

The Social Determinants of Risky Driving on the Intercity Roads of Tehran Province, Iran: A Case-Cohort Study

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Received 2016 January 21; Revised 2016 May 30; Accepted 2016 June 06.

Abstract

Background: Traffic accidents are the major cause of injuries that endanger the lives of many people annually. It seems that studying the factors and grounds of this type of event including risky driving contributes to the identification of groups at risk and development of preventive programs.

Objectives: Given the importance of this issue, we decided to conduct a study to examine the social factors of risky driving.

Methods: The present study was implemented based on a case-cohort design. The target community was all the drivers who drove on the intercity roads of Tehran Province. Each driver with and without a history of being guilty in a car accident leading to injury or death during the last 5 years was assigned to the case and control groups, respectively. The questionnaires were completed through a review of documents and interview within the groups. In the analytical analysis, a chi-square test and, if necessary, the odds ratio and confidence intervals were used to determine the relationship between the variables. In each case, the necessary investigation of confounding or interacting variables was performed using regression models and the final model of the factors affecting a risky driving was extracted.

Results: From a total of 990 drivers studied, 54 cases (5.5%) were females and 936 (94.5%) were males. The mean and SD of the drivers' ages were 39.4 and 11.8 years, respectively. People with a driving job, chronic disease, poor socio-economic status, having only a family dispute, without a religious attitude, and under medical supervision (all with $P < 0.001$), secondary education ($P = 0.01$), women ($P = 0.01$), using drugs ($P = 0.03$) were found to have a greater history of road traffic injuries or deaths.

Conclusions: This study showed that gender, education level, occupation, socioeconomic status, medical care, health condition, lifestyle, family conflict, drug abuse history, and religious attitudes are the major social factors of risky driving on the intercity roads of Tehran Province.

Keywords: Accidents, Traffic, Epidemiology

1. Background

Traffic accidents are the cause of 1.2 million annual deaths and injuries of tens of millions of people in the world (1). In 2014, almost 25 700 road fatalities were reported in the EU (2). Due to the lack of reduced deaths from traffic accidents in the world, in 2010, the general assembly of the United Nations passed a resolution to call the current decade (2011 - 2020) as decade of action for road safety (3). Road traffic safety remains the perennial topic for all transportation professionals across the globe (4).

This is a specific intricate health problem of the community in Iran. Iran has been reported to be among the countries with the highest incidence of accidents and fatalities caused by traffic accidents. According to the statistics of the legal medicine organization issued in 2014, 16,872 deaths and 304,485 cases of injuries caused by traffic accidents have happened in Iran (5). Human factor is a most important factor that is highly different in various soci-

eties. In other words, each of the people involved is with certain social, economic, and cultural bases. Some studies conducted in the past indicate that the degrees of violation of traffic regulations differ in various social bases and the offenses committed are also different. It seems that some bases have less and some more offenses (6). Nevertheless, investigation of the factors and social contexts involving these types of events including risky driving helps an identification of groups at risk and formulation of preventive programs.

Accordingly, the social factors of risky driving have been studied around the world. A research in Canada revealed that elderly people who live in crowded households and have more than one chronic disease drive less frequently (7). Another study in Switzerland showed that there is no difference between the drivers with repeated injuries and those with one case of injury in terms of gender, education level, and economic and socioeconomic classes, while the chance of occurrence of repeated injuries in

drivers who are self-employed is higher (8). An investigation in Sweden displayed that economic factors have a significant relationship with injuries associated with vehicles (9). Another study in Israel demonstrated that a relationship exists between the size of community and family atmosphere, driving style, willingness of risk-taking in driving, careless driving habits, and personal commitment to a safe driving. In addition, the positive aspects of the relationship between children and parents and high degrees of conformity with power and agreement and linked with a more cautious driving style, while lack of family commitment to safety, high level of pressure, and low conformity with power are associated with a careless driving style (10). In Baltimore, Ryb et al. showed that the rate of road traffic injuries (RTIs) is higher in single, unemployed, low educated and low-income people, as well as alcohol consumers and those aged less than 55 years compared to that of the other unintentional injuries (11).

Bina et al. from Italy showed that boys with a history of risky driving are more likely to have the lifestyle characteristics of anti-social behaviors such as smoking tobacco, spending time at home and with friends without a schedule and girls of the same experience more probably develop anti-social and other risky behaviors such as drug abuse (12).

The results of another study in Australia revealed that various substance abuse (alcohol, tobacco, marijuana, and wine) in groups with a risky driving have been most frequently reported. Moreover, anti-social behaviors in this group were found to be of a higher rate compared to other groups (13). In Australia, Hatfield et al. showed that men and adolescents have stronger motifs for exceeding the legal speed or driving when drunk and young men's seeking for respect is an incentive to speed up (14). A study in Taiwan indicated that men's illegal speeding behaviors are significantly greater than women. In men, stress has a negative effect on risky driving. However, anger, excitement-seeking, and social abnormality have positive impacts on risky driving (15).

A study in New Zealand was indicative of a strong relation between risky driving and traffic accidents and the fact that men have more risky driving behaviors and abuse of cannabis or alcohol is strongly associated with risky driving. Also, teens participating in violent offenses were found to have a contact with criminal peers or drug-dependent people (16). Schwebel et al. demonstrated that risky driving is linked with high excitement seeking and low control of arousal and mood (17). Gulliver et al. showed that no predicting variable exists for risky driving in women. Yet in men, aggression, adventurousness, and alienation from other variables account for better predictors for risky driving and traffic accidents (18).

2. Objectives

Given the importance of this issue, the researchers decided to do a case-cohort study on the social factors of risky driving in Iran.

3. Methods

3.1. The Study Type

This research is of a descriptive and analytical type, which was conducted based on a case-cohort project.

3.2. Target Population

All the drivers driving on the intercity roads of Tehran province with and without a history of risky driving followed by being and not being known as guilty in a car accident leading and not leading to injury or death during the past 5 years were considered in the case and control groups, respectively.

3.3. Inclusion Criteria of the Groups

The inclusion criteria of the case group included the drivers who had an Iranian citizenship and a complete mental health at the time of accident occurrence based on the information existing in police files and used to continuously or intermittently drive during the past 5 years.

3.4. Administration

The interviewers and traffic officers were trained about how to collect data using the relevant tools. Using Tehran traffic police data, the participants of the case group were selected and the necessary data were received over the telephone or via in-person interviews. Also, in the control group, the drivers who would drive on the intercity roads of Tehran province were requested to participate in the study and if agreed, their information were collected through interviews and recorded in the questionnaires. To eliminate the effects of the different days of the week, hours, limits of road speed and overtaking on the probable sampling errors in the control group, the subjects were selected on different week days, daily and nightly hours, and road limits.

3.5. Sample Size

The sample size required for the case group and each control group was determined to consist of 327 subjects based on the average lowest odds ratio of greater than 1 between the case and control groups reported in the previous studies, including the study of Bello et al., who obtained a value of almost 1.7 (19), while considering type I and II errors to be 0.05 and 0.20, respectively, a chance of 0.5 for an

incompatible couple, design effect 1.2, and 2 controls for 1 case. Samples of the case and control groups were randomly selected through the Tehran traffic police database and from among the drivers who were traveling on Tehran suburban streets, respectively, with the cooperation of the intercity police stations of Tehran province.

3.6. Analysis Project

After collecting the data, they were imported into a computer and analyzed by SPSS (V. 21.0, IBM Corp., USA, 2012) and Stata software as follows: the analysis was performed within the two descriptive and analytic frameworks. The descriptive analysis was implemented for the quantitative variables and ranked and classified data using means and standard deviations of the study variables and absolute and relative frequencies, respectively. To determine the association between the qualitative variables in the analytical analysis, chi-square test and, if necessary, the OR index and confidence intervals were used. In each case, the necessary investigation of confounding or interacting variables was performed using regression models and the final model of the factors affecting a risky driving was extracted.

4. Results

In this study, 990 drivers (54 (5.5%) females and 936 (94.5%) males) were examined. The mean and standard deviation of the drivers' ages were 39.4 and 11.8 years, respectively. 783 (79.1%) and 207 (20.9%) of the subjects were born in the city and village, respectively. Most study drivers had Persian (575 drivers, 58.1%) and Azerbaijani (258 drivers, 26.1%) tongue languages, while a few number of them (nearly 18%) had other languages such as Kurdish and Lori. Six hundred ninety-two drivers (69.9%) lived with their wives and children or parents and 105 drivers (10.6%) lived alone. Also, according to them, 839 (84.7%) and 151 (15.3%) drivers were healthy and had at least one chronic disease, respectively.

Table 1 represents the records of road traffic injuries or deaths (RTID) in the study drivers and their background variables. According to this tabulation, RTID records are higher in women and people who are younger than 35 years, born in the village, and under medical supervision, use certain drugs, live alone, and have secondary school education, a driving job, less family size (1 to 4 people), poor socio-economic status, chronic disease, family conflict, history of problems such as divorce, imprisonment, drug abuse, intentional injuries, criminal conviction, and childhood offense, and no wives, contacts with their relatives and friends, and religious attitudes. The statistical tests showed a significant relation between the history

of the drivers' RTID and variables of gender, occupation, socioeconomic status, medical care status, health condition, communication between close friends, lifestyle, family conflict, drug abuse history, and religious attitude.

The final model of social determinants of risky driving on the intercity roads of Tehran province (Table 2) includes the variables of education level, occupation, socioeconomic status, health care status, lifestyle, family conflict, drug abuse history, record of criminal conviction, religious attitude, and family size, from among which only the variables of education level, job, occupation, place of birth, socioeconomic status, medical care status, health condition, lifestyle, family conflict, drug abuse history, and religious attitude have a significant relationship with the dependent variable.

5. Discussion

Education level, occupation, place of birth, socioeconomic status, medical care status, health condition, tongue language, lifestyle, family conflict, drug abuse history, and religious attitude were of the major social factors of risky driving leading to RTID occurrence on the intercity roads of Tehran province.

Based on the education level, the final model demonstrated that RTID occurrence was significantly higher in drivers with secondary school education compared to other groups. The study of Yongchaitrakul et al. carried out in Thailand revealed that the incidence of RTID was higher among people with low education levels, in Bangkok and other provinces (20). Similarly, the research of Romano et al. in the United States showed such a relationship (21). This indicates the role of education as one of the determining factors of people's socioeconomic status in RTI incidence. Given that some studies including that of Shell et al. in the United States have shown that providing training programs when issuing a driver's license has a large role in reducing the incidence of RTIs (22) and based on the study of Shams et al., concentration can lessen RTI incidence while driving (23), it is necessary that such training programs be developed for at-risk groups in terms of the education level when issuing a driver's license and its renewal.

One of the most important findings of this study was the discovery of a significant relationship between RTID and the study drivers' socio-economic status in the final model. Several studies worldwide, including those of Anthikkat et al. from Australia (24), Yiannakoulis and Scott in Canada (25), Chakravarthy et al. in the United States (26), Turrell and Mathers in Australia (27), Chen et al. from Australia (28), Factor et al. in Israel (29), Laflamme from Sweden, Sethi from the European office of the world health organization (30), and the review study of Laflamme and

Table 2. The Final Regression Model of the Relationship Between the History of Road Traffic Injuries or Deaths and Some Underlying Variables in the Studied Drivers

Variable	Base Level	Other Levels	P-Value	OR	95% CI OR	
					Lower	Upper
Education grade	University	High school	0.007	1.87	1.19	2.94
		Guidance	0.604	1.19	0.61	2.34
		Primary	0.584	0.79	0.34	1.85
		Illiterate	0.337	0.51	0.13	2.00
Job	Employee	Worker	0.093	0.49	0.22	1.12
		Tradesman	0.013	0.53	0.32	0.88
		Driver	0.893	1.05	0.50	2.23
		Other	< 0.001	9.79	3.92	24.45
Place of birth	City	Village	0.043	1.62	1.01	2.60
Family size	-	-	0.078	0.90	0.80	1.01
Socioeconomic status	High	Middle	0.001	3.21	1.61	6.42
		Low	0.015	2.66	1.21	5.85
Health care status	Under medical supervision	Without medical care	< 0.001	3.52	2.24	5.53
Health Status	Healthy	Chronic disease	0.232	1.46	0.78	2.74
Regular specific medicine consumption	Yes	No	0.258	0.69	0.37	1.31
Positions of Friends	Academic staff	Public sector Employee	0.769	1.17	0.41	3.37
		Private sector Employee	0.212	2.03	0.67	6.18
		Worker	0.567	1.44	0.41	5.05
		Tradesman	0.746	0.83	0.27	2.54
		Unemployed	0.900	0.91	0.21	4.01
		Other	< 0.001	7.88	2.74	22.67
Life Style	Live with wife and children	Single	< 0.001	0.35	0.20	0.59
		Live with parents	< 0.001	4.69	2.55	8.63
Family conflict history	No	Yes	0.012	1.88	1.15	3.09
Drug abuse history	No	Yes	0.294	1.25	0.82	1.89
Crime history	No	Yes	0.360	1.42	0.67	2.98
Religious attitudes	Positive	Negative	< 0.001	4.83	2.96	7.88
Intercept			< 0.001	0.02	0.01	0.07
Model checking criteria						
Hosmer-Lemsho Prob>Chi2		0.76				
Area under ROC curve		0.88				
AIC*n		851.7				
BIC		-298.8				

Diderichsen from Sweden (31) have shown that the incidence of these events are usually further in households with poor socioeconomic situations. Therefore, it can be said that socio-economic status is one of the most important factors of risky driving on the suburban roads of Tehran Province and it is thus necessary to pay attention to this issue in the intervention programs.

In the final model, the records of RTID were significantly higher in drivers who had been constantly under medical supervision compared to those who had had no needs for special health care. In addition, in the univariate model, the relationship between health condition and the history of RTID was significant and the occurrence of these types of events was lower for drivers who had had no chronic diseases. This would show the importance of com-

plete physical and mental health conditions when driving. Some studies including that of Clapp et al. in the United States, which showed drivers with a history of stress are anxious while driving to cause severe traffic accidents (32) have indicated that various illnesses, especially chronic diseases, have a role in a severe RTI incidence. With respect to the study of Hong et al. in South Korea, which showed the presence of depressive symptoms in drivers is the most important predictor of RTI in adults (33) and that of Karjalainen et al. in Finland representing individuals with mental illnesses cause more traffic accidents (34), it is incumbent to conduct medical examinations when issuing a driver's license as well as periodic examinations when renewing it in a more purposeful way. Furthermore, performing specialized studies to identify diseases that have

a greater impact on the behavior of unsafe driving can improve the relevant examination qualities.

Although in our final model, no significant relationship was found between certain medications and RTID incidence, some investigations, including those of Gjerde et al. in Norway (35), Corsenac et al. in France (36), Romano et al. in the United States (21), and Bogstrand et al. in Norway (37) indicated a significant relationship between the use of certain drugs and traffic accidents among car drivers. Besides, the study of Rudisill et al. in the United States demonstrated a rise in the consumption of drugs in drivers killed by RTI in recent years (38). Therefore, it can be said that drug use while driving has been as a serious risk factor for accidents in different parts of the world in recent years and due to the obscurity of the issue, wide studies are required to be done in this field inside the country.

Furthermore, the records of RTID were found to be significantly higher in drivers who were living alone compared to those living with their parents or spouses and children. On the other hand, one of the most important findings of this study was the presence of a significant relationship between RTID and family conflicts among the study drivers in our final model. Considering the fact that an improper family structure and poor communication between its members can lead to their mental imbalances and various diseases, the incidence of RTI as one of the most important damages has been no exception in recent decades, while family structure and the relationship between its members has been raised as a major social factor of dangerous behaviors when driving, which may lead to severe RTIs.

A history of RTID in drivers with religious attitudes was seen to be significantly less compared to those with no religious attitudes. This finding shows that people with religious attitudes avoid dangerous behaviors while driving, which can be due to their respect for driving rules.

A univariate model showed that a history of drug abuse significantly increases the incidence of RTID. According to several studies performed in various parts of the world, including those of Fergusson et al. (16), which displayed using drugs and alcohol is of factors of high-risk behaviors while driving and severe RTIs, it can be concluded that drugs and alcohol use is a leading cause of risky driving. Therefore, it is essential that the competent authorities, especially the police take necessary measures to control drug and alcohol uses when driving.

In the univariate model, the relationship between gender and a history of RTID was significant and the occurrences of these types of events were found to be higher in women than in men. However, the studies of Laflamme and Engstrom in Sweden (39) and Factor et al. in Israel (29) revealed the reverse. One reason for this could be women's

less experience of driving on the intercity roads as well as their lower skills in the control of vehicles when confronting with perilous and unexpected situations at high speeds compared to men.

According to the results of this study, it can be said that social factors have generally a great role in risky behaviors while driving and subsequent severe traffic accidents, i.e. those leading to injuries and deaths, in the study area. From among all, the variables related to socioeconomic status, health condition, and family structure and the relationship between the family members have a greater role.

Acknowledgments

At the end, all those who were involved in this study, especially the honorable police commanders of East Tehran avenues, Colonel Kranyan, West Tehran avenues, Colonel Mirzayi, Alborz province, Colonel Akbari, the respected commanders and officers of police stations of Tehran suburban roads, and the personnel of Sina trauma and surgery research center, especially Mrs. Jafari are sincerely acknowledged and appreciated. It should be noted that the funding for this project was provided by Sina trauma and surgery research center, Tehran University of Medical Sciences via the contract No. 203.

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Table 1. The Relationship Between History of Road Traffic Injuries or Deaths and Some Underlying Variables in the Studied Drivers

Levels of Variable	Case		Control		P-Value	OR	95% CI OR
	No.	%	No.	%			
Gender					0.01	1.93	1.11- 3.34
Female	26	7.9	28	4.2			
Male	304	92.1	632	95.8			
Age, y					0.78	1.03	0.79- 1.35
≤ 35	185	56.1	364	55.2			
> 35	145	43.9	296	44.8			
Marital status					0.50	1.11	0.80- 1.53
Unmarried	73	22.1	134	20.3			
Married	257	77.9	526	79.7			
Education grade					0.18	-	-
University	137	41.5	319	48.3			
High School	122	37.0	196	29.7			
Guidance	41	12.4	82	12.4			
Primary	23	7.0	45	6.8			
Illiterate	7	2.1	18	2.7			
Job					< 0.001	-	-
Employee	76	23.0	170	25.8			
Worker	20	6.1	76	11.5			
Tradesman	114	34.5	362	54.8			
Driver	45	13.6	42	6.4			
Other	75	22.8	10	1.5			
Place of birth					0.40	1.14	0.83- 1.57
Village	74	22.7	133	20.2			0
City	256	77.6	527	79.8			
Family size					0.12	1.25	0.93- 1.67
1- 4	236	71.5	439	66.7			
≥ 5	313	28.5	219	33.3			
Socioeconomic status					< 0.001	-	-
Low	87	26.4	170	25.8			
Middle	221	67.0	404	61.2			
High	22	6.7	86	13.0			
Meet the relatives					0.09	-	-
Monthly	230	69.7	472	71.5			
Yearly	82	24.8	170	25.5			
Never	18	5.5	18	2.7			
Meet the friends					0.20	-	-
Monthly	215	65.5	405	61.5			

Yearly	78	23.6	190	28.8			
Never	37	65.2	64	9.7			
Health care status					< 0.001	3.24	0.39 - 4.41
Under medical supervision	124	37.6	103	15.6			2
Without medical care	206	62.4	556	84.4			
Health status					< 0.001	1.63	1.15 - 2.33
Chronic disease	65	19.7	86	13.0			
Healthy	265	80.3	574	87.0			
Regularly specific medicine consumption					0.05	1.40	0.99 - 1.97
Yes	66	20.0	100	15.2			
No	264	80.0	260	84.8			
Positions of friends					< 0.001	-	-
Academic staff	6	1.8	29	4.4			
Public sector employees	49	14.8	147	22.3			
Private sector employees	26	7.9	67	10.2			
Worker	15	4.5	80	12.1			
Tradesman	27	8.2	212	32.2			
Unemployed	7	2.1	22	3.3			
Other	200	60.6	102	15.5			
Life style					< 0.001	-	-
Single	72	21.8	33	5.0			
live with parents	31	9.4	162	24.5			
live with wife and children	227	68.8	465	70.5			
Family conflict history					< 0.001	2.19	1.53 - 3.15
Yes	70	21.2	72	10.9			
No	260	78.8	588	89.1			
Divorce history					0.33	1.27	0.77 - 2.10
Yes	27	8.2	43	6.5			
No	303	91.9	617	93.5			
History of intentional injuries					0.10	1.39	0.93 - 2.09
Yes	45	13.6	67	10.2			
No	285	86.4	593	89.8			
Drug abuse history					0.03	1.36	1.01 - 1.82
Yes	104	31.5	166	25.2			
No	226	68.5	492	74.8			
Crime history					0.08	1.62	0.92 - 2.85
Yes	23	7.0	29	4.4			
No	307	93.0	629	95.6			
Conviction history					0.35	1.42	0.67 - 3.02
Yes	12	3.6	17	2.6			
No	318	96.4	643	97.4			
jail history					0.81	1.08	0.55 - 2.09

Yes	14	4.2	26	3.9		
No	316	95.8	634	96.1		
Religious attitudes				< 0.001	5.91	3.96 - 8.84
Negative	299	90.6	409	62.0		
Positive	31	9.4	251	38.0		