Original Article

Relationship between using cell phone and the risk of accident with motor vehicles: An analytical cross-sectional study

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ABSTRACT

Purpose: Traffic accidents are one of the major health problems in the world, being the first cause of burden of illness and the second leading cause of death in Iran. The Sistan-Baluchestan province is one of the most accidental provinces of Iran with the highest rate of accidents-caused deaths. This study was conducted to determine the risk factors associated with traffic accidents in Zahedan through 2013 to 2016.
Methods: This analytical cross-sectional study was carried out on 223 drivers from Zahedan who were traumatized by traffic accident and sent to Zahedan hospitals. The data were obtained through interviews taken by the trained interviewers via refereeing to the medical records and collected in the researcher-made checklist. Census was obtained from the study subjects. For data analysis, independent *t*-test, one-way ANOVA, Chi-square and logistic regression were used with the Stata software version 11.0.
Results: In this study, 223 male subjects with the mean age of (32.54 ± 12.95) years, 39.8% single and 60.2% married, entered for investigation. Most accidents (38.8%) occurred between 12:00 to 17:59. While driving, 47.1% of the study subjects were using cell phones, 89.1% had manual use of mobile phones, 21.9% had a habit of sending short message service (SMS) and 23.4% had sent SMS within 10 min before the accident. The one way analysis of variance showed that the mean age of individuals with marital status, driving experience, education and accident with motorcycle were significantly different ($p < 0.05$). Also, the multivariate logistic regression test indicated a significant relationship of smoking, ethnicity, insurance and SMS typing while driving with motorcycle accident ($p < 0.05$).
Conclusion: In this study, SMS and smoking while driving had the highest risk among the variables studied in the motorcycle accidents. Therefore, effective education attempting to enhance people's awareness about the consequences of using cell phone and smoking during driving to reduce traffic accidents seems necessary.

Introduction

Death from traffic accidents is defined as the death that occurs within 30 days after the accident injury. Traffic accidents are one of the major health problems in the world. Traffic accidents are the first cause of the burden of illness and the second cause of death. Iran is one of the countries with high rates of road accident mortality.[1]

Traffic incidents are growing due to the rapid development of societies and the other related factors.[2] Every year, more than 1.2 million people die of traffic accidents in the world and 20—50 million suffer from disabling injuries. In the low and middle income countries, the highest mortality rates are due to traffic accidents (21.5 and 19.5 per 100,000 population, respectively).[3] Traffic accidents in Iran are also consistent with the industrialization. It keeps

increasing and various studies indicate the rate of 39−30 per 100,000 people.[4,5]

Bahadorimonfared et al.[2] reported that the incidence of traffic accidents was 31 cases per 100,000 population in 2010. Severe accidents resulted in more deaths associated with human risk factors. The prevalence of traffic accident deaths has been noticed in people with poor driving experience.[6] Traffic patterns and their mortality rates in the developed and developing countries are very different. Dealing with traffic accidents and their consequences require specific approaches and strategies.[7] Different studies identified factors, such as sleep deprivation during driving, gender, non-use of seat belts,[8] travel time, age, speed,[9] and smoking as the main risk factors for traffic incident. In a study, drivers who talked on mobile phone for more than 10 min had a four-time more chance of an accident.[10]

Sedative medications, cardiovascular and gastrointestinal drugs, benzodiazepines and opioid drugs are the most commonly used drugs among drivers. Drivers using tramadol increased 11.4 times more of their chances of an accident. The province of Sistan-Baluchestan is considered the poorest province of Iran in terms of road condition, in which only 207 km of the roads in the north and south are in four-way and the remaining roads are in the form of two-way with a width of 7−7.5 m. On the other hand, a report indicated the presence of about 130 accident prone sites in this province, which has caused this province to be one of the most road accidental provinces in Iran and the highest accident rate is reported from the province.[11]

Identification of traffic accident risk factors can provide useful information for controlling and preventing traffic accidents to the health policy makers. This study aimed to investigate the effect of mobile phone use and the risk of accident with vehicles and motorcycles in Zahedan city through 2013 to 2016.

Methods

This analytical cross-sectional study was approved by Zahedan University of Medical Sciences (ethics code number: IR: ZAUMS.-REC.1395.252). The study subjects were 425 drivers, referring to hospitals in Zahedan city for medical rescue due to traffic accidents through 2013 to 2016. At first, according to the criteria for entering the study, the number of subjects under study was 425. Two hundred subjects were excluded from the study (50 drivers were reluctant to collaborate in the study. Information on 80 subjects was also incompletely recorded. 16 cases died and data on 56 cases was also mistakenly recorded, those cases with no telephone calls to the Traffic Accident Emergency Headquarter were excluded from the study). Finally 223 subjects were enrolled in the study.

The exclusion criteria included motorcyclists or cyclists who used phones or drugs, people who died as a result of accident, and those who injured in their head or those who were not willing to participate in this study.

In this study, data were collected in the researcher-made checklist. For data collection, coordination with the hospital department was carried out. Then, among public health students who had the knowledge about traffic accidents, 4 persons were selected for data collection who previously received necessary training for completion of the questionnaire. The checklist contained information that should also be collected through the medical records of both individuals and interviews. By referring to the files in the hospital archives, the telephone number and home address of the persons who had the criteria for entering the study were recorded, and then, by telephone, informed consent was obtained for participants.

Subjects were just by a phone number or registered address entered the study. Written consent was got for those who were taken to the study by telephone or on-line attendance. The died cases were excluded. Those with the incorrect phone number or with off phone, or with the incorrect address and with no phone numbers or unwilling to participate in the study were excluded.

The checklist was designed into two parts. The first part included information such as age, location of treatment, severity of injury, insurance status, ethnicity, employment status, and education level that could be accessed through the hospital records. The second part of the checklist comprised information on the type and number of chronic diseases including heart disease, stroke, dementia, Alzheimer's disease, diabetes, cancer, arthritis, Parkinson's disease, high blood pressure, chronic asthma, obstructive pulmonary disease, alcoholism, depression, anxiety, chronic kidney disease, substance abuse, alcohol consumption, taking medications (sedation, cardiovascular, gastrointestinal, psychedelic, metoprolol, aspirin, esomeprazole, furosemide), driving experience, how to use cell phones, use of mobile phones etc, which were obtained by interviewing the study subjects at their house.

The use of mobile phones is defined as the drivers have spoken to the phone during a crash, received or sent a text message. Those who have already received voicemail or text messages were dropped out of the study unless they confirm that they were checking when they encountered. Independent *t*-test, one-way ANOVA and Chi-square test were used to compare the frequency, mean and standard deviation of the variables. Multivariate logistic regression analysis of Forward RL model with the *p* value < 0.05 was used to determine the relationship between the variables studied and the risk of crashing with motorcycles. The odds ratio was calculated with a confidence interval of 95%. Analyses of the obtained data were performed on the stata software version 11.0.

Results

A total of 223 male eligible subjects with the mean age of (32.5 ± 12.9) years were examined; age range was 17−85 years, of which 58.6% were in the age group of 17−30 years old. The most frequent observed age was of 20 years. 75.1% of subjects were 38.2 years or younger. Eighty-nine subjects (39.9%) were single, 133 (59.6%) were married and 183 (82.1%) had surgery after the accident. The most complaints were multiple traumas following car accident, which accounted for 43.1% of the total complaints.

The lowest and highest injuries were level 1 injury including the life-threatening conditions (10.3%) and the level 2 of high-risk patients (68.2%), respectively. More than half of the accidents (54.3%) occurred outside the city, with the highest accidents (38.5%) occurring between 12:00 to 18:00. The majority (61.4%) of the subjects was Baloch people and 56.1% with free jobs. In terms of education, 8.9% were illiterate and the highest frequency of education was 10−15 years of study. Also, 22.7% had crash by motorcycles, 47.1% stated that they were using manual mobile phone while driving, and 89.1% of them were mobile users while they were driving.

Of those surveyed 21.9% had a habit of sending SMS while driving, 22.9% sent SMS within 10 min before the accident and 20.2% were smoking. In the case of drug use on the day of the accident, 86.1% did not use any drugs, and 13.9% used drugs such as opium, methadone, Naswar and hookah. As is presented in Table 1, the relationship between the use of mobile phone during driving and the severity of injury, collision with motorcycle, surgery, accident location or crash time was statistically insignificant (*p* > 0.05). Also, there was a statistically significant difference between the mean age of the subjects under study and marital status, driving experience, level of education and clashing with motorcycles (Table 2). So the average age of drivers who were hit by motorcycles was lower than other accidents of the subjects. This difference was

Table 1
Frequency distribution of the information of the participants according to the variables studied.

Variable	n	%
Patient's main complaint		
Car accident-induced multi-trauma	96	43.1
Motorcycle accident-induced multi-trauma	51	22.8
Car overturning	26	11.7
Other cases	50	22.4
Severity of injury		
Level 1	23	10.3
Level 2	152	68.2
Level 3	48	21.5
Accident location		
Inside the city	102	45.7
Outside the city	121	54.3
Accident time		
0:00–6:00	25	11.2
6:00–12:00	49	21.9
12:00–18:00	86	38.5
18:00–24:00	63	28.4
Ethnicity		
Fars	82	36.8
Baluchi	137	61.4
Others	4	1.8
Job		
Driver	22	9.9
Employee	28	12.6
Retired	4	1.8
Free job	125	56.1
Unemployed	44	19.6
Education		
Illiterate	20	8.9
1–5 years	29	13.2
5–10 years	50	22.4
10–15 years	107	47.9
15–20 years	17	7.6
Dealing with motorcycles		
Yes	50	22.4
No	173	77.6
Use of mobile during driving		
Yes	105	47.1
No	118	52.9
Sending SMS while driving		
Yes	49	21.9
No	174	77.6
Sending SMS 10 min before the incident		
Yes	51	22.9
No	172	77.1
Smoking		
Yes	45	20.2
No	178	79.8
Using of drug and alcohol on the day of the accident		
No	192	86.1
Opium	7	3.1
Methadone	4	1.8
Pan&Naswar[a]	16	7.1
Hookah	4	1.8

[a] Pan and Naswar are type of chewing substances.

Table 2
The mean age difference with the variables studied in the drivers who suffered from accidents.

Variable	n	Age (years)[a]	p value
Marital status			<0.001
Single	89	26.3 (9.1)	
Married	133	36.3 (13.9)	
Divorced	1	42	
Driving experience (years)			<0.001
0-5	72	28.4 (13.3)	
5-10	71	28.9 (9.5)	
>10	80	39.1 (11.4)	
Education level			<0.001
Illiterate & Elementary	48	39.7 (17.7)	
Guidance & High school	138	30.5 (8.6)	
Academic	37	30.6 (8.6)	
Dealing with motorcycles			<0.001
Yes	50	10.4 (29.5)	
No	173	13.9 (35.3)	

[a] Data were expressed as mean (SD).

insurance, accident insurance, employee insurance), the chance to clash with motorcycles was 0.4 lower than non-insurance holders ($p < 0.00$) 1) (Table 3).

Discussion

The control of human skill activity takes places subconsciously in the brain. On the one hand, a conversation with mobile phone requires hearing information, mental processing, and response to the content being heard. Many drivers use a mobile phone while driving.[12,13] This means that people's feeling is capable of performing two tasks simultaneously. On the other hand, the processing capacity of the mind is limited.[14] As a result, the rate of error in responding to external stimuli will increase. As a result the error in response to the external stimuli increases. In such condition, presence of susceptible factors in the external environment will lead to accident. Our study showed that there is a significant relationship between using a mobile phone while driving and an accident with a vehicle, such as motorcycle. The chance of an accident in these people was 9.4 times higher than those who did not use mobile phones while driving. World Health Organization reports in 2011[12] and 2009[13] confirmed our study.

We found a relationship between smoking and the risk of collisions with vehicles. Smoker drivers had a higher chance of a motorcycle accident than the non-smoker drivers. Mallia[14] reported a significant relationship between smoking intensity and number of accidents. In our study, there was a significant relationship between cigarette smoking with vehicle accident in

Table 3
Multiple logistic regression results of the relationship between the impact on motorcycles and the variables studied.

Variable	OR	CI	p value
Smoking			>0.01
No	1		
Yes	7.2	1.5–35.9	
Benefiting insurance			<0.001
Yes	1		
No	0.6	0.1–0.9	
Ethnicity			<0.05
Fars	1		
Balouchi	5.4	1.2–25.2	
Sending SMS while driving			<0.05
No	1		
Yes	9.4	2.3–37.6	

OR: odd ratio, *CI*: confidence interval.

also statistically significant ($p < 0.001$). To determine the relationship between the clash with the motorcycle and the variables studied, we used the forward RL logistic regression test. The results of the multivariate logistic regression test showed a relation between smoking, ethnicity, benefiting insurance and sending SMS while driving and motorcycles clash. But smoking increases the chance of clash with motorcycles 7 times higher ($p < 0.05$).

Also, Baloch ethnicity was seen as a risk factor for clashing with motorcycles. So the odds of having Baloch ethnicities were 5.4 times higher than the other ethnic groups ($p < 0.05$). Those who were typing SMS while driving had a chance of clash of 9.4 times higher ($p < 0.001$). Driving insurance was a protective factor for clashing with motorcycles. If drivers were insured, (personal

drivers, which is agreed with the study of Araqi.[15] The study of Taravatmanesh[11] showed the highest rate of deaths belonged to Iranshahr and Zahedan. Khash-Zahedan-Iranshahr main road is one of the most dangerous parts of the province, with high traffic accidents. These cities are considered as the main cities of the province. There are also reports of high incidences of traffic accidents and mortality between the Khash-Zahedanmain roads. Therefore, considering the fact that the majority of people are living in these Baluchi townships and in view of the difference in driving behavior of these people with the other parts of Iran, it may be possible to justify the observed data.

The insurance affects driving behavior. In our study, there was a relationship between insurance and the risk of traffic accidents, as insurance was a protective factor and reduced the risk of an accident to the vehicle. A study by Alfaki[16] in Abu Dhabi contradicted our results. A study by Sagberg[17] showed that people who had more accidents got higher score of inappropriate driving behavior. The data showed that there were 33 million vehicles and 11 million motorcycles, and more than 80% lacked third-party insurance, which is consistent with our study findings. In our study, there was no relation between drug use, driving experience and driver education level with the risk of accident involved in the vehicle. Studies of Gjerde et al.,[18] Corsenac et al.,[19] and Romano et al.[20] reported a significant correlation between drug use, alcohol and traffic accidents in automobile drivers, which is not consistent with our study data. In our study, there was no relationship between driving experience and the risk of collision with vehicles, but study of Sagberg[17] showed that the risk of an accident resulting in injury or death in the less experienced drivers was much higher than in the experienced drivers. Turner[21] and Corsenac et al.[19] also confirmed these findings.

Also, the results of this study showed that 58.6% of the people who were traumatized by accidents and being referred to hospital were in the age group of 17–30 years. The highest frequency was observed at the age of 20 years. Emotional and high-risk behaviors, less observance of traffic rules and regulations, high speed driving, driving without a license in this age group can most likely to lead to the accidents. The study of Taravatmanesh[11] and colleagues also confirmed our findings. This study showed that most accidents occurred in the suburban areas between 12:00 to 17:59, which can be influenced by factors such as excessive speed, fatigue and sleepiness, ease of traveling and mobile phone use. Oreyzi and colleagues[22] showed that the most important aspect in the incidence of high-risk behaviors in taxi driving is the personality factors, such as pleasure and excitement, convenience and ease of traveling, the nature of the job and the possibility of escape from the police.

The study of Shams et al.[23] showed the relationship between the influences of drivers' age and driving hours per day. As the age increases, the number of hours of driving increases per day. In the younger people, the number of driving hours per day decreases. However, because of insufficient experience and failure to observe driving laws and regulations, accident and hospitalization may increase in this age group.

In our study, 47.1% of the subjects were using mobile phones while driving and 89.1% of them had manual use of mobile phones. The study of Shams[23] also confirmed our data. Using mobile phone is one of the discomfort factors especially in driving situations. As most people who were involved in the accident were using cell phones, in the same way, it is possible to say that using a mobile phone while driving can cause distraction, discomfort, loss of concentration, depression, excitement and leisure, all of which affect the driving quality leading to irreversible injuries. The result of a study showed that people were nervous as talking with cell phones; the most was manual use of handsets among drivers.[24] We found insignificant relationship between the uses of mobile phones with motorcycle accident. The data of Shams[23] in Tehran disagree with our findings. The probable reason for this difference is that drivers in this study considered themselves in the stage of non-performing hazardous driving behavior and maintaining good behavior, while observing their behaviors showed a high percentage of mobile phone usage during driving. Therefore, it seems that a direct question of drivers about the behavioral situation has been accompanied by their cautious responses. And they denied the dangerous behavior in their daily driving routine. Such a situation was observed in alcohol consumption, smoking and the use of drugs that affect mental health during or before driving; therefore, 86.1% of them reported no drug use on the day of the accident, and only 7.1% accepted consumption of Naswar and 3.1% reported opium use on the day of the incident. In our study, there was no relationship between the use of drugs, such as heart drugs, tranquilizers, psychotropic drugs, blood pressure control and traffic accidents, but the risk of such incidents in drivers who took such drugs was slightly higher than in the other groups. Moradi[25] agreed with our findings, but various studies, including Gjerde et al.,[18] Corsenac et al.,[19] and Romano et al.[20] found a significant relationship between the drug use, alcohol and traffic accidents in the car drivers.

Our findings showed that few people during the day of incident have alcohol consumption, which agrees with the result of a study by Afukaar et al.[7] Our study was performed on the male drivers due to an accident being referred to hospital. Study showed that women are more likely to observe the driving rule and regulations and less likely to have accident. The literate people are more likely to observe traffic rules than the illiterates, therefore with less chance of accidents, which corresponds with our findings. In our study subjects aged 15–20 years and educated had lower rate of accident. In the study of Moradi,[26] the risk of this type of events in the illiterate and the less educated drivers have been more.

Our data indicated that the maximum number of accident occurring between 0:00 and 6:00. Therefore, it is necessary to consider the measures to reduce traffic accidents related to low visibility at night in traffic control plans.

We noticed the relationship between the severity of injury and the use of mobile phones. Therefore, most people who were severely injured had mobile phone use while driving. Also, 44.7% of people who used mobile phones when driving had their injuries that led to surgery. And 53.3% of crash-related surgeries did not use mobile phones during driving, which was statistically insignificant.

Our another objective was to determine the relationship between the use of mobile phones and traffic accidents based on the location of the accident. In this regard, 45.7% of the people who experienced an accident while driving within the city while using a mobile phone, which was statistically insignificant. As already observed, direct questions from people may lead to cautious responses, adhere to the rules of good driving behavior, and to deny high-risk behavior. Similar findings were observed in the study of Moradi.[26]

Since our study included drivers who had been hospitalized due to traffic accidents, the number of eligible people for study was lower than the actual number of traffic accidents in Zahedan. On the other hand, drivers' cooperation with interviewers was low due to lack of trust among drivers.

In conclusion, texting and smoking while driving had the highest risk among the variables studied in the motorcycle accidents. Therefore, effective education and increasing people's awareness about the consequences of using cell phone and smoking during driving to reduce traffic accidents seems necessary.

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Ethical Statement

This article was extracted from a research project approved by Zahedan University of Medical Sciences (Iran) and also the financial support of this project is the responsibility of the university according to the contract.

Declaration of Competing Interest

The authors declare that they have no competing interests.

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