

Years of Life Lost and Mortality Rate Due to Road Traffic Injuries in Kashan Region, Iran, During 2012- 2013

Mehrdad Mahdian¹, Mohammad Reza Fazel¹,
Mojtaba Sehat², Mahdi Mohammadzadeh¹ and Hossein Akbari¹

¹Trauma Research Center, Kashan University of Medical Sciences, Kashan, Iran.

²Department of Epidemiology, School of Medicine,
Kashan University of Medical Sciences, Kashan, Iran.

doi: <http://dx.doi.org/10.13005/bbra/2255>

(Received: 25 June 2015; accepted: 08 August 2015)

Road traffic injuries (RTIs) are a major public health problem, particularly in developing countries. High quality data on the burden of this problem can help to provide the preventive strategies. The aim of this study was to determine of mortality and years of life lost (YLL) due to RTI between March 2012 and March 2013 in Kashan Region, Iran. The global burden of disease (GBD) methodology 2010 was used to compute years of life lost due to premature mortality (YLL). The results showed that a total of 101 persons [83 male (82.2%), male/female sex ratio of almost 5:1] were died during the study period. The mortality rate of RTI was 25.3 per 100,000 populations and men had a greater mortality rate. No significant differences were found between the fatality rate and different seasons of the year. The YLL during our study were 3754 years for males (18.4 per 1000), 949 years for females (4.8 per 1000) and 4703 years for both sexes (12.1 per 1000). The most YLL due to premature death in males were accounted for the age group of 30-44 yr (22.1 per 1000). It can be concluded that the RTIs' fatality rate is high in our region and should be considered as a major public health problem, notable for authorities, policymakers and strategic planners.

Key words: Years life lost, road traffic injuries, mortality rates, Iran.

Globally, road traffic injuries (RTIs) are a major public health problem, imposing a considerable socioeconomic burden on the community regarding their related death and disability, especially in developing countries.¹ Based on WHO statistics, the total number of road traffic fatalities is unacceptably high at 1.24 million per year and the Eastern Mediterranean Region is responsible for 10% of the world's road traffic fatalities, the second highest road traffic fatality rate among WHO regions. Among its high-income countries, the Region is unusual in having the

highest rates of road traffic fatalities, at 21.7 per 100 000 population, more than double the global rate of 8.7 per 100 000 population for high-income countries.² Road traffic accidents (RTAs) in Iran with an incidence of 34.1 per 100000 population are the second cause of death, first cause of years of life lost (YLL) because of premature death and is the most common cause of injury³. From the first registered incident of road traffic death reported 87 years ago, on 14th November 1926, numbers of deaths caused by RTIs raised due to rapidly high urbanization and industrialization process of the country and reaching to the extremely high and the disgraceful number of 27755 in 2005⁴. Changes in traffic regulations and driving policies which started from 2005 caused a declining number of RTIs related deaths since 2007 despite increasing number of motor vehicles⁵. However, according to

* To whom all correspondence should be addressed.
Tel: +98 9131622007; Fax: +98 361 55575057;
E-mail: om_sehat@yahoo.com

National Burden of Disease (NBD) study in Iran, 2003, RTIs had the highest burden in all ages and both sexes, responsible for 15.1% of total YLL among unintentional injuries. Based on the same study, 57% (684210) of all years of life lost was accounted for the age group of 15-29 years.⁶ On the other hand, no many studies in Iran were performed regarding burden of RTIs' death, and the most recent NBD study was carried out nearly 12 years ago. Significantly increases the number of motor vehicles, developing the roads situation, efforts to improve the quality of domestic cars along with serious enforcement of driving rules in recent years are important issues that can affect the RTIs' mortality rate and YLLs. Knowing about RTI impacts in terms of epidemiologic indicators such as mortality rates, YLLs and other indices on the community may help to evaluate the importance of the issue and lead to the improvement of strategies in the prevention and enhancement of care for trauma patients.

The aim of this study was to determine of mortality and YLL due to RTI during March 2012 to March 2013 in Kashan Region (Kashan and Aran-Bidgol Counties) that would be represented regions with around 400000 populations in Iran.

MATERIALS AND METHODS

Throughout a retrospective study and after obtaining an approval from the Institute Research Board to calculate RTIs' mortality rate and YLL, the death registration system of Deputy of Health (DH) of Kashan University of Medical Sciences (KAUMS) from March 2012 to March 2013 was used for data analysis. Generally, it is proved that the death data source of health centers of medical universities of Ministry of Health and Medical Education in Iran have more reliable completeness and classification of the cause of death compared with other sources like the National Organization for Civil Registration.⁷ A RTI death was defined as one who was died due to a RTA within 30 days as a result of the crash. According to the International Classification of Diseases and Causes of Death (ICD 10), V01-V99 codes are devoted for RTAs as underlying causes of death. Based on this classification, all recorded fatalities because of RTAs in Kashan Region in DH of KAUMS database during the study period was

included in this study and the garbage codes were redistributed proportionally based on RTAs causes. The global burden of disease (GBD) methodology was used to calculate premature mortality (YLL) according to the following formula⁸:

$$YLL = N \times L$$

N = number of deaths

L = standard life expectancy at age of death in years

In current study YLLs were calculated using the reference standard life expectancy table that was used in the 2010 GBD study.⁹ The most important feature of the new reference table is that life expectancy at birth of 86.02 years and similar for both sexes. Also in this study based on the GBD 2010 Guidelines, discount rate for time and age weighting were not applied.¹⁰ Age and gender composition of Kashan Region in 2012 were received from the statistics department of KAUMS. Since the national census was conducted the year before our study, the validity of KAUMS data was checked with national census data on 2011. Data after gathering were fed into Microsoft Excel and finally the same software was used for calculating YLL and mortality rate analysis.

Statistical analysis

Chi-square test was used to determine the association between the categorical variables and the Student's t-test for quantitative variables using SPSS software version 16.0 (SPSS for Windows, Version 16.0. Chicago, SPSS Inc). P value < 0.05 was considered as statistically significant.

RESULTS

A total of 101 persons of the Kashan Region [83 male (82.2%), male/female sex ratio of almost 5:1] were died during March 2012 to March 2013 due to RTIs. The mean age of deaths was 40.3±23.8 years (41.63±22.6 for males and 34.17±22.6 for females). No significant difference was found between male and female victims regarding age (P=0.23). In relation to place of residence of the deceased, 92 (91%) lived in urban areas and the remaining (9%) were rural residents. Concerning the seasonal and monthly pattern of fatalities, the highest number of deaths was belonging to spring and Iranian Ordibehesht month (April 21- May 21) and the lowest number of deaths was belonging to autumn and Iranian Azar month (November 21-

December 21) (Table 1). No significant association was found between deaths frequency and different seasons of the year ($P>0.05$) and also between gender and season regarding deaths frequency ($P=0.126$). Based on the population of the Kashan Region during the study period (398971) the rate attributed to RTIs in Kashan Region during the study period was 25.3 per 100000 (41.1 per 100000 for males and 9.1 per 100000 for females). The highest road traffic fatality rate per 100000 people was accounted for people aged above 70 years (Table 2 and Figure 1). Among RTIs fatalities and within 30 days as a result of a traffic crash, 48 (47.5%) cases died at the scene or during transportation, 32 cases (31.6%) in hospitals and 20 (20.9%) persons after discharging hospital. The most common cause of fatal injury was traumatic brain injury (51%) and the most common mechanism of injury was fatal car crash (46%), followed by motorcycle accident (37%). The years

of life lost during our study were 3754 yr for males (18.4 per 1000), 949 yr for females (4.8 per 1000) and 4703 yr for both sexes (12.1 per 1000). The most years of life lost due to premature death in males were accounted for the age group of 30-44 yr (22.1 per 1000), in female for the age group of 0-4 yr (16.8 per 1000) and for both sexes for the age group of 15-29 yr (14.9 per 1000) (Table 3).

DISCUSSION

The present study showed that mortality rate of RTI in Kashan Region was 25.3 per 100,000 populations and men had greater mortality rate and YLL than women. The highest mortality rate in both sexes was in the age group above 70 whereas the highest YLL was accounted for the age group 15-29 yr. Although the mortality rate in our study is lower than the national rate (34.1 per 100000), but compared with the most parts of the world [e.g.

Table 1. Frequency of deceased persons based on seasons, months of the year and gender

| Season | Months | Male No (%) | Female No (%) | total No(%) | Total(Based on season) |
|--------|--------------------------|-------------|---------------|-------------|------------------------|
| Spring | March21-April 20 | 9 (10.8) | 3 (16.7) | 12 (11.9) | 32 (31.7) |
| | April 21- May 21 | 12 (14.6) | 1 (5.6) | 13 (12.9) | |
| | May 22- June 21 | 5 (6) | 2 (11.1) | 7 (6.9) | |
| Summer | June 22- July 22 | 5 (6) | 2 (11.1) | 7 (6.9) | 26 (25.7) |
| | July 23- August 22 | 6 (7.2) | 4 (22.1) | 10 (9.9) | |
| | August 23- September 22 | 7 (8.4) | 2 (11.1) | 9 (8.9) | |
| Autumn | September 23- October 22 | 7 (8.4) | 3 (16.7) | 10 (9.9) | 21 (20.8) |
| | October 23- November 21 | 8 (9.7) | 0 (0) | 8 (7.9) | |
| | November21- December 21 | 3 (3.6) | 0 (0) | 3 (3) | |
| Winter | December 21-January 20 | 4 (4.8) | 0 (0) | 4 (4) | 22 (21.8) |
| | January 21- February 20 | 8 (9.7) | 0(0) | 8 (7.9) | |
| | February 20- March 19 | 9 (10.8) | 1 (5.6) | 10 (9.9) | |
| Total | | 83 | 18 | 101 | 101 (100) |

Table 2. Mortality rates based on age and sex groups per 100000 populations

| Age group | Population | | | Deaths numbers | | | Mortality rate | | |
|-----------|------------|--------|--------|----------------|--------|-------|----------------|--------|-------|
| | Male | Female | Total | Male | Female | Total | Male | Female | Total |
| 0-4 | 15562 | 14928 | 30490 | 4 | 3 | 7 | 25.7 | 20.1 | 22.9 |
| 5-14 | 25709 | 24688 | 50397 | 3 | 2 | 5 | 11.7 | 8.1 | 9.9 |
| 15-29 | 58885 | 60489 | 119374 | 19 | 5 | 24 | 32.3 | 8.3 | 20.1 |
| 30-44 | 52917 | 49349 | 102266 | 23 | 3 | 26 | 43.5 | 6.1 | 25.4 |
| 45-59 | 27925 | 26915 | 54840 | 14 | 1 | 15 | 50.1 | 3.7 | 27.3 |
| 60-69 | 9003 | 9000 | 18003 | 7 | 0 | 7 | 77.8 | 0 | 38.9 |
| +70 | 12039 | 11562 | 23601 | 13 | 4 | 17 | 108 | 34.6 | 72 |
| Sum | 202040 | 196931 | 398971 | 83 | 18 | 101 | 41.1 | 9.1 | 25.3 |

Switzerland (4.3), United Kingdom (3.7), the United States (11.4), Pakistan (17.4) Turkey (12)]² is high. While, based on the 2013 WHO report, the global average mortality rate for RTA was 18 per 100,000 people (declined from 20.8 in 2000), middle-income countries have the highest annual road traffic fatality rates at 20.1 per 100 000, whereas the rate in high-income countries is lowest at 8.7 per 100 000. As it was mentioned above, the RTAs mortality rate in our country is very high. Only 3 countries in the world, including the Dominican Republic with a fatality rate of (41.7), Thailand (38.1) and Venezuela (37.2) per 100000 are ranked above Iran in terms of traffic deaths.² Traffic fatalities accounting for 10.3 percent of all causes of death and are the fourth leading cause of death in our country.¹¹ One reason for the higher rate of traffic deaths in middle-income countries is that there are only 28 countries representing 449 million people (7% of the world's population) that have adequate laws addressing all five risk factors

(speed, drink-driving, helmets, seat-belts and child restraints) effective in the traffic accidents.² In a study which conducted in Kashan Region cleared that among patients were hospitalized more than 24 hours, motorcyclists and pedestrians had a higher admission rate with 73.4% and 14.3% respectively.¹² Based on WHO report more than a third of road traffic fatalities in low- and middle-income countries are among pedestrians and cyclists while less than 35% of such countries have policies in place to protect these road users.² On the other hand, another study has shown that only 3.1% of motorcyclists in Kashan Region use helmet.¹³ Failure to obey driving rules, not wearing helmets and risky driving behaviors could be the causes of higher traffic mortality in our region compared to the world average. Although our country has adequate laws for at least 4 out of 5 important RTA risk factors (no law for child restraint only), unfortunately regulation's enforcement seems to be very weak in some cases especially

Table 3. Years of life lost due to road traffic accidents based on age and sex

| Age group | YLLs (years) | | | YLLs (per 1000) | | |
|-----------|--------------|--------|-------|-----------------|--------|-------|
| | Male | Female | Total | Male | Female | Total |
| 0-4 | 335 | 251 | 586 | 21.5 | 16.8 | 13.7 |
| 5-14 | 231 | 153 | 384 | 9 | 6.2 | 7.6 |
| 15-29 | 1204 | 310 | 1514 | 20.4 | 5.1 | 14.9 |
| 30-44 | 1169 | 152 | 1321 | 22.1 | 3.1 | 13.4 |
| 45-59 | 505 | 39 | 544 | 18.1 | 1.5 | 9.4 |
| 60-69 | 152 | 0 | 152 | 16.9 | 0 | 8.5 |
| 70-79 | 102 | 30 | 132 | 13.4 | 4.1 | 8.9 |
| +80 | 56 | 14 | 70 | 12.6 | 3.3 | 8 |
| Total | 3754 | 949 | 4703 | 18.6 | 4.8 | 12.1 |

Abbreviation: YLL, Years of life lost

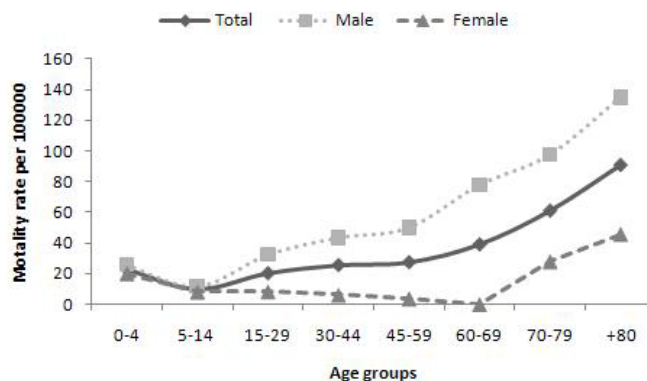


Fig. 1. Road traffic fatality rate classified by sex and age groups during 2012 - 2013 in Kashan Region

regarding wearing helmet and motorcyclists. This could be another reason for the higher traffic deaths. The mortality risk due to traffic accidents are not the same for men and women and also the risk is different in different age groups. Children and the elderly are the most vulnerable groups to traffic accidents.¹² The present study showed that mortality rate was increased with aging as the highest rate of RTA fatality in both sexes was in the age group over 70 years. Also, regarding the gender variable, mortality rate among men was more than women and men fatality rate in males was 4.5 times higher than females. Our results are in agreement with the findings of a series of studies.^{5, 14-21} Risk difference because of aging could be due to some features of aging that interfere with concentration, cognitive and motor function resulting in slower and more restricted movements, increased reaction time and make them susceptible to RTA crashes.²² In addition, such trauma victims often have more comorbidities and therefore their ability to tolerate of injury is decreased.²³ Risk differences regarding gender could be due to behavioral, occupational, cultural and other socioeconomic factors affecting higher mortality in men. Since men are more likely to travel than women because of occupational issues, they are more likely to be at danger. In our study, although no significant difference was found regarding fatality rate and season, but the number of deaths in the spring was more than the other seasons of the year. However, the findings of the current study do not support the previous research that has been conducted in our country which found higher mortality in summer.^{17, 24, 25} The higher mortality in spring may be due to "Festival of Rose and Rose Water" in Kashan. Every year during the second half of May, festival of Rose and Rose Water is being held in Kashan and many people from different parts of the country and abroad visit Kashan, the hub of Mohammadi Rose (special type of rose) in Iran. Unfortunately, the substandard local roads cannot meet the heavy traffic at this time that results more susceptibility for RTAs.

In the current study the YLL due to premature mortality (YLL per 1000) in both sexes was 12.1 and male to female ratio was 3.8 (18.6 per 1000 for males and 4.8 per 1000 for female respectively). Given that accident and related fatalities occurring at young ages, it can be

expected that road traffic accident's YLL be greater in this part of society. In the present study the most YLL in both sexes accounted for 15-29 yr age group (14.9 per 1000), and 4-fold greater in males than in females (20.4 and 5.1 for male female respectively). Calculated YLL in our study and also the age group with higher YLL is almost consistent with many national^{26, 27} and international studies.^{28, 29}

In conclusion, despite lower mortality rate in Kashan Region compared to the national average, the RTAs' fatality rate is high and should be considered as a major public health problem. Therefore, interventional programs such as safety training programs for drivers, especially for youth motorcyclists, dealing seriously with offensive drivers through police enforcement, making law for national mandatory usage of restraint for children passengers, more enforcement for wearing helmet, providing facilities for pedestrians, especially elderly people such as the underpass or overpass equipped with elevators and improving pre-hospital medical services will hopefully result in decreasing RTAs fatality.

ACKNOWLEDGMENTS

This study was a part of PhD dissertation supported by Deputy of Research, Kashan University of Medical sciences (Grant no. 92173).

REFERENCES

1. Jamshidbeygi E, Rastad H, Qorbani M, et al. National and sub-national trend and burden of injuries in Iran, 1990-2013: a study protocol. *Archives of Iranian medicine* 2014; **17**(3): 138-45.
2. Organization WH. WHO global status report on road safety 2013: supporting a decade of action: World Health Organization; 2013.
3. Hatamabadi H, Soori H, Vafae R, Hadadi M, Ainy E, Asnaashari H. Epidemiological pattern of road traffic injuries in Tehran-Abali Axis in 2008: A prospective study. *Payesh*, 2012; **11**: 29-37.
4. Lankarani KB, Sarikhani Y, Heydari ST, et al. Traffic accidents in Iran, a decade of progress but still challenges ahead. *Medical journal of the Islamic Republic of Iran* 2014; **28**: 96.
5. Bahadorimonfared A, Soori H, Mehrabi Y, et al. Trends of fatal road traffic injuries in Iran (2004-

- 2011). 2013.
6. Naghavi M, Abolhassani F, Pourmalek F, et al. The burden of disease and injury in Iran 2003. *Population health metrics* 2009; **7**(1): 9.
 7. Khosravi A, Taylor R, Naghavi M, Lopez AD. Mortality in the Islamic Republic of Iran, 1964-2004. *Bulletin of the World Health Organization* 2007; **85**(8): 607-14.
 8. WHO. Metrics: Disability-Adjusted Life Year (DALY). http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/.
 9. Murray CJ, Ezzati M, Flaxman AD, et al. GBD 2010: design, definitions, and metrics. *The Lancet* 2013; **380**(9859): 2063-6.
 10. Murray CJ, Vos T, Lozano R, et al. Disability-adjusted life years (DALYs) for 291 diseases and injuries in 21 regions, 1990-2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet* 2013; **380**(9859): 2197-223.
 11. Lozano R, Naghavi M, Foreman K, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet* 2013; **380**(9859): 2095-128.
 12. Mahdian M, Sehat M, Fazel MR, Moraveji A, Mohammadzadeh M. Epidemiology of Urban Traffic Accident Victims Hospitalized More Than 24 Hours in a Level III Trauma Center, Kashan Region, Iran, During 2012-2013. *Archives of trauma research* 2015; **4**(2).
 13. Paravar M, Hosseinpour M, Salehi S, et al. Pre-hospital trauma care in road traffic accidents in kashan, iran. *Archives of trauma research* 2013; **1**(4): 166.
 14. Abou Raya S, ElMeguid LA. Road traffic accidents and the elderly. *Geriatrics & gerontology international* 2009; **9**(3): 290-7.
 15. Bhuyan PJ, Ahmed F. Road traffic accident: an emerging public health problem in assam. *Indian journal of community medicine: official publication of Indian Association of Preventive & Social Medicine* 2013; **38**(2): 100.
 16. Chandran A, Sousa TRV, Guo Y, Bishai D, Pechansky F, Team TVNTE. Road traffic deaths in Brazil: rising trends in pedestrian and motorcycle occupant deaths. *Traffic injury prevention* 2012; **13**(sup1): 11-6.
 17. Hasanzadeh J, Moradinazar M, Najafi F, AHMADIJOUY T. Trends of Mortality of Road Traffic Accidents in Fars Province, Southern Iran, 2004-2010. *Iranian journal of public health* 2014; **43**(9): 1259-65.
 18. Heydari S, Hoseinzadeh A, Ghaffarpassand F, et al. Epidemiological characteristics of fatal traffic accidents in Fars province, Iran: a community-based survey. *Public health* 2013; **127**(8): 704-9.
 19. Majdan M, Rusnak M, Rehorcikova V, Brazinova A, Leitgeb J, Mauritz W. Epidemiology and Patterns of Transport-Related Fatalities in Austria 1980-2012. *Traffic injury prevention* 2015; **16**(5): 450-5.
 20. Mehmandar M, Soori H, Amiri M, Norouzrad R, Khabzkhooob M. Risk factors for fatal and nonfatal road crashes in Iran. *Iranian Red Crescent medical journal* 2014; **16**(8).
 21. Melchor I, Nolasco A, Moncho J, et al. Trends in mortality due to motor vehicle traffic accident injuries between 1987 and 2011 in a Spanish region (Comunitat Valenciana). *Accident Analysis & Prevention* 2015; **77**: 21-8.
 22. European Network for Safety Among Elderly. Fact sheet: Prevention of Road Traffic Injuries among Elderly. <http://www.injuryobservatory.net/wp-content/uploads/2012/08/OlderRoad-Guide-Prevention-of-Road.pdf>.
 23. Gowing R, Jain MK. Injury patterns and outcomes associated with elderly trauma victims in Kingston, Ontario. *Canadian journal of surgery* 2007; **50**(6): 437.
 24. Heydari ST, Hoseinzadeh A, Sarikhani Y, et al. Time analysis of fatal traffic accidents in Fars Province of Iran. *Chinese journal of traumatology* 2013; **16**(2): 84-8.
 25. Yadollahi M, Paydar S, Jahromi GS, et al. Types and causalities in dead patients due to traumatic injuries. *Archives of trauma research* 2015; **4**(1).
 26. Ayatollahi S, Hassanzadeh J, Ramezani A. The burden of traffic accidents in South Khorasan province, Iran in 2005. *Iranian journal of epidemiology* 2009; **4**(3): 51-7.
 27. Maracy M, Isfahani MT. The burden of road traffic injuries in Isfahan, Iran in 2010. *Journal of Kerman University of Medical Sciences* 2013; **20**(5): 505-19.
 28. Bhalla K, Naghavi M, Shahrzad S, Bartels D, Murray C. Building national estimates of the burden of road traffic injuries in developing countries from all available data sources: Iran. *Injury Prevention* 2009; **15**(3): 150-6.
 29. Ditsuwan V, Veerman LJ, Barendregt JJ, Bertram M, Vos T. The national burden of road traffic injuries in Thailand. *Popul health metr* 2011; **9**(2).