Chronic Diseases Journal

DOI: 10.22122/cdj.v9i3.620 Published by Vesnu Publications

Epidemiologic study of patients with upper extremity injuries in Besat Hospital in Hamadan City, Iran

Hamid Bouraghi[1], Kavan Hasani[2], Rasoul Salimi[2]

1 Department of Health Information Technology, School of Paramedical Sciences, Hamadan University of Medical Sciences, Hamadan, Iran
2 Department of Emergency Medicine, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran

Original Article

Abstract

BACKGROUND: Upper extremity trauma is the most common anatomical site of injuries with long-term effects. This epidemiological study aims to evaluate patients with upper extremity injuries who referred to the Emergency Department of Besat Hospital in Hamadan, Iran.

METHODS: This cross-sectional study was performed retrospectively from the beginning of March 2019 to the end of September 2019 at the Besat Educational Center in Hamadan. The convenience sampling method was used in which all patients with upper extremity trauma entered into the study. Data were analyzed using SPSS software. Quantitative data were expressed as mean and standard deviation (SD) and qualitative data were expressed as frequency and percentage. The chi-square test was used to analyze the data with a significance level of 0.05.

RESULTS: In this study, 467 patients with a mean age of 33.44 ± 24.15 years were studied, of whom 298 (63.8%) were men and 169 (36.2%) were women. The majority of people under study were in the age group of 1-9 years old (21.6%), married (51.4%), self-employed (27.8%), living in the city (58.5%), and illiterate (43.5%).

CONCLUSION: The most common cause of upper limb injury was related to falls from different levels and accidents. Therefore, observing the principles of safety at work, improving the safety of roads, personal vehicles, and public transport, addressing issues related to the prevention of accidents such as the forced use of safety equipment at work, and compliance with traffic rules and driving can play an important role in reducing trauma.

KEYWORDS: Trauma; Fractures; Upper Extremity; Epidemiology

Date of submission: 05 Jan. 2021, ***Date of acceptance:*** 28 Mar. 2021

Citation: Bouraghi H, Hasani K Salimi R. **Epidemiologic study of patients with upper extremity injuries in Besat Hospital in Hamadan City, Iran.** Chron Dis J 2021; 9(3): 109-17.

Introduction

Trauma or injury is defined as damage to the body with an energy beyond the body's capacity[1] and is considered as a health problem in every society.[2]

Despite the improvement in medical cares,[3] trauma is one of the most common causes of mortality in people with 1 to 44 years of age and the third most common cause of death in all ages.[4,5] Death from driving injuries accounts for the most deaths from unintentional injuries in the world. They annually kill 1.2 million people and cause more than 50 million injuries.[6] Upper extremity injuries are the most common injuries in the body, accounting for 6.6% to 28.6% of all injuries and 28.0% of musculoskeletal injuries.[7]

Hand injuries are the most common occupational injury in Turkey.[8] The most common type of injury in the upper extremities is a fracture, and the highest percentage of fractures occur in the fingers and forearm.[9] Fractures are one of the most common outcomes in occupational injuries and traffic

Corresponding Author:
Rasoul Salimi; Department of Emergency Medicine, School of Medicine, Hamadan University of Medical Sciences, Hamadan, Iran
Email: rasoulsl@yahoo.com

accidents which cause high economic losses to the government and the public.[10,11] Upper extremity trauma can have long-term effects on one's life due to organ failure and disability.[12] In general, such accidents cause physical and psychological damage as well as waste of capital and economic loss.[6]

The negative effects of this dilemma and the enormous costs it incurs on each country's economic system, as well as its recognition as one of the factors of disability in the society need to be addressed. Consequently, the need for planning and adoption of essential measures by health policymakers and health practitioners is required.[5] Today, countries' policies are based on the care needed for these patients and their related preventive measures.[13] Reduction of truma socio-economic burden is among the benefits of these policies.[14] It is evident that without precise information, planning is not permissible. By identifying at-risk groups and common trauma mechanisms, they can detect the probability of fracture in different situations and prevent the onset of the disease.[5,15] These valuable data can be collected after conducting epidemiological studies at different times and in different geographical areas. However, to our knowledge, no comprehensive epidemiological studies have been conducted on upper extremity injury in Iran.

Dolatabadi el al. conducted an epidemiology on upper extremity trauma in order to design a plan for decreasing the burden of disease. They indicated that truma caused by motorcycle accidents is the most common mechanism of trauma.[16] Bozorgi et al. performed a study about the mechanisms of traumatic injuries in patients with multiple trauma in order to help in easy treatment and decision-making. They showed that upper limb trumas were common injuries in multiple traumas. Besides, car accident was the most common mechanism of trauma.[17] Therefore, this epidemiological study of patients with upper extremity injuries who referred to the Emergency Department of Besat Hospital in Hamadan, Iran, was conducted during the first half of the year 2019.

Methods

This cross-sectional study was conducted retrospectively from March 2019 to September 2019 at the Besat Educational Center in Hamadan. Census sampling method was adopted in which all patients with upper extremity trauma (isolated or part of multiple trauma) who referred to the hospital emergency department were incorporated in the study. Despite having evidence of upper limb trauma, patients with incomplete information in their records were excluded from the study.

According to a previous study,[16] the minimum required sample size was calculated as 467 individuals according to the following formula, where Z is the value from the standard normal distribution reflecting the confidence level that will be used (Z = 1.96 for 95%), d is the desired margin of error (d = 0.05), and P is the proportion of distal radius and ulna fracture reported previous (P = 0.14).

$$n = \frac{Z_{1-\frac{\alpha}{2}}^{2} P(1-P)}{d^{2}}$$

A checklist was used to collect the data. The data recorded in this checklist included age, gender, marital status, occupation, residence, education, date, time, and location of the accident, trauma mechanism, and the affected area. The files were only accessible to the researcher and an anonymous individual filled out the checklists.

This research project had an ethical code (No. IR.UMSHA.REC.1398.361) from the Ethics Committee of Hamadan University of Medical Sciences. Eventually, the data were analyzed using SPSS software (version 22, IBM Corporation, Armonk, NY, USA). Quantitative data were expressed as mean and standard

deviation (SD) and qualitative data were expressed as frequency and percentage. The chi-square test was used to analyze the data with a significance level of 0.05.

Results

In this study, 467 patients with a mean age of 33.44 ± 24.15 years were studied, of whom 298 (63.8%) were men and 169 (36.2%) were women.

According to table 1, the majority of people under study were in the age group of 1-9 years (21.6%), married (51.4%), self-employed (27.8%), living in the city (58.5%), and illiterate (43.5%).

Table 1. Frequency distribution of demographic variables of upper limb injury in understudy patients

Variables	n (%)
Age range (year)	
1-9	101 (21.6)
10-19	73 (15.6)
20-29	56 (12.0)
30-39	69 (14.8)
40-49	44 (9.4)
50-59	40 (8.6)
69-60	39 (8.4)
Over 70	45 (9.6)
Marital status	
Married	240 (51.4)
Single	217 (46.5)
Divorced	10 (2.1)
Job	
Self-employed	130 (27.8)
Manual worker	51 (10.9)
Housewife	82 (17.6)
Retired	9 (1.9)
Employee	12 (2.6)
Unemployed	91 (19.5)
Farmer	12 (2.6)
University student	75 (16.1)
Others	5 (1.1)
Residence	
City	273 (58.5)
Village	194 (41.5)
Education	
Illiterate	203 (43.5)
Elementary	123 (26.3)
Middle school	85 (18.2)
High School	40 (8.6)
University education	16 (3.4)

According to table 2, the most common cause of upper limb injury was falling from heights (34.5%) followed by a car accident (14.6%), and most traumas occurred at home (38.5%).

Table 2. Frequency distribution of cause and location of upper extremity injury in the understudy patients

Variables	n (%)
Cause of injury	
Accident with cars	68 (14.6)
Motorcycle accident	9 (1.9)
Bicycle accident	2 (0.4)
Pedestrian accident	8 (1.7)
Falling at the same level	161 (34.5)
Falling from a height	63 (13.5)
Falling down the stairs	26 (5.6)
Falling from a wheelchair	10 (2.1)
Heavy objects fall on the person	41 (8.8)
Quarrel	8 (1.7)
Colliding with a device	64 (13.7)
Others (occupational trauma, tissue crushing, drowning, chemicals, heat, electric shock, radiation)	7 (1.5)
Location of trauma	
Home	180 (38.5)
Workplace	108 (23.1)
Road	62 (13.3)
Street	85 (18.2)
School	28 (6.0)
Others	3 (0.6)

Table 3 shows that the highest number of injuries were in the forearm area and the most common site of injury in the forearm was distal radius fractures (33.4%).

As shown in table 4, the frequency distribution of causes of upper extremity injury was significantly different between men and women as well as across age groups ($P < 0.01$).

According to table 5, the frequency distribution of the wrist dislocation, multiple trauma, and metacarpal fractures was significantly different among different age groups ($P < 0.01$). There was also a significant difference in the frequency distribution of injury to the shoulder, arm, elbow, forearm, and fingers among different age groups ($P < 0.01$).

Table 3. Frequency distribution of the anatomical location of upper limb injury in the understudy patients

Anatomical location of injury		n (%)
Clavicle fracture		14 (3.0)
Shoulder (n = 35)	Scapula fracture	10 (2.1)
	Dislocation	25 (5.4)
Arm (n = 12)		
	Proximal humerus fracture	2 (0.4)
	Humerus shaft fracture	9 (1.9)
	Proximal fracture and humerus shaft	1 (0.2)
Elbow (n = 84)		
	Dislocation	5 (1.1)
	Distal humerus fracture	61 (13.0)
	Proximal radius fracture	6 (1.3)
	Proximal ulna fracture	10 (2.1)
	Dislocation with proximal ulna fracture	1 (0.2)
	Proximal radius and ulna fractures with dislocation	1 (0.2)
Forearm (n = 224)		
	Distal radius fracture	156 (33.4)
	Radius shaft fracture	3 (0.6)
	Ulna shaft fracture	1 (0.2)
	Distal radius fracture with ulna shaft	7 (1.5)
	Multiple forearm trauma	55 (11.8)
	Distal ulna fracture and varadius shaft	2 (0.4)
Fingers (n = 100)		
	Fracture of a finger	21 (4.5)
	Fracture of two fingers and more	6 (1.3)
	Amputation	60 (12.8)
	Amputation with fractures	13 (2.8)
Multiple trauma		77 (16.5)
Metacarpal fracture		30 (6.4)

Table 4. Frequency distribution of causes of upper limb injury based on age and sex of understudy patients

Cause of injury	Gender [n (%)]		Age (year) [n (%)]							
	Male	Female	1-9	10-19	20-29	30-39	40-49	50-59	60-69	70 <
Accident with cars	47 (69.1)	21 (30.9)	9 (8.9)	4 (5.5)	9 (16.1)	17 (24.6)	3 (6.8)	11 (27.5)	10 (25.6)	5 (11.1)
Motorcycle accident	8 (88.9)	1 (11.1)	0 (0)	4 (5.5)	3 (5.4)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Bicycle accident	2 (100)	0 (0)	2 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Pedestrian accident	0 (0)	8 (100)	0 (0)	0 (0)	0 (0)	1 (1.4)	3 (6.8)	2 (5.0)	1 (2.6)	1 (2.2)
Falling from the same level	85 (52.8)	72 (47.2)	36 (35.6)	37 (50.7)	12 (21.4)	9 (13.0)	12 (27.3)	10 (25.0)	13 (33.3)	32 (71.1)
Falling from a height	42 (66.7)	21 (33.3)	18 (17.8)	10 (13.7)	1 (1.8)	10 (14.5)	13 (29.5)	2 (5.0)	9 (23.1)	0 (0)
Falling down the stairs	17 (65.4)	9 (34.6)	1 (1.0)	2 (2.7)	2 (3.6)	11 (15.9)	3 (6.8)	4 (10.0)	3 (7.7)	0 (0)
Falling from a wheelchair	4 (40.0)	6 (60.0)	6 (5.9)	0 (0)	0 (0)	1 (1.4)	0 (0)	1 (2.5)	0 (0)	2 (4.4)
Heavy objects fall on the person	29 (7.7)	12 (29.3)	9 (8.9)	7 (9.6)	14 (25.0)	3 (4.3)	5 (11.4)	1 (2.5)	2 (5.1)	0 (0)
Quarrel	8 (0.1)	0 (0)	0 (0)	2 (2.7)	4 (7.1)	2 (2.9)	0 (0)	0 (0)	0 (0)	0 (0)
Colliding with a device	51 (7.7)	13 (20.3)	20 (19.8)	4 (5.5)	9 (16.1)	14 (20.3)	5 (11.4)	9 (22.5)	0 (0)	3 (6.7)
P	0.001					0.001				

* Occupational trauma, tissue crushing, drowning, chemicals, heat, electric shock, radiation

Table 5. Frequency distribution of the anatomical location of upper limb injury in patients categorized by age range

Anatomical location of injury		Age (year) [n (%)]								P
		1-9	10-19	20-29	30-39	40-49	50-59	60-69	70 <	
Clavicle fracture		4 (9.0)	2 (4.0)	1 (2.0)	1 (2.0)	0 (0)	3 (6.0)	1 (2.0)	2 (4.0)	0.577
Shoulder	Scapula fracture	0 (0)	0 (0)	2 (6.3)	0 (0)	1 (3.2)	2 (0.5)	2 (1.5)	3 (7.6)	0.001
	Dislocation	0 (0)	4 (5.5)	5 (9.8)	1 (4.1)	0 (0)	3 (5.7)	6 (4.1)	6 (3.1)	
Arm	Proximal humerus fracture	0 (0)	0 (0)	2 (6.3)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0.010
	Humerus shaft fracture	1 (0.1)	2 (7.2)	4 (1.7)	0 (0)	0 (0)	0 (0)	2 (1.5)	0 (0)	
	Proximal fracture and humerus shaft	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (2.2)	
Elbows	Dislocation	0 (0)	2 (7.2)	0 (0)	3 (3.4)	0 (0)	0 (0)	0 (0)	0 (0)	0.001
	Distal humerus fracture	37 (7.3)	15 (5.2)	1 (8.1)	2 (9.2)	1 (3.2)	1 (5.2)	0 (0)	4 (9.8)	
	Proximal padius fracture	0 (0)	0 (0)	0 (0)	2 (9.2)	2 (5.4)	0 (0)	2 (1.5)	0 (0)	
	Proximal ulna fracture	5 (0.5)	1 (4.1)	0 (0)	2 (9.2)	0 (0)	0 (0)	2 (1.5)	0 (0)	
	Dislocation with proximal ulna fracture	0 (0)	1 (4.1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	
	Proximal radius and ulna fractures with dislocation	0 (0)	0 (0)	0 (0)	1 (4.1)	0 (0)	0 (0)	0 (0)	0 (0)	
Forearm	Distal radius fracture	8 (9.7)	22 (1.3)	12 (4.2)	27 (1.3)	23 (3.5)	17 (5.4)	27 (2.6)	20 (4.4)	0.001
	Radius shaft fracture	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		
	Ulna shaft fracture	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)		
	Distal radius fracture with ulna shaft	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	5 (5.1)	2 (1.5)		
	Multiple forearm trauma	33 (7.3)	12 (4.1)	4 (1.7)	3 (3.4)	0 (0)	0 (0)	0 (0)		
	Distal ulna and radius shaft fracture	0 (0)	1 (4.1)	0 (0)	1 (4.1)	0 (0)	0 (0)	0 (0)		
Wrist dislocation		0 (0)	0 (0)	0 (0)	1 (0.2)	3 (0.6)	0 (0)	0 (0)	0 (0)	0.003
Fingers		1 (1.0)	3 (4.1)	3 (4.1)	10 (14.5)	10 (14.5)	1 (2.3)	1 (2.5)	0 (0)	0.001
		0 (0)	0 (0)	0 (0)	2 (2.9)	2 (2.9)	0 (0)	0 (0)	2 (5.1)	
		20 (19.8)	5 (6.8)	5 (6.8)	9 (13.0)	9 (13.0)	4 (9.1)	4 (10.0)	0 (0)	
		2 (2.0)	1 (1.3)	1 (1.3)	3 (4.3)	3 (4.3)	0 (0)	5 (12.5)	1 (2.8)	
Multiple trauma		7 (1.5)	10 (2.1)	10 (2.1)	8 (1.7)	8 (1.7)	12 (2.6)	11 (2.4)	13 (2.8)	0.001
Metacarpal fracture		0 (0)	3 (0.6)	3 (0.6)	9 (1.9)	7 (1.5)	2 (0.4)	0 (0)	0 (0)	0.002

Discussion

The aim of this study was epidemiologic evaluation of patients with upper extremity injuries who referred to the Emergency Department of Besat Hospital in Hamadan during the first half of the year 2019.

Dolatabadi et al. study in 2007 on dormitory students showed that the mean age of patients with upper extremity trauma was 27 years and the majority (82.0%) were men.[16] The high rate of trauma in men was justified by the economic, social, and cultural conditions of the community (more women in the household and more men connected with the transportation system). In addition, the high prevalence of trauma in children is likely to be due to their small and lower body size and failure to observe child safety (placing children in the front seat of a car without using a child special seat). Bozorgi et al. in 2014 reported that the highest frequency of trauma was in the age group of 21-30 years.[17] In another study, which examined 205 upper limb injuries from industrial accidents in Tehran, Iran, the age range of 16 to 25 years with 16% of the cases was the first age group at risk and 78% of patients were younger than 5 years.[18]

In the current study, married people (51.4%), urban dwellers (58.5%), and self-employed individuals (27.8%) were the most frequent cases. In a study in Kashan, Iran, Davoodabadi et al. in 2011 showed that workers had the highest rate of trauma.[1] However, Kashan is an industrial city, with workers making up the majority of the population. Therefore, the pattern of trauma in different populations seems to be dependant on the population proportion of that community. For example, Mo et al. in 2002 reported a higher incidence of trauma in employees.[19]

Other findings showed that the majority of patients were illiterate (43.4%). Moreover, because most of the study population were children between 1-9 years old, it is obvious that the majority of them were illiterate. The most common cause of injury was related to the same level fall (34.5%) and car accident (14.6%), respectively. The causes of injury were significantly different in men and women. In the study of Fakour et al. in 2007, the most common causes of fracture were vehicle accident (55.9%) and fall (33.5%), respectively.[10] Consistent with the present study, Shivaji et al. in 2014 concluded that the primary mechanism of trauma was associated with falls (47.0%).[20] Bozorgi et al. found that motor vehicle accidents were the most common cause of trauma.[17]

Dolatabadi et al. reported that motorcycle accident injuries with 185 cases (24.6%) were the most common cause of trauma.[16] This report can be supported by the higher rate of motorcycle riders in Tehran and its use to transport passengers. In contrast to the present study, Yavari et al. in 1991 reported that the most common cause of injury was related to glass injury (63.0%).[21] In the present study, forearm with 47.9% and fingers with 21.4% were the most anatomical locations of upper extremity injury, and wrist with 0.9% had the least frequency, which is supported by the high incidence of motor vehicle crashes. In an epidemiologic study conducted by Ootes et al. in 2012 on upper extremity trauma cases referred to the United States (US) emergency departments, the most common anatomical site was finger injury.[22]

In our study, most patients with forearm injury were in the age group of 1-9 years and there was a statistically significant difference in forearm injury between different age groups. Consistent with the present study, Dolatabadi et al. showed that radius fractures were the most common fractures requiring surgery.[16] Contrary to our study, in Paryavi et al. study in 2015, most common type of injury was shoulder belt injury.[23]

The limitations of the present study are its short period and non-simultaneous

examination of trauma incidence in other body areas. We suggest an extensive public and professional health education and sufficient attention to occupational trauma.

Conclusion

The results of this study showed that among the children aged 1-9 years, and male gender are at high risk for upper extremity injury. The most common cause of upper limb injury is related to falls from different levels and other related accidents. So, improving the principles of safety at work, the safety of roads and personal vehicles and public transport can play an important role in reducing trauma.

Conflict of Interests

Authors have no conflict of interests.

Acknowledgments

This study was extracted from a university thesis at Hamadan University of Medical Sciences with ID No. 9805083562. The authors would like to acknowledge the Vice President of Research and Technology of Hamadan University of Medical Sciences, for their financial support.

References

1. Davoodabadi A, Yazdani A, Sayyah M, Mirzadeh Javaheri M. Trauma epidemiology and its consequences in victims referred to Kashan Trauma Center during 2007-8. Feyz 2011; 14(5): 500-5. [In Persian].
2. Kargar S. Trauma, priorities and controversial points. J Shaheed Sadoughi Univ Med Sci 2004; 12(1): 91. [In Persian].
3. Derakhshanfar H, Shojaee M, Majidi A, Dehghan ZS. Survey of Hemodynamic Management (Monitoring) of Multiple Trauma Patients by Sonography in the Emergency Department. J Mil Med 2019; 20(6): 609-17. [In Persian].
4. Forouzanfar MM, Safari S, Niazazari M, Baratloo A, Hashemi B, Hatamabadi HR, et al. Clinical decision rule to prevent unnecessary chest X-ray in patients with blunt multiple traumas. Emerg Med Australas 2014; 26(6): 561-6.
5. Khatami SM, Kalantar Motamedi MH, Mohebbi H, Tarighi P, Farzanegan GR, Rezai Y, et al. Epidemiology of trauma baqiatallah hospital: A one-Year Prospective study. J Mil Med 2003; 5(1): 13-9. [In Persian].
6. Khodadady N, Hoseinbabaie Z, Charmi L, Aliniya S, Asli A. Epidmiology of trauma due to driving accidents in Poursina Trauma Research Center in Rasht. Holist Nurs Midwifery 2011; 20(2): 22-6. [In Persian].
7. Jackson LL. Non-fatal occupational injuries and illnesses treated in hospital emergency departments in the United States. Inj Prev 2001; 7(Suppl 1): i21-i26.
8. Oleske DM, Hahn JJ. Work-related injuries of the hand: Data from an occupational injury/illness surveillance system. J Community Health 1992; 17(4): 205-19.
9. Golchin M, Attarchi M, Mirzamohammadi E, Ghaffari M, Mohammadi S. Assessment of the relationship between Quality of Life and Upper Extremity Impairment Due to Occupational Injuries. Med J Islam Repub Iran 2014; 28: 15.
10. Fakour M, Marashinezhad SA, Vaziri S. A five-year assessment of frequency of extremity fractures in adult patients referring to Ahwaz Imam Khomeini hospital. Jundishapur Sci Med J 2007; 5(4): 731-4. [In Persian].
11. Janmohammadi N, Montazeri M, Akbarnezhad E. The epidemiology of extremity fractures in trauma patients of Shahid Beheshti Hospital, Babol, 2001-2006. Iran J Emerg Med 2014; 1(1): 34-9. [In Persian].
12. Pourhossein M, Saeed Hosseini A, Babaei M. The study of cyclist situation died owing to road accidents referred to legal medicine center- sari, 2003. Sci J Forensic Med 2004; 10(35): 132-6. [In Persian].
13. Borg J, Holm L, Cassidy JD, Peloso PM, Carroll LJ, von Holst H, et al. Diagnostic procedures in mild traumatic brain injury: results of the WHO Collaborating Centre Task Force on Mild Traumatic Brain Injury. J Rehabil Med 2004; (43 Suppl): 61-75.
14. Vos PE, Alekseenko Y, Battistin L, Ehler E, Gerstenbrand F, Muresanu DF, et al. Mild traumatic brain injury. Eur J Neurol 2012; 19(2): 191-8.
15. Heydari ST, Maharlouei N, Foroutan A, Sarikhani Y, Ghaffarpasand F, Hedjazi A, et al. Fatal motorcycle accidents in Fars Province, Iran: a community-based survey. Chin J Traumatol 2012; 15(4): 222-7.
16. Dolatabadi AA, Ebrahimzadeh N, Amini A, Shojaee M, Amiri M. Epidemiology of upper extremity trauma in patients visiting the emergency department. Iran J Emerg Med 2016; 3(1): 34-9. [In Persian].
17. Bozorgi F, Lali A, Hosseini Nejad SM, Amini Ahidashti H, Mahdavi M, Fallah R. Rapidity of emergency services and associated factors in Sari Imam Khomeini Educational Hospital. J Mazandaran Univ Med Sci 2014; 24(114): 17-25.
18. Shobeiri E, Saiedi HR, Rezaei M, Jahanbakhshi A.

Relationship between brain's CT scan findings and consciousness level, surgical findings and outcome of the patients with traumatic intracranial hemorrhage. J Kermanshah Univ Med Sci 2014; 18(3): 165-72. [In Persian].
19. Mo F, Choi BC, Clottey C, LeBrun B, Robbins G. Characteristics and risk factors for accident injury in Canada from 1986 to 1996: an analysis of the Canadian Accident Injury Reporting and Evaluation (CAIRE) database. Inj Control Saf Promot 2002; 9(2): 73-81.
20. Shivaji T, Lee A, Dougall N, McMillan T, Stark C. The epidemiology of hospital treated traumatic brain injury in Scotland. BMC Neurol 2014; 14: 2.
21. Yavari M, Riyahi A, Valai N. Causes of upper extremity injuries in the years 2009 to 2011. Pajoohande 2012; 18(2): 97-102.
22. Ootes D, Lambers KT, Ring DC. The epidemiology of upper extremity injuries presenting to the emergency department in the United States. Hand (N Y) 2012; 7(1): 18-22.
23. Paryavi E, Gilotra MN, Johnson AJ, Pensy RA, Eglseder WA, Abzug JM. Upper extremity injuries in motorcyclists: Implications for mortality and need for rehabilitation services. J Trauma Acute Care Surg 2015; 78(5): 1021-5.