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# Epidemiologic Study of Trauma Patients Admitted to a Level 1 Trauma Center in Shiraz: One Year Survey

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**Abstract**

**Background:** Traumatic injuries exert significant burden on human populations around the world. Iran as a developing country is at top 5 deadliest countries regarding injuries; however, few studies have examined the descriptive epidemiology of trauma in Iran.

**Objectives:** To describe injuries regarding age, gender and injury mechanism and also time trend in emergency departments of Shahid Rajaee Trauma Center affiliated to Shiraz University of Medical Sciences.

**Patients and Methods:** This descriptive cross-sectional study was carried out on all trauma patients (n = 21542) admitted to Shahid Rajaee Trauma Hospital (level I trauma referral center in Shiraz) between March 2011 and March 2012. Data were analyzed separately by age, gender, month of admission, and injury mechanisms (motorcycle collision, car-pedestrian accidents, car-car accidents, fall from height, stab wounds and gunshot injuries).

**Results:** With a mean age of 36.0 ± 17.2 years, a total number of 21542 patients were visited, 16524 (76.7%) of whom were male. The male to female ratio was 3.3:1 with injured men being significantly younger than women (mean age 33.7 + 16.6 and 43.6 ± 19.2 years, respectively). There were 1492 trauma victims older than 60 years accounting for the smallest proportion of the population (6.92%). On admission, 1699 patients (7.9%) required cardiopulmonary cerebral resuscitation (CPCR) with a sex ratio of 2:1. Among those requiring CPCR, falling down was the major cause (45.24%) of injury in elderly (patients over 60 year) and car accident in those under 60 year (43.94%).

**Conclusions:** Injuries affect all age groups; however, the disproportionately at risk population is the productive youth. Preventive strategies should focus on reducing trauma incidence among young men at population level. Considering the higher number of incidents occurring in mid spring and late summer, authorities should devise preventive plans mainly through alteration of traffic rules in this period.

*Keywords:* Epidemiology, Road Accident, Trauma, Emergency Room

## 1. Background

It is known that injury is an important issue in public health globally with a heavy burden in developing countries (1). Traumatic injuries are the leading cause of death in people aged 15 - 29 years and according to the WHO, trauma will be the 5$^{th}$ main causes of mortality by the year 2030 (2). In the year 2010, violence and non-transport injuries accounted for more than 1.3 million deaths and caused significant physical morbidity and mental consequences (3, 4). At the same time, suicides, assaults and drowning were found to be important non-transport injuries (5-7). Moreover, road traffic injuries took 1.24 million lives and injured about 50 million globally in 2010, half of them were pedestrians, cyclists and motorcyclists. Seventy five percent of deaths occurred among men and 59% of dead victims were the people aged 15 - 44 years (8).

According to the WHO, 92% of all road traffic injuries and related deaths in the year 2012 were in low and middle income countries (8). Iran stands in a critical place in the world with the number of annual road traffic deaths in 2010 28% pedestrians, 23% motorcyclists, 22% drivers of four wheelers and 26% passengers of 4 wheelers. In 2003, traffic accident traumas caused 28% of expected years of lives lost in Iran which is a medium income Middle East country (9).

According to published reports from Iranian statistical center and forensic medicine organizations, Fars ranks fourth in Iran regarding road traffic accident (RTA) mortality and morbidity. An earlier study (2007-2008) (10) at Namazi hospital in Shiraz University of Medical Sciences (SUMS) showed that the majority of trauma victims were young (mean age 30.8 ± 20.1 years) with an ER mortality rate of 7%. Motorcycle crashes were the most frequent reported cause of hospitalization in young patients (10, 11). However, motorcycle to pedestrian accidents and falling down were the major causes of trauma particularly among the elderly.

Although, Iran suffers from a high incidence of injuries specifically road traffic injuries, it is evident that lack of sufficient epidemiological data on trauma prevents authorities from taking proper preventive actions.

## 2. Objectives

For the purpose of short and long term planning. Therefore, this study aims to provide a comprehensive descriptive analysis on mechanism of injuries across emergency departments of Shahid Rajaee hospital which is the largest referral center for trauma patients in Shiraz and suburbs.

## 3. Patients and Methods

### 3.1. Study Population and Sampling

This descriptive cross-sectional study was carried out in Rajaee Trauma Hospital in Shiraz, Iran, between March 2011 and March 2012. This hospital is a referral center for trauma patients over 16 years of age. Therefore, we included all trauma subjects, older than 16 years who sustained injuries through any mechanism, referring to Shahid Rajaee ER. Patients referring for causes other than emergency trauma intervention and subjects with complications of previous trauma care and those younger than 15 years were excluded, leaving a total of 21542 cases to be analyzed. The study protocol was approved by the institutional ethics review board affiliated to SUMS.

### 3.2. Measurements and Data Collection

Whenever a patient refers to Shahid Rajaee hospital, a unique 8 digit code will be generated by the hospital admission unit. This code is then used as a unique identification number for each patient. Both of the admission and medical records units use this identification number to record patients' information upon admission and discharge. Demographic characteristics including age, gender, admission date, injury mechanisms, and frequency of cases visited in triage, emergency department, and cardiopulmonary cerebral resuscitation (CPCR) room were routinely recorded by the admission unit employees immediately on admission. Information regarding hospitalization outcomes (mortality, CPCR succession rate) was gathered upon discharge by the medical records unit.

External causes of injury were coded using ICD-9 rubrics which included motor vehicle accidents (car to car accident, car turn over and car-motorcycle, car-pedestrians, motor-motor, motor turn over), violence related injuries (stab wound injuries and gunshots) or unintentionally caused injuries (falling down, fall from height and being struck by/against objects) and suicides.

### 3.3. Statistical Analysis

Patients' information was recoded and analyzed using the Statistical Package for the Social Sciences software (SPSS version 18.0). Summary statistics included mean and standard deviation (mean ± SD) in cases of normally distributed continuous variables. Categorical variables were summarized with frequencies and percentages (No. (%)). Patients were divided into two age categories and were compared regarding the most common injury mechanisms (16 - 60 years old and over 65 years old). Gender differences based on the injury patterns were also analyzed. The need for CPCR was investigated based on the mechanisms through which patients were injured. The independent sample t-test was used to compare distributions of continuous variables. To determine the relationship between sex and need for resuscitation, the Pearson chi-square test was employed. Similarly, time trends were analyzed by the Pearson chi-square test. All statistical analyses were conducted assuming a two-sided test on a 5% significance level.

## 4. Results

Overall, 21542 patients were admitted to our center between March 2011 and March 2012, 16524 (76.7%) of whom were men and the remaining 5018 (23.3%) were women (sex ratio 3.3:1). The mean ± SD age of the entire population was 35.4 ± 17.4. The average age of male and female patients was 33.7 + 16.6 and 43.6 ± 19.2 years, respectively ($P < 0.001$). Trauma patients older than 60 years accounted for the smallest proportion of the study population (1492 cases, 6.9%).

The most common cause of injury was car accident [(car to car accident, car turn over or car to static objects), (41.9%)], followed by motorcycle accidents (22.3%) and fall from height (14.3%). Only 3.6% of the patients were injured through violent actions and suicide. Additionally, men and women differed significantly on the basis of injury mechanisms. Men were mostly injured through car accidents (46%), motorcycle accidents (27%) and falls (12%) while women were mostly injured in car accidents (45%), falls (21%) and pedestrian accidents (16%). Less than 1% of women were injured by means of violence while the value was over 5% in men. The male to female ratio was highest for stab wound injuries, motorcycle injuries and firearm trauma (25:1, 11:1 and 10:1, respectively). Age categorization revealed that the elderly population (> 60 years) are remarkably injured through falls (45%) and being hit by cars (25%), while the young are victims of traffic related injuries, namely car accidents (44%) and motorcycle accidents (24%).

The majority of patients (90.9%) were transferred to ER, whereas 147 (0.7%) were discharged from triage and 122 (0.6%) released with personal consent. Injuries were profound in 1699 (7.8%) individuals requiring urgent CPCR. A significantly higher proportion of men required resuscitation co mparing to women (9.0% vs. 4.4%, respectively [$\chi^2 (1) = 112.5$, $P < 0.001$]). In particular, stab wounds and gunshots injuries had a significantly higher need of resuscitation (26.8% and 20%) comparing to an expected value of 7.8% [$\chi^2 (10) = 78.0$, $P < 0.001$]). Seventy three patients expired in CPCR, of whom 63 were male and 10 were female resulting in a mortality rate of 4.3%.

Of the total, 2165 patients accounting for 10.1% were admitted during August and September, signifying the highest admission rate in summer (Figure 1). The frequency of admissions regarding motor-vehicle accidents varied substantially across different months of the year with two peaks (mid spring and end of summer), while no specific time trend was observed for falls, violence-related injuries and suicides (Figure 2).

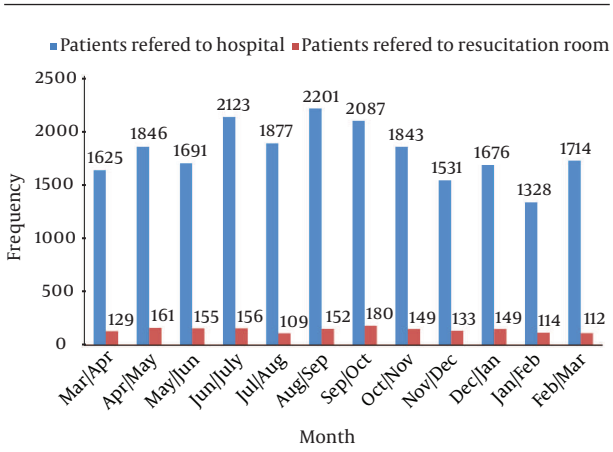


**Figure 1.** Frequency of Patients Referred to Rajaee Hospital Attributable to the Month of the Year

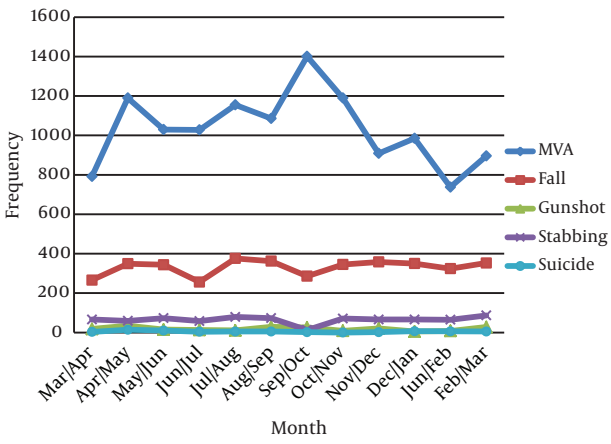


**Figure 2.** Trend of Admitted Patients to Rajaee Hospital Attributable to the Month and Type of Injury

**Table 1.** Injury Mechanism by Age and Gender

| Injury Mechanism | Gender[a] | | | M/F | Age[a] | | Resuscitated (%) |
|---|---|---|---|---|---|---|---|
| | Total (n = 21542) | Male (n = 16524) | Female (n = 5018) | | 16 - 60 Year Olds (n = 20050) | > 60 Year Olds (n = 1492) | |
| **Car accident** | 9034 (41.9) | 7571 (45.8) | 2265 (45.1) | 3.3 | 8811 (43.9) | 223 (14.9) | 7.2 |
| **Motorcyclists** | 4799 (22.3) | 4405 (26.7) | 384 (7.6) | 11.1 | 4678 (23.3) | 121 (8.1) | 9.2 |
| **Falling from height** | 3073 (14.3) | 2015 (12.2) | 1058 (21.1) | 1.9 | 2398 (12.0) | 675 (45.2) | 5.8 |
| **Car-pedestrians** | 2153 (10.0) | 1332 (8.1) | 821 (16.4) | 1.6 | 1793 (8.9) | 360 (24.1) | 9.0 |
| **Motorcycle-pedestrians** | 735 (3.4) | 467 (2.8) | 268 (5.3) | 1.7 | 631 (3.14) | 104 (6.8) | 7.5 |
| **Stab wound injuries** | 554 (2.6) | 532 (3.2) | 22 (0.4) | 25.2 | 549 (2.7) | 5 (0.3) | 26.8 |
| **Gun shot** | 180 (0.8) | 164 (1.0) | 16 (0.3) | 10.2 | 179 (0.9) | 1 (0.1) | 20.0 |
| **Suicide** | 54 (0.2) | 38 (0.2) | 16 (0.3) | 2.4 | 54 (0.3) | 0 | 14.2 |
| **Others**[b] | 960 (4.4) | 802 (4.8) | 158 | 5.1 | 957 (4.8) | 3 (0.2) | 0.2 |

[a]Values are presented as No. (%).
[b]Others include unspecified injury mechanisms.

## 5. Discussion

In this study, we retrospectively reviewed the epidemiologic characteristics of a large population of injured patients referring to Shahid Rajaee Hospital. The most important finding was that road traffic accidents affect the active productive age groups significantly. Moreover, gender differences regarding injury mechanism and seasonal variations in trauma incidents were reflected. The magnitude of profound injuries requiring CPCR was of concern. In addition, elderly patients comprised a considerable proportion of patients which is similar to the results of the studies conducted in Turkey, India, and Greece as well as to the reports provided by WHO (12-15). The sex ratio in our center was similar to that of the previous studies performed in other developing countries (14, 16-18). However, sex ratio was reported as 4.2 by a survey conducted in Tehran (the capital city of Iran) in 2004, which may reflect a change in incidence of injuries in recent years (19).

According to the results of the current study, young age and male gender played an important role in trauma injuries. The most common cause of trauma injuries in our study was motor vehicle accidents (motorcycle, car, pedestrian, bus) and fall from height, which was consistent with the findings of the study performed in Turkey (17). Moreover, motor vehicle accidents were the leading cause of injury in the patients younger than 60 years, while fall from height was the major cause in those over 60 years old. In general, a large number of motor vehicle accidents are due to the increased number of motor vehicles in our society, but occupational risk factors should also be considered in many fall injuries, especially in men (20). Our study indicated that 8% of the motor cyclists were female. It should be noted that women do not routinely ride motorcycles in Iran.

Although another study in Shiraz (10) (Namazi hospital in 2007-2008) showed that most of trauma events occurred in May, our survey demonstrated that the highest rate of motor vehicle accidents (MVAs) was in September. This may be explained by the higher rate of summer vacation travels and increased frequency of transportation as schools open on early fall. However, falling down, stabbing, and suicide showed relatively consistent admission rates during the year.

Although we did not report the severity of injuries, our findings revealed a higher need for resuscitation in men which can be explained by more serious accidents and higher injury scores among men (19). Multiple studies have confirmed the positive effects of using sit belts and helmets on decreasing trauma-related mortality and morbidity after motor vehicle crashes (21, 22). In our society, emphasis has been put on early in-hospital administration and appropriate treatment, while cultural issues and traffic rules play the key roles in prevention of traumatic accidents (19). Thus, ensuring the enforcement of traffic rules can significantly contribute to prevention of MVAs, eventually resulting in lower mortality rates.

Injuries affect all age groups; however, the disproportionately at risk population is the productive youth. Frequent causes of trauma in our region are road traffic accidents followed by fall from height. Motorcycle crashes, not surprisingly, involve the youth as the active economic group more than other traffic accidents. Considering the higher number of incidents occurring in mid spring and late summer, authorities should devise preventive plans mainly through alteration of traffic rules in this period. Improvements in acute care of the patients injured through penetrating trauma (firearms and stab wounds) may be promising methods of reducing trauma related mortality.

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## Footnotes

**Authors' Contribution:**The overall implementation of this study including design, experiments, data analysis, and manuscript preparation were the results of the corresponding author's efforts. All authors have made extensive contribution into the review and finalization of this manuscript. All authors have read and approved the final manuscript.

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