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Original Article

Frequency of intra-abdominal visceral injury due to penetrating trauma in the Emergency Department of Imam Khomeini Hospital in 2020

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Abstract

Introduction: Trauma is an injury that occurs due to the exchange of environmental energy with the body to an extent that is unbearable. In developing countries, such as Iran, trauma, especially abdominal trauma, has become increasingly important due to the enhanced development of vehicles and industries. The present study aimed to assess the frequency of intra-abdominal visceral injury due to penetrating trauma in the Emergency Department of Imam Khomeini Hospital in 2020.

Methods: This descriptive cross-sectional study was performed on 162 patients with penetrating abdominal trauma who were selected via the census method out of the patients referring to the Emergency Department of Imam Khomeini Hospital in Urmia, Iran. Data were collected using a checklist which included items on gender, age, length of hospital stay, patient's final condition, and cause of trauma, injury outcome, location of the injury, and laparotomy outcome. Data were entered into SPSS software (version 18) and analyzed using descriptive statistics (frequency, percentage, mean, and standard deviation) and chi-square test.

Results: Out of 162 impenetrable trauma patients, 135 (83.3%) and 27 (16.7%) cases were male and female, respectively. The mean age of patients was 33.25±18.99 years. The causes of trauma were accidents (75.4%) and falls from height (24.6%). Furthermore, regarding laparotomy results, 29.6% of patients had no intra-abdominal visceral injury, while intestinal, liver, and spleen injuries were observed in 24.7%, 25.9%, and 19.8% of cases, respectively.

Conclusion: As evidenced by the results of this study, the majority of trauma patients were male. Moreover, the most common mechanisms of trauma in patients referring to the emergency department of this accident center and the most commonly injured organs were the spleen and intestine. Therefore, appropriate measures are required to prevent these injuries.

Keywords: Agent, Hospital, Laparotomy, Injury, Wound

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Introduction

Trauma is the most common cause of death among people aged 1-44 years in terms of incidence and the third leading cause of death without taking into account age (1). Trauma is the result of damage to the body's energy exchange with the environment beyond tolerance (2-4). Motor vehicle crashes account for more than 50% of trauma deaths (5-6). Abdominal trauma is the most common blunt force trauma, especially following motor vehicle crashes. Other mechanisms of abdominal trauma include falls, assaults or rapes, industrial accidents, bullet wounds, and sharp tools (7).

Abdominal trauma refers to any type of injury to the abdominal area. This trauma can be penetrating or non-penetrating, and in both types, it can cause damage to the organs inside the abdominal cavity. The signs and symptoms of this trauma include abdominal pain, tenderness, abdominal stiffness, and bruising of the outer surface of the abdomen. Abdominal trauma carries the risk of bleeding and internal infection. In some cases, ultrasound and computed tomography (CT) scan, and in case of emergency, peritoneal diagnostic lavage surgery should be performed to confirm the diagnosis; moreover, surgery is required in the case of visceral injury (6). The spleen, liver, kidneys, and intestines are the most commonly vulnerable organs in abdominal trauma, with spleen being the most commonly injured organ (8-10).

Although abdominal trauma is less common than head and neck trauma, it has been on the rise in the United States over the past few years, and irregular abdominal trauma accounts for 79% of traumas. Among these injuries, liver trauma assumes critical importance due to its high prevalence and fatal complications; therefore, prompt diagnosis and timely treatment of patients can reduce mortality and complications. The liver, as the largest solid abdominal organ, is highly prone to damage in impenetrable traumas due to its fragile parenchyma, thin capsule, and its relatively fixed position in relation to the vertebrae (11). Blunt abdominal injuries account for 11% of all traumas and cause death in 8% of casualties. They lead to a wide range of mild, single-system, and multi-system injuries. Rapid diagnosis and treatment of blunt abdominal traumas, which include blunt force injuries of the abdomen, reduces mortality and increases patients' chances of survival; nonetheless, these injuries are not easy to assess and are often hidden by other traumas. The CT scan has been used since 1980 as the method of choice for intra-abdominal visceral injury. Ultrasound, a simple urine test, and measurement of vital signs are simple and readily available in the emergency room (12).

Difficult diagnosis of intra-abdominal injury following blunt trauma has led to the increasing use of modern diagnostic tests, such as a CT scan, which are expensive, difficult to access, and expose patients to high levels of radiation. Moreover, they can cause emergency department congestion which delays diagnostic and therapeutic measures; therefore, the quality, speed, and accuracy of treatment will be greatly reduced. Physical examination and ultrasound are the most important diagnostic methods in the majority of abdominal injuries. Ultrasound and diagnostic lavage of the peritoneum are highly sensitive in identifying the complications of abdominal injury; nonetheless, in the absence of free fluid flow, these diagnostic methods are of little value.

Even CT scans are less sensitive in identifying abdominal injuries, including damage to the mesentery, intestines, pancreas, and diaphragm. In addition, emergency physicians do not have clear criteria for the early discharge of patients with blunt abdominal trauma before the performance of a CT scan of the abdomen and pelvis. On the other hand, the correct choice of patients to perform abdominal and pelvic CT scans, as well as the discharge of low-risk patients, prevents the harmful effects of radiation, causes the costs to be spent in the right place, and turns medical staff's attention to the most high-risk patients (13).

In developing countries such as Iran, due to the increase of vehicles and industrial development, trauma, especially abdominal trauma, has become increasingly important (14), In various studies in Iran, penetrating trauma was more common than

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Impenetrable trauma; moreover, car accident and stabbing were the most common causes of abdominal trauma. The use of maintenance therapy for patients with liver trauma has more benefits and fewer complications, as compared to surgical treatments (13-15).

Considering the geographical location of West Azerbaijan province and the special location of Imam Khomeini Educational and Medical Center in Urmia, which is the largest referral center for patients in the province, as well as the importance of the issue and shortage of studies on intra-abdominal visceral damage in Urmia University of Medical Sciences, the current study aimed to assess the extent of intra-abdominal visceral injury due to penetrating abdominal trauma in patients referring to the Emergency Department of Imam Khomeini Hospital in Urmia in 2020.

Materials and Methods

This descriptive cross-sectional study was performed on patients with impenetrable abdominal trauma referring to the Emergency Department of Imam Khomeini Hospital in Urmia in 2020. They were selected via the census method based on the following inclusion criteria: complete medical history, and 2. referral to the hospital due to impenetrable abdominal trauma. For data collection, a checklist was used containing items on gender, age, length of hospital stay, patient's final condition, and cause of trauma, injury outcome, location of the injury, and laparotomy outcome. Data were analyzed in SPSS software (version 18) using descriptive statistics (frequency, percentage, mean, and standard deviation) and chi-square test. This article was extracted from the research plan approved by the Ethics Committee of Urmia University of Medical Sciences (IR.UMSU.REC.1398.188).

Results

In this study, out of 162 patients, 135 (83.3%) and 27 (16.7%) cases were male and female, respectively. The mean age of patients was 33.25±18.99 years, and the mean hospital stay of non-penetrating trauma patients was 12.80±14.73 days. A number of 129 (79.6%) subjects were discharged from the hospital and the causes of trauma were accidents (122; 75.4%) and falls from height (40; 24.6%) (Table 1). The most common sites of injury were Generalized (135; 83.3%) and right lower quadrant (RLQ) (14; 8.7%), respectively, and the most common laparotomy result was internal abdominal injury in 48 (29.6%) patients (Table 2). Abdominal over 43 years old was 43 (37.7%) and had no intra-abdominal injury 17 (35.4%) was under 20 years old and there was no significant relationship between age group and intra-abdominal injury (P=0.780).

Table 1. Demographic characteristics of impenetrable trauma patients referring to the hospital

Variable	Subgroup	Frequency	Percentage
Gender	Man	135	83.3
	Female	27	16.7
Final status of the patient	Improved	129	79.6
	Death	33	20.4
The cause of trauma	Accident	122	75.4
	Falling from a height	40	24.6

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Table 2. Clinical characteristics of blunt trauma patients referring to the hospital

Variable	Subgroup	Frequency	Percentage
Location of injury	Generalized	135	83.3
	Right lower quadrant	14	8.7
	Left lower quadrant	8	4.9
	Epigastric	5	3.1
Laparotomy result	They had no damage to the internal organs of the abdomen	48	29.6
	Intestine	40	24.7
	Liver	42	25.9
	Spleen	32	19.8

The most common site of intra-abdominal injury was generalized 100 (87.7%), no intra-abdominal injury was generalized (35.72%), and there was no significant relationship between intra-abdominal injury and the site of injury (P=0.614; Table 3). Moreover, the most common result of laparotomy was an internal liver injury in 42 (36.8) patients, the absence of damage to all organs was damaged, and there was a significant relationship between laparotomy result and intra-abdominal injury (P=0.001) (Table 3).

Finally, there was a significant relationship between intra-abdominal injury and trauma factor (P=0.004; Figure 1)

Table 3. Distribution of absolute and relative frequency of intra-abdominal visceral injury based on age groups, location of the injury, and laparotomy outcome in patients with impenetrable trauma

Variable	Subgroup	has it		does not have		Total
		Frequency	Percentage	Frequency	Percentage	
Age groups (year)	Less than 20	34	29.8	17	35.4	51 (31.5)
	30-20	15	13.2	12	25	27 (16.7)
	40-30	22	19.3	5	10.4	27 (16.7)
	More than 40	43	37.7	14	29.2	57 (35.2)
Location of injury	Generalized	100	87.7	35	72.9	135 (83.3)
	Right lower quadrant	8	7	6	12.5	14 (8.6)
	Left lower quadrant	3	2.6	5	10.4	8 (4.9)
	Epigastric	3	2.6	2	4.2	5 (3.1)
Laparotomy result	Intestine	40	35.1	0	0	40 (24.7)
	Liver	42	36.8	0	0	42 (25.9)
	Spleen	32	28.1	0	0	32 (19.8)
	No visceral damage	0	0	48	100	48 (29.6)

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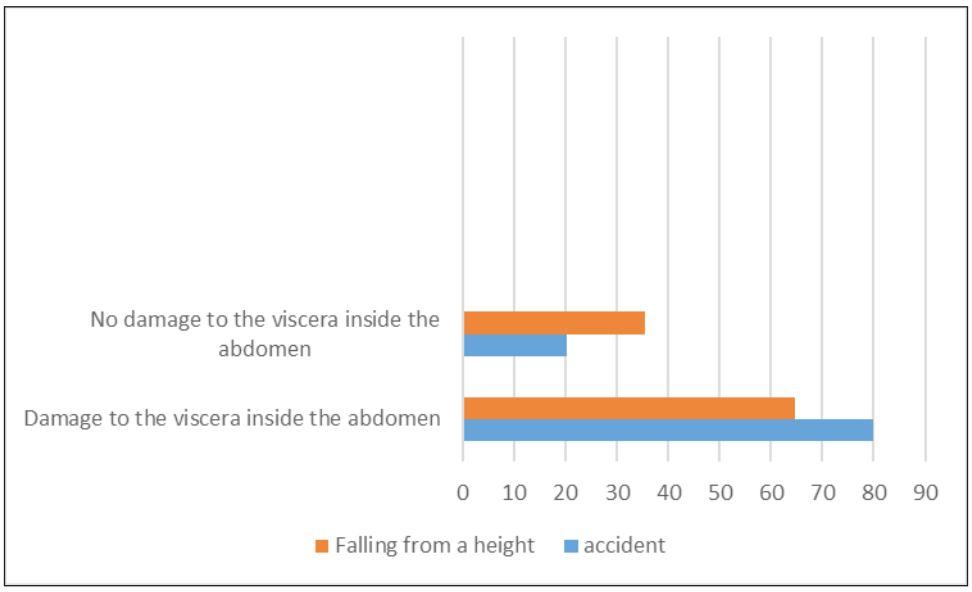

Figure 1. Distribution of relative frequency of intra-abdominal visceral injury based on trauma factor of impenetrable trauma patients

Discussion

Considering that trauma is the leading cause of death and one of the main causes of disability among the active population in developing countries, the studies of the death rate due to trauma per 100,000 population have reported the rates of 99% and 58% in the world and Iran, respectively. The use of preventive methods in the field of trauma is effective when accurate information and statistics on the incidence of various mechanisms of trauma and their consequences are available in society. Therefore, further progress in this area requires data collection, as well as planning and development of new strategies. The present study aimed to evaluate the frequency of intra-abdominal visceral injury due to penetrating trauma in the Emergency Department of Imam Khomeini Hospital in 2020 (16).

Abdominal trauma includes falls, assaults, rapes, industrial accidents, bullet wounds, and sharp tools. Abdominal trauma refers to any injury or damage to the abdominal area. This trauma can be penetrating or non-penetrating, and in both types, it can cause damage to the organs inside the abdominal cavity. Blunt abdominal traumas include impenetrable injuries of the abdomen and its rapid diagnosis and treatment can reduce mortality and increase patients' chances of survival (6).

In our country, trauma, especially abdominal trauma, has become increasingly important due to enhancements in industrial development. Therefore, impenetrable trauma due to accidents has been the most common cause of abdominal trauma. In the present study, 83.3% of patients studied were male and the mean age of the patients was 33.25±18.99 years. In a study by Amir Beigi, the majority of patients (80%) were in the second and third decades of life. In the study by Maske et al., penetrating trauma was more common than penetrating trauma, the male to female ratio was 2:1.6, and the mean age was 29.3±17.44 years (17). These findings are in line with the results of the present study in terms of mean scores of gender and age. Therefore, officials need to take appropriate measures to reduce injuries.

In agreement with the results of the current research in terms of gender, in a study by Shojaei et al, 80.2% of impenetrable trauma patients were male(11). The increase in trauma cases in males can be attributed to occupational and social conditions that make them more vulnerable to trauma. In the study by Mahmoudieh et al. who examined patients with penetrating liver trauma, out of 130 injured cases, 103 subjects were male and the mean age of the patients was 29.7±13.46 years (15).

In the present study, the most common cause of

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trauma was vehicle accidents in 75.4% of cases. In a similar vein, in their study, Dierks et al (18). Reported that the most common cause of injury in blunt trauma was car crash in 57.68% of cases. Furthermore, in accordance with the results of the current research, in the studies by Amir Beigi Tafti (13), Mahmoudieh et al. (15), and Maske et al (17)., accidents were the most common cause of blunt trauma. In the study by Yadolahi et al. The highest percentage of vehicle trauma mechanisms was reported (19).

In the present study, the liver (36.8%) was the most commonly injured organ, followed by the intestine (35.1%), and 29.6% of laparotomy reports were negative. In the study by Mahmoudieh et al., the most common diagnostic methods were ultrasound and CT scan; moreover, surgery was the treatment of choice in 67.7% of patients, followed by maintenance treatment (32.3%). In the study by Choudhary et al., the spleen was the most seriously damaged organ of the body, while the hollow viscous small intestine had the most damaged organs. The stated finding is inconsistent with the results of the present study in which the spleen was the first injured limb; nonetheless, they are similar in referring to the intestine as the second limb injured in impenetrable trauma (20).

In the present study, 20.4% of blunt trauma patients died. The highest percentage of deaths in blunt trauma patients was reported in the study by Maske et al (17). And the cause of death could be a delay in bringing patients to trauma centers. The present study did not investigate the cause of death since it was not among its objectives; consequently, it is recommended to be assessed in future studies. In the study by Amir Beigi Tafti, 7.2% of deaths were mainly related to delays in hospitalization, the severity of the trauma, and damage to other no abdominal organs (13).

Among the notable strengths of this study, we can refer to the fact that it was conducted over a period of one year. On the other hand, one of the limitations of this study was the incompleteness of some medical files and the lack of proper cooperation of hospital authorities. To reduce accidents and the death rate due to traumatic events, the following measures should be implemented: paying attention to the young population and motorcyclists, raising citizens' awareness of the details and demographic information, mechanism of injury, type of trauma, and the final outcome of patients.

Conclusion

As evidenced by the results of this study, the age group most affected by the trauma was the active and efficient human resources of the society. Moreover, the most common trauma mechanisms in patients referring to the emergency department of this accident center and the most commonly damaged organs were the spleen and intestine. In order to improve the quality of care in trauma patients, medical authorities should develop general promotion training programs, improve diagnostic and therapeutic methods, as well as hospital transfer systems.

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Conflicts of interest

The authors declare that they have no conflict of interest.

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