Injury epidemiology in Kermanshah: the National Trauma Project in Islamic Republic of Iran

M. Karbakhsh,[1] N.S. Zandi,[1] M. Rouzrokh[2] and M.R. Zarei[1]

وبائيات الإصابات في كرمنشاه: المشروع الوطني للرضوح في جمهورية إيران الإسلامية

مجقان كاربخش داوري، نكار صالحيان زندي، محسن روزرخ، محمد رضا زارعي

الخلاصة: في دراسة مستعرضة شملت جميع مرضى الرضوح الذين عولجوا لمدة أربع وعشرين ساعة على الأقل خلال أربعة أشهر، في مستشفى طالقاني، وهو مركز الإحالة التعليمي الوحيد في مدينة كرمنشاه، وقد بلغ عددهم 779 مريضاً. وكان وسطي أعمارهم 34.7 سنة (19.9). وكان أغلب المرضى من الذكور العاطلين غير المتعلّمين. وتبين أن أكثر مسببات الإصابات شيوعاً هي الحوادث على الطرق، والسقوط، والعنف بين الأفراد. وكان المشاة هم الأكثر عرضة للإصابات من بين ضحايا الحوادث على الطُرُق. وبلغت نسبة الوفيات الإجمالية 7.8٪، نجمت أغلبيتها (78.7٪) عن إصابات في الرأس. وقد دلّت نتائج البحث أيضاً على أهمية رضوح الرأس بوصفها الموقع التشريحي الرئيسي للإصابات.

ABSTRACT In a cross-sectional study, all trauma patients hospitalized for 24 hours or more over a 4-month period in Taleghani hospital, the only referral teaching centre in Kermanshah city, were studied (*n* = 779). Mean age was 34.7 (standard deviation 19.9) years. Male, unemployed and illiterate patients predominated. Road traffic accidents, falls and interpersonal violence were the most common mechanisms of injury. Among road traffic accident victims, pedestrians were the most vulnerable group. A total of 7.8% of patients died, mostly due to head injuries (78.7%). Our findings also showed the importance of head trauma as the main anatomical site of injury.

Épidémiologie des traumatismes à Kermanshah : le projet national sur les traumatismes en République islamique d'Iran

RÉSUMÉ Une étude transversale a été menée sur tous les patients atteints de traumatismes et hospitalisés pendant 24 heures au minimum sur une période de quatre mois à l'hôpital de Taleghani,seul centre spécialisé universitaire de Kermanshah (n = 779). La moyenne d'âge était de 34,7 ans (écart type 19,9). Les patients de sexe masculin, sans travail et analphabètes étaient les plus nombreux. Les accidents de la circulation, les chutes et la violence interpersonnelle étaient les mécanismes de blessure les plus courants. Parmi les victimes d'accidents de la circulation, les piétons représentaient le groupe le plus vulnérable. Au total, 7,8 % des patients sont décédés, la plupart de traumatismes crâniens (78,7 %). Nos résultats ont également montré l'importance de la tête en tant que principale zone anatomique touchée par les blessures.

[1]Sina Trauma Research Centre, Tehran University of Medical Sciences, Tehran, Islamic Republic of Iran (Correspondence to M. Karbakhsh: mkarbakh@sina.tums.ac.ir).
[2]Department of Paediatric Surgery, Shahid Beheshti University of Medical Sciences, Tehran, Islamic Republic of Iran.
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Introduction

Injuries account for about 12% of the world's burden of disease [*1*]. Injuries, irrespective of their intent or cause, have a major impact on the health system which provides care and support for victims [*2*]. Young people between the ages of 15 and 44 years—the most economically productive members of the population—account for almost 50% of the world's injury-related mortality [*3*].

In many developing countries, particularly in Asia, documentation of health statistics is limited and as a result the effect of trauma is poorly understood [*4*]. There are several articles describing different aspects of trauma in the Islamic Republic of Iran, e.g. road traffic accidents (RTA), paediatric trauma, burns, prehospital care, but comprehensive studies which give a broader view on patterns of trauma in the country are limited [*4,5*]. In this regard, Sina Trauma and Surgery Research Centre, the first registered trauma research centre in the Islamic Republic of Iran, carried out the National Trauma Project in 8 major cities of the country to provide a national profile of trauma, the circumstances in which it occurs and the characteristics of victims. The aim of this study was to demonstrate the characteristics of trauma patients and the pattern of trauma in one of these major cities, Kermanshah.

Methods

In this cross-sectional study, all consecutive patients admitted to Taleghani hospital for 24 hours or more over a 4-month period (from October to February 2004) were included (n = 779). Taleghani hospital is the only referral teaching hospital in Kermanshah, a city located in the western part of the Islamic Republic of Iran, with a population of about 822 921 in 2005. This hospital is recognized by the public as the only trauma centre admitting injured patients around the clock. Patients admitted to hospital for at least 1 day comprised about one-third of all trauma patients admitted; the remainder were discharged within 24 hours and were not included in our data.

Data collection for this study was performed around the clock by 5 general practitioners who had undergone a special training course to familiarize them with the questionnaires. Each patient was admitted to the emergency room, the clinical ward or intensive care unit, and was followed until discharge; the questionnaire was completed during the course of the stay. The variables included were: demographic characteristics of the patient, injury characteristics (time, place, intent, mechanism and situation of trauma), transportation to the hospital, level of consciousness on arrival according to the Glasgow coma score, anatomic site of injury, severity of injury and outcome. Severity was assessed by the injury severity score (ISS), defined as mild (score < 7), moderate (score 7–12) and severe (score 12+) [*6*]. These variables were collected in interviews with the patients and their relatives and the attending physicians.

An expert in medical records administration who was familiar with *International classification of diseases* (*ICD*) coding, coded the anatomical and external causes of injuries according to *ICD-10* (S00–S99 and V01–Y98). Two other medical practitioners checked all the filled questionnaires and evaluated and corrected them if necessary. Another physician supervised and coordinated the whole team as the project manager.

Descriptive (absolute and relative frequencies) and analytic (chi-squared) tests were performed using *SPSS*, version 11.5. $P < 0.05$ was considered as the level of significance.

Results

From a total of 779 patients, 78.6% were male (n = 612). The male to female ratio was 3.66. Mean age was 34.7 (standard deviation 19.9) years with a median of 28 years. About 31.4% of patients were illiterate (n = 224) and 20.5% had only primary education (n = 160). Only 2.6% of patients had university education (n = 20). The rate of illiteracy in the study patients was greater than that in the Islamic Republic of Iran overall ($P < 0.001$) [*7*].

Regarding the occupation of the patients, the largest group (16.3%, n = 127) were unemployed, 16.0% were housewives (n = 125), 14.3% were manual workers (n = 112) and 13.6% were students (n = 106). The proportion of unemployed people in our study was also higher than that in the Kermanshah general population [*8*].

About 17.5% of patients referred to hospital on holidays (n = 136), which was more than expected according to the number of holidays and workdays during the study period ($P = 0.004$). Injuries were more common between 24:00 and 06:00 hours (81.9%, n = 638). Roads were the most common place of trauma (61.9%, n = 482), followed by the home 27.1% (211), workplace (4.9%, n = 38) and other (6.2%, n = 48).

The mechanisms of injuries are shown in Table 1. Victims of RTA (53.5%) and falls (28.8%) were the highest proportion of cases, followed by interpersonal violence (10.1%). Pedestrians were 44.1% of RTA victims and 23.6% of all cases. Only 3.2% of car occupants had used seat belts and 14.0% of motorcyclists had used a helmet. The majority of cases sustaining stab wounds in violent interactions had been injured with a knife (90.9%).

A total of 482 patients arrived at hospital directly from the scene of the accident (i.e. were not referred), of whom 4.6% were transferred by ambulance (n = 22). Of the cases referred from another hospital/health centre, 75.4% were transported by ambulance (n = 224). Thus overall, 31.6% of patients were transferred to the hospital by ambulance (n = 246). The mean time to travel to the hospital was 2 h 42 min (standard deviation 6 h 32 min) with a median of 1 h 10 min.

In 81.4% of patients the Glasgow coma score was 13–15 (n = 634), in 11.3% it was 9–< 13 and in 7.3% it was ≤ 8.

About 64.2% of patients had more than 1 injury (n = 500). Figure 1 shows the distribution of patients according to the number of injuries they suffered.

Table 1 **Mechanisms of injury in the studied patients**

Mechanism of injury	No. of patients	%
Unintentional injury	692	88.8
Road traffic accident	417	53.5
Pedestrian	184	23.6
Car occupant	124	15.9
Motorcyclist	100	12.8
Other	3	0.4
Unknown	6	0.8
Fall	224	28.8
From a height < 4 m	150	19.3
From a height ≥ 4 m	11	1.4
Stumbling/slipping	58	7.4
Unknown	5	0.6
Laceration	23	3.0
Striking with blunt object	12	1.5
Other	16	2.1
Intentional injury	87	11.2
Interpersonal violence	79	10.1
Stabbing	44	5.6
Striking with blunt object	18	2.3
Gunshot	15	1.9
Other	2	0.3
Attempted suicide	8	1.0
Total	779	100.0

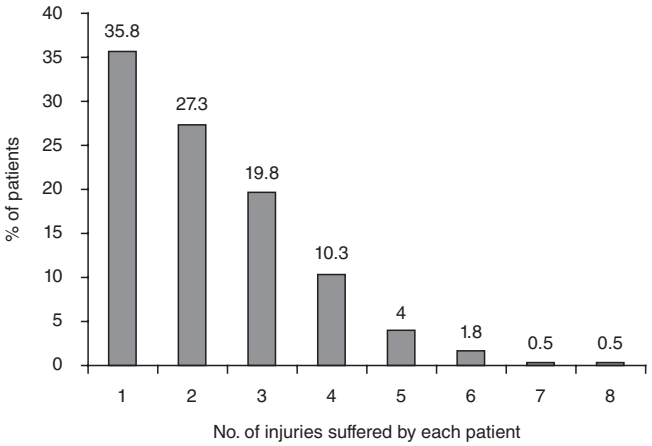

Figure 1 **Frequency distribution of the number of injuries among the studied patients (*n* = 779)**

The anatomic site of injuries is shown in Table 2 as a proportion of the number of patients (1 injury was categorized as the main reason for hospitalization for each patient) and as proportion of all 1786 injuries recorded. Head injuries were the most common injuries and also the most frequent among the lesions leading to hospitalization.

The injury severity score was < 7 in 48.3% of the patients (*n* = 376), 7–12 in 33.6% (*n* = 262) and 12+ in 18.1% (*n* = 141).

A total of 7.8% of patients died (*n* = 61). The injury severity score was 12+ in 90.2% of patients dying (*n* = 55). The main anatomic site of injury in these cases was

Table 2 **Anatomic site of injuries**

Anatomic site	No. of patients[a]	%	No. of injuries[b]	%
Head	215	27.6	602	33.7
Knee and lower leg	110	14.1	248	13.9
Abdomen, lower back, lumbar spine and pelvis	139	17.8	206	11.5
Hip and thigh	132	16.9	193	10.8
Elbow and forearm	39	5.0	119	6.7
Thorax	43	5.5	113	6.3
Wrist and hand	29	3.7	96	5.4
Shoulder and upper arm	33	4.2	94	5.3
Neck	23	0.3	61	3.4
Ankle and foot	15	1.9	54	3.0
Total	779	100.0	1786	100.0

[a]*One injury assigned as the main cause of hospitalization.*
[b]*All injuries.*

the head in 78.7% (n = 48), followed by the neck in 8.2% (n = 5), thorax in 8.2% (n = 5), hip and thigh in 3.3% (n = 2) and abdomen, lower back, lumbar spine and pelvis in 1.6% (n = 1). The mortality according to mechanism was: 13.3% striking with blunt objects (3 unintentional, 1 intentional), 10.1% RTA (n = 42), 6.3% gunshot (n = 1), 5.3 % falls (n = 12) and 2.7 % cutting (n = 2) (laceration 1, stabbing 1) (P = 0.065).

Death was more commonly seen in patients with head injuries (22.3%, n = 48) than other injuries ($P < 0.001$).

Discussion

In this 4-month study, 779 trauma patients were recorded. The male to female ratio was more than 3. Considering the sex ratio in the general population of our country [*9*], it might be concluded that men are more commonly victims of trauma. The majority of trauma cases were among young people. Previous studies have also indicated that young men are at the highest risk for trauma [*4,10*]. Several possible reasons for this have been proposed including the greater number of vehicles driven by males, more participation in high-risk sports and a greater tendency by males to acquire and use weapons [*11*].

Illiterate people were over-represented among trauma cases, which is in agreement with other studies [*4,12–16*]. The low education level of trauma patients suggests that poor education might increase the risk for trauma.

Trauma was also more common in unemployed people. To our knowledge few studies have evaluated the role of unemployment as a risk factor in injuries [*12,14*]. Unemployment has been used as an indicator of material deprivation because it reflects lack of income and insecurity [*12*]. The choice of mode of transport in developing countries is often influenced by socioeconomic factors, especially income. For people with low incomes the affordable means of transport are walking, travelling by bus or cycling, all of which expose them to high risk of RTA [*17*].

Injuries were more common on holidays, which was also consistent with other reports [*18,19*]. This could be the result of more high-risk behaviour on holidays. For instance, in one report from Australia, two-thirds of RTAs occurred during the Friday/Saturday/Sunday leisure period, and were concluded to be a consequence of leisure travel [*18*].

RTA, falls and interpersonal violence were the 3 most common mechanisms of trauma. The magnitude of RTA injury varies according to geographical region, with the highest burden in developing countries [*20*]. In these countries the impact of RTA is less well understood [*21*], but according to the hospital-based data, transport-related injuries are among the leading causes of more severe injuries, especially in urban environments [*21,22*]. Even in some rural areas, RTA has been the major mechanism of injury [*23*]. Our findings indicated that the most vulnerable road users were pedestrians, which is in agreement with other studies [*4,21*].

The use of safety belts and helmets was only 3.2% among car occupants and 14.0% in motorcyclists. Since safety belts were introduced in cars, a number of studies have been published describing their effectiveness [*24*]. The use of helmets was rather low compared with one American report, which stated that helmet use was nearly 100% after a law requiring all motorcyclists to wear helmets was implemented. Before the law, only about 28%–40% of motorcyclists wore helmets [*25*]. The efficiency of helmets

as a means of protection from injuries is universally attested [*24*].

Falls were the second most common mechanism of trauma in our study. We should take account of the fact that our study was hospital-based and did not include minor injuries (e.g. due to falls). This might explain why falls ranked second in the mechanism of trauma in our study. Some other studies have documented falls as first or second rank among all mechanisms of injury [*1,22,23*].

Interpersonal violence was the third most common mechanism of trauma. While other assault-related studies have documented the higher frequency of blunt instrument injuries [*26*], we recorded most assault-related cases as the result of stabbing with knives. This is likely to be due to the lack of laws against carrying sharp weapons in public in the Islamic Republic of Iran and, in addition, the unavailability of firearms due to strict legislation over ownership of weapons. The high rate of fatal acts of violence with firearms is apparently due to easy public access to them. In some countries, e.g. Denmark, ownership and access to firearms are only granted for hunting, police and military purposes, and knives are not to be carried in public without a permit [*26*].

Less than one-third of patients were transferred to hospital by the emergency medical services. Even when ambulances were used, they served to transport patients from hospital to hospital and rarely if ever collected the injured from the scene of injury (about 5%).

In most patients the Glasgow coma score was 13–15. About half of patients had mild injury (ISS < 7), which is less than the proportion of mild injuries in a similar study conducted in Tehran (92%) [*4*]. This disparity might be due to the difference in major mechanism of trauma between the 2 studies. While RTA was the main mechanism of injury in our setting, striking by objects was the major one in the other survey. We also found that many of our patients had multiple injuries, which is compatible with other studies and indicates that special attention should be paid to RTA because they are the dominant mechanism in multiple traumas [*4*].

About 7.8% patients died, mostly due to head injury and with high severity of injuries. The 2 most common mechanisms of injury with highest mortality were striking with blunt objects (13.3%) and RTA (10.1%).

The mortality observed in our study was considerable in comparison with another epidemiologic study from our country [*4*] and 2 other studies from Africa [*22,23*]. While treatment in the first hour after injury is considered crucial in reducing mortality [*23*], our findings showed that the emergency medical services did not provide good prehospital transportation of patients and the mean time for presentation to hospital was noticeably high (2 h 42 min). This has also been documented in another study from the Islamic Republic of Iran [*27*]. Many other factors such as the predominance of road traffic injuries, inadequacy of public health infrastructure [*4,17*] and poor enforcement of traffic safety regulations [*17*] can count towards the high mortality.

There are some limitations to our study. It was performed over 4 months and thus it could not demonstrate possible seasonal variations in trauma admissions; our dataset was hospital-based and did not include patients with minor injuries treated in outpatient settings or admitted for less than 24 hours; and cases of very severe injuries dying at the scene of trauma were also not included. Furthermore, there may have been injury-related deaths from various mechanisms that were referred directly to the

medicolegal centre and were not counted in the mortality rate.

Young men of low socioeconomic status were the most vulnerable group. Unintentional injuries due to RTA were the major cause of trauma, and pedestrians comprised a high proportion of the victims of RTA. Our finding also showed the importance of head trauma on the main anatomical site of injury. These findings stress the necessity of strict preventive strategies focusing on different aspects of RTA.

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