

Review Article

Injury epidemiology in Iran: a systematic review

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KEY WORDS

Injury
Trauma
Epidemiology
Pattern

Abstract:

Background: Injuries are the second greatest cause of mortality in Iran. Information about the epidemiological pattern of injuries is effective in decision-making. In this regard, the aim of the current study is to elaborate on the epidemiology of injuries in Iran through a systematic review.

Methods: Required data were collected searching the following key words and their Persian equivalents; trauma, injury, accident, epidemiology, prevalence, pattern, etiology, risk factors and Iran. The following databases were searched: Google Scholar, PubMed, Scopus, MagIran, Iranian scientific information database (SID) and Iran Medex. Some of the relevant journals and web sites were searched manually. The lists of references from the selected articles were also investigated. We have also searched the gray literature and consulted some experts.

Results: Out of 2747 retrieved articles, 25 articles were finally included in the review. A total of 3234481 cases have been investigated. Mean (SD) age among these cases was 30 (17.4) years. The males comprised 75.7% of all the patients. Only 31.1% of patients were transferred to hospital by ambulance. The most common mechanism of injuries was road traffic accidents (50.1%) followed by falls (22.3%). In road traffic accidents, motorcyclists have accounted for the majority of victims (45%). Roads were the most common accident scene for the injuries (57.5%). The most common injuries were to the head and neck. (47.3%). The mean (SD) Injury Severity Score (ISS) was 8.1(8.6%). The overall case-fatality proportion was 3.8% and 75% of all the mortalities related to road traffic accidents.

Conclusions: The main priorities in reducing the burden of injuries include: the young, male target group, improving pre-hospital and ambulance services, preventing road traffic accidents, improving road safety and the safety of motorcyclists (compulsory helmet use, safer vehicles, dedicated motorcycle lanes).

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Introduction

Nowadays, injuries are a serious health and socio-economic issue around the world.¹⁻³ They are the leading cause of death during the first four decades of life.^{4, 5} Injuries are believed to contribute to 10% of mortality globally.⁶ With Low and Middle Income Coun-

tries (LMICs) as the location of about 90% of injury mortality.⁷ Each year more than 5 million people lose their life across the world due to some kind of injury.⁸⁻¹⁰ With current trends, it is assumed that the global burden of injuries will increase in the coming decades, especially in LMICs.¹¹ Injuries are the second leading cause of mortality in Iran.¹²

In a 1966 White Paper, they were referred to as “the neglected disease of modern society” as there are fewer studies on injuries than on other diseases. This definition may describe the status of injuries in those LMICs which invest inadequate funds in public health programs as well as in injury research.¹³⁻¹⁵ An understanding of injury epidemiology makes it possible to develop appropriate approaches for injury prevention.¹⁶

Different studies have been published on the epidemiology of injuries in Iran in recent years.¹⁷⁻¹⁹ They have studied the epidemiology of injuries on a local level using only small sample sizes. Therefore, they cannot provide clear and beneficial information for decision-making on a macro level. Systematically reviewing the results and conclusions of these studies can provide useful information for decision-making and future research. Therefore, the aim of this study was to systematically review the epidemiology of injuries in Iran.

Methods

This systematic review and meta-analysis study was conducted in 2016, using an approach adopted from the book “A Systematic Review to Support Evidence-Based Medicine”.²⁰

Eligibility criteria

The inclusion criteria for the study were: cross-sectional studies on the injuries, articles written in Iran, articles published in Persian and English, articles published from 1 January 2000 to 30 March 2016. Studies that focused on injuries in specific age groups of patients (children, elderly, etc.) or gender (male or female), studies that focused on specific kinds of injuries (road traffic accidents, burns, falls, etc.), community-based studies, conference presentations, case reports, interventional and qualitative studies were excluded from the study.

Information sources

Required data were collected searching for the following key words and their Persian equivalents; trauma, injury, accident, epidemiology, prevalence, pattern, etiology, risk factors and Iran. The following databases were searched: Google Scholar, PubMed, Scopus, MagIran, Iranian scientific information database (SID) and IranMedex. Some of the relevant journals and web sites were searched manually. The list of references for the selected articles was also reviewed. In the final stage of the literature review, we searched the gray literature and consulted experts.

Review process

In the first phase of the review process, an extraction table was designed in which the following items were inserted: first author's name, year of publication, city, data collection (number of hospitals and data collection time period), sample size, age (Mean \pm SD), gender, major mechanisms of injuries, Road Traffic Accidents (RTAs) pattern, scene of injury, ambulance transportation, anatomical sites of injury, Injury Severity Score (ISS), mortality, and mortality due to RTAs. Validity of the data extraction table was improved by experts. A pilot study was conducted for further improvement of the extraction table. Two authors (SH and A-AS) had enough experience and knowledge in this field to be independently put in charge of the data extraction.

In the first phase of the article selection procedure, articles with non-relevant titles were excluded. In the second phase, the abstract and the full text of articles were reviewed to select the articles that matched the inclusion criteria. Reference management (Endnote X5) software was used in order to organize and assess the titles and abstracts, as well as to identify duplicate entries.

Quality assessment

Two reviewers (SH and A-AS) evaluated the reporting quality of articles according to the checklist of Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) (Appendix 1).²¹ Those cases in which there was a disagreement between these reviewers were referred to a third author.

Data analysis

In the current study, due to the high heterogeneity in the report of studies' results and some methodological issues, we could not conduct a quantitative analysis (Meta-Analysis methods). Data were analyzed manually. Descriptive statistics such as frequency, percentage, Mean \pm Standard Deviation were used to report the results. Excel 2010 software was used to draw the graphs.

Results

In this study, out of 2747 articles, 25 articles were finally found to be completely related to the study's objective and thus included in the study (Figure 1).

The results of the extracted data from the entered articles are summarized in Table 1.

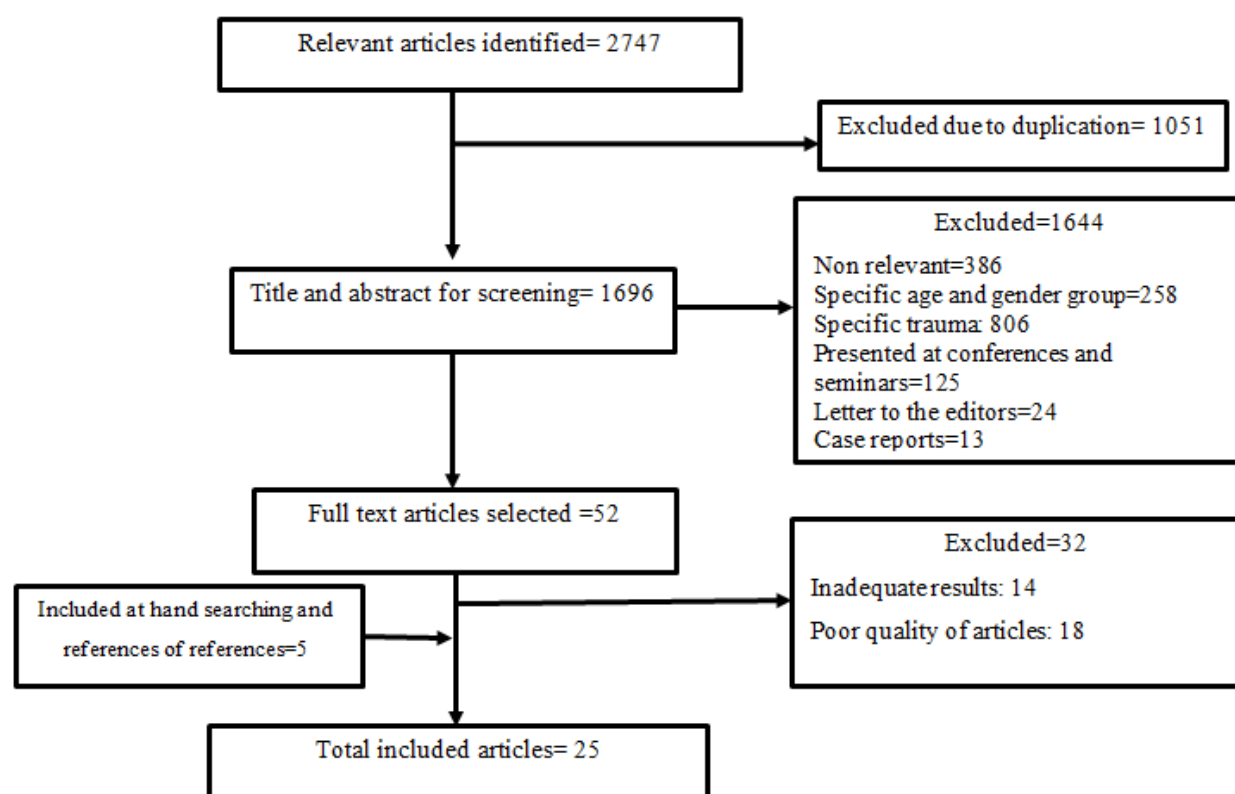


Figure 1: Bibliographical searches and inclusion process for injury epidemiology articles in Iran.

Table1: Characteristics of the included injury epidemiology articles in Iran

Author, Year	City/district	Data Collection	Sample Size	Age (Mean ± SD)	Male (%)	Major Mechanisms Of Injuries	RTA* (%) Pattern
Moini et al. 2000 ⁷³	Tehran	3 hospitals (12 Months)	2662	28 ± 19	78	RTAs (37.8), Fall (29.7), and Blunt Objects (16.3)	Pedestrian (54.1), Motorcycle (26.5), Car (16.8), and others (2.4)
Modaghegh et al. 2013 ⁷⁴	Mashhad	One hospital (12 Months)	1544	30.1	54	RTAs (67.2), Fall (20.2), Blunt Objects (5.4), and others (7.4)	Pedestrians (40.1), Motorcyclists (33.2), and Car (25.6)
Fazel, et al. 2012 ⁷⁵	Kashan	One hospital (60 Months)	22564	33.1 ± 10.9	75	RTAs (60.4)	-
Sheikhghomi, et al. 2015 ⁷⁶	Tehran	One hospital (12 Months)	73	40.1 ± 20.3	67.1	Falls (47.9), RTAs (40.8), and others (11.3)	-
Karami Joushin, et al. 2013 ⁷⁷	Qom	- (12 Months)	29426	29 ± 14.5	70	Strike (65.3), Fall (12.3), RTAs (11.1), and others (11.2)	Motorcycle (53), Car (33), and Pedestrian (14).
Rasouli, et al. 2011 ⁷⁸	Tehran	One hospital (36 Months)	2991624	26.5 ± 16.9	72.7	RTAs (31.9), Violence (25.5), Fall (10.9), and others (31.6)	Motorcycle (43.4), Car (37.5), and Pedestrian (19).
Karbakhsh, et al. 2009 ⁷⁹	Kerman-shah	One hospital (4 Months)	779	34.7 ± 19.9	78.6	RTA (53.5), Fall (28.8) (10.1), and others (7.6)	Pedestrian (44.1), Car (29.7), Motorcycle (23.9), and others (2.1)
Abbasi, et al. 2013 ⁸⁰	Shiraz	One hospital (13 Months)	1217	26.6 ± 15.1	75.8	RTA (53.9), Fall (18.5), Violence (14.7), and others (12.9)	Car (42.9), Motorcycle (41.1), and Pedestrian (16.3)
Hossein, et al. 2009 ⁸¹	Rasht	One hospital (9 Months)	3598	31.85 ± 17.76	77.7	RTA (73.8), Fall (15.5), Violence (5.4), and others (5.2)	Motorcycle (47), Car (24), Pedestrian (20), and others (9)
Sadeghi-Bazargani, et al. 2013 ¹⁹	Tabriz	One hospital (12 Months)	19530	31 ± 19.9	76.7	RTA Falls	-

Continue table1: Characteristics of the included injury epidemiology articles in Iran

Author, Year	City/district	Data Collection	Sample Size	Age (Mean ± SD)	Male (%)	Major Mechanisms Of Injuries	RTA* (%) Pattern
Shahrokh Yousefzadeh, et al. 2009 ⁸²	Rasht	One hospital (6 Months)	1141	344± 18	78.2	RTAs (74.4), Fall (14.9), Violence (4.6), and others (6.1)	Motorcycle(47), Pedestrian (23.1), Car (21.4), and others(8.5)
Farzandipour, et al. 2007 ⁸³	Kashan	One hospital (12 Months)	6415	27.7 ± 17.1	77.8	RTAs (47.5), Fall (29.9), Blunt Objects (9.3), Violence (3.7), and others (9.6)	Motorcycle(60.6), Car (18.6), Pedestrian (13.5), and others(7.3)
Beigzadeh, et al. 2015 ⁸⁴	Kerman	One hospital (12 Months)	10161	-	76.8	RTAs (49.7), Violence (16.9), Fall (15.1), Occupation (11.6), and others (6.7)	-
Solhi, et al. 2010 ⁸⁵	Arak	One hospital (12 Months)	813	-	74	RTAs (43), Occupation (21), and others (36)	-
Khatami, et al. 2003 ⁸⁶	Tehran	One hospital (12 Months)	1393	28.8 ± 17.3	89.3	RTAs (37), Fall (35), Cut (11.5), and others (16.5)	Motorcycle(42.1), Car (28.1), Pedestrian (25.6), and others(4.2)
Salimi, et al. 2008 ⁸⁷	Ahvaz	One hospital (7 Months)	1141	26.7 ± 17	83.4	RTAs (59), Fall (21), Blunt Objects (12.3), Cut (4.7), and others (3)	Pedestrian (35.9), Motorcycle(35.3), Car (26.4), and others (2.4)
Khosravi, And Ebrahimi 2008 ⁸⁸	Shahrood	One hospital (18 Months)	220	32.3 ± 18.6	79.1	RTAs (80), Fall (12.3), Violence (2.7), and others (2.3)	-
Amani, et al. 2009 ⁸⁹	Ardabil	One hospital (6 Months)	955	28.7±18.7	69.9	Fall (38.5), Cut (22.1), RTAs (10.8), Violence (5.6), Burn (5), and others (18.1)	-
Zamani, et al. 2014 ⁹⁰	Isfahan	3 hospitals (3Months)	1363	30.5 ±17.35	73.6	RTAs (62.5), Fall (17.3), Cut (6.8), Blunt Objects (5.7), and others (7.7)	Motorcycle(78.8), Pedestrian (15.3), and Car (5.9)
Chardoli And Rahimi-Movaghar 2006 ⁹¹	Zahedan	One hospital (12 Months)	768	22.8 ±16.1	82	RTAs (59.4), Fall (18.1), and others (22.5)	-
Soroush, et al. 2008 ⁹²	Shiraz	2 hospitals (6 Months)	1765	33±20	81.3	RTAs (53.3), Fall (25.9), Cut (8.8), Blunt Objects (7.2), and others (9.8)	Motorcycle(42.3), Pedestrian (29), Car (21.1), and others (7.6)
Moosazadeh, et al. 2013 ⁹³	Mazandaran	15 hospitals (12 Months)	58750	29.9±17.01	71.7	RTAs (39.8), Fall (31.8), Violence (5.3), Burn (5.2), and others (17.9)	Car (44.1), Motorcycle(41.9), and Pedestrian (14)
Fazel, et al. 2008 ⁹⁴	Kashan	3 hospitals (6 Months)	18166	29.2±19.9	76.5	RTAs (50.5), Fall (32.3), Violence (6.2), and others (11)	Motorcycle(59), Pedestrian (22), Car (13), and others (6)
Adib-Hajbaghery And Maghaminejad 2014 ⁹⁵	Kashan	One hospital (6 Months)	400	-	75.2	RTAs (87.2), Fall (9.2), Violence (2.5), and others (1.1)	Motorcycle(61.3), Car (23.8), Pedestrian (14.9)
Zargar, et al. 2001 ⁹⁶	Tehran	3 hospitals (12 Months)	58013	27±16	80	Blunt Objects (50), RTAs (19), Cut (18.9), Fall (7.5), and others (4.6)	Pedestrian (47), Motorcycle(30), Car (19), and others (4)

Continue table1: Characteristics of the included injury epidemiology articles in Iran

Author, Year	City/district	Place Of Injury (%)	Ambulance Transportation (%)	Anatomical Sites Of Injury (%)	Injury Severity ** (%)	Case fatality proportion (%)	proportion of Mortality Due To RTA
Moini et al. 2000 ⁷³	Tehran	-	14	-	Mild=65, Moderate=25, Severe=10, and Mean \pm SD=6.1 \pm 5.5	2	-
Modaghegh et al. 2013 ⁷⁴	Mashhad	-	39.5	Head And Neck (42.5), and Lower Extremities (45.5)	Mild=47.3, Moderate=31.8, Severe=20.9, and Mean \pm SD=10.3 \pm 12.83	6.1	87.7
Fazel, et al. 2012 ⁷⁵	Kashan	Road(60.4), Workplace(15.1), Home(19.7), Sports (1.4), and others (3.4)	40	Head, Neck, Spine (31.2), Extremities (58.8), Ear, nose, Throat (7.2), and others (2.8)	-	1.1	76
Sheikhghomi, et al. 2015 ⁷⁶	Tehran	-	-	Head (23.8), Elbow And Forearm (19), Hip And Thigh (15.9), And Multiple Body Regions (14.3), and others (13.3)	Mean \pm SD=7.26 \pm 7	3.7	-
Karami Joushin, et al. 2013 ⁷⁷	Qom	Road(65), Workplace(8), Home(20), Sports Place (1), and others (6)	-	-	-	-	-
Rasouli, et al. 2011 ⁷⁸	Tehran	-	-	-	-	0.6	55.4
Karbaksh, et al. 2009 ⁷⁹	Kermanshah	Road(61.9), Workplace(4.9), Home(27.1), and others (6.2)	31.6	Head (27.6), Knee And Lower Leg (14.1), Abdomen, Lower Back, Lumbar Spine And Pelvis (17.8), Hip And Thigh(16.9), and others (23.6)	Mild=48.3, Moderate=33.6, and Severe=18.1	7.8	68.8
Abbasi, et al. 2013 ⁸⁰	Shiraz	-	-	Head And Neck (86.8), Face (18.4), Chest (24.2), Abdomen (20.3), and Extremity and External Injuries (40.9)	1-7= 65.9, 8-16=27, 17-25=3.5, and 25<=3.5	-	-
Hosseini, et al. 2009 ⁸¹	Rasht	-	47	Head And Neck(82.4), Limb&Pelvic (37.7), Face (13.9), Spine(7), Chest(3.8), and Abdomen (3)	-	2.7	79
Sadeghi-Bazargani, et al. 2013 ¹⁹	Tabriz	-	-	-	-	.2	-
Shahrokh Yousefzadeh, et al. 2009 ⁸²	Rasht	-	49.7	Head And Neck(80.8), Limb&Pelvic (25.4),Face (17.8), Spine(6.9), Chest(5.2), and Abdomen (4.3)	Mild=77.8, Moderate=11, and Severe=11.4	5.17	83
Farzandipour, et al. 2007 ⁸³	Kashan	-	-	Hand(36.4), Head And Neck(28.4), Limb&Pelvic (28.3), Spine(2.2), Chest(1), and Abdomen (3.6)	-	-	78.1
Beigzadeh, et al. 2015 ⁸⁴	Kerman	-	-	Limb&Pelvic (44.6), Head And Neck(18.8), Abdomen (18.1) Spine(12.2), and Chest(6.4),	-	-	-

Continue table1: Characteristics of the included injury epidemiology articles in Iran

Author, Year	City/district	Place Of Injury (%)	Ambulance Transportation (%)	Anatomical Sites Of Injury (%)	Injury Severity ** (%)	Case fatality proportion (%)	proportion of Mortality Due To RTA
Solhi, et al. 2010 ⁸⁵	Arak	-	15	-	-	-	-
Khatami, et al. 2003 ⁸⁶	Tehran	Road(43.7), Workplace(26), Home(17.5), and others(12.8)	35.1	-	Mild=75.6, Moderate=18.2, and Severe=6.2	1	-
Salimi, et al. 2008 ⁸⁷	Ahvaz	-	11.8	-	-	8.4	74
Khosravi, And Ebrahimi 2008 ⁸⁸	Shahrood	-	-	Limb&Pelvic (78.2), Head And Neck(71.4), Face (50.9), Chest(35), and Abdomen (29.1)	-	21.3	-
Amani, et al. 2009 ⁸⁹	Ardabil	-	9	Limb&Pelvic (68.7), Head (24.1), Face (13.9), Chest(4.6), and Abdomen (2.6)	-	0.1	-
Zamani, et al. 2014 ⁹⁰	Isfahan	-	49.6	Limb&Pelvic (44.9), Head And Neck (30.8), Face (13.9), Chest(3.3), Abdomen (4.3), and Spine(4.3),	-	0.7	-
Chardoli And Rahimi-Movaghar 2006 ⁹¹	Zahedan	-	-	-	-	8	-
Soroush, et al. 2008 ⁹²	Shiraz	Road(61), Workplace(10.5), and Home(27.1),	43	-	Mild=43.4, Moderate=34.2, Severe=22.4, and Mean \pm SD=10.2 \pm 10.9	2	75
Moosazadeh, et al. 2013 ⁹³	Mazandaran	Road(47.9), Workplace(10.6), Home(33.7), and others (6.8)	-	-	-	0.8	-
Fazel, et al. 2008 ⁹⁴	Kashan	-	-	-	-	1.3	83
Adib-Hajbagheri And M-ghaminejad 2014 ⁹⁵	Kashan	Road(94.2), Workplace(3.3), and Home(2.5)	-	Upper Limb (65.1), Head And Neck (60), Lower Limb (60.8), Chest(11.7), and Abdomen (32.2)	-	-	-
Zargar, et al. 2001 ⁹⁶	Tehran	Road(34), Workplace(35), Home(30), and Sports(1)	22	Head And Neck (46), Extremities (43), and Limb&Pelvic (44.9)	Mild=92, Moderate=6, Severe=2, and Mean \pm SD=7.1 \pm 7.2	1	-

*RTA: Road Traffic Accidents

** Mild<7 Moderate7-12 Severe>12 ranging from 1 to 75

The pattern of injuries had been studied in 16 cities in 15 provinces. In 24 studies, where the number of studied hospitals had been indicated, data were collected from 47 hospitals over a 324 month period. The total number of studied injury cases was 3 234 481 and the mean \pm standard deviation of the age of the cases was 30 ± 17.4 . In all of the studies, the number of the males was higher than the females (75.75% vs. 24.3%). Only 31.3% of injured cases had been referred to hospitals by ambulance.

RTAs, followed by fall accidents, were the leading cause of injuries in the vast majority of the studies (21 studies out of 25) (Figure 2).

Among RTAs injuries, the highest frequency was caused by motorcycle crashes (Figure 3).

The majority of injuries occurred on roads including urban roads, rural roads and highways (Figure 4).

Head and neck injuries were the most common during accidents (47.3% of cases) while the spinal cord suffered the least number of injuries (6.5% of cases) (Figure 5).

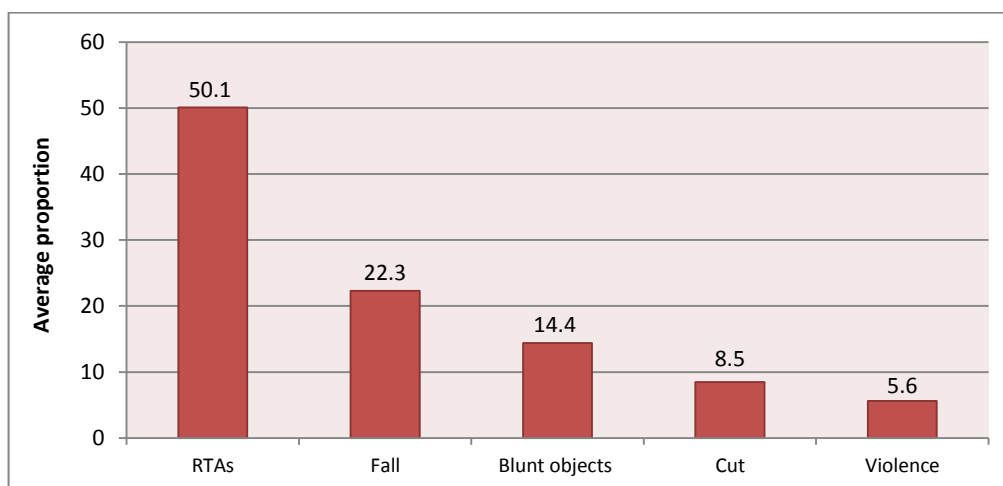


Figure 2: Average proportion of the mechanisms of injuries reported in various studies in Iran

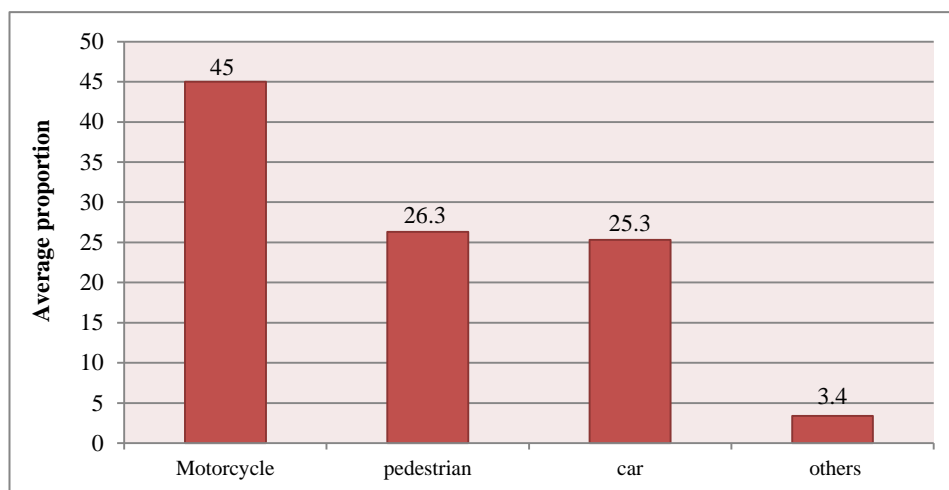


Figure 3: Average proportion of the different modes of road traffic injuries reported in various studies in Iran

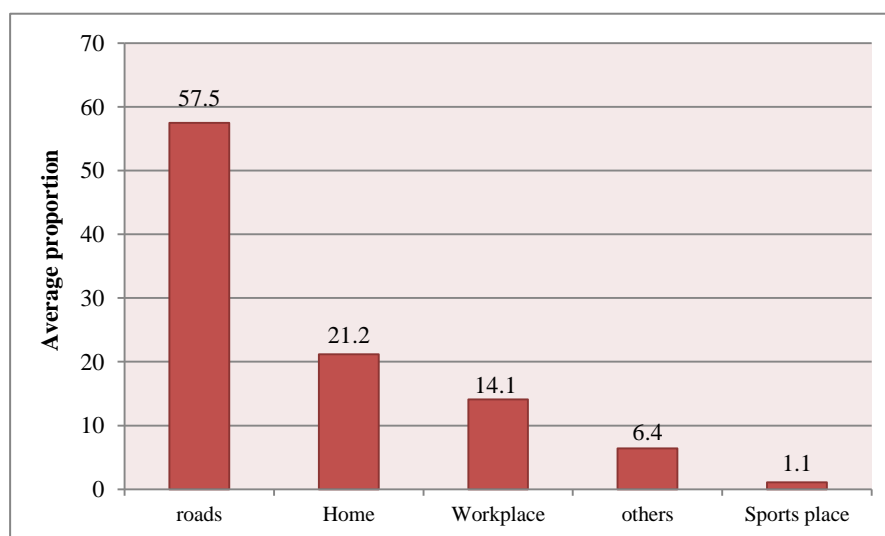


Figure 4: Average proportion of the place of injuries reported in various studies in Iran

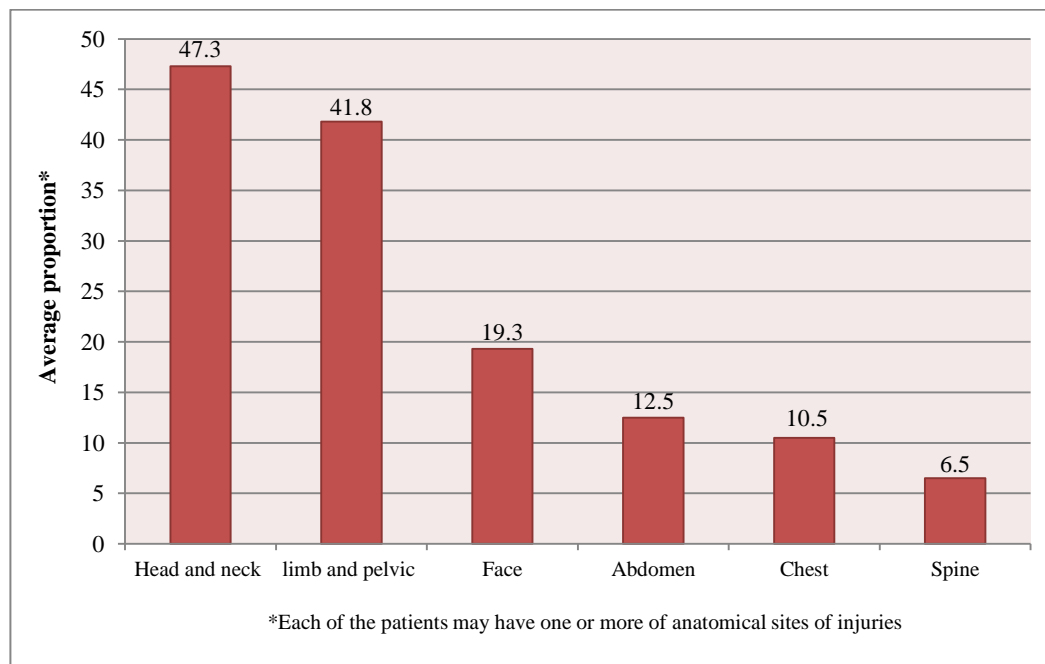


Figure 5: Average proportion of the anatomical sites of injuries reported in various studies in Iran

The mean \pm standard deviation of the severity of injuries was calculated to be 8.1 ± 8.6 (average proportion of mild injuries was 64, moderate injuries 23 and severe injuries 13).

In these studies, the case-fatality proportion ranged from 0.1 to 21.3 with the total mean of 3.8. RTAs accounted for 75% of injury-caused case-fatality proportion.

Discussion

According to this study, young people account for a large number of injury victims which is consistent with the majority of studies conducted in this area.²²⁻²⁵ Since the studied cases were often of working and productive age and many of them were the breadwinners of their families, their injuries impose serious socioeconomic costs in comparison with other groups. Therefore, it is important to pay more attention to the prevention of injuries in this group. In addition, the frequency of injuries is higher in males than the females. This is consistent with the majority of studies conducted in other countries.²⁶⁻²⁹ The studies that have been conducted in this area have pointed out several factors which may be applicable to Iran. Similar to their counterparts in most LMICs compared with High Income Countries (HICs), Iranian males are more vulnerable to injury risks due to the special socio-cultural context of Iran (more driving, more occupational threats, violence-induced injuries and so on).

Nevertheless, some types of injuries such as fractures and injuries that occur at home may be seen more in females than males due to females' gender roles or the nature of their duties.^{30, 31}

According to the reviewed studies, less than one third of the injured cases were referred to hospitals by ambulance. This is a poor performance compared with other countries.^{32, 33} The study by Naghavi and colleagues in 12 provinces of Iran in 2002 showed that 7.2% and 90.8% of injury cases were referred to hospitals by ambulance and conventional vehicles, respectively.¹² Whereas according to the results of Zafarghandi and Moeinian, only 5% of injury cases in Tehran had been referred to hospitals by ambulance in 1999.³⁴ This may indicate the improved status of pre-hospital care and the quantitative and qualitative promotion of the ambulances service in Iran in recent years. Given the importance of the rapid and professional transfer of the injured to hospitals, this condition cannot be considered as satisfactory since it is far below the standard. Thus, additional plans and endeavors for the qualitative and quantitative promotion of pre-hospital services seem necessary.

According to the current study's result, RTAs account for the majority of injuries which is consistent with the results of most of studies in this field.³⁵⁻⁴⁰ From 2005 to 2008, Iran had the world's highest road injury death rate.⁴¹ At that time, the study of Khorasani-zavare and colleagues showed that there are many obstacles to the

prevention of RTAs.⁴² Since that time, the Iranian authorities have designed and implemented many interventions in order to prevent RTAs⁴³⁻⁴⁷ so that, according to a WHO 2015 report, RTAs mortality has shown a descending trend decreasing from 40 cases in every 100 thousand cases in 2005 to 24 cases in every 100 thousand cases in 2014.⁴⁸ Despite the advances in the prevention of RTAs in recent years, they continue to be the primary cause of injuries and the second greatest cause of mortality in Iran.⁴⁹⁻⁵¹ It seems that there still are many barriers to preventing RTAs in Iran. In this regard more valid studies are needed in this field.

Based on the results, the rate of motorcycle accidents and their injuries is higher among RTAs cases which is consistent with the numbers obtained in other studies.⁵²⁻⁵⁵ Crash injuries and mortality among motorcyclists have been reduced in HICs communities to a large extent, thanks to the promoted preventive actions, improved injury diagnosis and treatment and enhanced injury centers and care system.⁵⁶ Many efforts have been made in Iran in recent years in order to reduce the crash rate among motorcyclists. Harsher punishment for a motorcyclist who breaks the law is a special plan that has been considered by the traffic department. The study conducted by Yunesian and colleagues revealed that the daily mean of the number of traffic-caused injured cases referred to Sina hospital during the first month of the implementation of this plan shows an ascending trend compared with the previous month as well as with the corresponding month of last year. However, the occurrence of severe traffic-caused injuries as well as severe head and neck injuries have decreased.⁵⁷ Given the fact that motorcycle crashes are still the main cause of injuries in Iran and other LMICs,⁵⁸ considerable amount of attention should be paid to this field. A set of plans for promoting helmet use by motorcyclists and designing special lanes for them may yield better results.⁵⁹⁻⁶¹

The results of these studies showed that the vast majority of accidents have occurred on roads. Since RTAs are the main cause of the injuries, roads are of course the primary accident scene. According to a 2009 WHO report, roads in Iran are sub-standard from a safety point of view.⁶² In addition, the results of Khorasani-zavare and colleagues (2009) confirm that the poor road safety in Iran is the main obstacle to accident prevention.⁴² The results of Jafari and colleagues also revealed the poor safety standard from 2001 to 2005.⁶³ Nevertheless, according to a 2013 WHO report, the safety of Iran's roads has improved slightly in the past few years.⁶⁴ But more initiatives are needed in order to achieve a satisfactory level.

Head and neck injuries are the most common. This conclusion is consistent with a lot of studies conducted outside Iran.⁶⁵⁻⁶⁸ It seems that RTAs are the main cause of these injuries. Therefore, safety considerations should be particularly taken into account regarding vehicles and motorcycles. Installing standard air bags, and making seat belt and helmet use compulsory are among the most important courses of action.

The total mean of case-fatality proportion was computed to be 3.8 where RTAs account for 75% of this number. Although this appears a negligible number, its severity will be highlighted by paying attention to two important facts: 1) only those cases that were referred to hospitals were included in this number. It should be noted that more cases die at the accident scene and they are not referred to hospitals. Thus, injury case-fatality proportion is definitely higher than 3.8. 2) Since about 4 deaths happen in every 100 thousand cases referred to hospitals, the case-fatality proportion will be a high number considering thousands of people who are referred daily to hospitals due to injuries resulting from accidents. Problems associated with recording systems and underestimation of problems can be added to this challenge. This study observed no special increasing/decreasing trend of injury case-fatality proportion.⁶⁹⁻⁷² Observing safety considerations at different locations including roads, work places, and homes and so on, improving pre-hospital care systems and capabilities, improving care systems and methods for injury cases, public training courses and different preventive programs can reduce injury-related mortality.

Despite serious follow ups, some reports and theses were not available. This was an important limitation of this study. Non-homogenous results were another limitation of this study making it impossible to conduct meta-analyses and Standardized Mean Difference (SMD). In this regard this limitation should be considered when interpreting the results of this study.

Conclusion

According to the results obtained in the current study, it is recommended that managers and policy-makers pay more attention and give priority to the following items: paying more attention to the prevention of accident injuries among men especially young men, qualitative and quantitative promotion of pre-hospital services and ambulance services, promoting the safety of roads and vehicles, developing a set of actions for promoting the safety of motorcycles (manufacturing safe motorcycles, creating special motorcycle lanes, and laws to make

helmet use compulsory) and improving emergency care, especially for head and neck injuries.

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References

- Magruder KM, Kassam-Adams N, Thoresen S, Olff M. Prevention and public health approaches to trauma and traumatic stress: a rationale and a call to action. *Eur J Psychotraumatol*. 2016 Mar 18;7:29715.
- Sar V. Trauma and dissociation in context: personal life, social process, and public health. *J Trauma Dissociation*. 2008;9(1):1-8.
- Sadeghi-Bazargani H, Saadati M. Speed Management Strategies; A Systematic Review. *Bull Emerg Trauma*. 2016 Jul;4(3):126-33.
- Pfeifer R, Teuben M, Andruszkow H, Barkatali BM, Pape HC. Mortality Patterns in Patients with Multiple Trauma: A Systematic Review of Autopsy Studies. *PLoS One*. 2016 Feb 12;11(2): e0148844.
- Roy N, Gerdin M, Ghosh S, Gupta A, Kumar V, Khajanchi M, et al. 30-Day In-hospital Trauma Mortality in Four Urban University Hospitals Using an Indian Trauma Registry. *World J Surg*. 2016 Jun; 40(6):1299-307.
- Soreide K. Epidemiology of major trauma. *Br J Surg*. 2009 Jul;96(7):697-8.
- Norman R, Matzopoulos R, Groenewald P, Bradshaw D. The high burden of injuries in South Africa. *Bull World Health Organ*. 2007 Sep;85(9):695-702.
- Gielen AC, Wilson ME, Faden RR, Wissow L, Harvilchuck JD. In-home injury prevention practices for infants and toddlers: the role of parental beliefs, barriers, and housing quality. *Health Educ Q*. 1995 Feb;22(1):85-95.
- Tin Tin S, Woodward A, Ameratunga S. Injuries to pedal cyclists on New Zealand roads, 1988-2007. *BMC Public Health*. 2010 Oct 30;10:655.
- Chitturi MV, Ooms AW, Bill AR, Noyce DA. Injury outcomes and costs for cross-median and median barrier crashes. *J Safety Res*. 2011 Apr;42(2):87-92.
- McIlvenny S, Al Mahrouqi F, Al Busaidi T, Al Nabhani A, Al Hikmani F, Al Kharousi Z, et al. Rear seat belt use as an indicator of safe road behaviour in a rapidly developing country. *J R Soc Promot Health*. 2004 Nov;124(6):280-3.
- Naghavi M, Akbari M. Injury Epidemiology External caused of Accident in Iran. Tehran: Fekrat Publications, 2002.
- Otieno T, Woodfield JC, Bird P, Hill AG. Trauma in rural Kenya. *Injury*. 2004 Dec;35(12):1228-33.
- El-Shinawi M, McCunn M, Sisley AC, El-Setouhy M, Hirshon JM. Developing sustainable trauma care education in Egypt: sequential trauma education program, steps to success. *J Surg Educ*. 2015 Jul-Agu;72(4):e29-32.
- Plummer JM, Ferron-Boothe D, Meeks-Aitken N, McDonald AH. Trauma in the developing world: the Jamaican experience. *West Indian Med J*. 2014 Jun;63(3):267-70.
- Mock C, Arreola-Risa C, Quansah R. Strengthening care for injured persons in less developed countries: a case study of Ghana and Mexico. *Inj Control Saf Promot*. 2003 Mar-Jun;10(1-2):45-51.
- Sadeghi-Bazargani H, Ayubi E, Azami-Aghdash S, Abedi L, Zemestani A, Amanati L, et al. Epidemiological Patterns of Road Traffic Crashes During the Last Two Decades in Iran: A Review of the Literature from 1996 to 2014. *Arch Trauma Res*. InPress.
- Safiri S, Sadeghi-Bazargani H, Amiri S, Khanjani N, Safarpour H, Karamzad N, et al. Association between Adult Attention Deficit-Hyperactivity Disorder and motorcycle traffic injuries in Kerman, Iran: a case-control study. *Clinic Res Gov J*. 2013;2(1):17-21.
- Sadeghi-Bazargani H, Azami-Aghdash S, Ziapour B, Deljavan R. Trauma-related Therapeutic Procedures at Shohada Trauma Center in Tabriz. *Trauma Mon*. 2013 Winter;17(4):389-92.
- Johnson BT, Low RE, LaCroix JM. Systematic reviews to support evidence-based medicine, (2nd edition). by Khalid Khan, Regina Kunz, Jos Kleijnen and Gerd Antes: A Review. *Research Synthesis Methods*. 2013;4(1):102-8.
- Vandenbroucke JP, von Elm E, Altman DG, Gotsche PC, Mulrow CD, Pocock SJ, et al. Strengthening the Reporting of Observational Studies in Epidemiology (STROBE): explanation and elaboration. *Epidemiology*. 2007 Nov;18(6):805-35.
- Alberdi F, Garcia I, Atutxa L, Zabarte M. Epidemiology of severe trauma. *Med Intensiva*. 2014 Dec;38(9):580-8.
- Khorasani-Zavareh D, Bigdeli M, Farrokh-Eslamlou H, Abdoos H, Mohammadi R. Traffic injury deaths in reproductive age group in Iran. *J Clin Res Gov*. 2012;1(1):25.

24. 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 County, Iran, During 2012-2013. *Arch Trauma Res.* 2015 Jun 20;4(2): e28465.
25. Majercik S, Day S, Stevens MH, MacDonald JD, Bledsoe J. Epidemiology of Traumatic Brain Injury After Small-Wheeled Vehicle Trauma in Utah. *Neurosurgery.* 2015 Dec;77(6):927-30.
26. Ferrando J, Rodríguez-Sanz M, Borrell C, Martínez V, Plasència A. Individual and contextual effects in injury morbidity in Barcelona(Spain). *Accid Anal Prev.* 2005 Jan;37(1):85-92.
27. Haider AH, Crompton JG, Oyetunji T, Stevens KA, Efron DT, Kieninger AN, et al. Females have fewer complications and lower mortality following trauma than similarly injured males: a risk adjusted analysis of adults in the National Trauma Data Bank. *Surgery.* 2009 Aug;146(2):308-15.
28. El-Menyar A, El-Hennawy H, Al-Thani H, Asim M, Abdelrahman H, Zarour A, et al. Traumatic injury among females: does gender matter? *J Trauma Manag Outcomes.* 2014 Jul 28;8:8.
29. Laupland KB, Kortbeek JB, Findlay C, Hameed SM. A population-based assessment of major trauma in a large Canadian region. *Am J Surg.* 2005 May;189(5):571-5.
30. National Hospital Discharge Survey (NHDS), National Center for Health Statistics, <http://www.cdc.gov/nchs/hdi.htm>, accessed 14 September 2011.
31. Cassell E, Ozanne-Smith J. Women's injury in the home. Monash University Accident Research Centre 1999, <http://www.monash.edu.au/iri/research/reports/muarc158.html>, accessed 25 April 2013.
32. O'Toole P, Callender O, O'Hare B, Walsh S, Orr D, Fogarty E. Epidemiology of major paediatric trauma. *Ir Med J.* 2008 Sep;101(8):251-3.
33. Masiira-Mukasa N, Ombito BR. Surgical admissions to the Rift Valley provincial general hospital, Kenya. *East Afr Med J.* 2002 Jul;79(7):373-8.
34. Zafarghandi M, Moeeny M. Evaluation of transportation of traumatic patients to a trauma center in Tehran. *Tehran Univ Med J.* 1999;57(1):68-71.
35. O'Reilly DA, Bouamra O, Kausar A, Malde DJ, Dickson EJ, Lecky F. The epidemiology of and outcome from pancreatoduodenal trauma in the UK, 1989-2013. *Ann R Coll Surg Engl.* 2015 Mar;97(2):125-30.
36. Heim C, Bosisio F, Roth A, Bloch J, Borens O, Daniel RT, et al. Is trauma in Switzerland any different? epidemiology and patterns of injury in major trauma - a 5-year review from a Swiss trauma centre. *Swiss Med Wkly.* 2014 Apr 2;144:w13958.
37. Rastogi D, Meena S, Sharma V, Singh GK. Epidemiology of patients admitted to a major trauma centre in northern India. *Chin J Traumatol.* 2014 Apr 1;17(2):103-7.
38. Davarinos N, Ellanti P, Morris S, Mc Elwain JP. Epidemiology of pelvic and acetabular trauma in a Dublin tertiary hospital: a 10-year experience. *Ir J Med Sci.* 2012 Jun;181(2):243-6.
39. Osifo OD, Iribhogbe PE, Ugiagbe EE. Epidemiology and pattern of paediatric and adolescent trauma deaths in a level 1 trauma centre in Benin city, Nigeria. *Injury.* 2012 Nov;43(11):1861-4.
40. Solagberu BA, Adekanye AO, Ofoegbu CP, Udoffa US, Abdur-Rahman LO, Taiwo JO. Epidemiology of trauma deaths. *West Afr J Med.* 2003 Jun;22(2):177-81.
41. Akbari ME, Naghavi M, Soori H. Epidemiology of deaths from injuries in the Islamic Republic of Iran. *East Mediterr Health J.* 2006 May-Jul;12(3-4):382-90.
42. Khorasani-Zavareh D, Mohammadi R, Khankeh HR, Laflamme L, Bikmoradi A, Haglund BJ. The requirements and challenges in preventing of road traffic injury in Iran. A qualitative study. *BMC Public Health.* 2009 Dec 23;9:486.
43. Soori H, Ainy E, Movahedinejad AA, Mahfozphoor S, Movahedi M, Reza zadeh Azari M, et al. A Practical Model of Political Mapping in Road Traffic Injury in Iran in 2008. *Hakim.* 2009;12(3):1- 9.
44. Khorasani-Zavareh D, Shoar S, Saadat S. Antilock braking system effectiveness in prevention of road traffic crashes in Iran. *BMC Public Health.* 2013 May 4;13:439.
45. Soori H, Ainy E, Montazeri A, Omidvari S, Jahangiree AR, Shiran GR. The role of pupil liaisons' on traffic penalties and road traffic injuries. *Payesh.* 2010;9:339-48.
46. Soori H, Nasermodadi A, Ainy E, Movahedi M, Mehmendar MR, Massoudei Nejjhad MR, et al. The effect of mandatory seat belt use legislations on mortalities from road traffic injuries in Iran. *Hakim.* 2009;12(1):48-54.
47. Soori H, Royanian M, Zali AR, Movahedinejad A. Study of changes on Road Traffic Injury Rates, before and after of Four Interventions by Iran Traffic Police. *Pajouhandeh.* 2009;14(1):15-20.
48. World Health Organization. Global status report on road safety 2015. Geneva, Switzerland: WHO, 2015.
49. Bakhtiyari M, Mehmendar MR, Mirbagheri B, Hariri GR, Delpisheh A, Soori H. An epidemiological survey on road traffic crashes in Iran: application of the two logistic regression models. *Int J Inj Contr Saf Promot.* 2014;21(2):103-9.
50. Ardalan A, Sephehvand N, Pourmalek F, Masoumi G, Sarvar M, Mahmoudabadi A, et al. Deadly rural road traffic injury: a rising public health concern in I.R. Iran. *Int J Prev Med.* 2014 Feb;5(2):241-4.
51. Forensic Medicine Organization of Iran. Statistical Data, Accidents (in Farsi). Forensic Medicine Organization of Iran 2009, <http://www.lmo.ir/?siteid=1&pageid=1347>, accessed 31 May 2009.

52. Trajano AD, Pereira BM, Fraga GP. Epidemiology of in-hospital trauma deaths in a Brazilian university hospital. *BMC Emerg Med.* 2014 Oct 31;14:22.
53. Carrasco CE, Godinho M, Berti de Azevedo Barros M, Rizoli S, Fraga GP. Fatal motorcycle crashes: a serious public health problem in Brazil. *World J Emerg Surg.* 2012 Aug 22;7(Suppl 1): S5.
54. Gawryszewski VP, Coelho HM, Scarpelini S, Zan R, Jorge MH, Rodrigues EM. Land transport injuries among emergency department visits in the state of Sao Paulo, in 2005. *Rev Saude Publica.* 2009 Apr;43(2): 275-82.
55. Reichenheim ME, de Souza ER, Moraes CL, de Mello Jorge MH, da Silva CM, de Souza Minayo MC. Violence and injuries in Brazil: the effect, progress made, and challenges ahead. *Lancet.* 2011 Jun 4;377(9781):1962-75.
56. Solagberu BA, Ofoegbu CK, Nasir AA, Ogundipe OK, Adekanye AO, Abdur-Rahman LO. Motorcycle injuries in a developing country and the vulnerability of riders, passengers, and pedestrians. *Inj Prev.* 2006 Aug;12(4):266-8.
57. Yunesian M, Moradi A, Khaji A, Mesdaghinia AR, Zargar M. Evaluation of the effect of offender motorcyclists' penalty enforcement project on the incidence of road traffic accident injuries in Tehran. *Payesh.* 2007;6(1):19-26.
58. Abedi L, Sadeghi-Bazargani H. Epidemiological patterns and risk factors of motorcycle injuries in Iran and Eastern Mediterranean Region countries: a systematic review. *Int J Inj Contr Saf Promot.* 2015 Sep; 22:1-8.
59. Lastfogel J, Soleimani T, Flores R, Cohen A, Wooden WA, Munshi I, et al. Helmet Use and Injury Patterns in Motorcycle-Related Trauma. *JAMA Surg.* 2016 Jan;151(1):88-90.
60. Olsen CS, Thomas AM, Singleton M, Gaichas AM, Smith TJ, Smith GA, et al. Motorcycle helmet effectiveness in reducing head, face and brain injuries by state and helmet law. *Inj Epidemiol.* 2016;3:8.
61. MacLeod JB, Digiacomio JC, Tinkoff G. An evidence-based review: helmet efficacy to reduce head injury and mortality in motorcycle crashes: EAST practice management guidelines. *J Trauma.* 2010 Nov;69(5):1101-11.
62. World Health Organization. Global status report on road safety: time for action. Geneva, Switzerland: WHO, 2009.
63. Jafari MJ, Hokmabadi R, Soori H. The Status of Road Safety in Iran during 2001 – 2006. *J Heal Safe Work.* 2013;3(1):1-12.
64. World Health Organization. Global status report on road safety 2013. Geneva, Switzerland: WHO, 2013.
65. Liao HM, Liao JK. An epidemiological study of 2,353 patients injured in motor vehicle accidents. *Di Yi Jun Yi Da Xue Xue Bao.* 2003 May;23(5):485-7.
66. Banerjee M, Bouillon B, Shafizadeh S, Paffrath T, Lefering R, Wafaisade A; German Trauma Registry Group. Epidemiology of extremity injuries in multiple trauma patients. *Injury.* 2013 Aug;44(8):1015-21.
67. Lefering R, Paffrath T, Bouamra O, Coats TJ, Woodford M, Jenks T, et al. Epidemiology of in-hospital trauma deaths. *Eur J Trauma Emerg Surg.* 2012 Feb;38(1):3-9.
68. Tsatsanidis GV, Minopoulos GI, Liratzopoulos ND, Papathanasiou JV, Simopoulos KE. The structure of trauma patients, its management and health care in the University Hospital of Alexandroupolis. *Folia Med (Plovdiv).* 2014 Jan-Mar;56(1):50-5.
69. Sise RG, Calvo RY, Spain DA, Weiser TG, Staudenmayer KL. The epidemiology of trauma-related mortality in the United States from 2002 to 2010. *J Trauma Acute Care Surg.* 2014 Apr;76(4):913-9.
70. Di Saverio S, Gambale G, Coccolini F, Catena F, Giorgini E, Ansaloni L, et al. Changes in the outcomes of severe trauma patients from 15-year experience in a Western European trauma ICU of Emilia Romagna region (1996-2010). A population cross-sectional survey study. *Langenbecks Arch Surg.* 2014 Jan;399(1):109-26.
71. Pracht EE, Langland-Orban B, Tepas JJ, Celso BG, Flint L. Analysis of trends in the Florida Trauma System (1991-2003): Changes in mortality after establishment of new centers. *Surgery.* 2006 Jul;140(1):34-43.
72. Moore K. Trauma mortality: understanding mortality distribution to improve outcomes. *J Emerg Nur.* 2014 Jul;40(4):405-6.
73. Moini M, Rezaishiraz H, Zafarghandi MR. Characteristics and outcome of injured patients treated in urban trauma centers in Iran. *J Trauma.* 2000 Mar;48(3):503-7.
74. Modaghegh MH, Saremi E, Mohamadian M, Jafarzadeh R. Characteristics of trauma in North East Iran and the prevention strategies. *Arch Iran Med.* 2013 Oct;16(10):576-9.
75. Fazel MR, Fakharian E, Mahdian M, Mohammadzadeh M, Salehfard L, Ramezani M. Demographic Profiles of Adult Trauma during a 5 Year Period (2007-2011) in Kashan, IR Iran. *Arch Trauma Res.* 2012 Summer;1(2):63-6.
76. Sheikhhomi S, Rahimi-Movaghar V, Jafarpour S, Saadat S. Epidemiology and short-term mortality in traumatic patients admitted to Shariati Hospital in Iran between 2012 and 2013. *Chin J Traumatol.* 2015;18(5):275-8.
77. Karami Joushin M, Saghafipour A, Noroozi M, Soori H, Khedmati Morasae E. Epidemiology of accidents and traumas in Qom province in 2010. *Arch Trauma Res.* 2013 Dec;2(3):113-7.
78. Rasouli MR, Saadat S, Haddadi M, Gooya MM, Afsari M, Rahimi-Movaghar V. Epidemiology of injuries and poisonings in emergency departments in Iran. *Public Health.* 2011 Oct;125(10):727-33.

79. Karbakhsh M, Zandi NS, Rouzrokh M, Zarei MR. Injury epidemiology in Kermanshah: the National Trauma Project in Islamic Republic of Iran. *East Mediterr Health J*. 2009 Jan-Feb;15(1):57-64.
80. Abbasi HR, Mousavi SM, Taheri Akeri A, Niakan MH, Bolandparvaz S, Paydar S. Pattern of Traumatic Injuries and Injury Severity Score in a Major Trauma Center in Shiraz, Southern Iran. *Bull Emerg Trauma*. 2013 Apr;1(2):81-5.
81. Hemmati H, Yousefzadeh Chabok S, Dehnadimoghdam A, Mohammadi Melksari H, Ahmadi Dafchahi M, Shabani S. Trauma in Guilan (North of Iran): An Epidemiologic Study. *Acta Medica Iranica*. 2009;47(5):403-8.
82. Yousefzadeh S, Ahmadi Dafchahi M, Mohammadi Maleksari M, Dehnadi Moghadam A, Hemati H, Shabani S. Epidemiology of Injuries and their Causes among Traumatic Patients Admitted into Poursina Hospital, Rasht (second half of the year 2005). *Behbood*. 2007;11(3):286-95.
83. Farzandipour M, Ghattan H, Mazrouei L, Nejati M, Aghabagheri T. Epidemiological study of traumatic patients referred to Neghavi hospital of Kashan. *J Kermanshah Uni Med Sci*. 2007;11(1):58-68.
84. Beigzadeh A, Naghibzadeh Tahami A, Rezaei H, Bahmanbijari B, Nazarieh M, Seyed Askari S. Epidemiology of trauma in Shahid Bahonar hospital in Kerman. *J Emerg Prac Trauma*. 2016;2(2):33-6.
85. Solhi H, Kalantari M, Gudarzi D, Noori GR, Yaghubi AA, Cyrus A, et al. Epidemiological Assessment of Trauma Patients Referring to Arak Vali-Asr Hospital. *Rescue & Relief*. 2010;2(1):9-16.
86. Khatami SM, Kalantar Motamedi MH, Mohebbi HA, Tarighi P, Farzanegan GR, Rezaei Y, et al. Epidemiology of trauma Baqiatallah hospital: A one-Year Prospective study. *J Mil Med*. 2003;5(1):13-9.
87. Salimi J, Zarei MR. Trauma: an epidemiological study from a single institute in Ahvaz, Iran. *Payesh*. 2008;7(2):115-20.
88. Khosravi A, Ebrahimi H. To Evaluate the Outcomes of Patients with Trauma Admitted to the Imam Hossein Hospital, Shahrood Using the Trauma and Injury Severity Score (TRISS). *Iran J Epidemiol*. 2008;4(2):35-41.
89. Amani F, Habibzadeh S, Rostami K. Specifications of Traumatized Patients Referring to Fatemi Hospital of Ardabil, 2007-8. *J Ardabil Univ Med Sci*. 2009;9(1):13-22.
90. Zamani M, Esmailian M, Mirazimi MS, Ebrahimian M, Golshani K. Cause and Final Outcome of Trauma in Patients Referred to the Emergency Department; a Cross Sectional Study. *Iran J Emerg Med*. 2014;1(1):22-7.
91. Chardoli M, Rahimi-Movaghar V. Analysis of trauma outcome at a university hospital in Zahedan, Iran using the TRISS method. *East Afr Med J*. 2006 Aug;83(8):440-2.
92. Soroush AR, Ghahri-Saremi S, Rambod M, Malek-Hosseini SA, Nick-Eghbal S, Khaji A. Pattern of injury in Shiraz. *Chin J Traumatol*. 2008 Feb;11(1):8-12.
93. Moosazadeh M, Nasehi MM, Mirzajani M, Bahrami MA. Epidemiological Study of Traumatic Injuries in Emergency Departments of Mazandaran Hospitals, 2010. *J Mazand Univ Med Sci*. 2013;23(98):144-54.
94. Fazel MR, Tabesh H, Azordegan F. Epidemiological Study on Injuries in Kashan from 1383 to 1385. *KAUMS Journal (FEYZ)*. 2008;11(5):28-31.
95. Adib-Hajbaghery M, Maghaminejad F. Epidemiology of patients with multiple trauma and the quality of their prehospital respiration management in Kashan, Iran: six months assessment. *Arch Trauma Res*. 2014 Jun;3(2):e17150.
96. Zargar M, Modaghegh MH, Rezaishiraz H. Urban injuries in Tehran: demography of trauma patients and evaluation of trauma care. *Injury*. 2001 Oct;32(8):613-7.

Appendix 1: STROBE Statement-checklist of items that should be included in reports of observational studies.		
	Item No	Recommendation
Title and abstract	1	(a) Indicate the study's design with a commonly used term in the title or the abstract (b) Provide in the abstract an informative and balanced summary of what was done and what was found
Introduction		
Background/rationale	2	Explain the scientific background and rationale for the investigation being reported
Objectives	3	State specific objectives, including any prespecified hypotheses
Methods		
Study design	4	Present key elements of study design early in the paper
Setting	5	Describe the setting, locations, and relevant dates, including periods of recruitment, exposure, follow-up, and data collection
Participants	6	(a) <i>Cohort study</i> —Give the eligibility criteria, and the sources and methods of selection of participants. Describe methods of follow-up <i>Case-control study</i> —Give the eligibility criteria, and the sources and methods of case ascertainment and control selection. Give the rationale for the choice of cases and controls <i>Cross-sectional study</i> —Give the eligibility criteria, and the sources and methods of selection of participants (b) <i>Cohort study</i> —For matched studies, give matching criteria and number of exposed and unexposed <i>Case-control study</i> —For matched studies, give matching criteria and the number of controls per case
Variables	7	Clearly define all outcomes, exposures, predictors, potential confounders, and effect modifiers. Give diagnostic criteria, if applicable
Data sources/ measurement	8*	For each variable of interest, give sources of data and details of methods of assessment (measurement). Describe comparability of assessment methods if there is more than one group
Bias	9	Describe any efforts to address potential sources of bias
Study size	10	Explain how the study size was arrived at
Quantitative variables	11	Explain how quantitative variables were handled in the analyses. If applicable, describe which groupings were chosen and why
Statistical methods	12	(a) Describe all statistical methods, including those used to control for confounding (b) Describe any methods used to examine subgroups and interactions (c) Explain how missing data were addressed (d) <i>Cohort study</i> —If applicable, explain how loss to follow-up was addressed <i>Case-control study</i> —If applicable, explain how matching of cases and controls was addressed <i>Cross-sectional study</i> —If applicable, describe analytical methods taking account of sampling strategy (e) Describe any sensitivity analyses
Result		
Participants	13*	(a) Report numbers of individuals at each stage of study—eg numbers potentially eligible, examined for eligibility, confirmed eligible, included in the study, completing follow-up, and analyzed (b) Give reasons for non-participation at each stage (c) Consider use of a flow diagram
Descriptive data	14*	(a) Give characteristics of study participants (eg demographic, clinical, social) and information on exposures and potential confounders (b) Indicate number of participants with missing data for each variable of interest (c) <i>Cohort study</i> —Summarize follow-up time (eg, average and total amount)
Outcome data	15*	<i>Cohort study</i> —Report numbers of outcome events or summary measures over time <i>Case-control study</i> —Report numbers in each exposure category, or summary measures of exposure <i>Cross-sectional study</i> —Report numbers of outcome events or summary measures
Main results	16	(a) Give unadjusted estimates and, if applicable, confounder-adjusted estimates and their precision (eg, 95% confidence interval). Make clear which confounders were adjusted for and why they were included (b) Report category boundaries when continuous variables were categorized (c) If relevant, consider translating estimates of relative risk into absolute risk for a meaningful time period
Other analyses	17	Report other analyses done—eg analyses of subgroups and interactions, and sensitivity analyses
Discussion		
Key results	18	Summarize key results with reference to study objectives
Limitations	19	Discuss limitations of the study, taking into account sources of potential bias or imprecision. Discuss both direction and magnitude of any potential bias
Interpretation	20	Give a cautious overall interpretation of results considering objectives, limitations, multiplicity of analyses, results from similar studies, and other relevant evidence
Generalizability	21	Discuss the generalizability (external validity) of the study results
Other information		
Funding	22	Give the source of funding and the role of the funders for the present study and, if applicable, for the original study on which the present article is based