



## Trends of Mortality of Road Traffic Accidents in Fars Province, Southern Iran, 2004 – 2010

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### Abstract

**Background:** The aim of this study was to investigate the trends in mortality from road traffic accidents (RTA) in Fars Province, southern Iran.

**Methods:** The Age and sex-standardized mortality rate attributed to RTA from 2004 to 2010 in Fars Province was calculated using world standard population. We also used linear regression and chi-squared tests.

**Results:** Over the period of study (7 years), 12954 people died in RTA. The age- and sex-standardized mortality rate was 27 per 100,000. While the rate of death due to RTA had an incremental rate in age group 18-30 years and among women, it had a decreasing trend in age groups 35-45, under18 and among men.

**Conclusion:** An increase in mortality rate of RTA among people aged 18-30 yr and women need to be addressed by health policy makers and other involved sections.

**Keywords:** Trends, Mortality, Road-Traffic accident

### Introduction

Road traffic accidents (RTA) are one of the leading causes of fatality throughout the world (1) imposing a considerable cost on the countries' economy (2). According to the statistics of WHO, 5.6 million people die in unintentional injuries of whom 65% are victims of RTA (3, 4). Iran, representing 1% of the world population comprises one fortieth of road traffic accidents. The country has 17 million vehicles (approximately one vehicle for every four individuals), a number higher in eastern Mediterranean but lower comparing to industrialized and developed countries (5) which is also annually increasing by 1 to 1.5 million. The figure for fatalities is estimated at an annual rate of 5-6 million per 10000 cars worldwide. However,

35 people die for every 10000 cars in Iran (6, 7). In addition, RTA stands as the most prevalent cause of injury and the second leading cause of death in Iran (8, 9).

Accidents of these kinds can be reduced significantly through effective planning (10, 11). Yet, despite implementing interventions that target road user behavior such as, greater use of speed cameras and imposing heavier fines and penalties, the annual number of deaths is still on the rise and therefore the epidemiology of RTA need further investigations (12).

Although there have been numerous studies on the road-traffic accidents, the study of trends is limited in Iran. In addition, similar to other prov-

inces in Iran, traffic density has been increasing over the recent years and there has been a report on increase in rate of mortality from RTA in Fars Province (13).

This study was conducted to determine the trend of fatalities and its determinants in the province of Fars Province, southern Iran as the most populated province in south of Iran.

## Methods

### Study sample

This cross-sectional study was conducted to investigate the trends in fatalities from 2004 to 2010 in Fars Province. The province of Fars is the largest province in the south of Iran, which has a population over 4 million people and 2229 kilometers main road from which 569 kilometers is comprised of highways (13).

The data of mortality resulting from traffic accidents was obtained from the Province mortality data (excluding data from Fasa and Jahrom which are not part of Shiraz University of Medical Sciences), in which the disease coding system was based on the 3 digit coding of international classification of diseases 10<sup>th</sup> revision (ICD 10). For the purpose of this study we included all external causes coded as V01 to V99 (14).

In Iran, Deputy of Health in Ministry of Health and Medical Education is responsible for collection of death data. In order to increase the coverage of data, other sources such as reports from national organization for civil registration, cemetery and hospitals are usually cross-checked. In each province, the corresponding organizations are responsible for providing relevant mortality data (15). In addition, we obtained mortality data from Fars' le-

gal medicine organization and by matching with our data we completed the province mortality. While for matching we used name, family name, father's name plus the date of RTA, for doing analysis we deleted all identifiers. This study was approved by Research and Ethics Committee in Shiraz University of Medical Sciences.

### Data Analysis

After collecting the data, they were fed into Microsoft Excel software and then the repeated cases were deleted using matching the first, last and father name. Regarding the Fars population, we used census data (2006). We calculated road-traffic mortality rate and we standardized the rate by direct method, using the world standard population (16).

The data were analyzed using SPSS ver.19 and Excel. To investigate about trends in road-traffic fatalities, we used linear regression. In order to examine the seasonal, monthly and weekly pattern of deaths related to road-traffic accident we used chi-squared tests.

## Result

From 2004 to 2010, 12954 people died in traffic accidents in the province of Fars from which 10442 (80%) were male and 2512 (20%) were female. The mean age of deaths was  $36 \pm 20$ ,  $38 \pm 23$  for females and  $35 \pm 19$  for males ( $P < 0.001$ ).

Road-traffic fatalities are the causes of 14% and 5.5% of male and female mortality in Fars, respectively. Totally the deaths resulting from road-traffic accidents on the average have assigned to 12% of the overall deaths over the past 7 years.

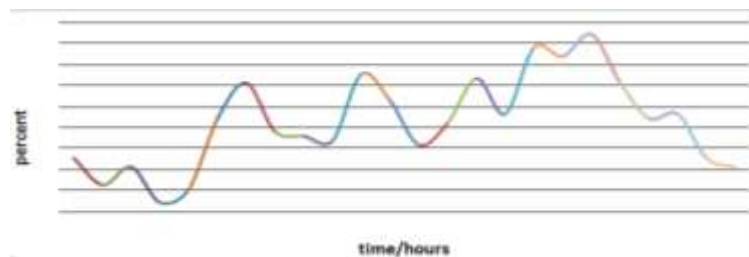


Fig. 1: The percentage of mortality from RTA in 24 hours, Fars, Province, Iran (2004-2010)

We succeeded to determine the cause of death of 5840 people who had died in traffic accidents. 2254 people (38%) died because of head injuries, 292 people (5%) because of bleeding, 1600 people (27%) because of multiple fractures and injuries and the rest due to other reasons.

We investigated time of road-traffic fatalities for 2568 cases (Fig. 1).

The highest number of deaths is belonging to the time interval between 6 p.m. to 8 p.m. followed by 11 a.m. to 12 noon.

Investigation of weekly, monthly and seasonal pattern of such fatalities revealed that road-traffic fatalities were highest in summer especially in September and weekends (Table 1).

The annual mean crude death rate attributed to road-traffic accident in Fars was 45 per 100000, 18 per 100000 for females and 73 per 100000 for males ( $P<0.001$ ). After standardization with world standard population the corresponding values decreased to 27, 12 and 42 per 100000, respectively.

On the other hand, investigating the mortality rate over the study period in men and women revealed a decreasing and an increasing trend, respectively ( $P<0.05$ ) (Fig. 2).

The other finding of this study indicated that mortality rate varies with age. The highest annual mortality rate (76.6 per 100,000) belonged to the age group of 18 to 30 years old followed by people aged less than 18 years old (42 per 100,000). Regarding trends over the years of study, although the mortality rate among people aged 18 to 30 years old was incremental ( $P<0.05$ ), there was a decreasing trend for those aged 35 to 45 years old and under 18 years old. However, mortality

among those older than 45 years old showed fluctuation with no significant trend.

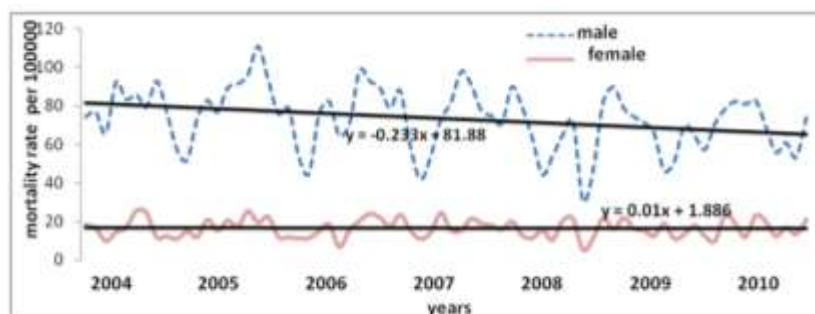
**Table 1:** Weekly, monthly and seasonal pattern of mortality from RTA, Fars Province, Iran (2004-2010)

Time of event	Explained variance*	FREQUENCY	P-value**
Week	8%		0.029
Sat		5.8 ± 3	
Sun		5.5 ± 3	
Man		5.3 ± 3	
Tue		6.2 ± 3	
Wed		6.4 ± 3	
Thu		6.7 ± 3	
Fri		6 ± 3	
Month	24%		0.001
January		127 ± 15	
February		130 ± 12	
March		152 ± 18	
April		185 ± 19	
May		183 ± 31	
June		189 ± 33	
July		208 ± 14	
August		210 ± 20	
September		227 ± 29	
October		202 ± 18	
November		179 ± 28	
December		161 ± 18	
SEASON	28%		0.001
Spring		558 ± 60	
Summer		647 ± 58	
Fall		543 ± 40	
Winter		409 ± 30	

\*The reported variance is the squared correlation of the original time series

\*\*chi-square test the significance of seasonality against the null hypothesis of no seasonality

Frequency is the number of cycles per year



**Fig. 2:** Trends in deaths resulting from RTA by sex, Fars, Province, Iran (2004-2010)

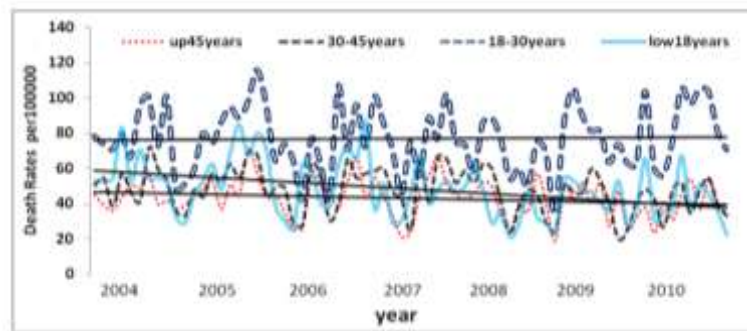


Fig. 3: Trends in deaths resulting from RTA by age group, Fars, Province, Iran (2004-2010)

## Discussion

The results of the present study showed that although trend in mortality rate among men is slightly decreasing, it is increasing among women. In addition, regarding age specific mortality rates, the highest value is in the age group 18-30 years which is approximately twice compared to the other age groups. While trends among all other age groups are slightly decreasing, death rate among people aged 18 - 30 years is increasing.

By involving the active part of the society, such fatalities in addition to the reduction in the productivity and economic losses, they cause numerous years of life lost. Similarly in the other parts of the world the mortality from traffic accidents mostly occurs in young ages: Spain 20 to 24(17), Brazil 20 to 39(18), Nigeria 15 to 20(19), China 18 to 30(20), Thailand 16 to 25(18) and India 18 to 37(21). All these reports are consistent with the reports from World Health Organization saying that most of fatalities occur in people aged 15-44 years old(17, 21, 22).

Due to the young population of Iran and the high mortality rate in young people, the age-standardized mortality rate of road-traffic accidents became less than crude death rate, but still more than the world average which is estimated to be 19 to 22 per 100,000(22). If we take into consideration the number of unregistered deaths related to road-traffic accident (which is claimed to be significant), such differences between mortality in Iran and the world will be critical (9). An important issue that requires serious consideration is

increasing trends in mortality due to road-traffic accidents among people aged 18-30 years which is the active part of each population. To address such issue, health policy makers plus other responsible organization need to implement effective preventive strategies. Such preventive measure might include changes in traffic rules in order to reduce the number of accidents and fatalities, improvement in road and vehicle safeties plus more focus on training of drivers. Although over recent years, the traffic police have been trying to reduce the number of accidents with an increase in the number of speed cameras, amount of fines and mass training programs, the effect of such measures have been hampered with lack of balance between the number of cars and development in road infrastructure (9, 23). Even, because of cultural issues, in large cities the number of overpasses and under passes that have been built over recent years is underused.

In regard to vehicle safety, periodic inspections of vehicle plus obligation in insertion of air bags to all vehicles are all regulations that can effectively reduce the number of fatalities in future.

The other findings of this study indicate that the rate of mortality of traffic accidents for males is 4 times higher than that in females which is consistent with the similar studies in Iran, United States, France, Sweden, Spain, India, Thailand, Brazil and many other countries(21, 22, 24). Various reasons are suggested for such finding such as higher risky driving styles and greater proportion of men who are less respecting to the driving law (25). However, with decrease in trends of mortality rate attributed to road-traffic accident in men

and simultaneous increase among women, it is expected in near future that the difference between mortality from traffic accidents for males and females disappears. More involvement of women in Social-economic activities outside home, greater tendency to use personal cars, are possible causes contributing to such trends (26, 27).

The present study indicated that the highest number of fatalities from road-traffic accidents occurs from 18 to 20 pm. Other studies had achieved different results: in Saudi Arabia, Jordan, turkey and china the highest number was between 12 noon to 18 pm, for Sweden 10 a.m. to 12 noon and for Italy 13 to 17 pm (24, 28, 29). Such differences are probably due to social and cultural differences of various countries. In addition, environmental factor (such as whether condition during summer and winter and the hours of sunrise and sunset) and busy times of day are other important factors that may lead to such variation. In western countries the main reason for traffic accidents is believed to be due to alcohol abuse. Drinking alcohol is illegal in Iran; however it cannot totally be disregarded. In fact, times between 18 to 20 pm are rush hour in cities in Iran and near to sun set which in turn increase the number of car accidents in roads out of towns. The highest number of fatalities during weekend and September is consistent with other reports and is mainly for increase in number of travels within and between cities (30-34). As it was mentioned earlier the main causes of death were head injuries and multiple fractures respectively, which was consistent with the finding of similar studies of Iran and other countries (21, 35).

In this study, due to the unspecified number of cars in Fars province and the condition of died people (pedestrian, driver or passenger) we were not able to determine mortality rate in terms of the number of vehicles and the condition of car occupants; therefore it is recommended the future studies consider such variables.

## Conclusion

An increasing trend in mortality rate attributed to road-traffic accident among women which might

be a reflection of improvement in socio-economic status of women in Iranian population plus still high road-traffic mortality rate need to be considered seriously. In order to reverse this trend, the Ministry of Health and Medical Education, Ministry of Roads and Urban Development, Ministry of Industry, Mine and Trade plus traffic police need to make an effective collaboration to improve: the injury medical services in all levels, roads infrastructures, quality of domestic cars and new regulations and implementation of traffic laws.

## 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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## Reference

1. de Farias MSJA, Cavalcante HPA, Silva Y, Brandao T, de Barros DTR, Correia DS, Cavalcante JC (2012). Analysis of deaths from traffic accidents in a Brazilian capital. *Int J Collab Res Internal Med Public Health*, 4(5):679-87.
2. Dhondt S, Macharis C, Terry N, Van Malderen F, Putman K (2012). Health burden of road traffic accidents, an analysis of clinical data on disability and mortality exposure rates in Flanders and Brussels. *Accid Anal Prev*, 50:659-66.
3. Bunn F, Collier T, Frost C, Ker K, Roberts I, Wentz R (2003). Traffic calming for the prevention of road traffic injuries: systematic review and meta-analysis. *Inj Prev*, 9(3):200-4.
4. Mathers C, Fat DM, Boerma J (2008). *The global burden of disease: 2004 update*. 1<sup>st</sup>ed. World Health Organization, Geneva, pp .27-49.

5. Nantulya VM, Reich MR (2002). The neglected epidemic: road traffic injuries in developing countries. *Br Med J*, 324(7346):1139-41.
6. Akbari M, Naghavi M, Soori H (2006). Epidemiology of deaths from injuries in the Islamic Republic of Iran. *East Mediterr Health J*, 12(3-4):382-90.
7. Soori H, Nasermoadeli A, Movahedi M, Mehmandar M, Hatam Abady H, Rezazadeh Azari M, et al. (2009). The effect of mandatory seat belt use legislations on mortalities from road traffic injuries in Iran. *Hakim Res J*, 12(1):48-54.
8. Naghavi M, Abolhassani F, Pourmalek F, Lakeh MM, Jafari N, Vaseghi S, Hezaveh NM, et al. (2009). The burden of disease and injury in Iran 2003. *Popul Health Metr*, 7(9):1-21.
9. Bhalla K, Naghavi M, Shahrzad S, Bartels D, Murray C (2009). Building national estimates of the burden of road traffic injuries in developing countries from all available data sources: Iran. *Inj Prev*, 15(3):150-6.
10. Bener A, Bener O (2011). Mobile phone use while driving and risk of road traffic injury: applying the Lorenz Curve and associated Gini Index. *J Adv Transport*, 13(7):77-82.
11. Hasanzadeh J, Amiresmaili M, Moosazadeh M, Najafi F, Moradinazar M (2013). Implementing a Weather-Based Early Warning System to Prevent Traffic Accidents Fatalities. *World Appl Sci J*, 24(1):113-7.
12. Bahadorimonfared A, Soori H, Mehrabi Y, Delpisheh A, Esmaili A, Salehi M, Bakhtiyari M (2013). Trends of Fatal Road Traffic Injuries in Iran (2004–2011). *Plus One*, 8(5):e65198.
13. Heydari ST, Hoseinzadeh A, Sarikhani Y, Hedjazi A, Zarenezhad M, Moafian G, et al. (2013). Time analysis of fatal traffic accidents in Fars Province of Iran. *Chin J Traumatol*, 16(2):84-8.
14. Panczak R, Galobardes B, Spoerri A, Zwahlen M, Egger M (2013). High life in the sky? Mortality by floor of residence in Switzerland. *Eur J Epidemiol*, 28(6):453-62.
15. Khosravi A, Taylor R, Naghavi M, Lopez AD (2007). Mortality in the Islamic Republic of Iran, 1964-2004. *Bull World Health Organ*, 85(8):607-14.
16. Ahmad OB, Boschi-Pinto C, Lopez AD, Murray CJL, Lozano R, Inoue M (2001). *Age standardization of rates: a new WHO standard*. 1<sup>st</sup>ed. World Health Organization, Geneva, pp .5-7.
17. Ferrando J, Plasencia A, MacKenzie E, Oros M, Arribas P, Borrell C (1998). Disabilities resulting from traffic injuries in Barcelona, Spain: 1-year incidence by age, gender and type of user. *Accident Anal Prev*, 30(6):723-30.
18. Suriyawongpaisal P, Kanchanasut S (2003). Road traffic injuries in Thailand: trends, selected underlying determinants and status of intervention. *Int J Inj Contr Saf Promot*, 10(1-2):95-104.
19. Seleye-Fubara D, Ekere A (2003). Pedestrian deaths resulting from road traffic accidents seen at the University of Port Harcourt Teaching Hospital—a six-year review. *Niger J Med*, 12(2):103-5.
20. Zhou J, Zhao X, Wang Z, Zhu P, Jian H (2003). The analysis of epidemiological characteristics of road traffic crashes in a mountain city in western China. *Chin J Traumatol*, 6(6):355-58.
21. Kumar A, Lalwani S, Agrawal D, Rautji R, Dogra T (2008). Fatal road traffic accidents and their relationship with head injuries: An epidemiological survey of five years. *Indian J Neurotrauma*, 5(2):63-7.
22. Peden M, Scurfield R, Sleet D, Mohan D, Hyder AA, Jarawan E, Mathers CD (2004). *World report on road traffic injury prevention*. World Health Organization, Geneva, pp.11-14.
23. Rasouli MR, Nouri M, Zarei M-R, Saadat S, Rahimi-Movaghar V (2008). Comparison of road traffic fatalities and injuries in Iran with other countries. *Chin J Traumatol*, 11(3):131-4.
24. Carmen del Río M, Gómez J, Sancho M, Alvarez FJ (2002). Alcohol, illicit drugs and medicinal drugs in fatally injured drivers in Spain between 1991 and 2000. *Forensic Sci Int*, 127(1-2):63-70.
25. Boyce TE, Geller ES (2002). An instrumented vehicle assessment of problem behavior and driving style: Do younger males really take more risks?. *Accident Anal Prev*, 34(1):51-64.
26. Afshar H (2005). *Women and politics in the Third World*. 3<sup>rd</sup> ed. Routledge, pp.1979-95.
27. Sedghi H. *Women and politics in Iran*(2007): Cambridge University Press, New York, pp.229-232.
28. Reynaud M, Breton P, Gilot B, Vervalle F, Falissard B (2002). Alcohol is the main factor in excess traffic accident fatalities in France. *Alcohol Clin Exp Res*, 26(12):1833-9.

29. Al-Khateeb GG(2010). Analysis of Accident Data and Evaluation of Leading Causes for Traffic Accidents in Jordan. *Jordan J Civ Eng*, 4(2):76-94.
30. Bell CM, Redelmeier DA (2001). Mortality among patients admitted to hospitals on weekends as compared with weekdays. *N Engl J Med*, 345(9):663-8.
31. Kadkhodaie M (2006). Three-year review of facial fractures at a teaching hospital in northern Iran. *Br J Oral Maxillofac Surg*, 44(3):229-31.
32. Engeland A, Skurtveit S, Mørland J (2007). Risk of road traffic accidents associated with the prescription of drugs: a registry-based cohort study. *Ann Epidemiol*, 17(8):597-602.
33. Bendak S (2005). Seat belt utilization in Saudi Arabia and its impact on road accident injuries. *Accid Anal Prev*, 37(2):367-71.
34. Lagos L, Picos J, Valero E (2012). Temporal pattern of wild ungulate-related traffic accidents in northwest Spain. *Eur J Wildl Res*, 58(4):661-8.
35. Zargar M, Khaji A, Karbakhsh M, Zarei MR (2004). Epidemiology study of facial injuries during a 13 month of trauma registry in Tehran. *Indian J Med Sci*, 58(3):109-14.

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