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Outcomes of Unintentional Traumas and their Influencing Factors

Ali Shahrami[1], Vishtasp Nikmanesh[1], Afshin Amini[1], Hossein Alomohammadi[1], Mehdi Samiei[1], Masoumeh Moallem[1]

[1] *Emergency medicine department, Immam Hossein Hospital, shahid Beheshti University of medical sciences, Tehran, Iran.*

* Corresponding author's Email: masoumehmoallem@gmail.com

ABSTRACT: Unintentional injuries are among the major causes of the morbidity and mortality in the world. Therefore, the researchers have attempted in the present study to provide a comprehensive picture of the status of unintentional traumas, their outcomes and influencing factors. This is a cross-sectional study of unintentional injuries in patients admitted to the emergency departments of the two hospitals, namely Imam Hossein (AS) Teaching Hospital and Shohaday Haftom Tir Hospital. After taking samples by using systematic sampling method, the relevant factors were studied using a questionnaire. Types of unintentional traumas, the outcomes of the incidents, affecting factors and the costs of treatment were evaluated. The level of statistical significance was considered to be $p < 0.05$. The findings of this study showed that from total 1500 patients, 716 patients (47.7%) were treated and discharged from the emergency departments, 411 subjects (27.4%) were hospitalized and 182 patients (12.1%) were discharged against medical advice (AMA) from the emergency departments or other departments (2 patients). It should be noted that 120 patients (8.0%) left the emergency departments without prior notice and 36 subjects (2.4%) were referred to other centers. The mortality rate of the patients was 2.33%, i.e. 35 patients died. The mortality rate in this study was 2.33%. The findings of this study showed that some factors including fracture in the head and neck, comatose during admission, hemodynamic instability, being non-married and failing to comply with safety regulations are the factors that increase the chance of death.

Key words: Unintentional injuries, Mortality rate, Outcome, Health care costs.

ORIGINAL ARTICLE

INTRODUCTION

For many centuries, infectious diseases were considered the leading cause of death for human beings. Nevertheless, after World War II, thanks to the advancement of medical sciences in the fields of vaccination, antibiotics and improved living conditions, non-communicable diseases became a major cause of death in industrialized societies. These progresses led to reduction of the burden of infectious diseases, but non-communicable diseases including unintentional injuries have been increasingly among the problems that communities are grappling with (Baglehole, 2011). As one of the major life-threatening factors, injuries cause over 5 million death per year or 16 thousand ones per day. Among 15 leading causes of death in people aged 15-29 years, 5 factors are associated with unintentional injuries, which include road accidents, drowning, burning, poisoning and falling down (Mehes et al., 2011).

The share of death in injuries is small, while non-fatal and debilitating complications have a greater share. Incidents often lead to permanent disability and impose too costs on health care system. Because incidents are more prevalent in young population, the number of the years that the patients spend with such disabilities is too high (Chen et al., 2013, Chandran et al., 2010, Gore et al., 2011). The extent of the problem is such that, according to World Health Organization's statistics, 50% of the children who are referred to hospitals because of unintentional injuries are discharged with some form of disability (Peden et al., 2004). Traffic accidents and falling down are the major causes of disabilities with incidence rate of 17.5% and 12.2%, respectively (Kerug et al., 2000).

Therefore, incidents and injuries are among the most important public health threats, and especially the poor and vulnerable groups are most affected by them. More than half of those who lose their lives in accidents are 15-45 years old and most of them are the breadwinners (Pickering et al., 2013). No country is exception to this rule, which specifically involves the young people. Given this, safety and prevention from incidents require thought and planning (Sleet et al., 2010). Obviously, design and planning should be conducted so that they can be responsive to the community needs and pave the way for elevation and improvement of safety and prevention culture among all people and institutions. This can be accomplished only when news and information about the types of accidents be collected in an organized manner and then the planners are provided with scientific analysis and conclusions regarding the main causes.

Therefore, in the present research it was decided to study the injured admitted to the emergency departments of two level III hospitals, so that the collected data can be used to examine the outcomes of the incidents, medical costs and influencing factors.

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METHODS AND MATERIALS

This is a cross-sectional research aimed at studying unintentional injuries in patients admitted to the emergency departments of the two hospitals, namely Imam Hossein (AS) Teaching Hospital and Shohaday Haftom Tir Hospital. Study duration was one year (the year 2011). The study population comprised all unintentional traumatic patients who were admitted to the emergency departments during this period. Inclusion criteria included the presence of the unintentional trauma and being Persian speaking. Exclusion criteria included intentional injuries, failing to agree with participating in the research, inability of the patient or his/her companions to cooperate and to answer the question, and using the drugs that affect the patient's consciousness and thinking. The strategy of determining the sample size in this study was based on the studies that aimed to investigate the frequency of the outcomes of a phenomenon. Therefore, given the Type I error equal to 5% ($\alpha = 0.05$) and accuracy (1%) ($d = 0.01$), the minimum sample of 829 patient seems to be appropriate for this study. In this study, researchers examined 1500 patients affected by unintentional injuries. Given this sample size, the power of the study increased to 99%.

In this study, sampling was conducted as systematic random sampling. To do this, each day the first patient affected by unintentional injury admitted to the emergency departments was evaluated. Then, one patient per five admitted patients was evaluated. Therefore, before conducting the research, a list was prepared and numbered, and then each patient was given a number. The patients whose numbers were a multiple of five were included. In accordance with the research protocol, the patients admitted to the emergency departments were provided with some explanations regarding the objectives of the research, and a questionnaire was completed by emergency medicine residents whenever the patients were willing to cooperate. If the patient was incapable of providing accurate and complete information about the incident, his/her companions were asked to do so, so that the questionnaire could be completed. Obviously, interviews and filling out the questionnaires were conducted after diagnosis and initial treatment, when the patient's condition was stable.

The inventory consisted of 22 questions in three sections, namely demographic data, characteristics of the trauma and outcomes of the injury. The inventory was presented to an emergency medicine specialist and an epidemiologist and after obtaining the confirmation of the experts in this regard, the Cronbach's alpha coefficient of the inventory was calculated. The Cronbach's alpha coefficient was equal to 0.86, so the reliability and validity of the inventory was confirmed. The studied data included: (a) demographic variables, including age, gender, educational level, marital status, income level, and previous similar trauma; (b) factors relevant to the injuries including the location of an accident, the transport method of the injured to hospital, transport time of the injured, mechanism of the injury (the cause of injury), substance abuse at the time of injury, the patient's vital signs, consciousness level (consciousness, comatose or stupor), affected part of the body (head, neck, face, chest, abdomen, and pelvis) and the status of compliance with safety measures during the incident; and (c) the outcomes included the discharge status of patients including being discharged from the emergency department, being hospitalized, leaving the department against medical advice, leaving without a prior notice, being referred to other medical centers and death of the patient. The data was entered into SPSS software program, Ver. 20.0 and then into another software, namely STATA Ver. 11.0 and were analyzed. The descriptive statistics were expressed as frequency and ratio (%). Factors influencing the outcomes of the injuries were studied using chi-square test and Fisher's exact test for qualitative variables, and independent T-test and one-way ANOVA for quantitative variables. To investigate the factors influencing the outcomes of the diseases, multiple regression analysis (Backward) was used and the level of statistical significance was considered to be $p < 0.05$.

RESULTS

Totally, 1500 subjects were included in this study (71.0% were males). The mean and standard deviation of age of the subjects were 38.6±20.5 years. The age of 242 patients (16.1%) was less than 18 years, 584 people (38.9%) were 18-39 years old, 391 patients (26.1%) were 40-64 years old and 283 subjects (18.9%) aged greater than or equal to 65 years. Most of the subjects were married. Among the subjects, 511 patients (34.1%) were single, 830 patients (55.3%) were married, 67 people (4.5%) were divorced, and 92 patients (6.1%) were widow. The mean and standard deviation of monthly income of the patients were 6,914±14,961 thousand IRR. Distribution of monthly income showed that 352 patients (29.3%) had no income. Totally, 544 subjects (45.3%) had an income below 5 million IRR, while 510 patients (42.5%) had a monthly income 5-9.9 million IRR, and 126 patients (10.5%) had an income of 10- 19.9 million IRR and finally the income of 20 subjects (1.7%) was above 20 million IRR.

The mean and standard deviation of transport time of patients transferred by ambulance, private vehicle or taxi were 59.4±22.9, 88.8±99.3 and 76.85±54.0 minutes respectively. One-way ANOVA and Tukey's post hoc analysis showed a significant relationship between the transport time and transport vehicle ($F = 35.9$; d.f.: 2,1497; $p < 0.0001$). Therefore, ambulance transfers the patients faster than private vehicle ($p < 0.001$) and taxi ($p = 0.011$).

Direct trauma, hitting the ground, falling from height and car accident was the most important mechanisms of injury. Direct trauma to the body affected 256 patients (17.1%) and had the highest frequency; 253 patients (16.9%) were hit the ground, and 204 subjects (13.6%) were injured due to falling from height. The etiology of injuries showed 236 cases (15.7%) of car-pedestrian accident, 112 cases (7.5%) of motorcycle-pedestrian accident, while 118 people (7.9%) were injured as a result of car-motorcycles accidents and 40 ones (2.7 percent) due to two motorcycles crash; other 281 patients (18.7%) were injured due to a car-to-car crash or collision of car with barriers. Intentional traumas resulted in 404 injuries to the head and neck (26.9%), injuries to the chest in 147 cases (9.8%), injuries to the abdomen or pelvis in 111 patients (7.4%) and 838 cases (55.9%) of the injuries to the organs. Table 1 represents the distribution of the demographic variables.

Table 1: Factors associated with trauma in the injured of the present study

Factor		Frequency	Percent
Injury mechanism	Direct trauma	256	17.1
	Hitting the ground	253	16.9
	Falling down from height	204	13.6
	Car-pedestrian accident	236	15.7
	Motorcycle-pedestrian accident	112	7.5
	Motorcycle-car accident	118	7.9
	Motorcycle- motorcycle accident	40	2.7
	Car-to-car crash	281	18.7
History of incident		389	25.9
Substance abuse	Drugs	268	17.9
	Alcohol	20	1.3
Failing to comply with safety regulations		1109	73.9
Hemodynamic status	Stable	1271	84.7
	Transient tachycardia	131	8.7
	Unstable	98	6.5
Consciousness level	Consciousness	1202	80.1
	Stupor	247	16.5
	Comatose	51	3.4

Outcomes of the Accidents:

From total 1500 patients, 716 patients (47.7%) were treated and discharged from the emergency departments, 411 subjects (27.4%) were hospitalized and 182 patients (12.1%) were discharged against medical advice (AMA) from the emergency departments or other departments (2 patients). It should be noted that 120 patients (8.0%) left the emergency departments without prior notice and 36 subjects (2.4%) were referred to other centers. The mortality rate of the patients was 2.33%, i.e. 35 patients died. Among these, three patients (1.9%) died during transportation, 11 subjects (3.33%) died in the emergency department and 19 patients (57.6%) died in the hospital. One-way ANOVA showed that there was no significant correlation between mean transport time and place of death ($F = 0.66$; d.f.:2,30; $p = 0.52$). Therefore, we can say that the cause of death is not correlated with the transport time of the patients to the hospital.

Among 35 deaths, only one (0.41%) happed to a person aged less than 18 years, while four other patients (1.05%) were aged above 65 years. Chi-square test showed a significant relationship between age and outcome. This means that most patients aged under 18 years (51.3%) were treated in the emergency department and discharged from there, while the majority of patients over age 65 (47.7%) were admitted to the hospital ($p< 0.0001$). Mortality rates were 2.5% (27 cases) in males and 1.8% (8 cases) in females. Chi-square test showed a significant differences between the two groups in terms of outcome ($p = 0.03$). Among these people, the mortality rate of the illiterate was 2.2% (4 patients), for the people with elementary school degree, it was 2.3% (12 cases), for those with high school degree it was 3.0% (15 cases) and for the people with university degrees it was 1.4% (4 patients). Fisher's exact test showed a significant relationship between education level and outcome ($p < 0.001$). In terms of substance abuse and its relationship with outcome, 329 drug-independent patients (27.2%) and 82 drug addicts (30.6%) were hospitalized. The mortality rate of these patients was respectively, 2.2% (27 patients) and 3.0% (8 cases). None of the patients with alcohol consumption habits died ($p< 0.001$).

Factors Influencing Mortality:

After determining the factors affecting mortality of patients in univariate analysis, a logistic regression model was developed so that the independent factors affecting mortality of the unintentional injury can be identified.

Multivariate logistic regression analysis showed that the fracture in the head and neck (OR = 36.2), comatose during admission (OR = 43.13), hemodynamic instability (OR = 6.65), being non-married (OR = 4.73) and failing to comply with safety regulations (OR = 23.65) are the factors that increase the patients' chance of death (Table 2).

Factors Influencing Hospitalization of the Injured:

As Table 3 represents, the incidence of bone fractures (OR = 9.37), comatose during admission (OR = 2.08), failing to comply with safety regulations (OR = 1.63) and low income levels (OR = 2.4) are the factors that may increase the risk of hospitalization. While the history of incident (OR = 0.46), higher education (OR = 0.46) and being non-married (OR = 0.75) are the factors that can reduce the risk of hospitalization for the victims of unintentional injuries.

Table 2: Relation between Recurrent UTI and Idiopathic Hypercalciuria

Variable	AOR*	Confidence level of 95%	P
Head and neck fractures	36.2	12.24-53.73	0.001
Comatose during admission	43.13	26.06-71.11	<0.001
Unstable hemodynamic status	6.65	4.15-13.5	0.001
Being non-married	4.73	3.67-7.4	0.003
Failing to comply with safety regulations	23.65	16.77-48.94	0.004
History of incident	9.55	3.77-21.6	0.009

Table 2: Results of logistic regression, factors influencing hospital victims

Variable	AOR*	Confidence level of 95%	P
Comatose during admission	2.08	1.53-2.83	<0.001
Risk of fracture	9.37	6.8-12.95	<0.001
Failing to comply with safety regulations	1.63	1.1-2.39	0.014
History of incident	0.46	0.32-0.67	<0.001
Level of education	0.46	0.38-0.57	<0.001
Being non-married	0.75	0.61-0.93	0.007
Low income	2.4	1.47-3.91	<0.001

* Adjusted odd ratio

DISCUSSION

The mortality rate in this study was 2.33%. The findings of this study showed that some factors including fracture in the head and neck, comatose during admission, hemodynamic instability, being non-married and failing to comply with safety regulations are the factors that increase the chance of death. The findings of this study may be compared with the study conducted by Farchi et al. who reported the incidence of home injuries mortality as 0.43%. Unlike the present study, their study showed that mortality rate increases with age (Farchi et al., 2006). Akbari et al. also conducted a study in 10 provinces of Iran and concluded that the prevalence of death in unintentional injuries is nearly 4%, which is close to the findings of this study. In their study, car accidents with rate of 7.51% were considered as the leading cause of death (Akbari et al., 2009).

Despite the fact that unintentional injuries are the ninth leading cause of death in the world (Mathers et al., 2009), since this cause, and especially traffic accidents as its subgroup, involves younger age groups of the community, unintentional injuries and its subgroup, i.e. traffic accidents, is ranked at the top of list of causes for years of life lost (Norton et al., 2006). Although control and reduction of traffic accidents is largely outside the scope of the duties and responsibilities of health care sector, informing the relevant agencies regarding the importance of them, planning for, and offering cooperation between various sectors for control and reduction of this major cause of death can be conducted by health sector. More importantly, the above figures underline the importance of paying more attention to emergency services and equipping trauma centers.

High mortality rate due to car accidents and it increasing trend can be regarded as a result of increased number of vehicles and industrialization in recent years and such accidents occur due to these factors, which have occurred without upgrading the standards of living in these new conditions. Beneficial measures in preventing injuries and deaths caused by them may include three levels of prevention in damage control such as reducing substance abuse, safety training, improving safety measures in the workplaces, primary and urgent care at the scene, eliminating the causal factors (slowdown, proper traffic

signs), increased enforcement of traffic laws and rehabilitation services.

As Table 2 displays, comatose during admission increases the patient's chance of death up to 43 times (OR = 43.13), while this figure for fracture in the head and neck is up 36 times (OR = 36.2), for failing to comply with safety regulations it is up to 23 times (OR = 23.65) and for hemodynamic instability is up to 6.5 times (OR = 6.65). Therefore, emergency physicians should pay much more attention to the management of patients with comatose, hemodynamic instability and fracture in head and neck to reduce the mortality rate of these patients. It is recommended that stricter rules be established for industrial and construction workshops for use of safety belts and helmets. More importantly, a powerful surveillance system must be developed to monitor the implementation of these laws.

The factors that increase the risk of hospitalization includes bone fractures, comatose during admission, failing to comply with safety regulations and increased income. Meanwhile history of incident, education and being non-married are the factors that can reduce the risk of hospitalization for unintentional injury victims. Compared with other studies in this field, the study accomplished by Rivara et al. showed that the most important mechanism of injury leading to hospitalization include car accidents, professional sports and falling down, respectively (Rivara et al., 1989). A study by Boland et al. showed that the main factors leading to hospital admission include traffic accidents, falling down and collisions with an object (Boland et al., 2005).

As shown in Table 2, the risk of hospitalization of the patients increases due to bone fractures approximately up to 9 times (PR = 9.37), due to comatose during admission up to 2 times (OR = 2.08) and because of failing to comply with safety regulations up to 1.5 times (OR = 1.63). While history of incident (OR = 0.46), higher education (OR = 0.46) and being non-married (OR = 0.75) are the factors that can reduce the risk of hospitalization for unintentional injury victims. Among these factors, performing safety measures, education level and marital status of the patients are the modifiable factors. Therefore, it is recommended that strict measures should be conducted to raise the public welfare, education level, income level and observance of required safety precautions during working. Moreover, providing facilities and incentives for marriage may reduce incidents and hospitalizations of the injured.

Since it is likely that the statistical population may not represent the whole traumatic population, the sample size was considered as large as possible so that the possible error may be reduced. In addition, the traumatic patients were voluntarily included, so that their data may not be artificial. Another limitation of the present study is that it is a two-center study and it is proposed that for future studies, multicenter studies or even national studies would be conducted.

CONCLUSION

The findings of this study showed that from total 1500 patients, 716 patients (47.7%) were treated and discharged from the emergency departments, 411 subjects (27.4%) were hospitalized and 182 patients (12.1%) were discharged against medical advice (AMA) from the emergency departments or other departments (2 patients). It should be noted that 120 patients (8.0%) left the emergency departments without prior notice and 36 subjects (2.4%) were referred to other centers. The mortality rate of the patients was 2.33%, i.e. 35 patients died. Among these, three patients (1.9%) died during transportation, 11 subjects (3.33%) died in the emergency department and 19 patients (57.6%) died in the hospital. The findings of this study showed that some factors including fracture in the head and neck, comatose during admission, hemodynamic instability, being non-married and failing to comply with safety regulations are the factors that increase the chance of death.

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