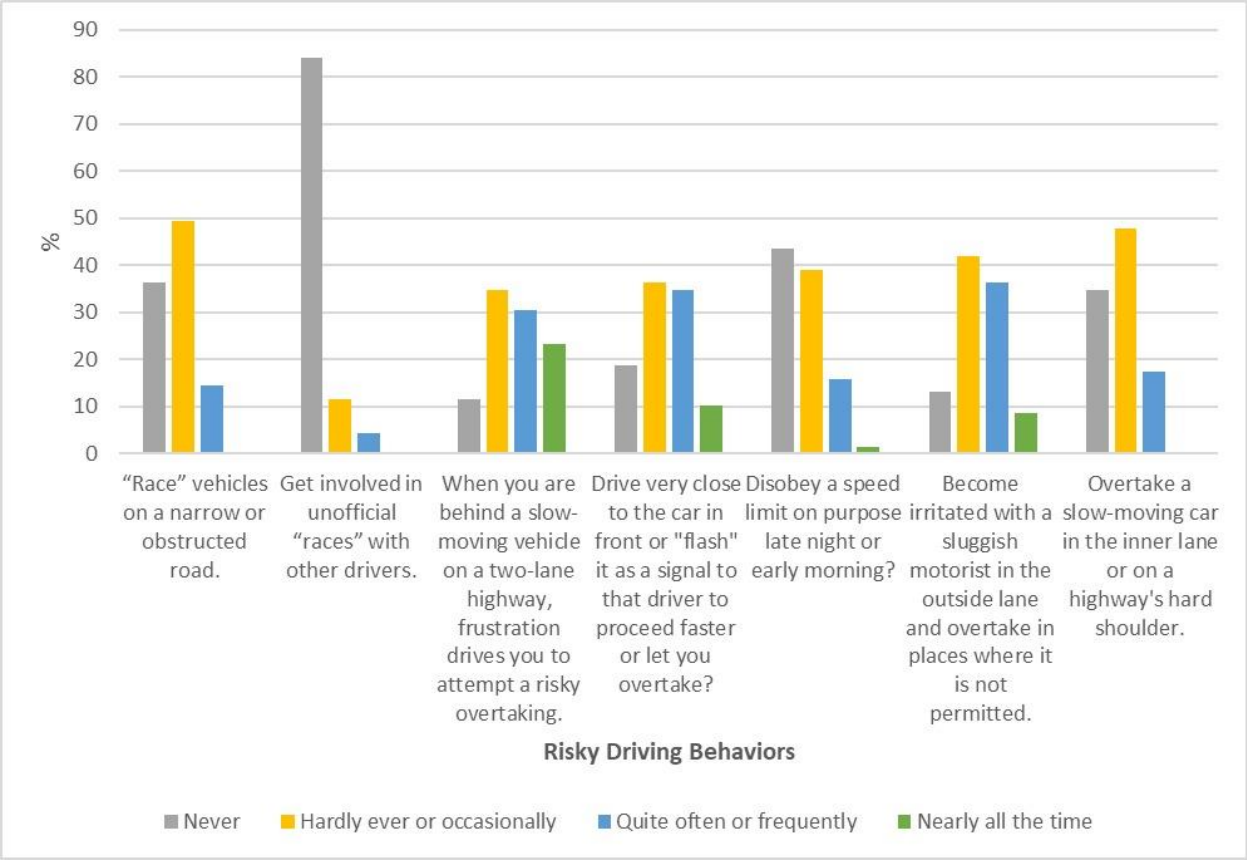

Figure 1 Patterns of Risky Driving Behavior Related to Dangerous Violations Among the Residents

It is essential to exhibit the patterns of risky driving behavior among participants regarding dangerous errors. A (5.8%) of residents admitted to often or frequently misjudging their crossing interval when turning right and narrowly missing a collision (Figure 2). Similarly, (4.3%) of participants reported often or frequently failing to check their mirrors before pulling out, changing lanes, or turning. These behaviors indicate a lack of attention and awareness while driving, which can increase the likelihood of dangerous errors and potential accidents.

Meanwhile (43.5%) of participants indicated never failing to notice pedestrians crossing when turning into a side street from a main road and never ignoring "give way" signs, and (55.1%) narrowly avoiding collisions with traffic that has the right of way. These findings suggest that most medical residents establish responsible driving habits when observing pedestrian safety and adhering to traffic signs and regulations.

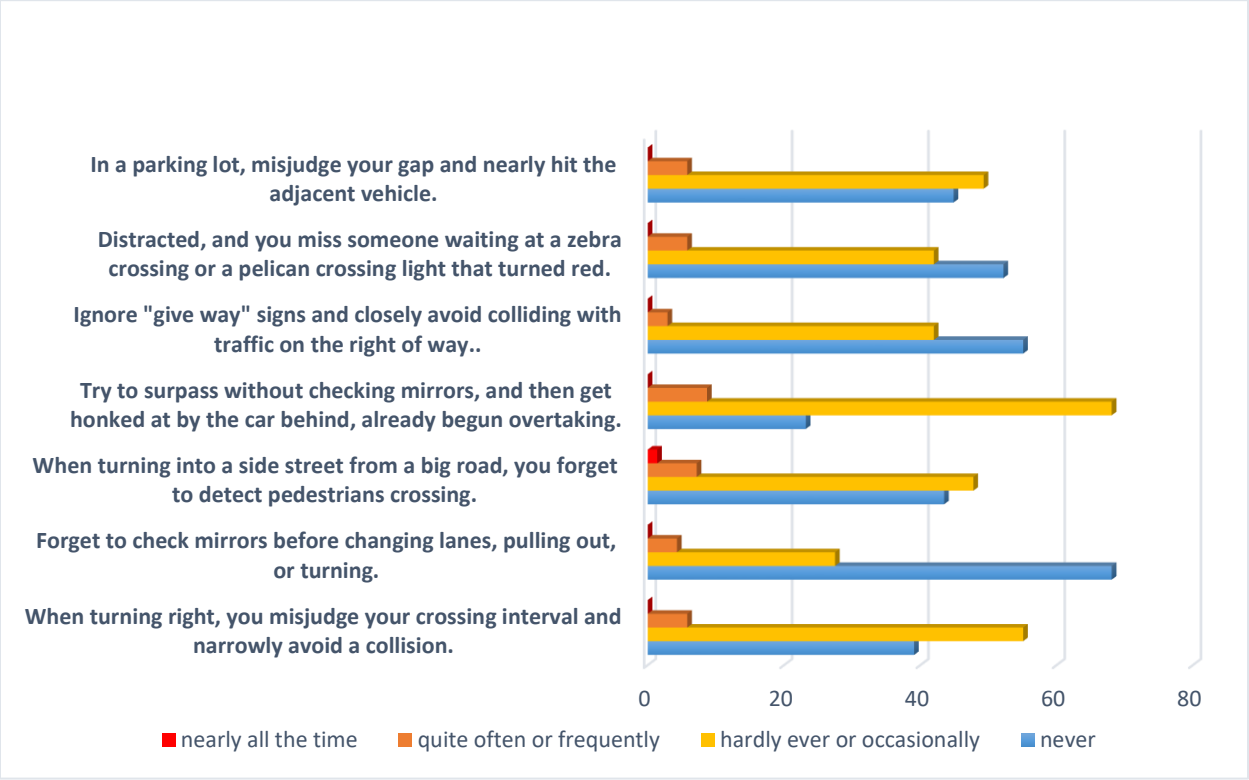

Figure 2 Patterns of Risky Driving Behavior Related to Dangerous Errors Among the Residents

Not only violent behaviors or performing errors are considered risky driving. Therefore, a lack of attention while driving could lead to dangerous consequences. It is crucial to reveal the proportionate of participants who reported occasionally or frequently experiencing situations that reflect a lack of attention or orientation while driving. As in Figure 3, (18.8%) of residents admitted to quite often or frequently missing their exit on a highway and making detours. Similarly, a notable portion of participants reported quite often or frequently planning their route poorly, leading to encountering avoidable traffic congestion (24.6%). These behaviors indicate a lack of focus, attention to detail, or proper planning, which may lead to inefficient driving and potential delays on the road.

On the other hand, it is encouraging to see that the participants' majority reported never or rarely engaging in some of the more severe forms of not paying attention or straying while driving. For instance, a substantial proportion of residents indicated never exiting from a roundabout on the wrong road (42.0%) and never "waking up" to find themselves at a different destination than intended (27.5%). The percentage of residents who admitted to often or frequently "waking up" realize they have no clear recollection of the road they just traveled (13.0%).

Substantially, (26.1%) of participants reported often or frequently forgetting where they left their car in a multi-level or large car park. These behaviors indicate potential lapses in attention, focus, or memory recall while driving, which can pose risks to road safety. Even though (27.5%) of participants noted never getting into the wrong lane at a round about or traffic intersection, still, there is a notable proportion (10%) who have frequently committed this mistake. Confusion and lack of attention during driving maneuvers can lead to potential traffic conflicts or hazards.

A log-linear regression model indicates that several predictors significantly influence the occurrence of dangerous violations among medical residents. Firstly, the variable "Distance per day (in Km)" in (Table 2) shows a statistically significant association with risky driving behavior, with a risk ratio of 1.02. This suggests that for an increase in distance driven per day, there is an increase in the risk of dangerous violations. Secondly, gender is found to be a significant predictor, with males having a higher risk ratio of 4.1 compared to females. This implies that male medical residents are more prone to engaging in dangerous violations compared to their female counterparts.

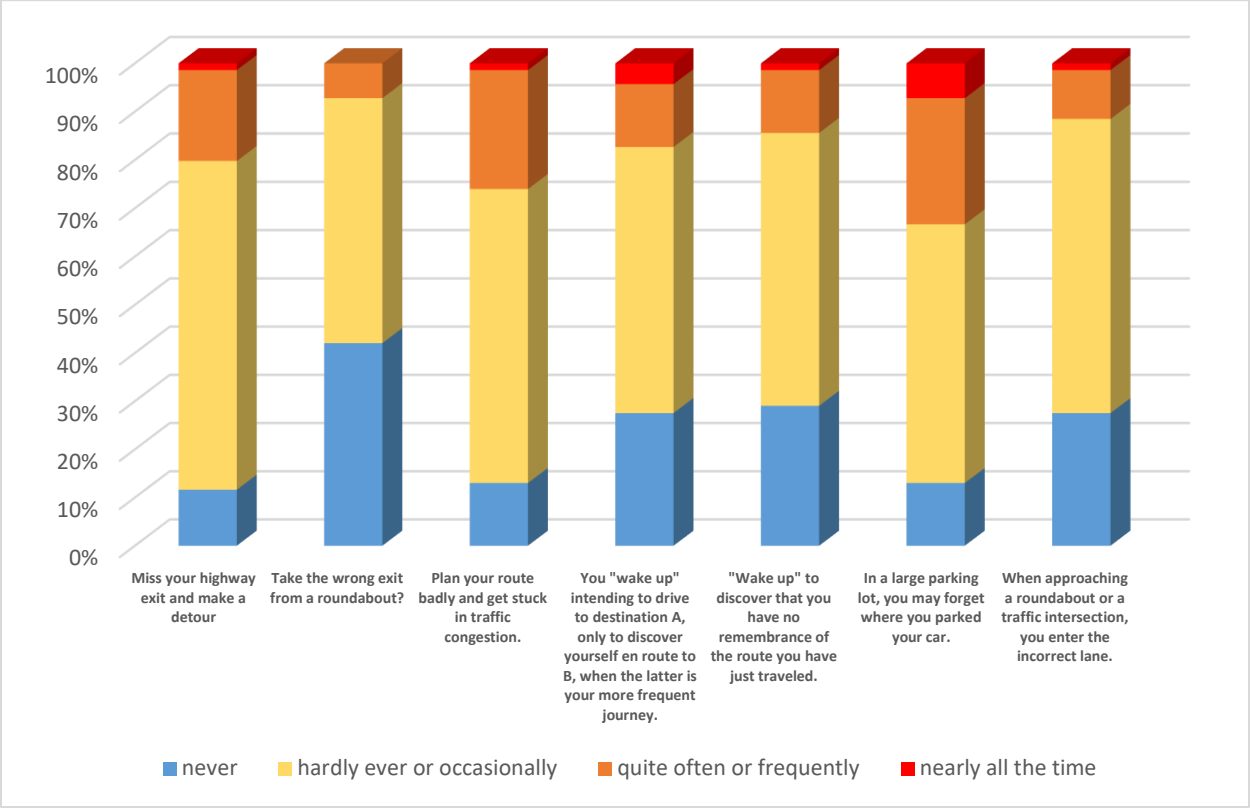

Figure 3 Patterns of Risky Driving Behavior Related to "Not Paying Attention to Driving, Straying, and Loss of Orientation" among the Residents

Furthermore, single and married participants had a significnat lower risk when compared to divorce participants with relative risks of 0.5 and 0.6, respectively. The residency level also plays a role in risky driving behavior. Residents in R1 and R3, exhibit lower risk ratios compared to the reference group of R4, indicating a relatively lower likelihood of dangerous violations. Additionally, the duration of driving experience is a significant predictor, with residents who have been driving for less than one year and those with 1-4 years of driving experience having significantly higher risk ratios compared to those with more than nine years of experience.

Overall, the findings from the log-linear regression model provide insights into the predictors associated with dangerous violations among medical residents. These predictors include the distance driven per day, gender, residency level, and years of driving experience. Understanding these factors can help inform interventions and targeted strategies to mitigate risky driving behaviors and enhance road safety among medical residents in the preventive medicine board in Saudi Arabia.

Table 2 Findings of Log-linear Regression Model for Predictors of Dangerous Violations among the Residents

Predictors	Categories	Reference group	Risk ratio	Lower limit (95% CI)	Upper limit (95% CI)	p-value
Age	-	-	0.995	0.95	1.05	0.822
Distance per day (in Km)	-	-	1.02	1.01	1.03	<0.001*
Gender	Male	Female	4.1	3.1	5.4	<0.001*
Marital status	Single	Divorced	0.5	0.4	0.7	<0.001
	Married	Divorced	0.6	0.5	0.9	0.004
Residency level	R1	R4	0.7	0.6	0.8	<0.001*
	R2	R4	1.0	0.9	1.1	0.831
	R3	R4	0.8	0.7	0.9	<0.001*
	Graduates	R4	0.6	0.5	0.7	<0.001
Years of driving	< One year	>9 years	1.8	1.4	2.3	0.018*
	1-4 years	>9 years	3.0	2.2	4.0	<0.001*

	5-9 years	>9 years	0.9	0.7	1.0	0.085

Km: Kilometers; CI: Confidence interval

Table 3 presents the findings of a log-linear regression model that aimed to identify predictors of dangerous errors among the medical residents. The Table 3 includes predictors, risk ratios, confidence intervals, and p-values. The results of the analysis indicate several significant predictors of dangerous errors among medical residents. Firstly, the variable "Distance per day (in Km)" shows a statistically significant association with risky driving behavior. This suggests that an increase in the distance driven per day is associated with a higher likelihood of dangerous errors.

Secondly, gender is found to be a significant predictor, with males having a risk ratio of 2.4 compared to females. This suggests that male medical residents have a slightly higher likelihood of engaging in dangerous errors compared to their female counterparts. Residency level shows significant decrease in risk of dangerous error among R2 and R3 in comparison with R4. Furthermore, the years of driving experience are also significant predictors. Medical residents with less than one year and 1-4 years of driving experience have higher risk ratios compared to those with more than nine years of experience. This implies that less experienced drivers are more prone to committing dangerous errors. This implies that less experienced drivers are more prone to committing dangerous errors.

Overall, the findings from the log-linear regression model provide insights into the predictors associated with dangerous errors among medical residents. These predictors include the distance driven per day, gender, and years of driving experience. Understanding these factors can help in designing targeted interventions and educational programs to reduce the occurrence of risky driving behaviors and improve road safety among medical residents in the preventive medicine board in Saudi Arabia.

Table 3 Findings of Log-linear Regression Model for Predictors of Dangerous Errors Among the Residents

Predictors	Categories	Reference group	Risk ratio	Lower limit (95% CI)	Upper limit (95% CI)	p-value
Age	-	-	0.96	0.86	1.03	0.208
Distance per day (in Km)	-	-	1.002	1.001	1.003	0.001*
Gender	Male	Female	2.4	1.8	3.3	0.001*
Marital status	Single	Divorced	0.5	0.4	0.8	0.001
	Married	Divorced	0.6	0.4	0.9	0.025
Residency level	R1	R4	1.0	0.8	1.3	0.731
	R2	R4	0.8	0.6	0.9	0.004*
	R3	R4	0.8	0.7	0.9	0.004*
	Graduates	R4	1.0	0.8	1.3	0.783
Years of driving	< One year	>9 years	3.4	2.5	4.6	<0.001*
	1-4 years	>9 years	2.1	1.5	3.0	0.001*
	5-9 years	>9 years	1.0	0.8	1.3	0.839

Km: Kilometers; CI: Confidence interval

Table 4 indicate that age in years and categories such as single and R3 in comparison with divorced and R4 participants demonstrate a significant difference included in the model have a statistically significant association with "Not Paying Attention to Driving, Straying, and Loss of Orientation" among medical residents. These findings suggest that an increase in age by years shows a higher likelihood of dangerously not paying attention while driving. Also, single participants have a lower risk of not paying attention compared to divorced participants. Resedents in R3 exhibit a higher risk ratio than their comparison group R4, indicating a higher likelihood of not paying attention while driving. Furthermore, predictors such as distance per day, gender, and years of driving show no significant relationship with not paying attention while driving.

Table 4 Findings of Log-linear Regression Model for Predictors of "Not Paying Attention to Driving, Straying, and Loss of Orientation"

Predictors	Categories	Reference group	Risk ratio	Lower limit (95% CI)	Upper limit (95% CI)	p-value
Age	-	-	0.9	0.9	1.0	0.004*
Distance per day (in Km)	-	-	0.93	0.88	0.98	0.178
Gender	Male	Female	0.70	0.51	0.95	0.180
Marital status	Single	Divorced	0.7	0.5	1.0	0.024*
	Married	Divorced	0.8	0.5	1.0	0.086
Residency level	R1	R4	0.9	0.8	1.1	0.454
	R2	R4	1.0	0.9	1.1	0.924
	R3	R4	1.2	1.1	1.4	<0.001*
	Graduates	R4	1.1	0.96	1.30	0.149
Years of driving	< One year	>9 years	1.1	0.9	1.4	0.449
	1-4 years	>9 years	1.2	0.9	1.5	0.312
	5-9 years	>9 years	1.1	0.9	1.3	0.200

Km: Kilometers; CI: Confidence interval

4. DISCUSSION

This study investigated the behaviors and determinants affecting risky driving among medical residents in the preventive medicine board in Saudi Arabia. The results of the study indicated that a significant proportion of the residents engaged in risky behaviors while driving. For example, 14.5% of the residents admitted to racing vehicles on narrow or obstructed roads, while 4.3% of the residents were involved in unofficial races with other drivers. Moreover, 30.4% of the residents expressed frustration-induced risky overtaking on two-lane highways, and 34.8% of the residents drove too closely or flashed lights to signal the car in front to go faster or move aside. These behaviors are indicative of aggressive and impatient driving habits that can significantly increase the risk of accidents, endangering road safety.

The results are consistent with previous studies that have identified similar patterns of behaviors of risky driving in medical residents. However, some studies have reported higher percentages of dangerous driving behaviors among medical residents, indicating a need for further investigation and intervention (Bunjo et al., 2019). The risky driving behaviors among residents call for action to promote road safety awareness and behavior modification efforts. Similar findings were observed in previous studies conducted in Saudi Arabia and other Gulf and Arabic countries (Al-Ketbi et al., 2020).

The situation is worse in Saudi adolescents, where about 40% of the students engage in risky driving behavior called Tafheet, a high-speed drifting (Ramisetty-Mikler and Almakadma, 2016). Mansuri et al., (2015) found that Saudi drivers tend to speed and fail to use seatbelts, while a study by Alghnam et al., (2018) found that Saudi drivers have a high prevalence of using mobile phones while driving. Furthermore, studies in other countries have also reported a high prevalence of risky driving habits among young adults.

For example, a study by Ivers et al., (2009) found that young drivers are more inclined to participate in unsafe driving behaviors such as excessive speed, tailgating, and overtaking compared to older drivers (Harbeck and Glendon, 2013). Similarly, another study found that over 60% of young drivers in DRIVE study in Australia reported engaging in risky driving behaviors, particularly due to sleep deprivation (Martiniuk et al., 2013). The results of the present study have shown that while some residents get in risky driving, a majority reported never or rarely participating in dangerous driving practices.

For example, 84.1% of the residents claimed to never engage in unofficial races, while 43.5% never deliberately disregard speed limits late at night or early in the morning, and 34.8% never overtake slow-moving vehicles in prohibited areas. These findings suggest a responsible approach to driving among a substantial proportion of the surveyed medical residents, highlighting the importance of promoting safe driving practices and maintaining compliance with traffic regulations. Similar findings were observed in previous studies conducted in Saudi Arabia, as drivers generally reported safely driving, although some admitted that they sometimes exceed the legal speed limit (Al-Wathinani et al., 2021).

Alghnam et al., (2018) reported a high prevalence of dangerous driving behaviors among healthcare providers in comparison to non-healthcare providers in Saudi Arabia, with factors such as distraction, fatigue, and stress contributing to these behaviors (Jawadi et al., 2017). The results of the current study should be used to inform targeted awareness and behavior modification

interventions aimed at reducing risky driving behaviors among medical residents. Several studies have shown the effectiveness of such interventions in promoting safe driving behaviors (Al-Turki, 2014; Mark-Lee and Al-Mansour, 2020).

Though most participants never engaged in more severe forms of not paying attention while driving, 18.8% admitted to quite often or frequently missing their exit on a motorway, whereas 24.6% reported that they often or frequently encountered avoidable traffic congestion due to poor planning. Approximately 13.0% of residents reported occasionally or frequently "waking up" to realize that they do not remember the road they just traveled, while 26.1% admitted to occasionally or frequently forgetting where they left their car in a multi-level or large car park. Previous studies have identified such cognitive lapses as potential contributors to road accidents (Okamura et al., 2019).

Another critical finding from this study is the occurrence of approaching a road junction or entering the wrong roundabout lane. While the majority of participants reported never experiencing this behavior, 42% admitted to occasionally or frequently making this mistake, indicating confusion or lack of orientation during critical driving maneuvers. Previous studies have also recognized the importance of understanding the challenges relating to road junctions and roundabouts in the context of road safety (Distefano et al., 2018).

The present study's findings show the need of addressing cognitive and orientational aspects of driving among medical residents in the Preventive Medicine Board in Saudi Arabia. Improving cognitive functions such as attention and memory recall capacity is essential to ensure safe driving behaviors. Moreover, emphasis should be placed on developing the necessary skills for critical driving maneuvers at road junctions and roundabouts to ensure safe and efficient driving (Anstey et al., 2005). Previous studies have identified a range of factors of risky driving, including age, gender, and experience (Alhomoud et al., 2022; Song et al., 2021), consistent with our findings. Likewise, previous studies have reported associations between experience of driving and driving behavior (Al-Tit, 2020; Fu and Lee, 2022).

The current study's findings further support these findings by indicating that residents with less than one year of driving experience or those with 1-4 years of experience are more likely to engage in dangerous violations compared to those with more than nine years of experience. Specifically, those with limited driving experience, less than one year and 1-4 years of driving experience, have higher risk ratios compared to those with more than nine years of experience. This suggests that less experienced drivers tend to commit dangerous errors while driving and are at higher risk of being involved in traffic accidents, consistent with previous studies (Fu and Lee, 2022).

This study indicated that among the significant predictors of dangerous errors among medical residents, distance per day and gender were found to impact risky driving behavior. These findings are consistent with previous studies showing that an increase in distance is associated with a higher likelihood of engaging in dangerous errors while driving (Jiménez-Mejías et al., 2014). This finding is also consistent with prior studies suggesting that driving duration can negatively affect driving skills and increase the likelihood of accidents (Mansuri et al., 2015). This study also found that gender plays an essential role in risky driving behavior, with male residents having a higher likelihood of dangerous errors compared to females. Males get into more traffic accidents than females (Fu and Lee, 2022).

5. CONCLUSION

The study indicated that there are several behavioral patterns and determinants that contribute to risky driving among medical residents. These include misjudging crossing intervals, failing to check mirrors, ignoring "give way" signs and driving per day, gender, and years of driving experience. Overall, the study highlights the importance of addressing risky driving behaviors among medical residents in the preventive medicine board in Saudi Arabia. The identified patterns and determinants could inform targeted interventions and educational programs aimed at promoting safer driving practices among this group. Furthermore, the study emphasizes the need for further research to explore additional factors and behaviors that may contribute to risky driving in this context and to evaluate the effectiveness of any intervention or program aimed at reducing risky driving behaviors among medical residents.

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Author Contributions

The authors confirm contribution to the paper as follows: Study conception and design: 1. Leena; data collection: 1. Leena; analysis and interpretation of results: 1. Leena, 2. Amal; draft manuscript preparation: 1. Leena, 2. Amal. All authors reviewed the results and approved the final version of the manuscript.

Ethical approval

The study was approved by the The Research Committee of The Joint Program for Preventive Medicine and from the General Directorate of Research & Studies/MOH/KSA (Ethical approval code: A01636).

Informed consent

Written informed consent was obtained from all individual participants included in the study.

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Conflict of interest

The authors declare that there is no conflict of interests.

Data and materials availability

All data sets collected during this study are available upon reasonable request from the corresponding author.

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