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Original Article

Epidemiologic Pattern of Fatal Traffic Injuries among Iranian Drivers; 2004-2010

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Abstract

Background: Due to their specific nature, such as high incidence, high intensity and direct involvement of all members of society, traffic injuries are of particular importance. Through a mega data, this study investigated the epidemiological aspects and depict current situation of road traffic injuries in Iran.

Methods: Using legal medicine and traffic police data, deaths from road traffic injuries in men were predicted through determining the most appropriate model for death using time series statistical models; and then most important human factors associated with it in a period of 6 yr in Iran was analyzed using multi-nominal regression model.

Results: The frequency of deaths from traffic injuries in the last seven years was 172,834 cases and the number of deaths at the accident scene was 42798 cases, of which 24.24% (41,971 cases) were recorded by the Traffic Police experts. Death rate from traffic injuries has been declined from 38 cases per 100,000 people in 2004 to 31 cases per 100,000 people between 2009 and 2010. Fatigue and sleepiness (AOR=10.36, 95% CI: 8.41-13.3) was the most significant human risk factors for death outcome in the urban and suburban traffic injuries. According to the predictions, the death rate is about 16488 (CI 95%, 8531-24364) for the year 2012.

Conclusion: Despite all measures to prevent such injuries, even fatal injuries have still a high incidence. Intervention in the human risk factors field would be more effective due to their important roles in traffic injuries in Iran.

Keywords: Epidemiology, Traffic injuries, Trend, Human factors, Iran

Introduction

Due to their specific nature, such as high incidence, high intensity and direct involvement of all members of society, traffic injuries are of particular importance. This role can be seen much in the low-and middle -income countries such as Iran (1). Among the reasons, a rapid increase in the number of motor vehicles, increased exposure to risk factors such as speed and alcohol use [by drivers], as well as inadequate rules for traffic safety and poor public health structures can be mentioned (2, 3). Identification and exact depicture of the situation is the first essential step to reduce and control these events (4). Human behavior complexities, influenced by various and numerous cultural, educational, economic, social, and mental health factors, are effective on how drivers and passengers of vehicles and pedestrians, as traffic users, act; and play a main role in shaping safe traffic behavior and respect for law (5).

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Since traffic injuries in the world, especially in Iran, is one of the most important public health problems, continuous and effective prevention for traffic injuries requires coordinated and comprehensive efforts. Although sufficient attention must be paid to several factors in a comprehensive preventive program to reduce accidents or fatalities, but it seems that intervention in the human factors would be more effective due to their important role in traffic injuries in Iran. Human factors mean pedestrians, passengers and drivers; and psychological, behavioral, social and cultural factors effective on them (2, 6, 7).

Despite the efforts made in the field of traffic injuries in Iran by the three organs of Ministry of Health and Medical Education, Traffic Police and Ministry of Roads and Urban Development, numerous casualties and financial losses in this area are witnessed because of the lack of coherent planning and lack of a health approach to this issue in the country (8). Due to lack of comprehensive studies in the field of measurements on cost-effectiveness of performed interventions and the trend of these accidents in the country, it was not possible to evaluate properly the situation of traffic injuries.

Comparative analysis of observed trends of traffic injuries and issues related to the road safety, have attracted the attention of researchers in the recent decades (9, 10). Generally, the projects carried out to investigate the process of a health event such as death, are applicable in the following cases:(11) A- Comparing the relevant situation with the similar situation in other countries; B- Witnessing the results of efforts made with the aim of reducing or moderating the relevant event; C- Directing the measures to control the relevant event more effectively.

Providing detailed suggestions to modify the meticulous care system of the event; D- Better understanding of the factors influencing the occurrence of deaths caused by relevant accident**;**

Finally, from the above-mentioned discussion it is inferred that in line with the preventing the burden of such accidents in the country, knowing which intervention is more valuable in the prevention of deaths caused by traffic injuries will direct authorities to a better planning and consequently preventive programs will lead to more efficiency in that area with lower costs.

This study investigated the epidemiological aspects and depict current situation of road traffic injuries in Iran.

Methods

This study investigated the all human risk factors for fatal traffic injuries and then the trend of deaths caused by traffic injuries in male drivers were dealt with using time series models in Iran from March 2004 to March 2010. In this study, all persons injured from traffic injuries including motor vehicle drivers with two or more wheels, passengers, pedestrians recorded in mechanized systems of ICT Department of Traffic Police in the Mar 2004 to Mar 2010 were included in whole number in the study and the sampling was not required. The data for deaths caused by traffic injuries in the years Mar 2004 to Mar 2010 registered in Iran Legal Medicine Organization were used for determining the trend of death in men**.**

As the data of traffic injuries leading to injury or death are recorded by the three organs of Ministry of Health and Medical Education, Iran Legal Medicine Organization and the State Traffic Police including the traffic police (urban) and (suburban), it is ideal for the study in the field of traffic injuries to list all data collected from all sources and to analyze them after removing duplicates and summarization of data. However it must be said that each of these sources has their own limitations which reduce the possibility of aggregation of this data**.**

For example, the data related to traffic injuries - recorded in hospitals- has no information about the cause of accidents and generally the traffic features of the accidents. They only have some demographic and injury-related information which are not suitable for determining strategies for the prevention of traffic injuries. Moreover, the Traffic Police records only those deaths caused by traffic injuries happened only at the accident scene. To solve this problem, deaths occurred within 30 days after the accidents are confirmed

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and recorded by Legal Medicine Organization. The main sources and administrations responsible for recording these accidents in the country, i.e. ICT Department of Traffic Police (FAVA) and the Data Processing Department of Legal Medicine were used for data collection. About the data related to the Traffic Police, Data collection forms (COM 114) are added, as online, to the General Information Support System (FAVA) after being filled out by accidents' experts in each city or region of the country.

The data were stored in four separate tables including accident-related information tables. In the relevant database used for data links, three codes having title, serial number, series, and date of accident were used in each of four tables within the format of Microsoft Access Office Program. Accordingly, the data processing capability was first enhanced through transferring the tables to the SAS software; and then, considering these issues, the processing phase was carried out to determine the duplicated codes that were identical in every respect with each other. In the table of passengers, for example, a code was repeated 52 times. After identifying these cases, all of them were reduced to 1 code. In doing this, all codes were converted to the once-repeated codes in the accident-related tables; and then the repeated cases were excluded. The next step was to link the tables together in a final file. For this purpose, the data relating to the accident were considered as reference and other data were linked while considering the above-mentioned three codes.

Validity of the source of data in this study has been discussed in previous studies (2, 12). According to ICD10, traffic injuries are categorized by codes V01-V99 which include accidents occurred in various transportation industries such as air, rail and sea. In this study, traffic injuries, occurred in the field of road transportation, are considered and therefore, those accidents with the involvement of two or more –wheeled motorized vehicle were included. Other accidents nonconforming with this condition were excluded from the study. For example, an accident caused by a collision between a bicycle (cyclist) and a pedestrian was not included. Human risk factors discussed in this study include closing or not closing the seat belt, disregarding the regulations, Deliberately violating traffic laws, failure to recognize the right of others passing, Driver rush, Fatigue and sleepiness, weakness, body weakness due to aging, Driver impairment, drugs and alcohol use and not being familiar with the road. To assess the effect of each of the variables mentioned, the Multi Nominal Logistic Regression Model was used. The purpose of using this type of regression by researchers is the lower Akaike Information Criterion (AIC) of this model compared with other fitted models such as binominal logistic and ordinal logistic models.

Response variable in this model is the consequence of traffic injuries which could be accident leading to death, injury and not-injury accident. Considering the non-injury category as the reference category, the chance of being in each of the categories leading to death or injury were reported based on it. The details of this model have already been published elsewhere (13, 14). For realizing the secondary goal of the study, firstly, Box-Jenkins Modeling was used to find the best seasonal ARIMA model for the aggregated monthly number of accidents. Secondly, statistical forecasting was used to predict the future total number of fatal accident data by utilizing the fitted model. It is necessary to mention that as the number of years studied was numerically low and the prediction model presented in terms of the year was not accurate enough, months of accidents were used instead of the years of the accidents. Estimation of changes in the number of accidents over time and making necessary adjustments to change risk factors were carried out using Poisson regression. If we consider the classical process as

$Yt = b_1 Y_{t-1} + \epsilon_t$,

Where $|b_1| < 1$ and $\{\epsilon_t\}$ is a sequence of independent and identically distributed (iid) normal random variables with zero mean and variance σ^2. This is a standard model used for the analysis of real valued time series. It implies that the value of the process at time t depends on the value of the process at time $(t - 1)$ plus a random error. Note that the random component of the model belongs to the exponential family of distribution.

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To make analysis of data time series (ARIMA models), several evaluation steps were performed which include elimination of the non-stationary components, identification of an appropriate ARIMA model, estimation of parameters, analysis of residuals and evaluation of prediction models, respectively. ARIMA and SARIMA models are extensions of ARMA class in order to include more realistic dynamics, in particular, respectively, non stationarity in mean and seasonal behaviors.
The proposal of the current study was approved at Shahid Beheshti University of Medical Sciences.

Results

Data of 5774078 injured drivers in inter-urban routes including 5,262,832 males (91.1%), 511,246 females (8.9%), and 374,763 drivers in suburban routes (including 2.3% females and the remaining males) were used. The mean age was 34.4± 12.4 yr for men and 29.1 ± 13.1 yr for women. In sum, in the studied traffic injuries, the minimum age was 15 yr and the maximum age was 81 yr**.**
The frequency of deaths from traffic injuries in the last seven years was 172,834 cases and the number of deaths at the accident scene was 42798 cases, of which 24.24% (41,971 cases) were recorded by the Traffic Police experts.
As Table 1 shows, the growth rate of deaths per 100,000 people from traffic injuries has been declining, so that the growth rate of death was declined by 3.09% from 2008 to 2009. Death rate at the accident scene to the total deaths from traffic injuries was increasing, so that it has risen from 21.32% in 2004 to 49.27% in 2010. The frequency distribution of studied human risk factors, separately for their consequences for the entire country has been reported in Table 2. As data on risk factors of the traffic injuries including human and environmental factors as well as factors related to vehicles were only found in the database of Traffic Police, the frequency of human risk factors leading to death is only related to the deaths recorded at the accident scene by the accident experts.
The inter-urban traffic injuries the human factor of disregarding the regulations (74.5%), Driver rush (18.5%) are accounted for the most common factors (Table 2).
In suburban traffic injuries leading to death, Driver rush and disregarding the regulations were accounted for the highest frequency among other factors. As far as the consequences of being injured or uninjured from accident are concerned, the human factor of disregarding the regulations, Driver rush and Fatigue and sleepiness are accounted for the highest frequency among other factors. Then, the most important risk factors leading to injury and death were discussed. To determine the odds ratio for each risk factor, nominal logistic regression was used because it has the lowest AIC criterion among a number of fitted models.

Table 1: The rate of deaths at the scene caused by traffic accidents from 2004 to 2010

Year	Population**	Total death*	The ratio of death at the scene to the total deaths (%)	death at the accident scene ***	Percentage of changes
2004	68344730	26089	21.32	5561	-
2005	69390405	27677	14.90	4123	4.49
2006	70495782	27565	14.91	4111	-1.97
2007	71532063	22918	17.61	4036	-18.06
2008	72583587	23362	16.60	3878	0.46
2009	73650566	22974	38.33	8807	-3.09
2010	74733230	23249	49.27	11455	-0.27
Total	68344730	173834	24.14	41971	-

Source: Legal Medicine Organization*
Iran National Center for Statistics**
Traffic Police***

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Table 2: The frequency distribution of studied human factors, separately for each consequence of traffic injuries in the entire country between the years 2005 and 2010

	Risk factors	Consequences					
		Death		Injury		No Injuries	
		Number	Percentage	Number	Percentage	Number	Percentage
Urban Traffic injuries	Driver rush	30.42	22.60	204825	22.31	959036	17.89
	disregarding the regulations	6055	44.99	633459	69.00	4044300	75.42
	failure to recognize the right of others passing	78	0.58	6790	0.74	37334	0.70
	Drug abuse	64	0.48	261	0.03	1098	0.02
	Deliberately violating traffic laws	197	1.46	3893	0.42	11510	0.21
	Fatigue and sleepiness	39	0.29	2944	0.32	25336	0.47
	not being familiar with the road	11	0.08	3053	0.33	6741	0.13
	Alcohol use	3	0.02	393	0.04	3494	0.07
	Driver impairment	5	0.04	594	0.06	2176	0.04
	Body weakness due to aging	1	0.01	97	0.01	788	0.01
	Failure in correct cargo containment	325	2.41	60	0.01	118	0.00
	Others	598	4.44	27413	2.99	190671	3.56
	None	3042	22.60	34310	3.74	79457	1.48
	Total	13460	100.00	918092	100.00	5362059	100.00
Sub-urban Traffic injuries	Driver rush	4589	40.75	32915	35.25	91300	30.68
	disregarding the regulations	4091	36.33	44621	47.79	157921	53.06
	failure to recognize the right of others passing	119	1.06	1120	1.20	2606	0.88
	Drug abuse	4	0.04	27	0.03	82	0.03
	Deliberately violating traffic laws	33	0.29	374	0.40	847	0.28
	Fatigue and sleepiness	898	7.97	3417	3.66	8747	2.94
	not being familiar with the road	45	0.40	302	0.32	1000	0.34
	Alcohol use	9	0.08	31	0.03	149	0.05
	Driver impairment	9	0.08	57	0.06	177	0.06
	body weakness due to aging	13	0.12	71	0.08	111	0.04
	Failure in correct cargo containment	1	0.01	10	0.01	62	0.02
	Others	120	1.07	1437	1.54	6979	2.34
	None	1330	11.81	8994	9.63	27635	9.29
	Total	11261	100.00	93376	100.00	297616	100.00

Consequences of traffic injuries in this model are dependent variable (considering uninjured individuals as the reference) and the risk factors of traffic injuries were considered as the independent variables. This model has been adapted in terms of the factors effective on being injured or dying in traffic injuries.

The results of this regression model for inter-urban traffic injuries indicate that with taking into account the age, sex and daylight (brightness), those drivers that do not apply the seatbelt have 4.85 times greater risk of dying from inter-urban traffic injuries compared with those who use the seatbelt. About assessing the effect of studied hu-

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man factors on the consequences of the accidents, those who did not have any of these risk factors were considered as the reference category. In this model, with taking into account the age, sex, and daylight (brightness), it can be observed that among 11 studied human factors, 8 cases had very high and significant effect on the consequences of accidents, i.e. being included in the category of consequences leading to death. Among these factors, the most frequent effects are related to the failure in correct cargo containment, lack of familiarity with the road, Fatigue and sleepiness and alcohol use, respectively. The results for the category of injured people show that those drivers who do not apply the seatbelt have 4.25 times greater risk of being injured from inter-urban traffic injuries compared with those who use the seatbelt.

All studied human factors have very high and significant effect on the consequence of accidents, i.e. being included in the category of accident consequences leading to the injury. Among these human factors, the most frequent effects are related to the lack of familiarity with the road, failure in proper cargo containment, deliberately violating traffic laws, Driver impairment and drug abuse, respectively. The results of this regression model for suburban traffic injuries also show that taking into account the age, sex, daylight (brightness), those drivers that do not apply the seatbelt have 2.66 times greater risk of dying from suburban traffic injuries compared with those who use their seatbelt.

In this model, with taking into account the age, sex, and daylight (brightness) as far as suburban traffic injuries are concerned, of 11 human factors, 7 factors have a very high significant effect on the consequence of the accidents, i.e. being included in the category of accident consequences leading to death. Moreover among these human factors, the most frequent effects are related to the Fatigue and sleepiness, drug abuse, lack of familiarity with the road, not recognizing the contribution (right) of others passing, Driver rush and Deliberately violating traffic laws, respectively. Then, according to the steps mentioned in the procedure, the trend of deaths from traffic injuries in the years 2005 to end of 2010 among men are discussed and assessed. In this analysis, due to the increased precision, months were used instead of the years.

Fig. 1 shows that the range of the time series is seasonal and almost non-stationary. The data of this time series has been collected on a monthly basis. The figure shows that with each viewing, the changes pattern is repeated once. Therefore, there are some evidences of seasonality of series. However, the value of series is averagely reduced with the time increase. Increases in certain months of the year which have the largest number of trips (summer months) are more evident. Thus, time series have the signs of being non-stationary. Ka-squared statistic of autocorrelation coefficients is significant for the lags 6, 9 and 18 of the time series at >0.001. The coefficient of the first lag is about 0.9 which indicates non-stationary series. Finding a model for the time-series is reasonable when there is at least a first-order correlation between observations of the final series (static).

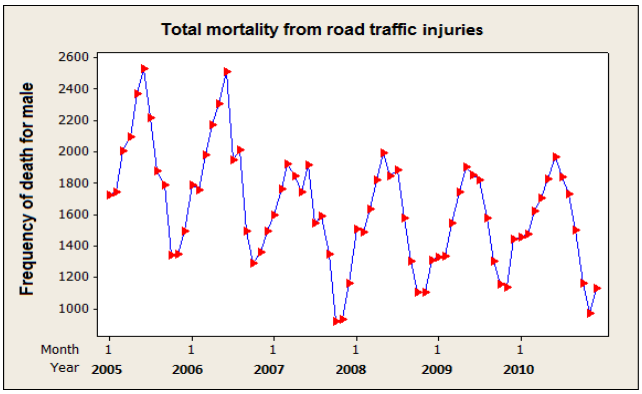

Fig. 1: Time series of deaths from traffic injuries for men by month and year during 2004-2010

Results showed the partial autocorrelation coefficients of the time-series of deaths from traffic injuries among men for the first 18 values. Analytical results of figure for the time-series autocorrelation coefficients show that time-series of mortality in men is non-stationary, so subtraction should be done to make it static.

Seasonal or non- seasonal subtraction with an order more than 1 is not necessary. Second-order non- seasonal subtraction increases the AIC crite-

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rion. Second-order seasonal subtraction increases also AIC. The higher order subtraction triggers the differences. According to the above Table, the minimum value for AICF is found in the model SARIMA (0, 1, 1) x $(0, 1, 1)_{12}$ (759) which a suitable model for the fitting of the series. The next step in doing estimation phase of model fitting is to assess the autocorrelation of residuals after model fitting. The test statistic under the null hypothesis (which indicates being uncorrelated) does not pass any of the remaining intervals.

In the examination of autocorrelation coefficients of the model residuals, ACF and PACF, none of the vertical lines representing the autocorrelation with a certain delay was outside the horizontal dash line. This indicates that the null hypothesis is not rejected ($r_k = 0$) at a significance level of 5% and the residuals are independent from each other.

Mortality rate from traffic injuries among men in Iran for years between 2011 and 2012 using Seasonal Auto Regressive Integrated Moving Average (SARIMA) (0, 1, 1) x $(0, 1, 1)_{12}$ model is forecasted as follows:

The present model suggests that, according to the predictions, with approximately 17,088 deaths and confidence range of CI 95% in 2011 in Iran, there is a negative growth of 7.06 percent compared with the year 2010. The death rate is about 16488 (CI 95%, 8531-24364) for the year 2012. There is a negative growth of 3.75% for the year 2012 compared with the year 2011 (Fig. 2). Besides, the highest rate of mortality from traffic injuries for men in Iran have been occurred in the months of Aug and Sep in both above years.

Discussion

Traffic injuries behavior in the national roads is an iterative process repeated in the years within a curve. The constant factors involved in the occurrence of traffic injuries, including damaged roads, black spots, old cars, and many other social and economic factors which are effective on the duration and manner of driving need planning in order to be removed (15).

As results showed the total number of fatal accidents at scene increased during the studied years, this event may be due to lack of appropriate prehospital care, increasing the production of without quality vehicles, lack of attention to the issue of driver training and increase in travels intercity.

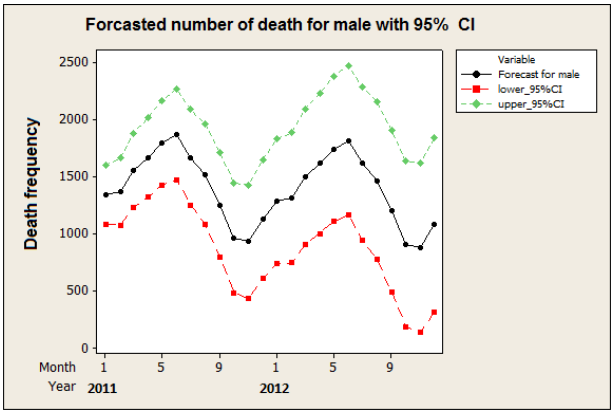

Fig. 2: Prediction of mortality rate from traffic injuries in the years 2011 and 2012 for men

Among the factors listed, fatal traffic injuries have mostly been associated with human factors and more importantly, these factors are preventable (16). In this study, the multinomial regression model was used to estimate the effect of the studied risk factors. In recent decades, the uses of statistical methods to analyze data resulting from traffic injuries have been become common (17). The use of this kind of analysis was led to the increase in the accuracy and speed of estimations resulting from traffic data. In this study, with taking into account the multiple models and their fittings, AIC was used and its lowest value was considered as a better fitting for the model. In this study, the age of driver, for the consequences of death and being injured, was associated with a modest increase in the risk of death in suburban traffic injuries. In this regard, several studies have been conducted about the effect of age on the incidence and severity of road accidents in the world (18, 19).

Younger age is associated with more severe accidents and more incidences. In one of the studies conducted on the effects of age on drivers' behavior, it was shown that in both sexes, the accurate quantity classification of the relationship between the risks of death as a result of accidents with the

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same intensity is not comparable. The author has cited that this lack of comparability is due to the unpredictable behavior of the individuals (20). In a study on human factors of traffic injuries, Bakhtiyari et al. described the role of age in the urban road traffic injuries with no statistically significant difference and in the suburban roads with a slightly increased risk of death or injury. In this study, the specific statistical methods were used to analyze the data (2).

About the sex variable, the males are risk factors in the urban roads, but they have a protective role in suburban routes (For example, the odds ratio of death for men in urban roads is equal to 2.18 and in suburban roads is equal to 0.61). Among the realistic reasons for this issue in Iran, being at a more risk of having accidents due to the occupational, cultural, social, and more car ownership can be mentioned.

Many studies have been published regarding the effect of gender on the incidence of traffic injuries. They have pointed out various problems including physical condition and ability to deal with risk in the same condition or better skills of men, but in Iran, there is equal access to traffic training for receiving driving license. On the other hand, with the advent of a new generation of vehicles in the country, equipped with an easy flow steering (hydraulic), the issue of physical condition and more skills of men are not discussed. Although in Iran and around the world, a few studies have been conducted to evaluate this role (21, 22), but according to the researcher of this article, conducting a qualitative study to obtain the more realistic reasons, is not far-fetched. With a brief glance at events in the country, we can conclude that gender and age of the drivers and front-passengers of vehicles have little differences in most cases. This opportunity can be used to analyze the role of gender in future studies, although about the issue of the age, the situation will not be easy and its analysis requires its own requirements (23). As far as the time of occurrence of events (accidents) is concerned, for the consequences of death and injury, driving at dusk is considered as a risk factor by drivers.

(For urban routes and death consequences OR = 5.96). In other words, the odds ratio of death in the evening among drivers who may be driving this time is approximately six times compared to the death rate of those who drive during the day. Among the reasons for this, the busy streets and more possibility of the incidence of accidents can be mentioned. Studies have shown that more than half of accidents (crashes) leading to death or injury are occurred in daylight. However, only 29% of them occur in the dark (no sunlight or artificial lighting). Thus, the climate condition and the light level at which most accidents leading to injury or death occur is associated with the daylight, during which any rainfall or environmental factors does not restrict the visibility and the pavement is dry. It is noteworthy that for every one person died in an accident in the dark or when snow falls, 87 people lose their lives in the daytime (daylight) under good weather and for every one person who is died in the dark and rain, 19 people lose their lives in the daytime (daylight) under good weather in the crashes (24). Then, the most important human risk factors leading to injury and death will be discussed. As Table 3 shows, as far as the consequence of death in the urban roads is concerned, the main causes of death were lack of familiarity with the road, fatigue and sleepiness, not using the seat belt and alcohol use. But in the suburban routes, the most important cause of death was Fatigue and sleepiness of drivers.

For other consequences of injuries from accidents, the results have been shown in Table 4. The most important factors the Traffic Police face with for reducing traffic injuries in the country, Fatigue and sleepiness and institutionalizing the culture of using safety belts by drivers and passengers of vehicles can be mentioned. Many studies have been conducted on not using seat belt and the severity of traffic injuries in the country and other countries. And researchers support the results of this study (25, 26). Using the seat belt is also an example of secondary prevention and it does not prevent the occurrence of accident, but it can decrease the intensity of accident. About the lack of familiarity with the road, observance of traffic rules is considered as the best way to deal with

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this risk factor. Although alcohol use is banned in the country; and a small number of young drivers illegally use it, but as far as its effect on driving behavior is concerned, it can be prevented and is considered one of the training examples. Traffic injuries are recognized as the most important social-cultural issues in Iran. Despite all measures to prevent such accidents, even fatal accidents have still a high incidence.

Table 3: Multinominal logistic regression model to determine the effects of studied human factors on the deaths and injuries caused by traffic injuries among urban and suburban drivers

Outcomes	Variables	Category	Urban			Suburban		
			AOR	%95 CI	P-value	AOR	%95 CI	P-value
Death	Age	Year	1.87	0.98-3.33	0.21	1.32	1.02-5.76	0.037
	Gender	Male	2.18	1.88-2.52	0.001	0.61	0.42-0.72	0.001
		Female	Reference			Refer-ence		
	Seat belt use	No/Yes	4.85	4.56-5.09	0.001	2.66	2.16-3.1	0.001
	Driver rush	Yes/No	2.99	1.81-3.14	0.001	1.8	1.5-2.22	0.001
	failure to recognize the right of others passing	Yes/No	1.37	0.84-2.23	0.001	2.14	1.26-3.65	0.005
	Drug abuse	Yes/No	-	-	-	4.67	2.12-9.42	0.001
	Deliberately violating traffic laws	Yes/No	2.53	1.9-3.23	0.001	1.51	0.8-2.84	0.196
	Fatigue and sleepiness	Yes/No	5.67	3.29-7.88	0.001	10.36	8.41-13.3	0.001
	not being familiar with the road	Yes/No	6.62	5.87-10.22	0.001	2.43	1.65-5.21	0.009
	Alcohol use	Yes/No	4.58	4.2-5.0	0.001	-	-	-
	body weakness due to aging*	Yes/No	4.02	3.14-9.06	0.001	-	-	-
	Failure in correct cargo containment	Yes/No	6.84	3.26-12.53	0.001	-	-	-
Injury	Age	Year	0.99	0.88-3.41	0.067	1.08	1.03-1.11	0.025
	Gender	Male	1.42	1.4-1.44	0.001	0.85	0.72-1.02	0.17
		Female	Reference			Refer-ence		
	Seat belt use	No/Yes	4.25	1.22-4.37	0.001	2.49	2.14-2.9	0.001
	Driver rush	Yes/No	5.69	5.28-6.14	0.001	1.62	1.53-1.78	0.001
	Disregarding the regulation	Yes/No	3.53	3.26-4.82	0.001	-	-	-
	failure to recognize the right of others passing	Yes/No	5.63	5.2-6.23	0.001	1.75	1.49-2.08	0.001
	Drug abuse	Yes/No	5.85	4.87-6.22	0.001	1.53	0.78-2.99	0.21
	Deliberately violating traffic laws	Yes/No	9.61	8.77-10.52	0.001	1.72	1.46-2.04	0.001
	Fatigue and sleepiness	Yes/No	3.58	3.2-4.0	0.001	2.75	2.39-3.16	0.001
	not being familiar with the road	Yes/No	12.78	11.14-14.06	0.001	1.59	1.38-2.03	0.001
	Alcohol use	Yes/No	3.84	3.26-4.53	0.001	-	-	-
	Driver Impairment	Yes/No	7.86	6.39-8.54	0.001	-	-	-
	body weakness due to aging	Yes/No	5.28	4.09-6.82	0.001	-	-	-
	Failure in correct cargo containment	Yes/No	11.7	8.68-16.29	0.001	-	-	-

About assessing the effect of human factors on the consequence of the accidents, those who did not have any of these risk factors were considered as the reference category.

*Age> 65 yr

Table 4: SBC & AIC values for the estimation of RIMA models by the first subtraction and also through first-order subtraction and then twelfth order of the time-series

Row	With 1st order subtraction			With 1st order and then 12th order subtraction		
	Model	AIC	SBC	Model	AIC	SBC
1	ARIMA(0,1)	962	967	ARIMA/(0,1)	773	777
2	ARIMA(0,2)	962	967	ARIMA/(0,2)	783	788
3	ARIMA(0,12)	944	949	ARIMA/(0,12)	768	773
4	ARIMA(1,12)	946	953	ARIMA/(1,12)	759	765
5	ARIMA(2,12)	946	952	ARIMA/(1,12)	770	776

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In this study it is tried to show the occurrence of these accidents and also its evolution over time. By putting together data from 2005 to Jan 2010, and drawing a time-series of mortality rate based on which, it can be found that this time-series is seasonal and non- static. Considering the time period of data entry which was monthly, an annual pattern can be observed in these data. Also the values of series are averagely decreased with increasing time. Given the decline and prediction of decline of deaths from traffic injuries for the years of 2011 and 2012, the deaths and injuries caused by road accidents have been increased over the past 40 yr, but in recent years we have witnessed a halt and then a reduction in this trend. This increase was rose rapidly in 1999, coinciding with an increase in domestic car production. The figure of 27,789 people killed, as the peak of the disaster was recorded in Kosher. This trend experienced a slight decline in 2006 for the first time after four decades of increase and reached to 27,567 people. This decrease was significant in 2007 with a recorded figure of 22,918 918 people. Then again it remained unchanged at about 23,000 people. Estimates in 2011 indicate that a reduction more significant than ever, of approximately 14%, occurred and it is predicted the number of people dying in accidents not to go higher than 20,000 people. The reasons for this decline is likely due to the interventions such as changes in the rules of driving violations, police measures, improvement of traffic infrastructures in the country, improving health services, especially in the pre-hospital part. Police measures in this regard include applying rules and regulations as to seriously deal with those who violate traffic rules, mandating the use of motorcycle helmets, safety belts in passenger cars, establishment of fixed and mobile police stations in the highways and country roads and making changes in the attitudes of people and teaching people using mass media. Iran is located in a privileged position as far as this issue is concerned. This decline has started in Iran much earlier than in other developing countries, but there are serious concerns about the stability and continuity of the process of reducing and there is a serious gap with the ideal situation.

Some studies showed that conventional Auto Regressive Integrated Moving Average (ARIMA) models used for the prediction of road accidents are less accurate than time series Poisson regression models including models of Box Jenkins. Probably the low number of events (accidents) in a short period of time and deviations from Normality in ARIMA models as the reasons for it (10, 27). Given the high number of road accidents in Iran, the use of his proposed method did not seem suitable. Therefore, the conventional model was used in this study. This study can be considered as the first sample of time-series analysis of the traffic injuries, how the data is predicted and also the estimates of their unreliable points in Iran. The predictions made in this study can be used as health strategies and development of preventive measures in road accidents in a short period in Iran.

By giving a quantitative trait to any studied human risk factor, this study has also provided a context for other studies and a decision making and planning capability to the relevant authorities for the modification of the risk factors. Also, considering the data obtained from Traffic Police database and the large sample size, it can be argued that statistical significances of most of the variables included in model are due to this large sample size and deserve to interpret with more attention.

The last thing to mention is that in general, the investigation approach to data in this study was a single-variable. Therefore, sometimes we are forced to speculate about some characteristics of the series, especially when discussing the mortality rate from traffic injuries.

In fact, part of an overall data is examined alone. This means ignoring another part of the data and characteristics of them. Another approach applied on these data is their multivariate analysis. When time series are considered simultaneously, some results will be obtained which, through putting them together with the results of this research, some information having more details than what we have achieved so far can be gained.

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Therefore, the multivariate approach to the time-series of traffic injuries can be used as a supplement for the results of this study. Other obstacles and limitations of this study include the impossibility of establishing a link between databases of Legal Medicine and Traffic Police. Nevertheless Traffic Police database has also provided some problems for the researchers such as the inability to have a link with information about the drivers, passengers or pedestrians.

Conclusion

Despite all measures to prevent such injuries, even fatal injuries have still a high incidence. Intervention in the human risk factors field would be more effective due to their important roles in traffic injuries in Iran

Ethical considerations

Ethical issues (Including plagiarism, informed consent, misconduct, data fabrication and/or falsification, double publication and/or submission, redundancy, etc.) have been completely observed by the authors.

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The authors declare that there is no conflict of interests.

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