Review Article

A Review of Epidemiologic Factors of Trauma in Road Accidents in Southern Iran, Jahrom, 2009-2014

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ABSTRACT

Introduction: Driving accidents in recent years have endangered human health and caused many deaths per year. This study investigated the epidemiologic factors of trauma in road accidents between 2009 and 2014in Jahromin southern Iran.

Methodology: This study was a descriptive survey. The records of driving accidentsassisted by emergency department of Jahrom University of Medical Sciences were extracted in a 5-year period and the data were analyzed by SPSSV14 software.

Findings: The findings showed that during a period of 5 years, most accidents occurred at 12 pm to 2 pm and 6 pm to 8 pm. The most common trauma was the injury to the limbs (37.9%) and head injury (30.50%). The vehicles involved in car accidents were mostly car-motorcycles (35.30%) and reversal of motorcycles (23.07%). The type of injury resulting from road accidents is related to the accident location, the age of the injured, daylight and the vehicle collision type.

Conclusion: Given the role of motorcycles in driving accidents, training is needed to improve the motorcyclists' performance and to use safety helmet in future plans. Preventive measures and appropriate plans should be considered to improve road safety and provide them with lighting, especially accident-prone points.

Keywords: Accident, Traffic, Epidemiologic factors

INTRODUCTION:

According to the World Health Organization, an incident is an event that causes a recognizable injury. The increased number of driving accidents is one of the important health problems whichthreaten the community health promotion process and sustainable development and cause many deaths per year (1). According to the World Health Organization (WHO) in 2015, it was the ninth cause of mortality on the roads across the world (2). Predictions showed that in 2030, driving accidents will be the third leading cause of death and disability around the world after coronary heart disease and depression (3). Although less than 1% of the

world's population live in Iran; Iran is one of the countries with the highest mortality rate in road accidents across the world (4). In Iran, after cardiovascular disease, the highest mortality rate (11%) is related to driving accidents. 69% of deaths from accidents occur outside cities or on rural roads. However, the records in Fars Province were reported to be about 61.9% (5-7). The mortality rate from driving accidents in Iran during the period 2003-2007 was 24.47% and the average age was 37 years (8). In 2015, the mortality rate from driving accidents in Iran was 32.1% per 100,000 people (2, 3). These accidents impose a significant burden on the Iranian economy (9). There are four human (behavioral), technical (road and vehicle), environmental and organizational factors involved in driving accidents (10). Out of driving accidents, 57% are related to human (behavioral) factors and 43% are related to other factors (11). Human factors include the driver's behavior, visual acuity, hearing ability, decision ability and reaction speed, etc. Technical factors (road and vehicle) include vehicle design and its maintenance and repair (such as healthybrakes and tires)and some safety features such as seatbelts and airbags that are likely to result in accident prevention and reduce the risk of death and serious injury.

The causes of road accidents are not limited to human error or negligence of drivers, but road design and its non-standard nature can be also considered a factor in driving accident [12]. In Iran, the majority of accidents (67%) have occurred from 12 am to 12 pm and the highest number of fatal injuries occurred in the early hours of the morning and the smallest number of fatal injuries occurred between 12 pm and 6 am (5). The studies conducted in 2009-2010 in southern Iran showed that the chance of accident for passenger vehicles was 33%. The driver's age, the type of vehicle and the car damage condition affected the severity of the injury. In most cases, accidents occurred in urban areas and victims were male (largely in the group of drivers). The most common type of injury was in the lower limbs, knees, legs, and head (4, 13, and 14). Considering the psychological, financial and psychological losses caused by driving accidents, it can be considered a public

health priority. It is possible to control the factors affecting road accidents and resulting mortality by identifying the factors affecting driving accidents. The identification of these factors can help traffic policymakers and emergency management organization provide proper service. Therefore, this study was conducted in 2009-2014to evaluate the epidemiologic factors of trauma in road accidents in southern Iran, Jahrom.

METHODOLOGY:
This study was conducted in Jahrom City, one of southern cities in Fars Province. In this cross-sectional descriptive study, 18270 car accidents were extracted from a driving accident records assisted by emergency department of Jahrom University of Medical Sciences in a 5-year period from 2009-2014. The data with incomplete information was excluded from the study. A two-part checklist was used to collect data. The first part included epidemiological variables including age and gender. The second part included the accident related variables including accident time, accident location, daylight, and the type of trauma and injury. After obtaining permission from the ethics committee of Jahrom University of Medical Sciences under the code IR.JUMS.REC.1394.124, the subjects were assured that the information collected from them would be confidential and there would be no need to mention their full name. The data were analyzed by SPSS V14 using descriptive statistics and Chi-square test was used to compare the type of injuries caused by driving accidents and epidemiologic characteristics. Significant level was considered to be 0.05

FINDINGS:
The findings showed that in JahromCity, during a five year period (2009-2014), 57.7% of the emergency missions were residential and the rest were non-residential. 59.3% of accidents occurred during the day. In 52.9% of the accidents, motorcycle was involved. The majority of the injured in car accidents (57.3%) were between 15 and 30 years of age. 2.5% of the injured were dead and the rest were wounded (Table 1).

The accident process in the 5-year period (2009-2014), by time, showed that most accidents occurred between 12 pm and 2 pm and 6 pm to 8 pm. The peak of accidents was in the range of 10 am to 20 (Figure 1).

The most common trauma caused by 18270 emergency assisted car accidents wastrauma tothe limbs (37.9%) and head trauma (30.50%). Most injured were sent to the orthopedic and neurosurgery units (Figure 2).

The vehicles involved in car accidents were mostly car-motorcycles (35.30%) and reversal of motorcycles (23.07%) (Figure3).

In fatal road accidents, casualties occurred more in men rather than women (79.9% vs. 20.1%). Most fatal accidents occurred from 18 pm to 24 pm. The results of logistic regression analysis showed that the type of injury caused by driving accidents is related to the accident location, the age of the injured, and the daylight. The odds of death for injured people in non-residential accidents were almost five times higher than residential accidents. 78.6% of fatal accidents occurred in non-residential areas. The odds of death for the injured people in day accidents were 1.26 times higher than night accidents. 57.2% of fatal accidents and 59.4% of injury accidents occurred during the day. Meanwhile, with the increase of age, the chance of a fatal injury decreases.

Almost half of the dead in accidents were under 30. Among the injury accidents, 65.8% were under 30 years of age (Table 2). There was also a significant relationship between the type of injury caused by driving accidents and the type of vehicle collision. Carreversal accidents and car-motorcycle accidents have increased the severity of injuries in driving accidents (Table 3).

DISCUSSION:

This study aimed to evaluate the epidemiologic factors of trauma in road accidents in southern Iran, Jahrom city in 2009-2014. The result of data analysis using logistic regression showed that among the environmental factors, the risk of death of injured people in non-residential accidents was approximately 5 times greater than that in residential accidents. This indicates that the severity of accidents in non-residential areas is higher than residential areas. 78.6% of fatal accidents occurred in non-residential areas. The studies by Salamati (2014) and Navali (2013) also showed that fatal injuries are more frequent in non-residential accidents (13, 15).

In the present study, the chance of death for the injured in day accidents was reported to be 1.26 times higher than night accidents. 57.2% of fatal accidents and 59.4% of injury accidents occurred during the day. The result showed that the intensity of accidents in daylight is higher than that at night. Studies conducted by Salamati (2014), Lam (2004), and Romano (2012) also showed an increase in the severity of injuries caused byaccidents duringthe day (11, 15, and 16).

Although the severity of the injuries and deaths caused by accidents in men was (or=1.079), this difference was not statistically significant. Theseresults were inconsistent withthat of the studies conducted by Salamati (2014), which showed that the severity of injuries in women was higher than that in men (15). Whereas, a review study conducted bySadeghi-Bazargani (2016) showed that the severity of injuries in pedestrians, drivers, and male passengers was higher than that of women (17).

However, in fatal accidents, mortality rate in men was higher than that of women (OR=1.079), but there was no difference between men and women in severity of accident injuries. In Fars Province, like the present study, the number of deceased men was more than women. In the northwest Iran, this ratio was 3.34 (14, 18). This ratio varied from country to country. In Spain, it was 1.63. In the United States, the incidence of accident injuries in men was twice that in women. The studies conducted by Ansari (2013) and (2010) Ferdowsi and Heidari (2012) introduced women with more cautious and less risky behaviors (19-21).

The study results showed that with increasing age of drivers, the risk of fatal injuries related to driving accidents decreases. The highest rate of deaths and injuries occurred in the second decade (42.7%) and the third decade of life (57.7%). In Fars Province, most deceased were in their third decade of life (32.2 years) (18). The results of the studies by Romano (2012) and Vassalo (2007) and Navali (2013) showed that

young drivers play a major role in severe accident injuries. These studies suggested that one of the reasons for increased incidence of injuries in road accidents wasyounger drivers' over limited speed (14, 16, and 22). However, the study results wereinconsistent with that of the studies conducted by Salamati (2014) in Tehran (15). One of the reasons for low severity of driving injuries in drivers under 40 in Tehran is traffic jams on streets and highways and high speed cameras in highways. These factors do not allow drivers to violate speed limits and perform other driving incident violations.

The study results showed that 63.7% of the fatal accidents occurred in the afternoon and evening (12 pm to 2 pm and 6 pm to 8 pm). However, this difference was not statistically significant. This result was inconsistent with that of the study conducted by salamati (2014) (15). In Tehran, 67% of accidents occurred at 12 am-12pm. The results of studies by Romano (2012) and Vassalo (2007) and Navali (2013), like the present study, showed a correlation between the time of day and severity of accident injuries (14, 16, and 22). According to the study of Sadeghi-Bazargani (2016), accident mortality rate was higher in the summer, especially during midnight among all age groups (17).

In the present study, the most common injuries were reported to be trauma to the limbs (37.9%) and then head injury (30.50%). This result wasobtaineddue to the fact that all traumas caused by road accidents in Jahromwere referred to Peymanieh Hospital. The studies by Navali (2013) reported the most injuries to the knees, legs and head (14). Whereas,the study of Ansari (2013) reported head injuries as the most frequent (19). The most common injuries in Fars Province were head injury in all ages (18).

The study of Yadollahi (2017) reported chest and head injuries associated with death after car accidents among the people older than 65 (23). In the present study, the majority of vehicles involved in accidents were motorcycle-car (35.30%) and motorcycle reversal (23.07%). This was despite the fact that in Fars Province, the most accidents were related to the car-car collision (52.3%) (24 S.T. Heydari). In the study by Salamati (2014), cyclists caused 55% of

injuries and were the most important cause of injuries (15, 24).

CONCLUSION:

This study was conducted to investigate the relationship between epidemiologic characteristics and type of accident injuries in Jahrom City from 2009-2014.

The study results showed the effective role of gender, daylight and age in the type of injury in road accidents in Jahrom. The risk factors identified in this study and similar studies should be taken into consideration by relevant authorities in future policies. Younger age increases the risk of injuries in driving accidents. Therefore, educational programs should be considered to change the attitude and behavior of human factors, especially younger drivers. Non-residentialand suburban roads have increased the number of injuries caused by accidents especially reversal accidents. Therefore, preventive measures and appropriate plans seem necessary to improve road safety, police precautionary monitoring, and compliance with traffic laws such as mandatory use of safety belts and required training for controlling speed limit and other laws, especially in suburban roads. Given the role of motorcycles in over 58% of driving accidents, it is essential to train motorcyclists regarding the use of safety helmets and to monitor their traffic behavior. Moreover, the trauma to the limbs and head injuries caused by traffic accidents should be considered a major problem, and training the general public, especially regarding the use of safety belts and helmets to prevent trauma, should be a priority. In the end, it seems that future policies need to focus on precise and targeted planning, combined with human factors and traffic engineering principles.

Table 1: Descriptive indicators of Driving Accidents in Jahrom City

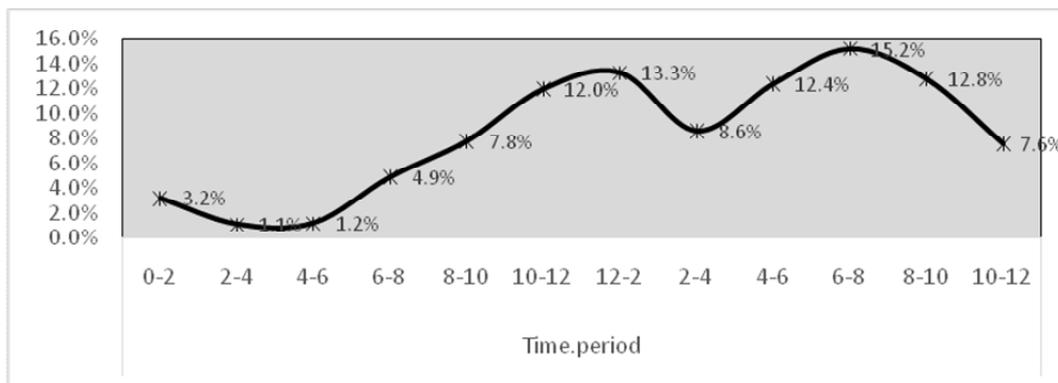|		Number	Percentage
Accident location	Non-residential	7724	42.3%
	Residential	10546	57.7%
Season	First quarter	4845	26.5%
	Second quarter	4689	25.7%
	Third quarter	4691	25.7%
	Fourth quarter	4045	22.1%
Age	<15	1355	8.0%
	15-30	9681	57.3%
	31-60	4735	28.0%
	>61	1131	6.7%
Gender	Male	13821	80.9%
	Female	3255	19.1%
Daylight	Night	7435	40.7%
	Day	10835	59.3%

Figure 1: The process of emergency assisted driving accidents in a 5-year period by time
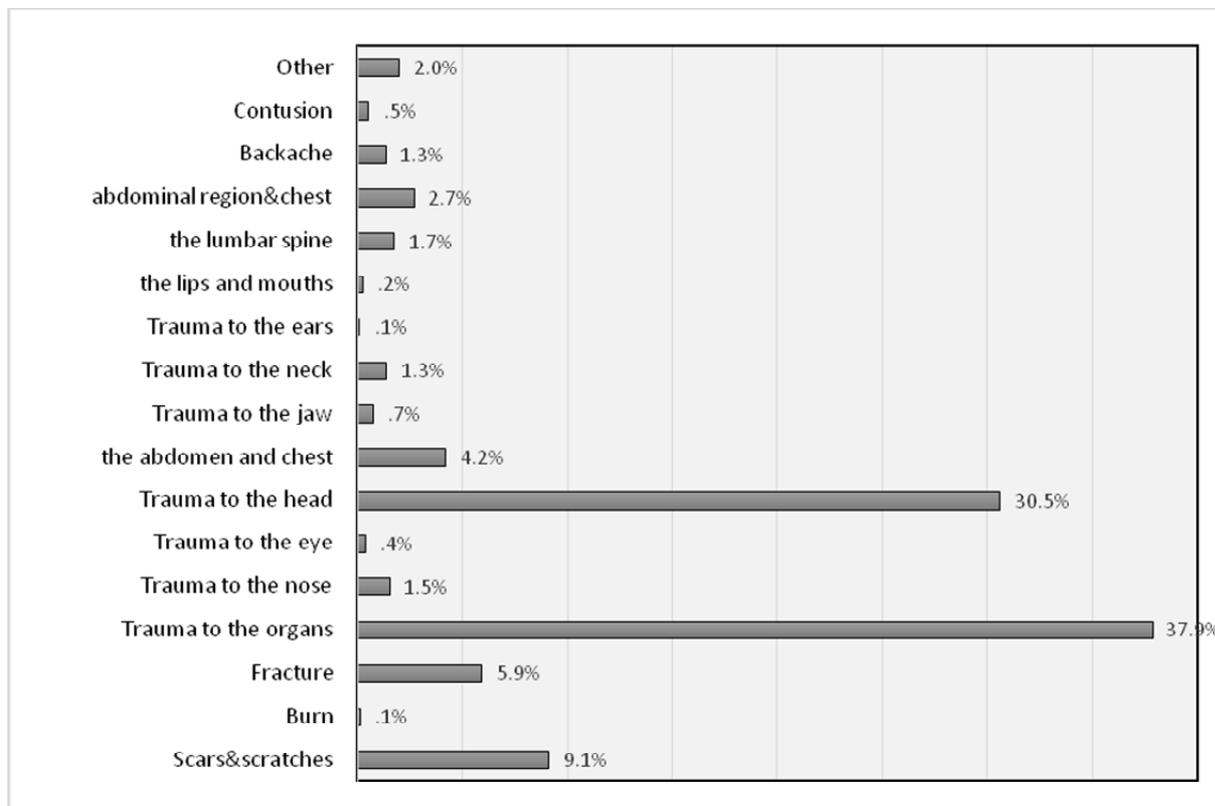

Figure 2: Frequency of traumacaused by emergency assisted driving accidents

Table 2: The relationship between the types of injuries caused by driving accidents and epidemiological characteristics

| | | Trauma type | | | | OR | p-value |
| | | Fatal | | Injury | | | |
		N	%	N	%		
Accident location	Non-residential	364	78.6%	7360	41.3%	4.965	0.001
	Residential	99	21.4%	10447	58.7%		
Season	First quarter	118	25.5%	4727	26.5%	0.962	0.380
	Second quarter	110	23.8%	4579	25.7%		
	Third quarter	126	27.2%	4565	25.6%		
	Fourth quarter	109	23.5%	3936	22.1%		
Gender	Male	366	79.9%	13455	81.0%	1.079	0.529
	Female	92	20.1%	3163	19.0%		
Age	<15	30	6.7%	1325	8.1%	0.607	0.001
	15-30	191	42.7%	9490	57.7%		
	31-60	149	33.3%	4586	27.9%		
	>61	77	17.2%	1054	6.4%		
Daylight	Night	198	42.8%	7237	40.6%	1.263	0.034
	Day	265	57.2%	10570	59.4%		
Time	0-6	31	6.7%	972	5.5%	1.061	0.951
	6-12	137	29.6%	4378	24.6%		
	12-18	128	27.6%	6137	34.5%		
	18-24	167	36.1%	6320	35.5%		

Table 3: The relationship between the types of injuries caused by driving accidents and the type of vehicle

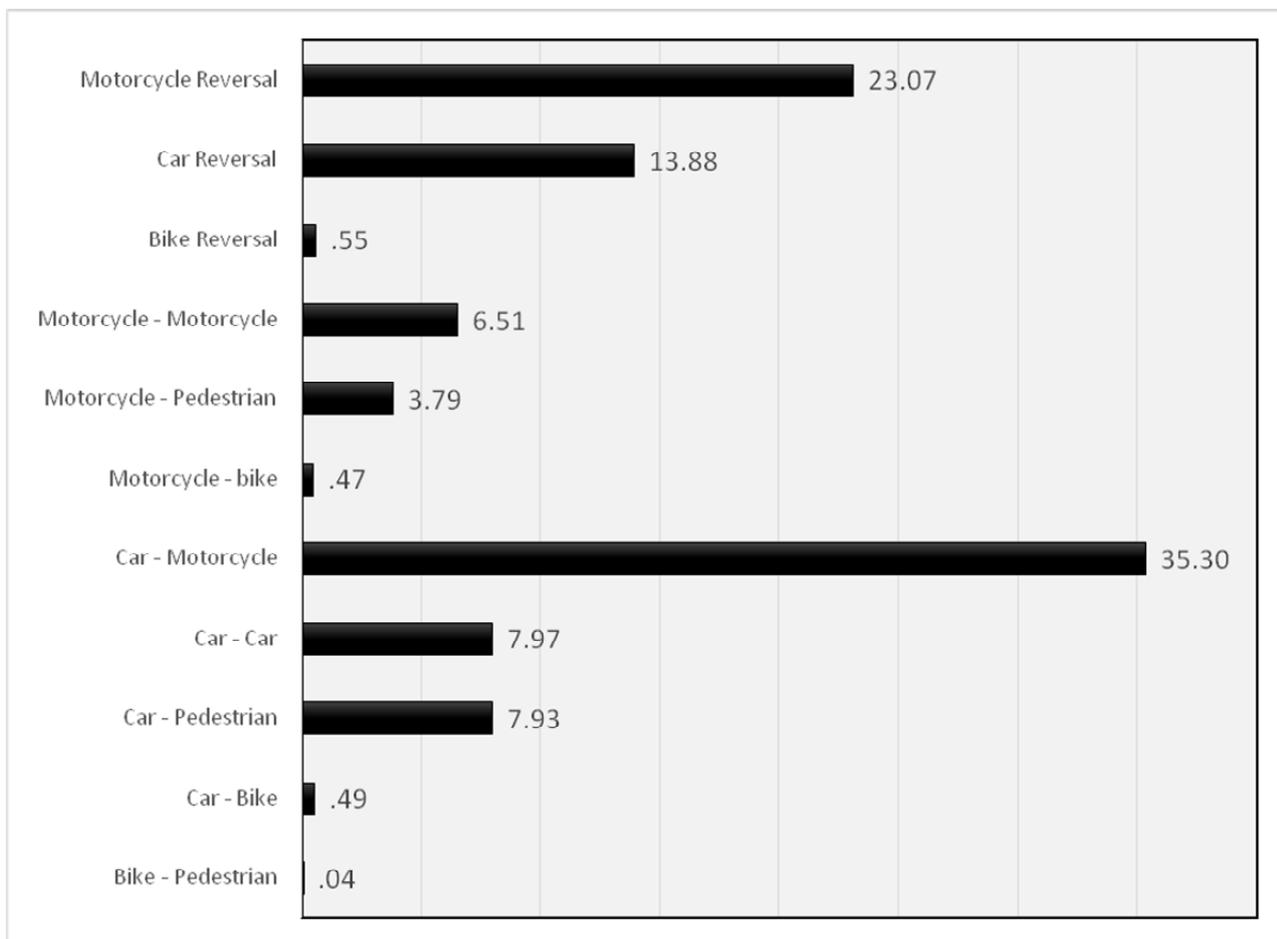| | Trauma type | | | | p-value |
| | Fatal | | Fatal | | |
	N	%	N	%	
Bike - Pedestrian	1	0.2%	4	0%	0.001
Car - Bike	0	0	69	0.5%	
Car - Pedestrian	55	12.6%	1053	7.8%	
Car - Car	78	17.9%	1035	7.6%	
Car - Motorcycle	87	20%	4844	35.8%	
Motorcycle - bike	1	0.2%	64	0.5%	
Motorcycle - Pedestrian	5	1.1%	525	3.9%	
Motorcycle - Motorcycle	16	3.7%	893	6.6%	
Bike Reversal	1	0.2%	76	0.6%	
Car Reversal	153	35.2%	1785	13.2%	
Motorcycle Reversal	38	8.7%	3184	23.5%	

Figure 3: Frequency of the vehicles involved in emergency assisted driving accidents