Epidemiology of deaths from injuries in the Islamic Republic of Iran

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وبائيات الوفيات الناجمة عن الإصابات في جمهورية إيران الإسلامية

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الخلاصة: أُجريَتْ دراسة لمدة عام (2000 — 2001) حول الإصابات المميتة التي وقعت في 10 محافظات في جمهورية إيران الإسلامية، يقطنها نحو 637 740 16 نسمة. وقد تم التحقُّق من كل الوفيات المبلغ عنها، ومقارنتها بالمصادر الأخرى الخاصة بتسجيل الوفيات. وقد اتَّضح أن من بين 846 66 وفاة حدثت بأسباب مختلفة، نجم 9733 وفاة عن الإصابات (58 لكل 000 10). وكانت النسبة الإجمالية للوفيات الناجمة عن الإصابات 14.9٪ من جميع الوفيات، مما يمثِّل 26.9٪ من سنوات العمر المفقودة. والمُلاحَظ أن معظم الإصابات المميتة غير متعمَّدة (48.0 لكل 000 100). وإذْ تعتبر الوفيات الناجمة عن حوادث المرور (30.0 لكل 000 100) أعلى المعدلات في العالم. أما الإصابات المميتة المتعمَّدة والتي يبلغ عددها 1693، فيُعزَى 61٪ منها لحالات الانتحار، التي تحدث في سن يقدَّر وسطيُّها بنحو 29 عاماً.

ABSTRACT A 1-year study of fatal injuries was carried out in 10 provinces of the Islamic Republic of Iran based on a population of 16 740 637 in 2000–01. All reported deaths were compared and validated with other sources of death registration. Out of 66 846 deaths, 9733 (58/100 000) resulted from injuries. Overall, 14.9% of all deaths with 26.9% of years of lost life were from injuries. Most fatal injuries were unintentional (48.0/100 000). Deaths from traffic injuries (30.0/100 000) are the highest in the world. Of 1693 intentional fatal injuries, 61% were due to suicide, at a mean age of 29 years.

Épidémiologie des décès dus à des traumatismes en République islamique d'Iran

RÉSUMÉ Une étude d'un an sur les traumatismes mortels a été réalisée en 2000-2001 dans 10 provinces de la République islamique d'Iran à partir d'une population de 16 740 637 personnes. Tous les décès déclarés ont été comparés et validés au moyen d'autres sources d'enregistrement des décès. Sur les 66 846 décès, 9733 (58 pour 100 000) étaient dus à des traumatismes. Globalement, 14,9 % de tous les décès impliquant 26,9 % d'années de vie perdues étaient imputables à des traumatismes. La plupart des traumatismes mortels étaient non intentionnels (48,0 pour 100 000). La mortalité par accident de la circulation (30,0 pour 100 000) est la plus élevée au monde. Sur les 1693 traumatismes mortels intentionnels, 61 % étaient dus à des suicides, à un âge moyen de 29 ans.

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Introduction

Injuries are a major cause of avoidable death in many countries of the world. It is estimated that in the year 2000 more than 6 million deaths resulted from accidental injuries worldwide, with 3.8 million unintentional and 2.2 million intentional injuries [*1*]. The spectrum of death and diseases has changed in recent decades in many countries [*2,3*] and deaths from injury have become a serious concern. Most injuries are preventable and in many developed countries injury prevention has been established as a national priority and deaths rates from injuries have been falling steadily for many years. The collection of more data on injury and ill-health caused by accidental injuries is a priority [*4*].

The usual data sources about deaths in the Islamic Republic of Iran are reports collected from the national registry for deaths, the hospital and cemetery data information systems, and medico-legal data. All these 4 sources of data are computerized and checked against each other. However, like many other developing countries, the Islamic Republic of Iran suffers from a lack of a complete data capture system for injuries; the epidemiological pattern of deaths from injuries is not available and the police and national death registration is inadequate. In rural areas, data on deaths are mainly collected in local community "health houses" whose main function is to offer primary health care services to rural areas of the country and their data exclude details about intentional and unintentional injuries. A population-based study on deaths from injuries in the Islamic Republic of Iran published in 1999 [*5*] only included the unintentional injury deaths and some rural areas of the country. Therefore, no previous study in the Islamic Republic of Iran has attempted to present a full epidemiological picture of intentional and unintentional fatal injuries.

The goal of this study was primarily to assist health managers and relevant directors in the Islamic Republic of Iran to develop strategies for reducing mortality in each key area. In this paper an epidemiological description of deaths from injuries from a sample of provinces is presented and some possible implications for control and prevention measures will be suggested.

Methods

A 1-year study was carried out in 10 out of 28 provinces of the Islamic Republic of Iran randomly selected from 21 March 2000 to 20 March 2001 (21 March is the first day of the year in the Iranian calendar) in the year 2000. The provinces, selected randomly according to their geographical distribution, were West Azerbaijan, Ilam, Kermanshah, Bushehr, Charmahal-Bakhtiari, Semnan, Fars, Kerman, Markazi and Yazd, with a total population of 16 740 637 inhabitants. The urban and rural areas were defined according to the criteria from the Ministry of Interior of the Islamic Republic of Iran.

Trained staff (rural health workers in rural areas and either urban health workers or health volunteers in urban areas) of the National Health Network followed all deaths that occurred in their area within the year of study and completed a checklist questionnaire on the cause of death, epidemiological information about the injuries that resulted in death and other demographic information such as age, sex and place of residence.

Cause of death was classified according to 3-digit coding system of the *International classification of diseases* (ICD-10) [*6*]. "External causes of morbidity and mortality" followed codes V01 to Y98 (for example, transport accidents were coded as V01 to V99, falls as W00 to W19, and exposure to

forces of nature coded from X30 to X39). To ensure the completeness and accuracy of the data, all data obtained from the above study were compared and validated with other sources of death registration, including: the national registry for deaths, the hospital and cemetery data information systems, and medico-legal data.

The standard expected years of life lost (SEYLL) was calculated as:

$$SEYLL = \sum_{I\text{-}0} d_x\, e_x$$

where I = limited age, X = age at death, d_x = number of deaths from a particular type of injury, and e_x = expected years of life at a particular age [*1*].

All confirmed data were referred to the Ministry of Health every month and entered into a computer for statistical analyses. All analyses were conducted using *SPSS* for Windows, version 10.0.

Results

During the year 2000–01, 9733 out of 66 846 deaths in the Islamic Republic of Iran resulted from all types of injuries. Overall, 14.6% of all deaths were from injuries, accounting for 261 848 (26.9%) of SEYLL. Based on the total population in these provinces of 16 740 637 (42.9% were females and 66.8% from urban areas), the death rate of injuries was estimated as 58.0 per 100 000. This figure was significantly higher for males than females (84.2 versus 31.0 per 100 000). The leading causes of deaths from injuries in descending order were: transport accidents (30.0 per 100 000), suicide (6.2 per 100 000) and violence and homicide (3.9 per 100 000). Table 1 shows more details on distribution of fatal intentional and unintentional injuries occurring during the year of study by age group, sex and place of residence.

Unintentional fatal injuries

Overall, 8040 deaths (48.0 per 100 000 population) caused by unintentional injuries occurred during the study year, at a mean age of 35.3 years. These were 12.0% of all deaths in the year and 82.6% of deaths from injury. The rate of unintentional fatal injury was higher among males than females (71.3 versus 23.0 per 100 000). However, this figure was nearly equal among residents of urban and rural areas (47.9 versus 48.2 per 100 000). The total years of lost life from unintentional fatal injuries was 210 754 years (21.6% of SEYLL for all deaths).

Table 2 shows some epidemiological measures of deaths from unintentional injuries. The top 3 common injuries for all age groups were transport accidents (30.0 per 100 000), burns and scalds (4.0 per 100 000) and falls (2.1 per 100 000). Except for burns and scalds, deaths from other types of unintentional injuries were more common among males than females. The lowest and highest mean age at death were for suffocation after ingestion (mean age 18.1 years) and for complications of medical and surgical care (58.2 years).

In urban areas the top 3 causes of unintentional fatal injuries were transport accidents (30.3 per 100 000), burns from heat and hot substances and fire and flames (4.0 per 100 000) and poisoning (1.7 per 100 000). For rural areas the rates was similar as the top 2 causes were transport accidents (29.5 per 100 000), burns from heat and hot substances, and flame and fires (3.9 per 100 000); however falls were the 3rd ranked cause (3.0 per 100 000).

Intentional injuries

The death rate of intentional injuries was 10.1 per 100 000 (2.5% of all deaths in the year), with a mean age of 30.1 years at the time of death. Of 1693 intentional fatal injuries, 61.0% were from suicides (6.2

Table 1 **Frequency of deaths resulting from injuries by age group, sex and place of residence in 2000 (total deaths = 66 846; total population = 16 740 637)**

Type of injury/ age group	Urban areas		Rural areas		Total
	Male	Female	Male	Female	
Unintentional fatal injuries					
< 1 year	38	27	54	57	176
1–4 years	68	42	94	51	255
5–14 years	299	150	269	134	852
15–49 years	2 421	561	1 438	315	4 735
> 50 years	830	352	584	256	2 022
Total	3 656	1 132	2 439	813	8 040
Intentional fatal injuries					
< 1 year	0	0	0	0	0
1–4 years	1	0	1	0	2
5–14 years	10	9	8	6	33
15–49 years	527	255	404	275	1 461
> 50 years	78	28	65	26	197
Total	616	292	478	307	1 693
Total deaths					
< 1 year	38	27	54	57	176
1–4 years	69	42	95	51	257
5–14 years	309	159	277	140	885
15–49 years	2 922	802	1 829	583	6 196
> 50 years	908	380	649	282	2 219
Total	4 246	1 410	2 904	1 113	9 733

per 100 000) and the rest from homicide, war, violence, assault, etc. (other types of intentional injuries) (3.9 per 100 000). Intentional fatal injuries were more common among males than females (12.9 versus 8.0 per 100 000), and in rural versus urban areas (11.8 versus 9.0 per 100 000). The years of lost life resulted from fatal intentional injuries was 51 093 years (5.3% of SEYLL for all deaths).

Table 3 shows some of the epidemiological measures of intentional fatal injuries by type of injury. The top 3 types of intentional fatal injuries were intentional self-harm by smoke, fire and flames (2.3 per 100 000), homicide (2.0 per 100 000) and intention self-harm by hanging (1.5 per 100 000).

Except for intentional self-harm by smoke, fire and flames, deaths were more common among males than females for all types of intentional injury. Deaths from homicides, injuries by explosion of mines and suicides by self-burnings, poisons, and gunshots were more common among those living in rural areas. The lowest and highest mean age of deaths were from suicides by fall from heights (23.0 years), and suicide by drowning and submersion (40.2 years).

Table 2 **Selected epidemiological measures of deaths from unintentional injuries by type of injury (total deaths = 66 846; total population = 16 740 637)**

Type of injury	% of all deaths	Total rate per 100 000	Rate per 100 000				Mean age of death (years)	Years of lost life	Total deaths
			Male	Female	Rural areas	Urban areas			
Transport accidents	7.51	30.0	47.1	12.0	29.5	30.3	35.7	131 288	5 019
Burns from heat and hot substances, and fire and flames	0.99	4.0	3.1	5.0	3.9	4.0	30.5	19 173	662
Falls	0.53	2.1	3.2	1.0	3.0	1.5	40.3	8 048	351
Accidental drowning and submersion	0.43	1.7	2.8	1.0	2.3	1.3	21.4	9 326	286
Accidental poisonings	0.38	1.5	2.1	1.0	1.2	1.7	33.1	6 719	251
Struck by thrown, projected or falling object	0.29	1.2	1.9	0.0	1.0	1.3	37.1	4 953	194
Complications of medical and surgical care	0.23	0.9	1.0	1.0	0.9	1.0	58.2	2 213	156
Exposure to electric currents, etc.	0.20	0.8	1.3	0.0	1.0	0.7	29.4	3 896	133
Other accidental threats to breathing	0.18	0.7	1.0	0.0	0.7	0.7	35.1	3 148	119
Accidental suffocation and strangulation	0.15	0.6	0.8	0.0	0.8	0.4	18.1	2 922	97
Contact with venomous animals and plants	0.07	0.3	0.3	0.0	0.5	0.1	24.6	1 301	44
Exposure to forces of natures	0.05	0.2	0.3	0.0	0.3	0.1	31.2	871	31
Accidental expose to other and unspecified factors	1.02	4.0	6.5	2.0	3.2	4.9	42.1	16 896	697
Total	12.03	48.0	71.3	23.0	48.2	47.9	35.3	210 754	8 040

Table 3 **Some epidemiological measures of deaths from intentional injuries by type of injury (total deaths = 66 846; total population = 16 740 637)**

Type of injury	% of all deaths	Total rate per 100 000	Rate per 100 000				Mean age of death (years)	Years of lost life	Total deaths
			Male	Female	Rural areas	Urban areas			
Violence and homicide									
Homicide/injuries inflicted by another person	0.51	2.0	3.4	1.0	2.6	1.7	32.0	9 714	338
Injuries by explosion of mines	0.26	1.0	1.9	0.0	1.3	0.8	27.7	5 330	171
Legal intervention (execution)	0.11	0.5	0.9	0.0	0.3	0.6	33.1	2 171	76
Operations of war	0.03	0.1	0.2	0.0	0.1	0.1	28.6	590	19
Assault by other specified means (assaults, fights)	0.08	0.3	0.5	0.0	0.3	0.4	34.8	1 529	56
Suicide by:									
Smoke, fire and flames	0.58	2.3	0.8	4.0	2.8	2.0	26.9	12 498	391
Hanging	0.37	1.5	2.4	1.0	1.4	1.5	32.3	7 041	245
Self-poisoning	0.30	1.2	1.2	1.0	1.7	0.9	29.1	6 187	202
Drugs, medicaments and biological substances	0.07	0.3	0.4	0.0	0.2	0.3	30.8	1 348	45
Rifle and shotgun	0.06	0.2	0.4	0.0	0.4	0.1	27.9	1 285	41
Drowning and submersion	0.01	0.0	0.01	0.0	0.01	0.0	40.2	123	5
Jumping from a high place	0.00	0.0	0.01	0.0	0.01	0.0	23.0	35	1
Other self-harm by unspecified means	0.15	0.6	0.7	1.0	0.8	0.5	27.8	3 243	103
Total	2.53	10.0	12.8	8.0	11.9	8.9	30.3	51 094	1693

Discussion

This study showed that the Islamic Republic of Iran has one of the highest death rates of unintentional injuries relative to other countries. This study was the first to be conducted on fatal injuries in the country and recorded both intentional and unintentional injuries in a large population for rural and urban areas. However, this study does not present complete data about the place and time of deaths from injury or more details about the victims. Furthermore, because cases from remote populations of the country may be unreported, the data may be incomplete.

With an incidence of 30.0 per 100 000, deaths from traffic accidents in the Islamic Republic of Iran are the highest in the world (compared with 22.6 per 100 000 worldwide and 13.9 per 100 000 in the Eastern Mediterranean Region) [*7,8*]. This is probably due to the mass production of automobiles within the past 2 decades, which has not been accompanied by improvements in other components of injury prevention such as environmental and behavioral modifications. For intentional injuries, however, the death rate at 10.1 per 100 000 is substantially lower than in many countries in the Eastern Mediterranean Region [*7,8*].

In industrialized countries, intentional and unintentional injuries have become the 3rd most important cause of overall mortality among all age groups [*7*]. This figure is similar in the Islamic Republic of Iran and there is evidence, moreover, that the incidence of injuries, particularly unintentional injuries, is growing. Overall, injuries in the Islamic Republic of Iran represent about 15% of all deaths, which is greater than the global estimate of 12% [*7,8*].

Road traffic injuries are the leading cause of death by injury and the 3rd leading cause of all deaths nationally. They take the lives of 1.2 million individuals around the world each year [*9*]. They are the leading cause of years of lost life in the Islamic Republic of Iran, with 7.5% of all deaths nationally for all age groups. This is greater than the global estimate of 2.9% and the average figure in the Eastern Mediterranean Region of 1.9% [*1*]. Road traffic fatal injuries are largely preventable. Policies such as lowering average vehicle speeds, environmental modifications on roads, road safety education aimed at drivers and children, use of restraints for car occupants, and operational and interventional programmes have been shown to afford protection and prevention of motor vehicle traffic injuries [*10,11*].

Fatal burns and scalds in this study were the 2nd leading cause of unintentional fatal injuries with an incidence of 4.0 per 100 000. They also resulted in about 2% of all years of life lost in the Islamic Republic of Iran. This figure is greater than the mean incidence of fatal burns in other countries in the Eastern Mediterranean Region (2.7 per 100 000) [*12*]. Burns from heat and hot substances and fire and flames are one of the leading causes of death in many communities and over 90% of burns occur in low and middle-income countries. Safe homes and product designs, surveillance systems, installation of smoke detectors in high-risk places and educational campaigns to increase awareness of the risks have been suggested as important strategies to reduce the risk of burn and scald injuries [*10*].

Globally, an estimated 283 000 people die due to falls each year [*7,8*]. Falls are the leading cause of non-fatal injuries in some countries [*13*]. The incidence of fatal unintentional falls is estimated at 5.6 per 100 000 worldwide and 2.1 per 100 000 in the Eastern Mediterranean Region. This study showed that falls from heights are the 3rd leading cause of unintentional injuries (similar to the average incidence in the

region with 2.1 per 100 000), after deaths from traffic and burn injuries.

Suicide has been recognized as the 11th leading cause of all deaths in developed countries [*14*]. The death rate for suicide attempts in the Islamic Republic of Iran is lower than many other countries [*3,15,16*]. However, the low age of suicide attempters results in 3.3% of all years of lost life in this country. Younger adults may experience more life crises and there is a need for careful assessment and evaluation of attempted suicides among them.

The broad context of social, behavioural, regulation and environmental research and land use policies is rarely addressed in relation to intentional and unintentional injuries in this community. Many health workers in the Islamic Republic of Iran have positive attitudes about participating in injury prevention programmes [*17*]. Therefore, their incorporation into these activities needs systematic support. It is essential to develop good quality measures of injuries. The potential for further research in this field appears to be high.

In conclusion, the epidemiology of injuries the Islamic Republic of Iran, particularly for traffic accident deaths, has a completely different pattern of death compared to past decades [*18*] and these are lessons for developing countries. Injury-related policies must therefore be considered as key elements of health promotion and as a priority for the health-related organizations in this country. Participating in local multi-agency schemes and international support as well as national efforts may enhance the chances of prevention and control of injuries in the Islamic Republic of Iran.

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