

# Epidemiology, Incidence, and Trend of Injuries in Iran: A National Study

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## Abstract

**Introduction:** Injuries are one of the well-known leading causes of disability and mortality in all societies. This study aims to determine the incidence and trend of injuries and their epidemiologic characteristics in Iran. **Methods:** In a cross-sectional study, injury fatality data from 2008 to 2016 were obtained from the registry of the Ministry of Health and Medical Education (Iran) and analyzed to determine the epidemiological pattern of injuries. Data were analyzed using descriptive analysis. Excel and the statistical package of SPSS version 22 were used for data analysis.  $P \leq 0.05$  was considered statistically significant. **Results:** The highest incidence of injuries was related to traffic injuries with 546.4/100,000 population, followed by trauma and falls from heights with 497.7 and 195.2/100,000 population, respectively. The highest incidence of traffic injuries in Iran had occurred in 2011 with 628.1/100,000 population. **Conclusion:** Regarding the high incidence of injuries, especially traffic crashes, traumas, and falls, the priorities for close monitoring of these injuries during the high-risk periods to decrease and control the rate of the injuries strongly felt.

**Keywords:** Epidemiology, incidence, injury, Iran, trend

## INTRODUCTION

The increasing of various injuries is one of the most important dangers of human life, which annually causes the death of more than 6 million people worldwide.<sup>[1]</sup> Globally, injuries and related injuries are one of the leading causes of death and disability.<sup>[2]</sup> Traffic injuries are one of the most important unintentional types of injuries. Motor vehicle crash is the most common cause of death among young people in developed or high-income countries and developing countries, 65% of deaths and 90% of disabilities are caused by this problem.<sup>[3]</sup> According to Forensic Medicine Organization in 2011 and 2012, a total of 20,068 and 19,089 deaths and 297,259 and 318802 injuries were recorded due to traffic injuries in Iran, respectively.<sup>[4,5]</sup> Rapid population growth, increasing vehicles and intercity trips and changing lifestyles, and willingness to use private cars are considered the main causes of traffic injuries.<sup>[6,7]</sup> Since in

Iran, fatality from injuries is the second-leading cause of death and on the other hand, useful and purposeful information is necessary to injuries prevention in any society, this study was designed to investigate the 8-year trend of different types and epidemiological profiles of injuries in Iran during 2008–2016.

## METHODS

This study has been performed based on the collection and analysis of recorded data in the medical emergency and

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injury management center affiliated with Ministry of Health and Medical Education (Iran). This study was approved by the Ethics Committee of Kashan University of Medical Sciences (IR.KAUMS.NUHEPM. REC.1399.036).

Injuries information from all hospitals affiliated with medical universities in Iran is sent and aggregated in the aforementioned registry center. This registration system is designed and developed, aligned with the National Injury Prevention Program by the Department of Health Centre for Disease Management through the Excel program. This registration system contains main variables such as age, sex, area of injury, place of injury, type of injury, month and year of injury, outcome, and the name of the registrar center. The validity of its data has been verified according to the national program. In this study, injury and death statistics for the designated facility from 2008 to 2016 were used to analyze the data. Population statistics of the country and provinces were extracted from the detailed results of the population census in 2006, 2011, and 2016. Moreover, population information in years between the censuses, including 2007–2009 based on the 2006 census with a growth rate of 1.29%, in 2012–2015 based on the census of 2011 and with a growth rate of 1.23 were estimated using the exponential method. Data included age groups (0–4, 5–19, 20–29, 30–59 years, and old  $\geq 60$  years) sex, injury area (urban and rural), and injury outcome (recovery, death, and disability). After extracting all injury and population information from the country, frequency, mortality, and incidence were calculated for each year. To analyze the results, the death rate of different injuries was calculated and their trend over different years was plotted, using Microsoft Excel.

## RESULTS

In 2008, the highest frequency of injuries was related to traffic injuries with 395,253 followed by trauma with 359,300 cases. In the meantime, drowning is ranked 12<sup>th</sup> in all years. In general, out of 1,483,425 injuries during 2016, 947 cases were related to drowning [Table 1].

In the 8-year study period, the highest incidence rate of injuries was related to traffic crashes with 546.4/100,000 populations, followed by trauma and falls from heights with 496.7 and 195.2/100,000 populations, respectively. During the study period, 2011 had the highest incidence rate of traffic injuries with 628.1/100,000 populations. While drowning had the lowest incidence during 2008–2016, electrocutions and animal attacks had the second and third lowest incidence rates during these years [Table 2].

In 2008, the highest mortality ratio was related to drowning with 1726.9 deaths/10,000, followed by electrocution with 441.2 deaths/10,000 injuries. Nevertheless, only 71.8 and 7.37 deaths/10,000 were related to traffic injuries and trauma, respectively. In 2008–2016, the highest mortality ratio was related to drowning, followed by electrocutions and suicides, and the lowest mortality ratio was related to trauma, scorpion bites, and animal attacks, respectively [Table 3].

Figures 1-3 show the trend of changes in the mortality ratio during 2008–2016 based on the type of injuries. Trauma, animal attacks, and scorpion bites have had a steady trend over the years, whereas falling, traffic injuries, poisoning, burns,

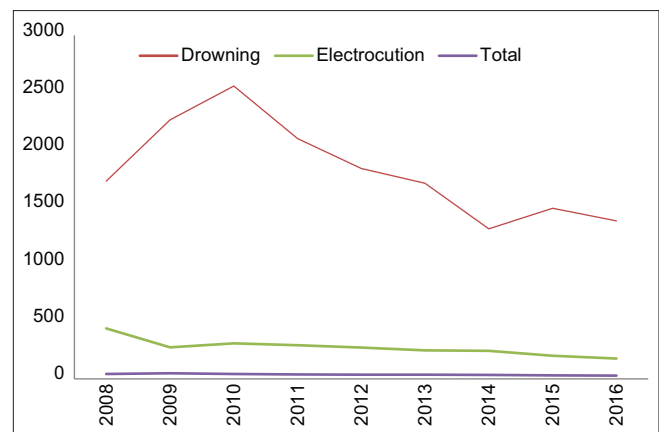


Figure 1: Mortality rate per 10,000 accidents in Iran during 2008-2016

Table 1: Frequency of the accidents in Iran based on the type of accident during 2008–2016

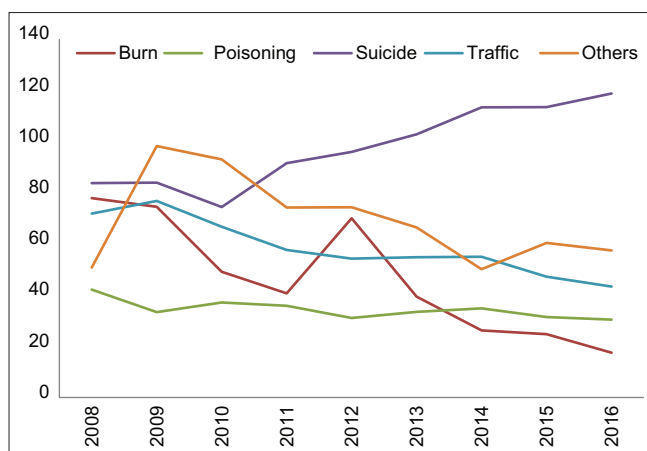
Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Assault	13,892	13,370	13,133	14,911	20,489	20,288	21,760	22,550	26,882
Scorpion bite	23,393	22,705	26,135	25,390	27,181	24,687	26,139	22,784	23,670
Burn	63,056	56,547	58,660	64,465	61,592	63,726	64,503	63,872	68,757
Drowning	747	885	923	1073	1083	1022	1008	1220	947
Electrocution	4351	3890	4681	5240	4847	4710	4694	4706	4746
Fall	141,210	116,802	143,581	165,449	154,609	162,411	148,225	165,603	203,523
Trauma	359,300	344,243	411,441	418,198	452,718	435,117	428,711	457,548	478,532
Poisoning	57,148	53,958	65,567	70,952	82,043	71,121	76,611	72,317	70,661
Violence	67,689	62,302	83,907	84,890	87,187	82,572	82,551	78,746	92,045
Suicide	53,162	54,937	60,083	55,275	53,805	46,800	42,178	40,049	37,595
Traffic	395,253	367,008	460,506	471,979	468,202	443,742	432,340	441,407	456,000
Others	107,600	95,501	113,914	117,223	141,944	221,216	185,448	196,131	496,366
Total	1,286,801	1,192,148	1,442,531	1,495,545	1,555,700	1,480,387	1,514,168	1,566,933	1,483,425

**Table 2: Incidence of accidents in Iran per 100,000 populations, based on the type of accident during 2008–2016**

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Assault	19.2	18.3	17.7	19.8	26.9	26.3	27.9	28.6	33.6
Scorpion bite	32.3	31.0	35.2	33.8	35.7	32.1	33.5	28.9	29.6
Burn	87.2	77.2	79.0	85.8	80.9	82.7	82.7	80.9	86.0
Drowning	1.03	1.21	1.24	1.43	1.4	1.3	1.3	1.6	1.2
Electrocution	6.01	5.31	6.31	6.97	6.37	6.12	6.02	5.96	5.94
Fall	195.2	159.4	193.43	220.16	203.22	210.87	190.09	209.78	254.64
Trauma	496.6	469.7	554.29	556.49	595.06	564.93	549.81	579.62	598.72
Poisoning	79	73.64	88.33	94.41	107.84	92.34	98.25	91.61	88.41
Violence	93.57	85.02	113.04	112.96	114.6	107.21	105.87	99.75	115.16
Suicide	73.49	74.97	80.94	73.55	70.72	60.76	54.09	50.73	47.04
Traffic	546.4	500.8	620.39	628.05	615.41	576.13	554.46	559.17	570.53
Others	148.7	130.3	153.46	155.99	186.57	287.21	237.83	248.46	621.03
Total	1778	1626	1943	1990	2044	1922	1941	1984	1855

**Table 3: Mortality ratio per 10,000 accidents in Iran during 2008–2016**

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016
Assault	6.47	5.23	6.85	8.71	6.34	7.36	7.35	7.81	8.04
Scorpion bite	17.52	7.92	8.41	9.45	5.88	8.1	10.71	6.49	5.68
Burn	77.86	74.45	49.09	40.64	69.97	39.34	26.2	24.75	17.45
Drowning	1726.9	2259.8	2556.8	2096.9	1837.4	1708.3	1309.5	1488.7	1378.9
Electrocution	441.2	275.1	309.7	293.8	274.3	250.4	244.9	202.3	178.2
Fall	19.33	20.63	21.59	21.15	21.86	22.1	22.12	22.9	23.3
Trauma	7.37	6.47	7.31	4.71	5.56	4.94	4.66	4.01	3.55
Poisoning	42.17	33.35	37.06	35.79	31.08	33.4	34.85	31.41	30.41
Violence	30.28	33.22	30.39	24.14	21.9	20.98	19.13	16.24	13.87
Suicide	83.7	83.91	74.39	91.54	95.9	102.8	113.32	113.4	118.6
Traffic	71.8	76.78	66.66	57.58	54.27	54.78	54.97	47.14	43.32
Others	50.74	98.21	92.96	74.2	74.3	66.4	50.1	60.4	57.3
Total	44.1	48.82	44.26	38.63	38.18	36.36	34.32	32.1	29.89

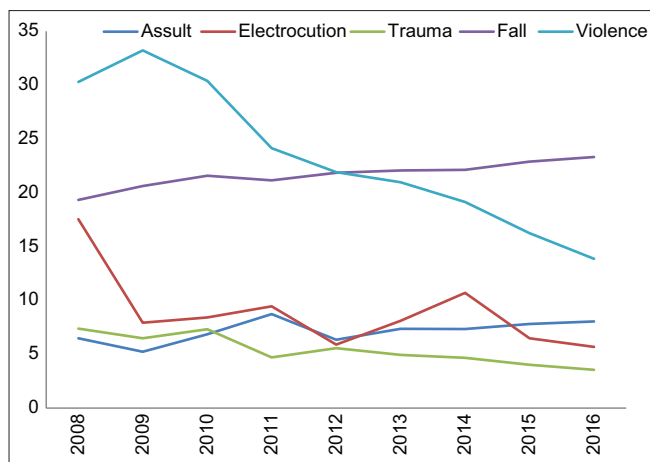


**Figure 2: Mortality rate per 10,000 accidents in Iran during 2008–2016**

and electrocutions have had a declining trend, and suicide and violence have been increased. Animal attacks, scorpion bites, traumas, falling, and violence had a fatality ratio in the range of 4–35 deaths/10,000 cases as well [Figure 1]. The fatality ratio of burns, poisoning, suicide, traffic crashes, and other injuries, ranged from 18 to 120 deaths/10,000 [Figure 1].

## DISCUSSION

The finding of the current study suggested that the incidence of injuries, in Iran had a growing trend from 2008 to 2016. This growing trend may be due to an increase in at-risk population, an improvement in injury registration systems, or a real increase in injuries.<sup>[8]</sup> According to our results, the highest incidence rate of injuries, in 2008 was related to traffic crashes with 546.4/100,000 and the highest incidence rate of traffic injuries was related to 2011 with 628.1/100,000 population. In general, the local probability of the occurrence of injuries, and especially traffic injuries, may be due to multiple factors such as geographical factors, low cost of fuel, poor public transport system, dangerous driving behaviors, growing in the automotive industry, and low-quality cars and motorcycles as well as unsafe road network.<sup>[9]</sup> According to the results of the current study in 2008, the highest mortality ratio for accidental death was related to drowning with 1726.9 deaths, 10,000 followed by electrocution with 441.2 deaths/10,000 injuries. Interestingly, traffic crashes included only 71.8 deaths/10,000 injuries, and 7.37 deaths/10,000 were seen in the trauma incidents. In 2009–2016, the highest mortality to injury ratio was related to drowning. The results indicate that although



**Figure 3:** Mortality rate per 10,000 accidents in Iran during 2008–2016

the incidence of drowning is lower than the other injuries, the mortality ratio in drowning is higher than in other injuries. According to the Iranian Forensic Medicine Organization, from 2013 to 2017, 3716 deaths occurred due to drowning in Iran,<sup>[10]</sup> of which, about one-third (1010 deaths) had happened in rivers. Unfortunately, most rivers do not have warning signs, many people do not realize how dangerous swimming can be, and due to financial problems, they cannot enjoy the benefits of swimming in private pools.<sup>[10]</sup> According to the results of the current study, the mortality rate from falling, traffic injuries, poisoning, burns, and electrocution has been declining in recent years. These results corroborate the findings of the Global Burden of Disease Study 2016.<sup>[11]</sup> The results of Mahdian *et al.*'s and Rahmani *et al.*'s study showed that in 2006–2012, mortality rate due to traffic injuries has decreased.<sup>[12,13]</sup> However, in proportion to this declining trend, there has been no significant reduction in the number of prehospital deaths (deaths at the scene of an injury or during transfer). Moreover, in some years (2009 and 2010) the number of deaths at the scene of the injury or during the transfer has been higher.<sup>[13]</sup> Although in recent years, much attention has been paid to prehospital care with the establishment of mobile emergency centers (115 emergency), due to the impact of many factors such as the type of vehicles used, road conditions, and traffic culture on the severity of injuries and mortality,<sup>[14,15]</sup> it is difficult to judge about increasing in fatality in those years. However, according to the results of Rahmani *et al.*'s study,<sup>[13]</sup> prehospital deaths at the scene of the injury as well as during transferring of the victims and the factors affecting them need to be analyzed as important factors to present to policymakers and officials. The present study also showed that mortality from poisoning declined in Iran over the study period and this finding is in agreement with the results of Ghodsi *et al.*'s study.<sup>[16]</sup> The reduction of poisoning mortality in Iran is in line with changes in global poisoning mortality.<sup>[17]</sup> A similar reduction in mortality has occurred in other countries.<sup>[18,19]</sup> This also accords with a Chinese study, which showed a reduction of plant pesticide poisoning between 2006 and 2016.<sup>[20]</sup> The incidence of burns in our study period showed a decreasing

trend, which is also in line with other parts of the world. This declining trend has been due to legal changes, prevention programs, and increased occupational safety.<sup>[21–23]</sup> Finding risk factors and their interaction on each other, and their relationship with injuries can contribute to the creation of new hypotheses, especially causal factors.

## CONCLUSION

Moreover, they eventually may lead to the development of new interventions to prevent injuries and related injuries. Implementing training programs through mass media and strengthening traffic law legislation as well as monitoring systems are necessary to reduce injuries in society. Building a safe society and success in implementing injury prevention programs will not be possible without the cooperation and participation of all responsible parties.

## Ethics approval

This study was approved by the Ethics Committee of Kashan University of Medical Sciences (IR.KAUMS.NUHEPM.REC.1399.036).

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Nil.

## Conflicts of interest

There are no conflicts of interest.

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