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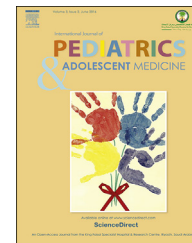


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ORIGINAL RESEARCH ARTICLE

Attitudes and behaviors towards risky driving among adolescents in Saudi Arabia



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KEYWORDS

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School setting;
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Abstract *Background and Objectives:* The main objective of the paper is to investigate perceptions and attitudes of school youth concerning risky driving behaviors (i.e.: Tafheet) in Saudi Arabia.

Design and Setting: This was a school-based cross-sectional study of adolescents in Riyadh that employed a multistage probability sampling scheme.

Subjects and Methods: The self-administered survey included questions adapted from the school-based studies conducted by the Centers for Disease Control and Prevention in the United States. The survey inquired about adolescents' behaviors and attitudes toward driving, perceptions of school and family, and leisure time activities.

Results: Nearly 40% of the students surveyed reported engaging in the risky driving behavior called Tafheet. Fifty-one percent of those who engage in dangerous activities also reported engaging in Tafheet. A higher proportion (70%) among those who believe Tafheet is a talent or a cool activity also engaged in Tafheet. Multivariate analyses indicate that students who are willing to engage in dangerous activities even when they are known to be dangerous (OR = 2.7; 95% CI = 1.55–4.72), those who think there is no harm in not wearing seat belts are at higher speeds (OR = 2.77; 95% CI = 1.24–6.21), and those who use a mobile telephone while driving are nearly three times (OR = 2.96; 95% CI = 1.41–6.23) at risk for engaging in Tafheet. Lack of respect towards traffic laws is also a risk factor.

Conclusion: Our study unequivocally points to pro-attitudes and behavior including a daring personality, not wearing a seat belt and using a mobile telephone while driving are significant factors associated with risky driving activity. Our study calls for a strategic intervention plan to

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change the culture of risky driving through a structured and stringent driving curriculum in school settings. A curriculum of this nature is currently non-existent in the Kingdom of Saudi Arabia (KSA). Multilevel and multifaceted interventions may hold great promise in reducing unintended motor vehicle injuries and changing the culture as a whole.

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1. Introduction

Motor vehicle accidents are the leading cause of death in adolescents and young adults worldwide. According to the Centers for Disease Control and Prevention [1], unintentional injuries related to motor vehicle accidents are consistently the leading cause of mortality from ages 5 through 24 in the United States. Road traffic accidents (RTAs) are a major public health concern worldwide that have resulted in nearly 1.24 million deaths and 20–50 million non-fatal injuries. RTAs are also ranked as the ninth-highest cause of disability-adjusted life years (DALY) lost, and they are estimated to rise by one-third by 2020 [2].

According to the 2013 World Health Organization (WHO) report, there are only 19 countries in the world with higher per capita road traffic death rates than the Kingdom of Saudi Arabia (KSA), where nearly one person is killed and four are injured every hour on average [2]. Excessive speed and disobeying traffic signals cause over 65% of traffic accidents, which result in considerable economic losses to victims, their families, and to nations as a whole [3]. RTAs are the second-greatest public health concern in the Kingdom, as they contribute to emergency and outpatient hospital admissions and are responsible for a yearly estimated loss of 500 million U.S. dollars [4]. In a recent review article, Mansuri et al [5] reported that over the past 25 years, RTAs accounted for 83.4% of all trauma admissions. Nearly 80% of total accidents are primarily due to speeding and non-compliance with right-of-way rules by drivers and pedestrians [6].

According to WHO [7], Saudi Arabia has the world's highest number of deaths from RTAs per capita. Road traffic accidents are now the primary cause of death, injury, and disability in adult males aged 16–36 years in the Kingdom and result in significant health care costs. For example, the cost of treating people injured due to road traffic crashes during 2002 was estimated at 652.5 million Saudi riyals (US\$ 174 million). According to recent estimates, the traffic accident death rate (age adjusted) in Saudi Arabia is 23.2 per 100,000 [8]. According to the Director of the General Directorate of Traffic, there were more than 544,000 accidents in Saudi Arabia during 2011, resulting in more than 39,000 injuries and 7153 deaths. Three-fourths of these accidents involved young people. Moreover, RTA losses amounted to more than 80% of the deaths and 7 billion in economic losses every year [9]. On average, 17 Saudis, primarily male, die on the roads each day. Furthermore, road traffic victims occupy one-fifth of hospital beds, with the majority of victims requiring long-term rehabilitation [10].

The number of road deaths per year has risen during recent years to a rate equal to an average of 19 deaths per day [5]. The most common human factors contributing towards traffic accidents include speeding (in 65% of accidents), driver error (in 80% of accidents), violation of traffic signals at intersections (in 50% of accidents), and illegal U-turns. Other causes are related to vehicles, the road, and the environment (e.g., road layout, which contributes to 20% of accidents) [11]. Excessive speeding was the most common cause reported in all recent and past studies. Driver error was identified as the main contributing factor in about two-thirds of all RTAs, mainly characterized as reckless driving and excess speeding [5,12].

Attitudes and behaviors in general are founded very early in life and are crucial for safe driving behavior. Adult role models and certain cultural factors may promote risky behaviors that contribute to unintentional injuries that result in premature death or lifelong impairment. Many young men in the Arab world treat driving like a hobby or a sport. It is not unusual to see teenage boys participate in "Saudi drifting" with a crowd of spectators, for example. The major objective of the paper is to examine attitudes and behavior that encourage risky driving called "drifting" among Saudi youth. The capital, and the actual birthplace of the "Arab Drift" (called "Tafheet" or "Hajwalah" in Arabic) is Riyadh. The combination of good roadways and fine desert sand give the drifter the sensation of driving on water rather than asphalt. Such thrill-seeking behavior is very alluring to young Saudi males. Many of them adopt "Tafheet" as their leisure-time activity, usually during weekends and late nights. Tafheet is an illegal street racing phenomenon that emerged in the late 1970s that involves trying to "drift" a motor vehicle at speeds of up to 260 km/h (160 mph) across wide highways. Racers often drive dangerously close to traffic at high speed or slide around on a wide flat straight road section at high speed, drifting sideways and ignoring road barriers. This activity often attracts spectators, who watch from the roadside without any protection. Tafheet practices and events occur with little to no concern for the safety of vehicle occupants, other drivers or spectators. Tafheet events are commonly seen on the wide-sectioned highways of Riyadh, Al-Qassim Province, and less notably in other parts of Saudi Arabia [12]. Because they occur in a secretive manner, there seems to be no police records or documentation by highway authorities regarding these events.

To date, no research studies have investigated youth attitudes favoring risky driving behaviors (pro-attitudes),

including "Tafheet", that are undoubtedly associated with unintentional injuries. Our study is the first of its kind to address this problem among school children using general population school samples. The main objective of the paper is to investigate youth risk behaviors related to driving, perceptions, and attitudes concerning driving behavior, including "Tafheet", in Saudi Arabia. We expect that behaviors and/or attitudes favoring thrill seeking and risk taking are associated with participation in this dangerous sport.

2. Subjects and Methods

The study was conducted in high schools in Riyadh, the capital and the largest city in Saudi Arabia. The study employed a multistage probability sampling scheme. Schools were selected based on geographical location and type of institution. Riyadh was divided into three geographical areas, North, South, and Middle for sampling purposes. In each geographical area, the two largest public schools, one private school, and one international school were selected. Public schools were single-gender institutions, while private and international schools were coeducational. Approximately 60 classes with a free period were selected at random. Each class had 25–40 students per classroom on average. All students in the selected classrooms were eligible to participate in the study.

Prior to administering the survey, a committee visited each school to explain the purpose of the study to students, informational letters, and consent forms were sent home to parents. Students were informed that participation in the study was completely voluntary. Four research teams composed of health professionals (e.g., nurses, health coordinators) collected the data from November 2010 to February 2012. Ethical approval for the study was obtained from King Fahad Medical City Institutional Review Board, along with permission from the Ministry of Education in Riyadh to administer the survey in schools.

2.1. Survey development and validity

A comprehensive adolescent health survey was developed for Saudi youth based on an extensive literature review of adolescent health, along with questions adopted from the Youth Risk Behavior Survey used by the United States Centers for Disease Control and Prevention (CDC). The Youth Risk Behavior Survey has been validated over the past several years in the USA. Using these standard questions helps confer high face validity and credibility to our survey. Questions regarding family and school connectedness were also developed by consulting experts in adolescent health to achieve further face validity.

The survey inquired about adolescents' behaviors and attitudes and included questions on smoking behavior, perceptions of school and family, use of technology, school activities, leisure time activities, and driving. The survey items were translated to Arabic and then were back-translated to English by bilingual professionals. The survey was administered in the language preferred by the student. A total of 1668 students participated in the survey. The current analysis included only boys, ($N = 799$) as

females are prohibited from driving. Accordingly, questions pertaining to driving are not relevant for female students.

2.2. Measures

Outcome: In this study, we measured Tafheet as a proxy for risky driving behavior by asking "Have you ever engaged in "Tafheet"? with response choices "yes" and "no".

2.2.1. Independent predictors

Personality factor: Those who responded either Strongly Agree or Agree to the question, "even if dangerous, I like to do exciting things", were grouped in the "yes" category for this predictor. Those who responded "Disagree" or "Strongly Disagree" were grouped as "no".

Thoughts about "Tafheet": Two questions were used to assess students' thoughts:

- (1) You think that "Tafheet" is a sort of a) Talent, b) Sport, c) Violence, d) Delinquency, or e) Cool activity
- (2) You think that "Tafheet" should be a) Prohibited, b) Supported by doing special clubs, c) Supported by making yearly tournament, or d) Supported by training and by providing the needed safety equipment.

Attitudes toward unintentional injury behaviors: Six questions were asked to measure students' attitudes. These questions assessed whether the teen thinks there is the potential for harm to himself or others (physically or otherwise) across different driving scenarios. The available responses are Always, Occasionally/rare, and Never: (1) Would there be harm for yourself or others (physically or otherwise) if you drive faster than the speed limit? (2) Would there be harm for yourself or others (physically or otherwise) if you drive the car without having a driving license? (3) Would there be harm for yourself or others (physically or otherwise) if you drive/ride the car without wearing a seat belt? (4) How often do you use your mobile phone while driving? (5) How much do you respect the traffic laws? (6) How often do you use a helmet when you rollerblade, skateboard, or ride a motorcycle?

Demographic variables: Included in the analyses were the type of school (Government, Private, and International), grade (7th–12th), which was also used as proxy for age, and nationality (Saudi, Arab, and non-Saudi)

2.3. Data analysis

Univariate descriptive statistics were examined, and variables were regrouped as suggested by the distribution. Descriptive statistics were calculated and expressed either as the means and standard deviations or as percentages. To test for bivariate associations between the risk behavior (Tafheet) and the predictors, cross tabulation with chi-squared (χ^2) analysis was conducted for categorical variables, and T-tests for continuous variables were used to test the group mean differences. Alpha was set at $P < .05$

for results to be considered statistically significant. For multivariable analysis, a logistic regression model was used, including variables that showed significant bivariate association with the risky behavior Tafheet. Adjusted odds ratios (OR) and 95% confidence intervals (CI) are presented. The missing data due to nonresponses or choice of a “don’t know” option were set as missing, which resulted in missing data rates of 10–15% for some variables in the multivariate analysis. All analyses were conducted using SPSS Statistics (Version 22.0) software.

3. Results

The current analyses included 799 male students (7th through 12th grade) from governmental (34%), private (45%), and international schools (21%) in Riyadh. Almost all of them are of Islamic faith (99%). Nearly two-thirds of the participants were Saudi (71%), with 23% from other Arab nations and approximately 6% from other cultures.

3.1. Prevalence of attitudes favoring risky driving

We tested for grade differences in attitudes favoring risky driving behavior. As noted in Table 1, significant grade differences are present across all four attitudes that may promote risky driving. In general, we observed a trend of increasing risk and rising grade in terms of pro-attitudes. This includes those who responded “never”, “rarely” or “occasionally” to questions inquiring whether the teen thinks there is potential harm to himself or others (physically or otherwise) across different driving scenarios.

For example, the number of teens who think it is not harmful to drive faster than speed limit (those who responded never, rarely or occasionally) is highest among 11th graders ($\chi^2 = 30.0$, $df = 6$, $P < .01$). A similar trend is also observed in other pro-attitudes. The rate of mobile phone use while driving (always) is also higher among 11th and 12th graders ($\chi^2 = 33.9$, $df = 6$, $P < .001$).

3.2. Predictors of teen engagement in Tafheet

More than three-quarters (77%) of the boys surveyed reported that they will engage in dangerous activities. Forty-four percent reported that they engaged in Tafheet, whereas nearly 40% of the students surveyed think it is a delinquent act and 12% believe it is a violent act. A positive attitude toward Tafheet was also voiced by 48% of the students, of whom 28% think it is a talent and 19% respond that it is a sport and a cool activity. On the other hand, nearly one half (46%) indicated that Tafheet should be prohibited. Twenty-six percent said it should be supported by special clubs, 20% said it requires special training, and 9% said it should be supported by conducting yearly tournaments.

Significant associations at the bivariate level were found between participation in Tafheet and the categories of “Do things even if they are dangerous”, “Harmful to drive a car without a driving license”, “Harmful to drive/ride the car without wearing a seat belt”, “How often do you use your mobile while driving?”, and “Respect traffic laws” (see Table 2). In general, a higher proportion of students engaged in Tafheet if they believed that there is no harm to themselves or others physically if they engaged in these

Table 1 Grade (age) differences in attitudes towards risky driving behaviors (N = 799).

	Grade (%)				χ^2 (df) sig
	<= 9th (n = 154)	10th (n = 223)	11th (n = 209)	12th (n = 211)	
Harmful to drive faster than the speed limit					30.0 (6)***
Always	33	33	20	24	
Occasionally/rarely	41	56	69	61	
Never	26	11	10	14	
Harmful to drive a car without a driving license					20.5 (6)**
Always	21	12	7	11	
Occasionally/rarely	44	56	66	59	
Never	35	32	27	30	
Harmful to drive/ride the car without wearing a seat belt					18.3 (6)**
Always	23	17	16	15	
Occasionally/rarely	43	54	66	62	
Never	34	29	18	23	
How often do you use mobile while driving?					33.9 (6)***
Always	22	26	39	29	
Occasionally/rarely	47	54	51	54	
Never	31	20	10	17	
How much do you think you respect traffic laws?					23.7 (6)***
Always	43	29	29	28	
Occasionally/rarely	42	59	64	65	
Never	15	12	7	7	

Percentages were rounded to the closest integer. P -value sig * $\leq .05$, ** $\leq .01$, *** $\leq .001$.

Table 2 Bivariate associations between Tafheet, attitudes, and driving risk behaviors among boys (N = 799).

	Engaged in Tafheet (%)		X ² (df) sig
	Yes	No	
Type of school			5.3 (2)
Government (n = 197)	40	60	
Private (n = 266)	50	50	
International (n = 138)	41	59	
Grade			8.4 (4)
7/8 (n = 40)	50	50	
9 (n = 73)	40	60	
10 (n = 166)	52	48	
11 (n = 160)	44	56	
12 (n = 167)	37	63	
Ethnic group			.86 (2)
Saudi (n = 424)	45	55	
Arab (n = 143)	43	57	
Neither (n = 37)	38	62	
Do things even if they are dangerous			22.4 (1)***
Yes (n = 435)	51	49	
No (n = 117)	27	73	
Harmful to drive faster than the speed limit			1.9 (2)
Always (n = 147)	46	54	
Occasionally/rarely (n = 323)	43	57	
Never (n = 86)	51	49	
Harmful to drive a car without a driving license			9.6 (2)**
Always (n = 64)	41	59	
Occasionally/rarely (n = 316)	40	60	
Never (n = 179)	54	46	
Harmful to drive/ride the car without wearing a seat belt			12.7 (2)**
Always (n = 91)	42	58	
Occasionally/rarely (n = 316)	39	61	
Never (n = 147)	57	43	
How often do you use your mobile while driving?			13.9 (2)***
Always (n = 169)	56	44	
Occasionally/rarely (n = 294)	44	56	
Never (n = 83)	33	67	
Use a helmet when you rollerblade, skateboard, or ride a motorcycle			3.5 (2)
Always (n = 59)	44	56	
Occasionally/rarely (n = 165)	41	59	
Never (n = 238)	50	50	
Respect traffic laws			42.05 (2)***
Always (n = 179)	31	69	
Occasionally/rarely (324)	46	54	
Never (n = 56)	80	20	
Do you think "Tafheet" is a sort of			58.8 (4)***
Talent (n = 94)	65	35	
Sport (n = 30)	37	63	
Violence (n = 41)	20	80	
Delinquency (n = 133)	23	77	
Cool Activity (n = 33)	70	30	
Do you think "Tafheet" should be			40.8 (3)***
Prohibited (n = 200)	24	76	
Supported by special clubs (n = 118)	55	45	
Supported by making it an early tournament (n = 37)	57	43	
Supported by training and by providing safety equipment (n = 76)	51	49	

Percentages were rounded to the closest integer. *P*-value sig * <= .05, ** <= .01, *** <= .001.

activities. A higher proportion among those who believe Tafheet is a talent or a cool activity also practiced Tafheet.

A similar trend was observed in multivariate analysis (see Table 3) after controlling for grade which indicates that those who are willing to engage in activities even when they are dangerous, those who think there is no harm in not wearing seat belt, and those who use a mobile phone while driving are at nearly three times higher risk for practicing Tafheet. Those who never or sometimes respect traffic laws are also at higher risk for practicing Tafheet.

Table 3 Adjusted odds ratios (OR) and 95% confidence intervals (CI) from regression model predicting Tafheet^a.

	Adjusted OR	95% CI (lower, upper)
Do things even if they are dangerous (ref: no)	2.70***	1.55, 4.72
Think harmful to drive faster than the speed limit (ref: Always)		
Occasionally/rarely	.52*	.293, .93
Never	.41*	.18, .93
Think harmful to drive a car without a driving license (ref: Always)		
Occasionally/rarely	.69	.32, 1.52
Never	.84	.34, 2.08
Think harmful to drive/ride the car without wearing a seat belt (ref: Always)		
Occasionally/rarely	1.21	.63, 2.33
Never	2.77*	1.24, 6.21
Using mobile while driving (ref: Never)		
Always	2.96**	1.41, 6.23
Occasionally/rarely	2.10*	1.04, 4.25
Respect traffic laws (ref: Always)		
Occasionally/rarely	1.89**	1.12, 3.19
Never	8.78***	3.59, 21.46

^a Regression model controlled for grade. *P*-value sig * <= .05, ** <= .01, *** <= .001.

4. Discussion

The current study examined the risky driving behaviors and attitudes among school youth that promote participation in the dangerous sport of "Tafheet". Our study undeniably points to pro-attitudes and behaviors that include daring personality, not wearing a seat belt and using a mobile phone while driving. The results indicate most notably that youth do not respect traffic laws. Research suggests that when considered alone, human factors have been found to contribute to 57% of the accidents in developed countries. When also considering vehicular and environmental factors, human factors account for approximately 92% of these accidents [13]. Approximately 80% of accidents reported in the KSA during 1994 were attributed to driver-related factors [14].

One of the common contributing factors to RTAs is not wearing a seat belt. Fewer than 2% of the drivers involved in accidents in the KSA during 2010 were wearing seat belts, compared to 85% in the USA [15]. Most industrialized and

many developing countries passed laws requiring the use of motor vehicle seat belts much earlier than Saudi Arabia did. Despite the fact that wearing a seat belt saves lives, the KSA had no safety belt use laws until the year 2000, when seat belt use became compulsory for the driver and front-seat passengers [16]. Despite the passage of this law, no public awareness campaigns were conducted to educate drivers on the importance of wearing seat belts. The seat belt use rate in two Riyadh suburbs was found to be between 4 and 33% for drivers and 41–87% for front-seat passengers. However, those low rates are encouraging when compared with usage rates before enactment of the law [16]. Seat belt use is rarely practiced even today due to lack of strict enforcement. The Kingdom is therefore in dire need of strategies to strictly enforce the law and to conduct a campaign to increase public awareness. Such campaigns, especially when combined with law enforcement, have been proven to be effective in increasing seat belt usage rates in western countries. Such educational programs also must be implemented in KSA high schools to ensure safe driving.

The second most common factor in RTAs is speeding and not obeying traffic regulations, both of which are major concerns in Saudi Arabia. A study by Ansari et al [17] reported that over 65% of accidents occurred because of vehicles traveling at excess speed and/or drivers disobeying traffic signals. The drivers were responsible for nearly 80% of accidents. The proportion of teenage drivers involved was found to be three times that of the USA. Approximately one-fifth of drivers involved in accidents did not have a driver's license, and nearly 70% of accidents were attributable to speeding, and failure to obey traffic signals. Teenage drivers were involved in 2.05% of all accidents that occurred in the USA during 1993, whereas the rate in KSA was approximately 7%, about three times greater. Young age, lack of proper training, and poor driving education all contribute to motor vehicle accidents. Further, it is not unusual for a young male to drive even if he is under age 18, which is the legal age to drive in KSA. The central problem lies with youth having few or no outlets for organized and supervised extra-curricular activities. It is very common for young males to view driving, including Tafheet, as a sport. However, these youth lack proper education on safe driving, respect for the road, and obeying traffic rules before they begin to drive [18].

Studies show that the layout of Riyadh city also contributes to traffic confusion and accidents. As in many big cities, roundabouts are used extensively in Riyadh. Driving through roundabouts can be a dangerous experience, as many drivers there do not follow regulations. Approximately 90% of all drivers violate at least one traffic regulation when driving through these roundabouts. The most frequent violations include failure to signal when leaving or entering a roundabout and neglecting the right of way [19]. Drivers lack proper knowledge on roundabout driving regulations, as driver training and the licensing process do not include enough information on roundabouts.

Lack of public transportation and relatively low prices of automobiles and gas are main reasons for increased driving rates in Saudi Arabia. The economy of Saudi Arabia is petroleum-based, and KSA is a central player in the global oil market. Over the period 1990–2011, Saudi Arabia

produced over 78 billion barrels of oil (approximately 13% of global supply), which accounted for approximately 75% of budget revenues and 90% of export earnings [20]. There were approximately 336 cars for every 1000 inhabitants in 2010 [21]. The country is large with a well-maintained highway structure, a well-designed local road system in large cities like Riyadh, and approximately 7 million registered cars [2]. Although the Kingdom has specified legal speed limits, driving at high speeds on the open wide roads is common and is a factor in many accidents.

As with the dangerous sport of Tafheet, the Saudi government adopted a tougher law in the past year to deter Arab drifting and joyriding. Previously, fatalities associated with drifting would have been classified as accidental. Now, they are classified as acts of criminal negligence, which carry a much heavier punishment. This is expected to help deter Arab drifters from performing reckless stunts. The punishments for Tafheet may include prison time or even a death sentence by beheading if deaths of other people result from the act [22,23]. However, although the police receive complaints about drifting, the drifters are rarely caught, as the events are organized under the vigilance of illegal spotters who help disband vehicle activity before police arrive on the scene. Although the police are responsive to public complaints, investigations are futile as the spectators and drivers disperse quickly into normal moving traffic when the police arrive. Occasionally, traffic police are even chased away by both the drivers and spectators. Videos of Tafheet events are often posted on the Internet for public viewing. Accessibility to such videos further inspires thrill-seeking behavior among young males.

The Saudi government has launched a road safety campaign targeting youth and has implemented the United Nations Global Plan for the Decade of Action for Road Safety 2011–2020. The Saudi Ministry of Interior also launched the Advanced Traffic Vehicle and Monitoring (ATVAM) project in 2011, known locally as *Saheer*. The project is still in its infancy, but early signs are encouraging, and further impact on driver behavior is expected. Following introduction of this program, there has been a 19% decline in the number of traffic deaths, a rate 7.7% lower than in the same month in 2010. Arab News has also reported a 19% reduction in road deaths and a 30.4% reduction in injuries. In some provinces, e.g., Tabuk, the rate has dropped by an overwhelming 63%. Similar improvements in road safety have been recorded in other cities and provinces where the program is active [24].

In addition to this major advancement to monitor RTAs, the Saudi government must consider promoting educational programs that should be mandated before youth graduate from high school. Our study underscores the desperate need for a standardized and effective educational curriculum to train and properly guide Saudi youth before they begin to drive. It is critical that children comprehend and develop positive attitudes towards respecting and obeying traffic laws. The Ministry of Education can facilitate intervention programs in each school to increase awareness and develop healthy attitudes about driving behavior. This approach has greater potential to change the current culture and to reduce the burden of traffic fatalities in the Kingdom.

High school is an ideal setting for timely intervention. Our data show that 11th grade is the most crucial time to change attitudes that might lead to risky driving behaviors. Schools must examine strategies for changing teen driving behavior and identifying effective measures for improving the use of seat belts and for reducing other risky behaviors. A multifaceted and multilevel model based on ecological theory can be used for understanding how teens make choices about driving behaviors and for understanding the array of factors that can influence these choices [25]. The model can aid in generating recommendations for comprehensive intervention strategies that can be used in Arab communities to reduce disparities in risk behaviors, injury, disability, and death. Furthermore, healthcare providers and schools should consider counseling parents to discourage giving novice teen drivers unsupervised access to vehicles. In communities such as Riyadh, where teens require primary access to private vehicles due to limited public transportation options, greater efforts should be made to promote safe behaviors.

4.1. Study strengths and drawbacks

Our study suffers from classic drawbacks that affect any survey-based research. The cross-sectional nature of the study limits our ability to draw any causal conclusions. Given the self-reported nature of the questions, we must rely on respondents' honesty and memory recall. We also acknowledge that many of the risk behaviors measured might have been under-reported, leading to lower estimates of prevalence. Furthermore, students with inadequate literacy levels may not have reliably understood or responded to the questions. Other challenges include missing data due to nonresponse or choice of "don't know" responses. This issue may have resulted in missing at least 15% of potential responses for any given variable. It is important to note that the specific question assessing "Tafheet" does not distinguish between drivers and passengers, as it simply asks whether students ever participated in Tafheet. Accordingly, this question limits our ability to separate drivers from other participants. Additionally, the dichotomy of risky behavior (yes/no response to Tafheet) does not discriminate between those who regularly engage in Tafheet and those who may have experimented once or twice in their lifetimes. A more specific question with regard to frequency would have been appropriate to elicit risk level and to identify characteristics of drivers. Because the study was conducted only in the city of Riyadh, it may not be appropriate to extrapolate the results to adolescents within the whole Kingdom, particularly those in the rural provinces. Nonetheless, the study strengths include a large sample set randomly selected to represent students across age groups and across a variety of school types and locations in Riyadh, the largest city in the Kingdom, with a population at nearly 7 million [26].

4.2. Policy implications

According to the Arriyadh Development Authority, young people make up the majority of Riyadh city population [27]. Youth below 15 years of age constitute approximately 34%

of the total Saudi native population (excluding expatriates). Therefore, the base of the population pyramid is wide and getting wider. The Saudi population as a whole is typically young compared to other countries, with a median age of 26.4 years.

Our study findings seem to suggest that male high school students do engage to some extent in risky driving behaviors and hold attitudes that support unsafe driving practices, regardless of whether they engage in Tafheet. Our study results clearly call for a strategic intervention plan to educate youth in school settings with special emphasis on the problems of speeding, disobeying traffic laws, driving without a driver's license, and the sport of Tafheet. Strict law enforcement and educational campaigns must be seriously considered to change the driving culture of Saudi Arabia. Strong enforcement of speeding laws should be enhanced, particularly on streets and at times when speeding and Tafheet are likely to take place. This includes weekends (i.e., Thursday thru Saturday) and national holidays. The use of public media can also help disseminate the messages of safe driving to reach a larger audience. Future research must explore the potential benefit of a multilevel systems approach that incorporates the school system, parents, and law enforcement to address unsafe youth attitudes and driving.

Human subjects approval statement

Ethical approval for the study was obtained from King Fahad Medical City Institutional Review Board along with permission from the Ministry of Education in Riyadh to administer the survey in schools.

Conflict of interest

None declared.

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