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Original article

Assessment of mechanism, type and severity of injury in multiple trauma patients: A cross sectional study of a trauma center in Iran

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ABSTRACT

Purpose: To accurately assess the mechanism, type and severity of injury in Iranian multiple trauma patients of a trauma center.**Methods:** Patients with multiple traumas referring to the emergency department of Hasheminejad University Hospital in Mashhad, Iran, entered this cross sectional study from March 2013 to December 2013. All the patients with injury severity score (ISS) > 9 were included in this study. Data analysis was performed by SPSS software (Version 11.5) and *P* values less than 0.05 were considered as significant differences.**Results:** Among the 6306 hospitalized trauma patients during this period, 148 had ISS>9. The male female ratio was 80%. The mean age of the patients was (33.5 ± 19.3) years. And 71% of the patients were younger than 44 years old. There were 19 (13%) deaths from which 68.5% were older than 44 years old. The mean transfer time from the injury scene to hospital was (55 ± 26) minutes. The most frequent mechanisms of injury were motorcycle crashes and falling from height, which together included 66.2% of all the injuries. A total of 84% of hospital deaths occurred after the first 24 h of hospitalization. Head and neck were the most common body injured areas with a prevalence of 111 cases (75%).**Conclusion:** Motorcycle crashes have high frequency in Iran. Since most victims are young males, injury prevention strategies should be considered to reduce the burden of injuries.

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Introduction

Injuries are one of the most important public health issues worldwide and have a considerable contribution to the disease burden, especially in young adults.¹ Global deaths from injuries increased by 10.7%, from 4.3 million deaths in 1990 to 4.8 million in 2013, but age-standardized rates declined over the same period by 21%. Injuries caused by interpersonal violence and road traffic crashes (RTC) constitute a significant proportion of preventable mortality cases in many countries. There are more than one million

deaths from RTC worldwide every year, which consist of 17% of all deaths in the age group of 10–40 years. The number of road traffic injuries (RTI) is estimated at more than 50 million people each year. Although the incidence of RTC is expected to decline about 30% in developed countries over the next 20 years, the frequency of deaths from RTC is predicted to rise in the least developed and developing countries.² The injuries spectrum has changed in recent decades worldwide. Years lived with disability (YLDs) from total injuries in 2013 are estimated to be about 37 million with a significant 37% rise in age-standardized YLDs since 1990.³

In addition, the proportion of disability-adjusted life years due to YLDs increased globally from 21.1% in 1990 to 31.2% in 2013.⁴ RTI including pedestrian injuries and cyclist, motorcyclist and motor vehicle road injuries had a 6.9% rise in YLDs from 1990 to 2013. From all the reasons of fatal injuries, 69% are unintentional. Fatality from falls, which is one of the most common causes of

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unintentional injuries, has significantly increased from about 340,000 in 1990 to 556,000 in 2013.³ Unintentional injuries also had a significant 17.9% rise in YLDs from 1990 with an incidence of about 22 million YLDs in 2013. Falls for example, had 23% increase in YLDs from 1990 to 2013.³ While decreases in mortality from unintentional injuries added 0.3 years to life expectancy since 1990, intentional injuries reduced life expectancy in developing and least developed countries.³

Although statistically unchanged from 1990, the trend in disability-adjusted life years (DALYs) which is the sum of years of life lost (YLLs) and years lived with disability (YLDs) has shown a steady, although slowing, increase worldwide, while road injuries shifted from the 12th cause of death to the 10th with 34% increase.⁵

A survey for all ages and both sexes of Iranian people in 2003 showed that among 21,572 DALYs due to all diseases and injuries per 100,000 people, 14% were due to injuries. RTC was the leading cause of DALYs in males and the fourth cause in females with 1,071 million and 235,000 DALYs, respectively.⁶ Based on the recent population-based study, the annual incidence rate of all injuries for Iranian is estimated at 905 per 1000 population, accounting for approximately nine injuries per ten persons.⁷ Total and out-of-pocket health costs of non-fatal injuries in Iran in 2011 were estimated to be 6,111,138,000 US\$ and 1,480,411,000 US\$, respectively.⁷

Considering the growing need for a clearer expression of injuries due to multiple traumas as an important part of mortality and disability particularly among young people, this study was conducted to investigate the mechanism, type and severity of injury in multiple trauma patients at a referral university trauma center in Mashhad, Iran during a period of ten months.

Materials and methods

This study was approved by the local ethics committee of Hasheminejad Hospital, Mashhad University of Medical Sciences. Between March and December 2013, patients referring to the trauma center of Hasheminejad Hospital with the diagnosis of multiple traumas, entered this cross sectional study. After an initial evaluation in the emergency department, a complete documentation of injured organs was used for Injury Severity Score (ISS) measurement and all the patients with ISS>9 were included in the study. The information included demographic data, vital signs, Glasgow Coma Scale (GCS), time of accident, place of accident, transport methods, mechanism, type and severity of injury, associated injuries, duration of hospital stay as well as mortality and mortality after 24 h. Patients dead upon their arrival to the emergency department in addition to the patients whose data were not available or were transferred to other medical centers before the end of the investigations were excluded from this study. The data were analyzed using SPSS software (Version 11.5) and *p* values less than 0.05 were considered as statistically significant difference.

Results

Of 6306 trauma patients referring to the trauma center of Hasheminejad Hospital during the study period, 148 had ISS>9. And 119 patients (80.4%) were male and 29 were female (19.6%) with the mean age of (33.5 ± 19.3) years (ranging from 6 months to 82 years). The frequency of injuries with severe damages was not the same during different hours of the day. And 33.8% of the injuries occurred from 12 o'clock at midnight to 12 o'clock at the mid day, while the majority of injuries (66.2%) occurred from 12 o'clock to 24 o'clock at midnight. However, the difference between the severity of injury in the morning, evening and night hours was not statistically significant (*p* = 0.381). Fig. 1 shows the frequency of injuries

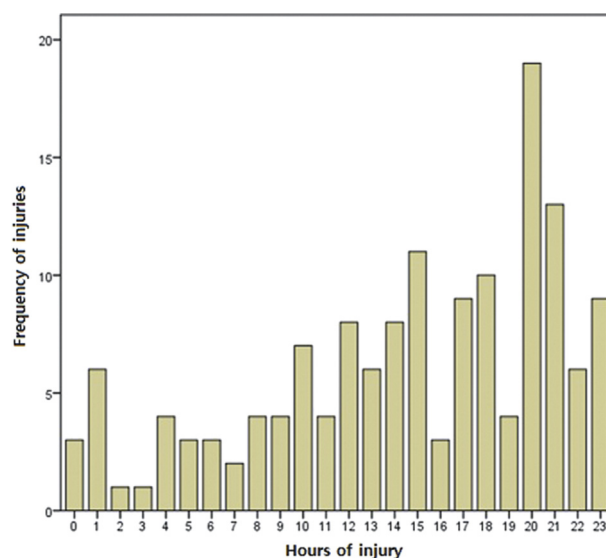


Fig. 1. Frequency of injuries during 24 h.

in different hours of the day. The frequency distribution of different kinds of injuries during 24-h is shown in Fig. 2. From the total number of 6306 patients, 73% were transferred to the emergency department by ambulances of the emergency medical service (EMS), but all the trauma patients with ISS>9 were transferred to the hospital by EMS. The average time length of rescue time was (55 ± 26) minutes. The patients were divided into three age groups including <10 years, 10–44 years and >44 years. Totally 148 patients were severely injured (ISS > 9), with 15 (10.1%) distributed in the <10 years age group, 91 (61.5%) in the 10–44 years age group and 42 (28.4%) in the >44 years age group. The age group of 10–44 years consists the highest level of severely injured patients. The most common mechanisms of injury were motorcycle crashes, falls, car pedestrian injury, interpersonal violence and car crashes, respectively (Fig. 3). The mechanism of injury was different between different age groups. In the age groups of less than 10 years and more than 44 years, falls were the most common cause of severe injury, while RTC was the most prevalent in the age group of 10–44 years (Table 1). The most common mechanism of injury in males was motorcycle crashes while pedestrian injuries and falls were both in the first rank for females (Fig. 4). The frequency of pedestrian injuries was 34.5% in females while 10% in males. Injuries occurred most commonly in roads (58.5%), followed by injuries at work and houses, respectively (Fig. 5). And 84 patients (56.8%) were in the group of ISS = 10–19, 52 patients (35%) in the group of ISS = 20–29, 10 (6.8%) in ISS = 30–39 and 2 persons (1.4%) in the group of ISS = 40–49 (Table 2). Overall, 19 patients (12.8%) died of traumatic injuries. And 13 out of 19 deaths (68.4%) were in the age group of >44 years while this age group was consisted of 42 patients (28.4% of the patients). The mean age of mortality was not statistically different between the males and females (*p* = 0.909). Two women (6.2%) and one man (0.8%) died in the first 24 h after trauma. The mean ISS score of all the patients was 20.22 ± 6.89, while it was 38 ± 15.58 in the patients who died in the first 24 h and 25.6 ± 2.97 in the patients who died after the first 24 h. The patients who died during the course of hospitalization had the mean ISS score of 27.11 ± 9.2. The mean difference of ISS between those who died in the first 24 h and those who survived was statistically significant (*p* < 0.001) but it was not statistically significant between the different mechanisms of injuries (*p* = 0.431). The most common causes of death were found in motorcycle crashes, pedestrian injuries and falls, respectively (Fig. 6). There was no patient with ISS

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