

The Impact of Prehospital Emergency Services on the Outcome of Trauma Patients

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Abstract

Background and Objectives: Trauma is one of the most important health problems in the world, and shock index is a good tool for evaluating trauma patients in emergency. The aim of this study was to evaluate the impact of prehospital emergency on the outcome of trauma patients. **Methods:** In this cross-sectional study, we investigated the records of 359 patients referred to the emergency department; they were selected non-randomly. Demographic information, trauma mechanism, patients' transportation, location and duration of hospitalization and the final outcomes of the patients were evaluated. the predictive power of the shock index in hospitalization and mortality was studied. The data were analyzed by SPSS software using descriptive and analytical statistics. **Results:** The results of study showed that 73.3% of patients were male and 26.7% were female with a median of 30 years. Car and motorcycle accidents and falling from altitude were the most common mechanisms of trauma and cause of death. Time interval between trauma and emergency shock index and patient status was normal and significant ($P < 0.7$). **Conclusion:** The rate of patients who were transferred by EMS is equal with those transferred by witness. Patients who had normal shock index with delay transfer time had a significantly high mortality rate.

Keywords: Emergency department, mortality, prehospital, trauma

INTRODUCTION

Prehospital care is one of the key pillars of the trauma care system and is defined as the beginning of care for trauma patients at the scene of the accident as soon as possible. This care begins at the scene of the accident and ends in a hospital emergency. Prehospital trauma care includes providers, trauma information systems, casualty transfer facilities, and communication systems.^[1]

In general, the postaccident phase involves the application and implementation of appropriate care and treatment in the prehospital and hospital phases to prevent the trauma and mortality consequences thereof. Trauma-related deaths are categorized into three groups based on time criteria, which include strategies to reduce trauma-related deaths.^[2]

The results of Feero *et al.* showed that there was no significant difference between unexpected survivors versus unexpected deaths.^[3] Newgard *et al.* also indicated no significant association between mortality and transfer time in minutes.^[4]

However, Gonzalez *et al.* and Petri *et al.* studied that nonsurvivors have a significant shorter transfer time.^[5,6] In the study of McGuffie *et al.* with urban or rural patients, the authors reported that there was no association between mortality and transfer time in both rural and urban settings. However, they

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How to cite this article: Pouraghaei M, Vahdati SS, Moharamzadeh P, Abrishami L, Balafar M. The impact of prehospital emergency services on the outcome of trauma patients. Arch Trauma Res 2020;9:139-42.

Received: 01-09-2019, **Accepted:** 20-07-2020, **Published:** 22-08-2020

showed transfer time to be a significant factor when total length of hospital stay was modeled, and longer transfer time was associated with a longer hospital stay. Three studies report on patients suffering penetrating trauma.^[7] Eachempati *et al.* and McCoy *et al.* reported that there was not any increase of mortality with longer transfer time.^[8,9]

In unknown injury in trauma patients, a shorter response time and also transfer time can have a positive effect on mortality.^[10]

The aim of this study was to evaluate the impact of prehospital emergency on the outcome of trauma patients.

METHODS

Study type

This was cross-sectional analytical study was conducted on all multiple trauma patients referred to the Emergency Department of Imam Reza Hospital in Tabriz (the largest trauma center in northwestern of Iran) from Fall 2017 to Winter 2018.

Demographic data (age and sex), patient information such as trauma mechanism and type of trauma, patients' transport, and outcome of patients were collected by the researcher in this study. For this purpose, a special form of data collection was prepared and the data were collected from patients' medical records during treatment.

In this study, a total number of 359 patients referred to Imam Reza Hospital in Tabriz were selected. Shock index criterion was extracted from patients' records and recorded in relevant forms.^[11] It should be noted that the results of the study did not directly interfere with the patient's treatment process and only the patients' workflow was observed and the checklist was filled.

Data analysis

The data were analyzed by the SPSS software version 22 IBM SPSS statistics for Windows, version 22.0; New York. Results were reported in frequency (percent) as well as mean, standard deviation, and by median (interquartile range). Kolmogorov–Smirnov test was used to test the normality of the data distribution. $P < 0.05$ was considered as the level of statistical significance.

Ethical considerations

This research was approved by the Ethics Committee and the Vice-Chancellor of Research and Technology of Tabriz University of Medical Sciences (Ethics No.IR.TBZMED.REC.1397533). Informed consent was obtained from the participants at the beginning of the study. Patients' information was completely confidential and the information used was reviewed without mentioning their personal identities.

RESULTS

In this study, 359 patients referred to the Emergency Department of Imam Reza Hospital were included. There were 263 (73.3%) male and 96 (26.7%) female patients. The mean

age of the patients was 33.94 ± 18.89 years with a median of 30 years.

In this study, 309 patients (86.1%) were transferred with EMS to the emergency department and 50 patients (13.9%) were transferred with witness. In this study, the highest frequency of trauma was car and motorcycle accidents (44.30%) and the least one was fight (8.60%). Table 1 shows the relationship between trauma mechanism and patients' status using the shock index.

In patients who were transferred by EMS, 57 (18.4%) died, 200 (64.7%) discharged, and 52 (16.8%) transferred to other specific centers. In patients transferred with witness, 1 (2%) died, 38 (76%) were discharged, and 11 (22%) were transferred to other centers ($P = 0.013$).

The time interval between trauma and emergency arrival for patients who were transferred with EMS was between 60 min and 100 min (minimum 60–maximum 100 min) and for patients who were transferred with witness, the median was 60 min with the quartile range (minimum 60–maximum 100 min), with no significant difference between the two groups ($P = 0.225$).

The time interval between trauma and EMS arrival among those with a shock index below 0.7 and normal who died was more than those who were discharged or transferred to other centers ($P = 0.021$ and $P = 0.003$, respectively). However, there was no statistically significant difference between patients with

Table 1: Relationship between trauma mechanism and patient status based on shock index

Type of trauma	Shock Index*	Patient status			P
		Death	Discharge	Move to other centers	
Falls from height	Under 0.7	1	13	0	0.116
	Normal	7	19	0	
	Positive	6	9	0	
Pedestrian accident	Under 0.7	0	5	4	0.199
	Normal	2	8	5	
	Positive	5	5	2	
Car crash	Under 0.7	6	21	8	0.007
	Normal	5	52	20	
	Positive	12	32	3	
Motorcycle accident	Under 0.7	1	14	3	<0.0001
	Normal	1	22	11	
	Positive	10	8	10	
Conflict and strife	Under 0.7	0	8	3	0.429
	Normal	0	15	3	
	Positive	0	10	0	
Other events	Under 0.7	1	1	0	0.771
	Normal	0	3	0	
	Positive	1	1	0	
Total	Under 0.7	9	62	18	<0.0001
	Normal	15	119	39	
	Positive	34	57	6	

*Normal SI is between 0.7 and 0.9 and Positive SI is upper 0.9. SI: Shock index

Table 2: Differentiation between shock index and patient status

SI in transmission	SI<0.7	0.7=<SI	=<SI
Pv	0.021	0.003	0.996

SI: shock index, Pv: P value

Table 3: Time interval between trauma occurrence and EMS arrival based on shock index and patient outcome

SI	Outcome		
	Positive	Normal	Under 0.7
Death	86.67±46.10	123.57±83.35	98.82±64.71
Discharge	84.43±54.52	80±42.10	98.87±68.23
Transfer to ward	62.22±15.17	65.38±19.85	96.67±57.15
Pv		<0.0001	

EMS: emergency medicine service, Pv: P value, SI: shock index

positive index in terms of time interval between trauma and EMS arrival ($P = 0.996$) [Tables 2 and 3].

DISCUSSION

According to the results of the present study, the most common cause of trauma was car and motorcycle accidents and falling from altitude. Most of the deaths and the need for hospitalization in ICUs also occurred in trauma patients with these two mechanisms. It seems that Tabriz city drivers do not comply with traffic laws, disregard for safety and discretion when using vehicles, and neglect of traffic signs in urban areas due to a higher prevalence of the mentioned mechanisms. Zamani *et al.*, in 2014, identified the most common cause of trauma as a car accident and falling from a height, which is in line with the present study.^[12] Also, Kariman *et al.* indicated that the most common cause of trauma was accident, which is consistent with the present study.^[13] This has also been confirmed in a study by Zarger *et al.*^[14]

The findings of the study indicate that men are more likely to be hospitalized than women due to trauma (2.8 times); this finding is quite in line with the results of Zamani *et al.*^[12] A study conducted in Tehran also reported men as the most at - risk group.^[14,15] The high rate of trauma in men is justified by the economic, social, and cultural conditions of the community (more housewives in the community and more men involved in the transportation system).

The mean age of trauma patients was 30 years, and trauma was the highest in the age group of 21–46 years old, indicating that most of the injured were active working age. These statistics are similar to most studies in Iran.^[15,16]

Transfer of injured patients to hospital is one of the most important issues in developed countries.^[17] In the present study, the majority of the patients (86%) were transferred to the emergency room by a prehospital emergency, and approximately 14% of the patients referred to these centers by

personal device. These results were in contrast to the findings of studies conducted in Isfahan in 2014^[13] and also in Tehran and Ardabil. The percentage of referrals by prehospital emergency was 49.7 in Isfahan and 7.2 and 8.8 in Tehran and Ardabil, respectively. These values were 8.39%, 90%, and 36.3%, respectively, for conventional car transport.^[14,18]

CONCLUSION

The most frequent cause of trauma was car crash. This study showed that the mortality rate of death in patients who were referred with EMS was high, maybe it depends on severity of injuries; in the other hand, the patients who were referred came with witness had no severe injury and because of that the mortality rate is low. It is so interesting that the rate of patients referred by EMS is equal with those transferred by witness. Patients who had normal shock index with delay transfer time had a significantly high mortality rate.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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