Original Research

Evaluation Of The Mechanism, Type, Severity And Pattern Of Injury In Multiple Trauma Patients Referred To The Emergency Department

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Abstract

Introduction: Severe injury is still one of the most important causes of death worldwide. Early diagnosis and treatment in patients with multiple injuries is extremely important. Due to the growing need to more clearly express injuries caused by multiple injuries as an important part of mortality and disability, especially among young patients, this study aimed to investigate the mechanism, type and severity of injuries in multiple trauma patients referred to Imam Reza Hospital in Birjand.

Method: In this cross-sectional study, a total of 792 individuals who had experienced multiple traumatic events were examined at Imam Reza Hospital in Birjand in 2021. The tool utilized for data collection was a comprehensive checklist, which encompassed various aspects such as age group, gender, marital status, education level, socio-economic class, severity and mechanism of the trauma, pattern and location of the trauma, time of hospital visit, types of fractures, final outcome, shock, radiological assessment, and the type of trauma. For the purpose of data analysis, the SPSS software version 21 was employed, utilizing both descriptive and analytical statistical analyses.

Result: The most age group referring to the hospital were 25-44 years old (27%), with male gender (61.6%) and with education High school (44.4%). The most common mechanism of referral was car accident (35.5%) and blunt pattern (87.3%). Most of the patients visited the emergency room at 12-18 o'clock (38.6) and radiological evaluation was done for (79.7%) of the patients.

Conclusion: The most common reason for patients visiting the emergency room is vehicle accidents in the patients aged 25-44 years which due to the importance of this age group as a dynamic group of the society, requires the serious attention of the authorities for practical and educational programs to prevent the occurrence of these accidents.

Keywords: Multiple trauma, Emergency, Trauma, Accidents, Blunt Trauma

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Introduction

Severe injury is still one of the leading causes of death. Patients with multiple injuries need to be diagnosed and treated early (1). In many countries, injuries resulting from interpersonal violence and road traffic accidents account for a significant proportion of preventable deaths, with 4.3 million deaths in 1990 and 4.8 million deaths in 2013. Gives it to you. More than one million deaths from interpersonal violence and road traffic accidents occur each year, representing 17% of all deaths in the 10-40 age group. The annual number of road-related injuries is estimated to reach more than fifty million individuals. The incidence of road traffic injuries in developed countries is expected to decrease by 30% over the next 20 years, whereas in developing and underdeveloped countries, the frequency of fatalities due to injuries is expected to increase (2). Injury rates among pedestrians and bicyclists, motorcyclists and motor vehicle drivers have increased by 6.9% between 1990 and 2013. 69% of fatal injuries are caused by unintentional causes. One of the leading causes of unintentional injuries, falls, has increased significantly from 340,000 in 1990 to 556,000 in 2013 (3). In developing countries, injury ranks third among all causes of death and permanent disability among the adult population, next to tuberculosis and AIDS (4). Among traumas to different parts of the body, trauma to the pelvis is 47.4%, head and neck 22.1%, chest 16.0%, skin 7.6%, abdominal contents 4.5% and face 2.3% (5). Based on a recent population-based study, the annual incidence rate of all injuries for Iranians is estimated at 905 per 1000 patients. It accounts for approximately 9 injuries in every 10 patients (6). Hypovolemic shock is one of the most common cases that doctors encounter in accidents and wars. The absence of traditional assistance in rural areas and far from the center makes it necessary to transfer the patient to the closest city hospital. An injured person who is bleeding due to trauma needs this transfer, which can put them at risk for hypovolemic shock. The importance of shock is to diagnose it in the early stages and provide first aid to the injured because after the shock is established, the death rate is high, even in the best treatment centers (7). The total health costs and non-fatal injuries in Iran in 2011 were estimated at more than 6 billion US dollars and nearly one and a half billion US dollars, respectively (6). Due to the growing need to more clearly express injuries caused by multiple injuries as an important part of mortality and disability, especially among young patients, this study was conducted to investigate the mechanism, type and severity of injuries in multiple trauma patients referred to Imam Reza Hospital in Birjand.

Method

In this descriptive-analytical study, 792 multiple trauma patients referred to Imam Reza Hospital in Birjand in 1400 were studied. According to the study of evaluating the mechanism, type and severity of trauma in multiple trauma patients referred to Mashhad Hashminejad Trauma Center by Rihani et al. (8) and using the following formula at a significance level of 0.05, a sample size of 792 patients was obtained.

This study was reviewed after receiving the ethic code in the trauma center of Imam Reza Hospital in Birjand (IR.BUMS.REC.1400.028) and taking the history of the patients for a period of 7 months. The inclusion criteria include: All multiple trauma patients referred to Imam Reza Hospital from the beginning of March to 31 September, 2021 to the Emergency Center of Imam Reza Hospital, and consented to participate in the study. Any cases that caused us to doubt the reliability of the information received from the patient or errors in the history, if the patient suffered shock or died for any reason other than trauma, were excluded from the study. The data collection tool in this study includes a checklist. This

checklist contains information; Age group, gender, marital status, education level, socio-economic class, trauma severity, trauma mechanism, trauma pattern, time to visit the hospital, location of trauma, types of fractures, final outcome, shock, radiological evaluation and type of trauma were measured. In order to know the socio-economic status, the SES questionnaire, which has 4 components, was examined. In order to check the final result in some patients with personal consent, a phone number was obtained from the patient or his companion for follow-up. Data analysis using spss software version 21 and descriptive statistics (percentage and frequency) and analytical statistical tests (chi-square, Fisher) were considered at a significance level of $P<0.05$.

Results

Most of the surveyed patients were in the age group of 25-44 years (27%), and most of the patients were male (61.6%) and had below Associate degree (44.3%). 40.7% of the surveyed patients evaluated their socio-economic status as low and 34% as average (Table 1).

There is no statistically significant relationship between the mortality rate due to trauma and the variables of age, gender and education level ($P>0.05$). However, the death rate in patients who evaluated their socio-economic status as low or downward is statistically significantly higher than other groups ($P=0.003$) (Table 2).

Most of the clients (35.5%) came because of a car accident. 86.7% of clients had a blunt trauma pattern and 23.2% had a penetrating trauma pattern. Most visits were made between 12-18 hours (38.4%) and the severity of injury was serious in 40.9% of patients . 41.4% of the examined patients were discharged from the hospital and 33.6% were admitted to the ward (Table 3).

65.3% of the patients had injuries in the upper limbs, 55.9% in the abdominal region, 51.4% in the lower limb, 50.9% of the examined patients had injuries in the pelvic region. In other areas, the percentage of injured patients was less than 50%. 16.7% of the patients were in a state of shock upon arrival. Radiography was done for 79.5% of the referring patients . 5.4% of patients died (Table 4).

There was a statistically significant relationship between socio-economic status and the severity of trauma and the final outcome ($P=0.001$). In such a way that people with lower socio-economic status had experienced more severe trauma and the result of referral was worse in them (Table 5).

There was no statistically significant relationship between the pattern of trauma and mortality due to trauma ($P>0.05$) (Table 6).

Discussion

According to the results of the present study, the frequency of each age group is less than 14 years (22%), 15-24 years old (23.2%), 25-44 age group (27%), 45-64 age group (17.4%) and it was more than 6 years (20.2%). Demetriades et al presented a report in 2004 on pedestrians injured in accidents. The number of patients was 5838, who were divided into 4 age groups: less than 14 years, 15-55 years, 56-65 years, and more than 65 years, and more than 50% of people (61%) were in the age group of 15-55 years, which is consistent with our study. had This issue plays the main role in trauma being high in terms of lost years of life as well as in the costs of death and disability (9). On the other hand, considering that the demographic composition of Iran is young, it can be said that the average age and the age group of young people in the study are affected by this issue. 61.6% of the surveyed people were male, which was done with a study by Yadollahi et al. 2011-2014 at Shahid Rajaei Trauma Center in Shiraz about patients who had a car accident. 68.9% of the population were male (10). Also, in the study conducted by Ghorbani et al., it was stated that most of the patients with lesions caused by trauma following urban accidents

were men (11), which was consistent with the study conducted by us. In the study conducted by Hadavi et al., it was stated that most of the accident patients hospitalized in the examined hospital were men, which was consistent with the study conducted by us (12). In the studies conducted by Rihani et al. 2017 (8), Champion H.R. et al. (13), Clark D. E. et al. (14), Vazirinejad et al. (17) It was stated that most of the examined trauma patients were men, which was consistent with the study conducted by us. According to the results of the present study and other studies mentioned above, trauma is mainly a problem for men, which is due to the greater number of male drivers and the activities related to accidents (such as high-risk driving and hard jobs) by Iranian men (11). According to the results of the present study, the most affected areas in patients were 65.3% of patients with upper limb trauma and then abdomen. According to the results of the study conducted by Reihani et al., 2017, head and neck injuries were the most involved areas in the examined patients, which was not consistent with our study. Among the reasons for this inconsistency, we can mention the difference in the studied society and also the geographical region in the two studies. In this study, after the face, the abdomen was the most common area involved in patients, which is consistent with our study (6). In the study of Reihani et al., 2017 (8), head and neck injuries accounted for the most injuries, which was not consistent with our study. One of the reasons for inconsistency is the difference in the study population. In the study of Reihani et al., patients with an injury level higher than 9 were examined. Based on the results of the study conducted by Yousefzadeh et al., it was stated that the head was the most common affected area in the examined patients, which was not consistent with the study conducted by us. Among the reasons for this inconsistency, we can mention the difference in the geographical area under investigation (18). In the study conducted by Davoodabadi et al., it was stated that the most common site of trauma in the examined patients was the upper limb, which was consistent with the study conducted by us (19). According to the results of the present study, 54.1% of patients visited the emergency room due to a vehicle accident. Based on the results of the study conducted by Hejininejad et al., it was stated that the most common reason for referral in the assayed patients was a vehicle accident, which was consistent with the study conducted by us (12). In the study conducted by Davoodabadi et al., it was stated that the most common cause of trauma in the assayed patients was a vehicle accident, which was consistent with the study conducted by us (19). In the study conducted by Forouzan et al., it was stated that the most common reason for patients to go to the emergency room in the studied study was falling from a height, which was not consistent with the study conducted by us. Among the reasons for this inconsistency, we can mention the difference in the studied community, as well as the geographical area, and the vehicles used (20). According to the results of the present study, 5.4% of patients died, 41.4% of patients recovered and 53.2% of patients were referred from the emergency department to other relevant departments. Based on the results of the study conducted by Hejininejad et al. (21), it was stated that the death rate in the assayed patients was 0.4%, which was consistent with the study conducted by us. According to the results of the study conducted by Ghorbani et al. (11), 2.3% and the study by Rezazadeh et al. 2.5% of the examined patients died, which was consistent with our study. Dealing with accidents and incidents in Iran requires a review of the three levels of prevention programs. The first level of prevention is clearly the foundation of action to reduce mortality, morbidity, and costs of trauma and reduce incidence. Today, the most well-known and simplest prevention methods (such as the use of belts and helmets or

occupational safety markets) are not widely used in our country. It seems that legal or executive deficiencies are the main problem in this field, and the three forces can play the best role in this field. The second level of prevention: the trauma care system in Iran is an incomplete and uncoordinated system without a rational design. In order to improve this system, hospitals should become complete trauma centers. Another essential and important component is the systematic and classified collection of information related to injured patients. Although the university departments of surgery, neurosurgery, orthopedics, otolaryngology and ophthalmology have an important role in this field, they cannot replace a national program for such a purpose. In addition to helping to treat each patient, this work paves the way for research in the field of treating patients and controlling the quality of treatment. The third level of prevention: injured patients should not be left alone after being discharged from the hospital. They should be prevented especially in terms of regaining previous occupational abilities, the usefulness of scoring methods in predicting disability related to accidents needs further investigation (22).

Conclusion:

Due to the importance of disability and limb defects and damages caused by trauma and accidents caused by vehicles as the most important cause of trauma in people in different fields, more attention should be paid to creating culture, raising awareness, and teaching the correct way. Reducing trauma and its consequences can be achieved by improving the security of vehicles by individuals and relevant institutions.

Suggestions:

It is suggested that this study be done with a larger sample size and more time.

Similar studies should be conducted in other centers in a multi-cantered manner.

Additional studies should be done to find the best method to reduce the damage and complications caused by it.

Limitations:

The unwillingness of all the referring people to participate in collecting the information needed for a more detailed investigation is one of the most important limitations of the study.

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Ethical considerations:

The present study was approved by the ethics committee of Birjand University of Medical Sciences with the number IR.BUMS.REC.1400.028. At first, the procedures and objectives of the work were explained to the patients or the first-degree companion of the patient, and informed consent was obtained from all the participants in this research before entering the study. All information obtained was confidential; only anonymous information was used in the report results. Also, patients could withdraw from the study at any stage if they did not want to.

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Authors' Contributions

All authors contributed toward data analysis, drafting, and revising the article and agreed to be responsible for all the aspects of this work.

Conflict of Interest

We, the authors, collectively grant consent for the publication of our content.

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Table & Figure:

Table 1: Demographic characterises of multiple trauma patients

	Variable	Number (%)
Age	=<14	174 (22)
Age	15-24	185 (23.4)
Age	25-44	214 (27)
Age	45-64	138 (17.4)
Age	>65	81 (20.2)
Gender	Male	488 (61.6)
Gender	Female	304 (38.4)
Level of Education	High school	357 (44.3)
Level of Education	Associate degree	27 2(34.3)
Level of Education	Bachelor's degree	144 (18.2)
Level of Education	Master degree and higher	25 (3.2)
Socio-economic class	Low	65 (8.2)
Socio-economic class	downwards	322 (40.7)
Socio-economic class	Average	269 (34)
Socio-economic class	upwards	109 (13.8)
Socio-economic class	High	27 (3.4)

Table 2: Relationship between the mortality rate and the Demographic variables

	Death		p
Age	Yes	No	0.06
=<14	5 (2.9)	169 (97.1)	
15-24	7 (3.8)	178 (96.2)	
25-44	18 (8.4)	196 (91.6)	
45-64	6 (4.3)	132 (95.7)	
>65	7 (8.6)	74 (91.4)	
Gender			0.15
Male	31 (64)	457 (93.6)	
Female	12 (3.9)	292 (96)	
Level of Education			0.06
High school	17 (4.8)	334(91.2)	
Associate degree	22 (8.1)	250(91.9)	
Bachelor's degree	4 (2.8)	140 (97.3)	
Master degree and higher	0	25 (100)	
Socio economic status			0.003
Low	5 (7.7)	60 (92.3)	
Lower middle	29 (9)	293 (91)	

Middle	6 (2.2)	263 (97.8)	
Upper middle	3 (2.8)	106 (97.2)	
High	0	27 (100)	

Table 3: Mechanism, type, severity and pattern of injury in multiple trauma patients referred to the emergency department

Variable	(%)Number
Mechanism	
Car accident	281 (35.5)
Motor accident	147 (18.6)
Pedestrian accident	57 (7.2)
Fall height	118 (14.9)
Assault	50 (6.3)
Other	139 (17.6)
Blunt pattern	
With	687 (86.7)
Without	105 (13.3)
Penetrating pattern	
With	184 (23.2)
Without	608 (76.8)
Time	
0-6	86 (10.9)
6-12	198 (25)
12-18	304 (38.4)
	204 (25.8)

18-24	
Severity	160(20.2)
Minor	324(40.9)
Moderate	185 (23.4)
Serious	72 (9.1)
severe	39 (4.9)
critical	12 (1.5)
Incompatible with life	
Outcome	
Discharge	328 (14.4)
Hospitalization	266 (23.6)
Transfer to the OR	46 (5.8)
Transfer to ICU	109 (13.8)
Death	43 (5.4)

Table 4: Distribution based on the Anatomical region of injury

Anatomical region	with	without
Head	362 (45.7)	430 (54.3)
Neck	251 (31.7)	541 (68.3)
Face	256 (32.3)	536 (67.7)
Thorax	353 (44.6)	439 (55.4)
Abdomen	443 (55.9)	339 (44.1)
Pelvic	403 (50.9)	381 (49.1)
Spinal cord	323 (40.8)	469 (59.2)
Upper limb	517 (65.3)	275 (34.7)
Lower limb	407 (514)	385 (48.6)

Table 5: The relationship between socioeconomic status and trauma severity and final outcome

Variable	Low	Lower middle	Middle	Upper middle	High	P
Minor	10 (6.3)	40 (25)	59 (36.9)	43 (26.9)	8 (5)	< 0.001
Moderate	26 (8)	141 (43.5)	112 (34.6)	36 (11.1)	9 (2.8)	
Serious	16 (8.6)	74 (40)	71 (38.4)	18 (9.7)	6 (3.2)	
Severe	9 (12.5)	35 (48.6)	17 (23.6)	7 (9.7)	4 (5.6)	
Critical	2 (5.1)	25 (64.1)	8 (205)	4 (10.3)	0 (0)	
Incompatible with life	2 (16.7)	7 (58.4)	2 (16.7)	1 (8.3)	0 (0)	
Discharge	29 (8.8)	112 (34.1)	117 (35.7)	58 (17.7)	12 (3.7)	< 0.001
Hospitalization	17 (6.4)	112 (42.1)	94 (35.3)	32 (12)	11 (4.1)	
Transfer to the OR	7 (15.2)	18 (39.1)	18 (39.1)	3 (6.5)	0 (0)	
Transfer to ICU	7 (6.4)	51 (46.8)	34 (31.2)	13 (11.9)	4 (3.7)	

Death	5 (11.6)	29 (67.4)	6 (14)	3 (7)	0 (0)

Table 6: Relationship between the pattern of trauma and mortality due to trauma

Variable	**Death**		P
	With Number (%)	Without Number (%)	
Blunt pattern With Without	 40 (58) 3 (2.9)	 647 (94.2) 102 (97.1)	0.26
Penetrating pattern with without	 9 (4.9) 34 (5.6)	 175 (95.1) 574 (94.4)	0.85