

Original Article

Evaluation of preventable trauma death in emergency department of Imam Reza hospital

Changiz Gholipour¹, Bahram Samadi Rad², Samad Shams Vahdati¹, Amir Ghaffar zad³, Armita Masoud³

¹ Road Traffic Injury Research Center, Tabriz University of Medical Science, Tabriz, Iran

² Legal Medicine Research Center, Legal Medicine Organization, Tehran, Iran

³ Emergency Department, Tabriz University of Medical Science, Tabriz, Iran

Corresponding Author: Samad Shams Vahdati, Email: sshamsv@yahoo.com

BACKGROUND: Trauma is considered as a worldwide problem despite socio-economic development. Motor vehicle accidents (MVAs) are the most important cause of trauma. Trauma related deaths are mostly preventable. This study aimed to investigate the causes and prevention of death in trauma patients.

METHODS: This retrospective, descriptive-analytic study assessed 100 trauma patients referred to our emergency department (ED) from January 2013 to January 2015. The included patients were those with trauma died after arrival at our ED. Age, sex, cause of trauma, clinical causes of death, causes of death defined by autopsy, way of transfer to the ED, time of ambulance arrival at the scene of trauma, and time elapsed to enter the ED from the scene of trauma were studied.

RESULTS: In the 100 patients, 21 (21%) patients were female and 79 (79%) male. Forty-three patients were older than 60 years. Trauma was largely due to pedestrian accidents in 31% of the patients, and 33% had a hypo-volemic shock. About 80% of deaths were due to intra-cranial hemorrhage (ICH) or intra-ventricular hemorrhage (IVH), and spinal injuries were not preventable. Autopsy revealed that 28% of the patients suffered from internal injuries. Autopsy revealed that 19% of the deaths were not preventable and 81% were considered preventable. In our patients, 76 were transferred to the hospital by emergency medicine services (EMS). Analysis of time for ambulance arrival to the scene and frequency of death revealed that 52.2% of the deaths occurred between 11 and 15 minutes. Analysis of time for admission to the ED from the scene of trauma showed that 74.6% deaths occurred between 6 and 10 minutes.

CONCLUSIONS: The rate of hospital preventable deaths is about 80%, a high mortality rate, which denotes a lack of proper diagnosis and treatment. The time for arrival of EMS at the scene of trauma is longer than that in other countries.

KEY WORDS: Trauma; Preventable death

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INTRODUCTION

Trauma is the most prevalent cause of mortality during the fourth decade of life. Trauma is considered as a health problem worldwide despite socio-economic development.^[1–4] In Africa and Asia in which infectious diseases are the causative factor of death, trauma is considered as the main cause of mortality and disabling.^[4,5] Motor vehicle accidents (MVAs) remain the most important

cause of trauma that leads to death in patients older than one year.^[6]

According to the estimate of World Health Organization (WHO), MVAs are responsible for 3.5 million deaths throughout the world, of which more than 2 million occur in developing countries.^[7] About 80% of 3 600 deaths reported in 2004 in our country were related to non-deliberately events like traffic accidents. The economic

burden of traffic events is estimated more than 2 billion dollars annually.^[3] Trauma related deaths are mostly preventable, and revention can decrease the rate of deaths. However, prevention and management of deaths due to traffic accidents is less studied in developing countries including Iran.^[8,9]

This study was undertaken to investigate the causes of deaths in trauma patients, determine the causes of preventable death in these patients, and provide solutions based on the features of our country's emergency medical system (EMS) to reduce the mortality rate in trauma patients.

METHODS

In this study, we retrospectively analyzed the trauma patients referred to our emergency department (ED) from January 2013 to January 2015. Inclusion criteria were deaths of patients after arrival at our ED. All patients with incomplete data of inhospital and pre-hospital treatment were excluded.

A checklist was prepared for recording patients' demographics (age, sex), causes of trauma, clinical causes of death, causes of death defined by autopsy, transfer to ED, time of ambulance arrival at the scene of trauma, and time elapsed to enter ED from the scene of trauma.

All data were analyzed using SPSS-15.0 software. Descriptive statistics was used to analyze demographics. The Chi-square test was used to analyze the relationship between the demographics. *P* value <0.05 was considered statistically significant.

RESULTS

In the 100 patients analyzed, 21 (21%) were female and 79 (79%) male. Seven patients were younger than 10 years, 3 were between 11–20, 16 between 21–30, 12 between 31–40, 3 between 41–50, 16 between 51–60, and 43 older than 60.

Causes of trauma were as follows: 19% car accidents, 15% car rollover, 12% car-bicycle accidents, 5% bicycle rollover, 18% fall from height, and 31% pedestrian accidents.

Three percent of the patients had hemothorax, 7% epidural hemorrhage (EDH), 7% sub-dural hemorrhage (SDH), 16% intra-cranial hemorrhage (ICH) or intra-ventricular hemorrhage (IVH), 4% internal organ damages followed by blood-shedding, 4% cardiac tamponade, 33% hypo-volemic shock, 4% spinal cord injuries, and 17% unknown cause of death. About 80% of deaths due to ICH, IVH and spinal injuries came out

to be preventable.

Autopsy revealed that 8% of the patients had pneumothorax, 17% hemothorax, 10% EDH, 7% SDH, 15% ICH/IVH, 28% internal injuries, 6% tamponade, 5% hypo-volemic shock, and 4% spinal cord injuries. Autopsy also showed that 19% of deaths were not preventable and 81% were considered preventable.

In our series, 76 patients were transferred to the hospital by EMS and 23 patients were not.

Analysis of time of ambulance arrival to the scene of trauma and the frequency of death revealed that 19.4% of deaths occurred in less than 10 minutes, 52.2% in 11–15 minutes and 28.4% in more than 15 minutes.

Analysis of time elapsed to enter ED from the scene of trauma showed that 16.9% of deaths occurred in 5 minutes or less, 74.6% in 6–10 minutes, and 8.5% in more than 10 minutes.

DISCUSSION

In this study most of the patients were old men (older than 60). Motomura et al^[10] and Eyi et al^[11] reported that men suffered from trauma more frequently than women aged on average 64 and 31 years respectively. In our study, pedestrian accidents were the frequent cause of trauma (*P*=0.004).

Salimi et al^[12] reported the most prevalent causes of trauma were traffic accidents, crash from height, and ruffianism, respectively. Motomura et al^[10] found that the most prevalent cause of trauma was car crash with passersby.

In our study, 20% of hospital deaths were not preventable, and 80% were preventable. The frequency of death in hypo-volemic shock was higher than that in other events (*P*=0.001).^[10,13] There is much difference in preventable deaths between our study and the others. This indicates that the rate of death due to trauma is high in our country and we could prevent most of deaths. Thus organized trauma system and trained emergency services are required to decrease probable errors of diagnosis and treatment and make emergency services quick and efficient.

Durusu et al^[14] reported that 16.2% of deaths were potentially preventable and 79.65% were not preventable. Another study^[12] showed that 4.1% of deaths were preventable, 14.5% potentially preventable, and 8.3% not preventable.

Comparison of the above-mentioned findings and ours shows that the mortality rate of trauma patients is much higher in our patients and that most trauma related deaths are preventable in our country.

In our study, 76.0% of the patients were transferred with ambulance and 23% without ambulance ($P=0.001$). This indicates that patients transferred with ambulance may have poor general conditions that ultimately lead to a higher mortality rate. Another study reported that patients who were not transferred with ambulance may have good general conditions, thus giving a low mortality rate. More attention given to transfer of patients could avoid preventable deaths^[15] especially in elderly patients.^[16]

We found a significant relationship between the arrival of EMS at the scene of trauma and the higher mortality rate in the 11–15 minutes group ($P=0.003$). Moreover, there was a significant relationship between the time elapsed to enter the ED from the scene of trauma and the higher mortality rate in the 6–10 minutes group ($P=0.001$). Motomura et al^[10] reported the time of ambulance arrival at the scene was around 9 minutes and 2 seconds and the time of ambulance arrival at the ED was about 18 minutes and 21 seconds. They did not report the relationship between the time of ambulance arrival at the ED and mortality. In our study, the time of arrival at the scene of trauma was longer but the time elapsed to enter the ED from the scene of trauma was short. There is no accurate explanation because many interrupting factors are involved in this issue including the readiness of the ambulance system, the condition of the country roads, traffic state, etc.

In conclusion, death after trauma is more common in old men in Iran. Pedestrian accident is the major cause of trauma. The rate of hospital preventable deaths is as high as 80%, which denotes a lack of proper diagnosis and treatment at the ED. The time for arrival of EMS at the scene of trauma in Iran is longer than that in other countries. Improvement of EMS in this country could reduce the rate of mortality.

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