Academic Journal of Medical Sciences
ISSN: 2708-2725
ORIGINAL ARTICLE

Clinical characteristics and Outcomes of Traumatic Abdominal Injuries among Iraqi Patients in Basrah: Comparison between Blunt and Penetrating Injuries

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Funding information
Self-funded

Conflict of interest
None declared by author

ABSTRACT

Traumatic abdominal injuries include blunt and penetrating injuries represent a significant health problem globally. In addition to its high morbidity and mortality rates, they cause a large burden on the health system. This study aimed to assess the clinical characteristics and outcomes of these injuries among Iraqi patients in Basrah city, south of Iraq and further to compare these characteristics according to the type of injury. Therefore during the study period a total of 127 cases of traumatic abdominal injuries were enrolled in the study. Our findings revealed that Traumatic abdominal injuries of blunt or penetrating natures were commonly affected young and middle age individuals and were about 4-fold more likely to occur in men than women. Road traffic accidents was the most common cause of blunt trauma while gunshots were the commonest causes of penetrating injuries. Liver and spleen were the more frequently injured organs in cases with blunt injuries while small and large bowels were the commonly affected in penetrating injuries. Urgent laparotomies were the management option in more 91.3% of cases and delayed laparotomy performed in 1.6% of cases. Conservative treatment was the option of management in 7.1%. Overall complication rate was 13.4% and the overall mortality rate was 4.7% and both rates were low considerably compared to previous literatures. Further studies of multiple centers are highly suggested particularly at a national level.

Keywords: *Abdominal Injuries, Blunt, Penetrating, clinical characteristics, Outcomes*

1. INTRODUCTION

Trauma contributes significantly to high mortality rates in all parts of the world, but it is particularly prevalent in individuals below the age of 45. In 2019, WHO affirmed that injury related mortalities were more than 4 million globally, which comprised 8% of the total cause of deaths. Among the numerous reasons of injuries, vehicle accidents, drowning, falling, burning, and interpersonal self-inflicted violence are widely recognized and observed. High rate of road traffic accidents are registered in Iraq and our country considered as one of forefront countries in the incidence of RTAs, and high rates of injuries and mortalities attributed to RTAs. According to the reports of the ministry of planning in Iraq, annually almost 15000 Iraqi individual are injured and 2500 are died due to RTAs [1]. On the other hand, the assaults accidents and gunshot injuries have increased in Iraq during the last few years leading to significant increase in the penetrating abdominal injuries. These facts signifies the burden of these injuries with particular the traumatic abdominal injuries from different points of view, economically, culturally, impact on health system and the burden on the hospitals and emergency services [2].

According to various reports, mortalities due to injuries are exceeding 14 thousand on daily basis and it is estimated to reach about 20 thousands by the year 20230 reporting a rising rate of almost 40% [3]. One of the major causes of injury related deaths include abdominal injuries. Abdomen remains the third most injured body part after the head and limbs. Globally, abdominal Trauma related fatalities are ranged between 1%-20%, based on the variation in the reported population and country. The annual adjusted incidence of all abdominal injuries was 7.2 per 100,000 population, moreover, almost 71.7% of abdominal injuries occurred among adults . Solid organs injured in almost 83% of cases. In Norway, 30-day and 90-day mortalities due to abdominal injuries were found at 12.5% and 13.6%, respectively [4]. Abdominal trauma remains a serious concern even in today's progressing era, as it is one of the leading causes of disability and life threatening situations across the globe. Broadly there are two classifications of these injuries which are either blunt or penetrating [5,6]. Gaining knowledge about these injuries along with improvement in the diagnostic and treatment approach performance of trauma patients are challenges in many

trauma centers because they are important for enhancing the quality of patient's care and improvement of the outcomes [7].

On the other, blunt abdominal injuries are the commonest type of these injuries and the more frequent causes of blunt injuries are road traffic accidents (RTA) . Falls, occupational and sport injuries are less frequent causes. A blunt abdominal trauma may involve damage to internal organs, as well as internal contusions and hemorrhages. In abdominal injuries, the liver, spleen, and intestines are the most vulnerable organs to be injured and the diagnosis is time consuming and complex because these organs are indirectly injured [4,8].

In the last two decades, despite advancements in the management of blunt abdominal injuries, the death rate for in-hospital patients with multiple organ injuries remains high, for instance, in Norway, 30-day and 90-day mortalities due to abdominal injuries were found at 12.5% and 13.6%, respectively [4,8].

Penetrating abdominal trauma are less frequent than blunt trauma and contribute for less than 15% of all trauma cases presented to trauma centers. These injuries are mainly resulted from violence as gunshots or stabbing. However, gunshot injuries are the more dangerous with higher mortality risk due to kinetic energy transferred to the tissue by the projectile object. All abdominal organs are vulnerable to injuries with some variation according to the site of organ. [9,10].

The burden of abdominal injuries represents a concern of the scientific society of surgeons and trauma centers, hence these injuries are widely studied and this topic still needs further studies. In low and middle income countries, these injuries cause high number of mortalities and negative impact the health system of these countries [11]. In middle east countries, up to 20% of abdominal injuries are died [12].

The clinical outcomes of patients with abdominal injuries can be significantly varies according to the type of injury, causative factor and patient's characteristics. In cases of blunt abdominal more severe complications can occur like internal bleeding which necessities larger amount of blood transfusion. Additionally, higher frequency of admission to intensive care unit was observed among patients with blunt abdominal injuries, compared to those with penetrating injuries [12]. Regarding management of abdominal injuries patients, regardless the underlying cause of injury, surgical interventions surgical

intervention is usually required and it is necessary in most of the time. The results of the surgical management also tend to vary based on how the other injuries impact the body and when the injury occurred, it was noted that patients with associated extra-abdominal injuries had a significantly higher mortality rate [13]. Additionally, poor outcomes have shown to be associated with delays in treatment, such as those exceeding six hours from injury to admission [13]. However, gastrointestinal tract injuries were the primary cause of delayed laparotomy following blunt trauma, accounting for 58% of cases. Instances of unsuccessful non-operative therapy of solid organ damage were infrequent, occurring in 15% of cases. Future initiatives should focus on the prompt detection of gastrointestinal tract injuries. Postponed laparotomy for blunt abdominal damage constitutes a legitimate quality enhancement strategy.[14]

In Iraq, most studies concerned with either blunt or penetrating abdominal injuries [13,15] while studies that compare the two types of injuries are scarce with small sample size and short duration, therefore, we tried to study the patterns and characteristics of abdominal injuries and to compare the blunt versus penetrating types with regard to patients characteristics, causes of injury, most damaged organs, and outcomes.

2. METHODOLOGY

1. Study Design and Setting

This was a cross-sectional study conducted at Al-Shifa Hospital in Basrah, south of Iraq, during the period from October 2022 to February 2024. The hospital received these cases as a primary referral center close to the location of accident/ injury, providing a diverse patient population with varying degrees of abdominal injuries.

2. Study Population and Sample

The study included a total of 127 patients who presented with abdominal trauma during the study period. To ensure the validity and reliability of our study findings, the selection of patients was done according to specific eligibility criteria as followed:

Inclusion Criteria

1. Adult Iraqi patients at the age 18 years or older
2. presented to our hospital with traumatic abdominal injuries; blunt or penetrating
3. agreed to provide informed consent or whose guardians provided consents

4. Managed at our hospital either conservatively or surgically

Exclusion Criteria

1. Patients who died at arrival to the hospital.
2. Pregnant ladies
3. Patients whose consent were not confirmed
4. Missed to follow-up, or leave the hospital without completing the management

3. Data Collection Tools

Data were collected using a special data collection form prepared by the researcher for the purpose of the study. This form was paper type and computerized one to gather demographic information (age, gender), type of injury, mechanism of trauma, clinical presentation. Findings of physical examination, laboratory results and findings of imaging studies (ultrasound, CT scans, X-rays). Data form also included the operative notes and findings, detailing the surgical procedures performed, including the number of injured organs and any complications encountered.

4. Intervention:

Patients were managed according to their clinical needs:

• Conservative Management: Non-surgical measures for care of stable patients.

• Surgical management: Laparotomy used in those patients who needed surgical exploration, however, urgent laparotomy was performed in majority of cases and late ore delayed laparotomy was done in some cases according to the clinical evaluation and decision of the surgeon . It was performed by a team of general surgeons and urologists, as well as surgeons of other surgical disciplines were called when their intervention was required

5. Follow-Up and Outcome Measures

All patients were observed and followed during their hospital stay, whether they were surgically or conservatively managed. During this time we looked for any complication and general clinical status of the patients. For surgically managed patients, we reported postoperative complications (e.g., infection, bleeding, organ failure, ….).

Duration of hospital stay, need for admission to the intensive care unit (ICU) and final outcomes of the patients and survival all were reported

6. Data Analysis

Statistical analysis was performed using SPSS version 28. The data were summarized using descriptive statistics that included means and standard deviations for continuous variables and frequencies and percentages for categorical variables. The Chi-Square test was applied to compare frequencies, Fisher's exact test used when chi-square was not valid. All statistical analysis performed with an assumption for significance of P. value ≤ 0.05.

3. RESULTS

Findings of this study and data analysis results are summarized in frequency distribution tables and cross-tabulation as followed:

The total participant patients in the study was 127 patients, of them 98 presented with blunt abdominal trauma and 29 presented with penetrating injuries. Age distribution showed that most patients with either trauma type were aged between 21 and 40 years. Males were dominant in both groups with an overall male to female ratio of almost 5.0: 1.0. The age and sex distraction in addition to the level of education were not significantly different between the studied groups are summarized in (**Table 1**). The cause of injury in blunt trauma group was mainly road traffic injuries (RTI) in 73.5% followed by falls in 21.4% while in the penetrating trauma cases, firearm (bullet injury) was the commonest cause which contributed for 82.8% followed by stab or cutting wound in 10.3%, other causes were least frequent, (**Table 2**). Regarding the injured organs, in total small bowel was the commonest injured organ followed by liver, large bowel, spleen and stomach while the least injured organ was the pancreases, the rate of these injured organs was 26.7%, 22.2%, 17.2, 13.6%, 10.4% and 4.1%, respectively, from other point of view, it had been significantly found that liver injured more frequently with blunt trauma while small bowel, large bowel and stomach were more frequently injured with penetrating abdominal injuries, (P. value <0.05). Frequency of injured spleen, pancreas and other organs was not significantly different according to the type of injury, (P. value>0.05). From other point of view we reported a total of 79 (62.2%) multiple injuries among the studied group compared to 48 (37.8%) abdominal injury only, however, multiple injuries were more common with blunt than penetrating injuries, 72.4% vs. 27.6%, respectively, (P. value <0.05), these findings are shown in (**Table 3, Table 4 & Figure 1**).

Majority of the patients presented with concomitant injuries in addition to their abdominal injuries, these included head, chest, extremities, pelvis and spine, therefore, these patients needed multidisciplinary team of surgeons and managed accordingly, however, no significant differences were found between both groups in the presence of concomitant injuries, (P. value >0.05), (**Table 5**).

Type of management and intervention plans varied according to the clinical evaluation, nature of injury and patient's condition; 9 (7.1%) patients had simple injuries and did not require surgical intervention and they were managed conservatively with observation and follow up. The remaining patients were managed surgically. Among these patients, 6 (4.7%) required local wound exploration, 116 (91.3%) required urgent laparotomy, in 2 patients laparotomy delayed for more than 6 hours because the nature of their gastrointestinal injuries that delayed laparotomy. Four patients of our cohort required Re-exploration surgery, while 12 patients (9.4%) referred to other centers for more advanced management. On the other hand, some patients required more than one intervention, (**Table 6**).

The incident complications of the studied groups were wound infection (11.8%), wound dehiscence (2.4%), chest infection (3.1%), septicemia in one patient (0.8%) and DVT in one patient (0.8%). In total, 17 patients developed complications providing an overall complication rate of 13.4%, (**Table 7**).

The duration of hospital stays and the final outcomes of the studied groups are summarized in (**Table 8**), 21 (16.5%) of patients stayed in the hospital for 3 days or less, most patients, (62.2%), stayed for a period of 4-8 days, and 18.1% stayed in the hospital for more than 8 days. Four patients among our cases required admission to the intensive care unit (ICU). Survival rate was 95.3% while unfortunately 6 patients died, 4 of them died before an intervention was conducted while 2 patients died after surgery due to septicemia and multiple complications, however, the overall mortality rate 4.7%, and we did not find a difference in survival or mortalities accrose the type of trauma, (**Table 8 and Figure 2**).

Table 1. Demographic characteristics of the studied groups

Variable		Group A		Group B		P. value
		No.	%	No.	%	
Age (year)	≤ 20	14	14.3	3	10.3	0.689 ns
	21 - 30	33	33.7	11	37.9	
	31 - 40	24	24.5	7	24.1	
	41 - 50	15	15.3	5	17.2	
	> 50	12	12.2	3	10.3	
Sex	Male	82	83.7	24	82.8	0.918 ns
	Female	16	16.3	5	17.2	
Level of Education	Illiterate	5	5.1	2	6.9	0.768 ns
	Primary	40	40.8	13	44.8	
	Secondary	27	27.6	9	31.0	
	Diploma	17	17.3	3	10.3	
	University	9	9.2	2	6.9	
Total		98	100.0	29	100.0	

Table 2. Distribution of causes of injury

Cause of Injury	Group A		Group B	
	No.	%	No.	%
RTI	72	73.5	1	3.4
Fall	21	21.4	1	3.4
Others	5	5.1	0	0.0
Stab or Cut	0	0.0	3	10.3
Firearm	0	0.0	24	82.8
Total	98	100.0	29	100.0

P. value < 0.001, significant

Table 3. Distribution and comparison of injured organs according to the type of abdominal injury

Injured organ	Blunt injury		Penetrating injury		Total Number		P. value
	No.	%	No.	%	No.	%	
Liver	41	41.8	8	27.6	49	22.2	0.012 sig
Spleen	27	27.6	3	10.3	30	13.6	0.151 ns
Pancreas	8	8.2	1	3.4	9	4.1	0.178 ns
Small bowel	34	34.7	25	86.2	59	26.7	0.001 sig
Large bowel	21	21.4	17	58.6	38	17.2	0.003 sig
Stomach	13	13.3	10	34.5	23	10.4	0.026 sig
Other organs	8	8.2	5	17.2	13	5.9	0.286 ns
Total injured organs	152	68.8	69	31.2	221	100.0	-

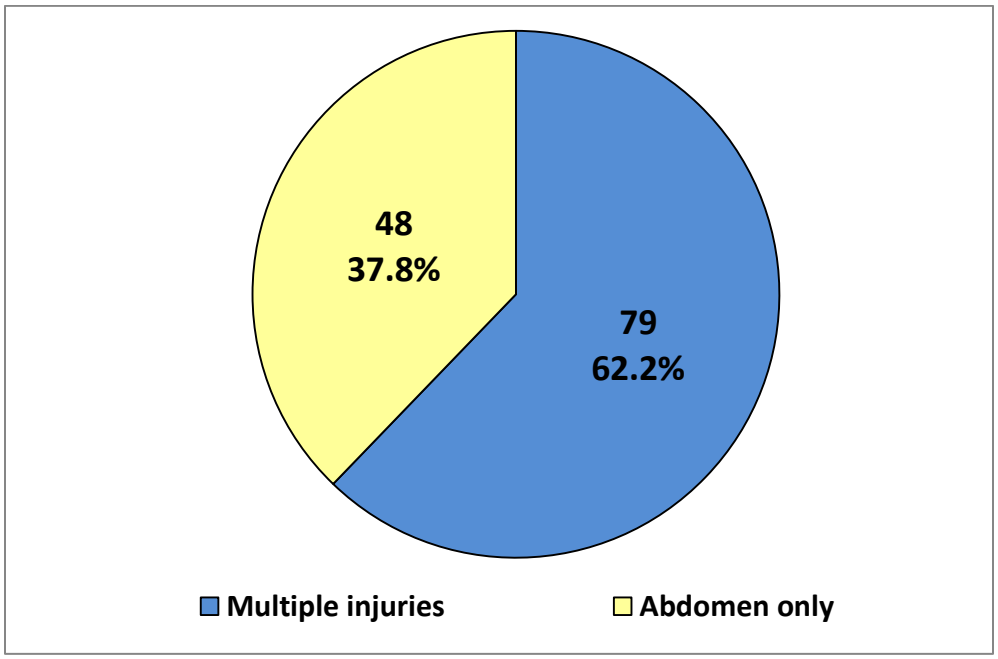

Figure 1. Distribution of the studied group according to the number of injuries at presentation

Table 4. Distribution and comparison of number of injuries at presentation according to the type of abdominal injury

Number of injuries	Blunt injury		Penetrating injury		Total Number	
	No.	%	No.	%	No.	%
Multiple	71	72.4	8	27.6	79	62.2
Only abdomen	27	27.6	21	72.4	48	37.8
Total	98	100.0	29	100.0	127	100.0

P. value < 0.001 , significant

Table 5. Distribution and comparison of concomitant Injuries at presentation according to the type of abdominal injury

Concomitant Injuries	Group A		Group B	
	No.	%	No.	%
None	27	27.6	12	41.4
Head	13	13.3	4	13.8
Chest	18	18.4	7	24.1
Extremities	11	11.2	2	6.9
Pelvis	6	6.1	1	3.4
Spine	2	2.0	0	0.0
Multiple Injuries	21	21.4	3	10.3
Total	98	100.0	29	100.0

P. value = 0.689 not significant

Table 6. Type of management and interventions

Management type		No.	%
Conservative and observation		9	7.1
Local wound exploration		6	4.7
Laparotomy	Urgent	116	91.3
	Delayed	2	1.6
Re-exploration surgery		4	3.1
Referred for further intervention		12	9.4

In some cases, Two or more interventions were required

Table 7. Incident complications of the studied groups

Complications	No.	%
Wound infection	15	11.8
Wound dehiscence	3	2.4
Chest infection	4	3.1
Septicemia	1	0.8
DVT	1	0.8
Overall complication	17	13.4

Table 8. Hospital stay duration and final outcomes of the studied group

Variable		No.	%
Hospital stay	≤ 3 days	21	16.5
	4 - 6 days	38	29.9
	7 - 8 days	41	32.3
	> 8 days	23	18.1
Needed Admission to ICU	Yes	4	3.1
	No	123	96.9
Final outcome	Survived, discharged well	121	95.3
	Preoperative death	4	3.1
	Postoperative death	2	1.6

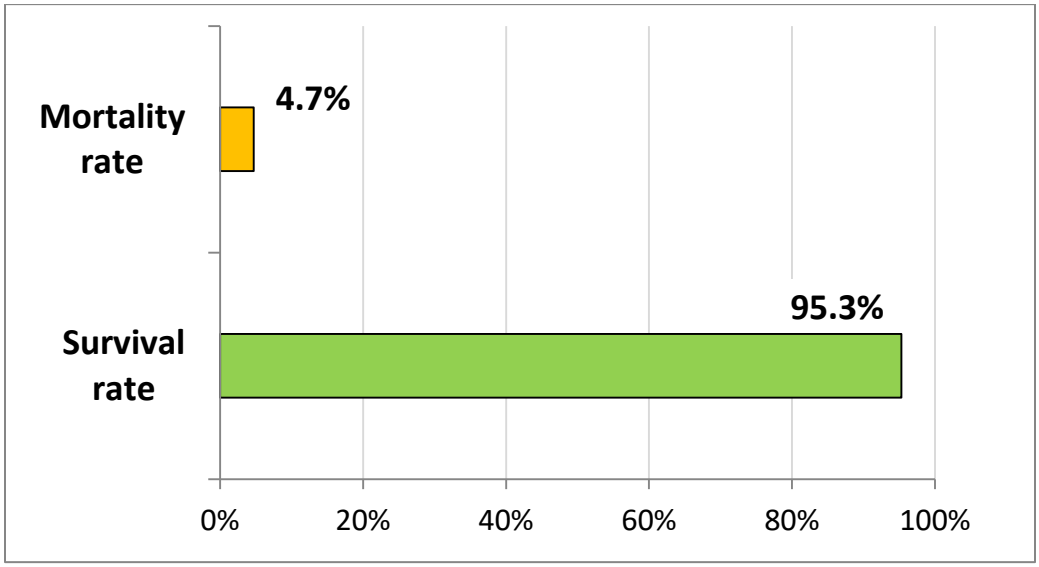

Figure 2. Clustered Bar-Chart of overall survival and mortality rates of Abdominal injury cases

4. DISCUSSION

In our cohort of 127 patients with abdominal injuries, we found that 98 injuries resulted from blunt trauma, and 29 from penetrating injuries. The majority of the affected individuals were young and middle-aged men between the age 21-40 years these findings consistent with the clinical and epidemiological pattern of trauma. In previous Iraqi study conducted at Al-Ramadi, middle-west of Iraq, Fakhree et al. reported that almost 90.5% of the patients with abdominal injuries were males at the age ≥ 30 years [15]. Additionally, most victims had only completed primary education, echoing similar observations made in a prior study conducted in India [16].

In the present study the cause of injury in blunt trauma group was mainly RTI in 73.5% followed by falls in 21.4% while in the penetrating trauma cases firearm (bullet injury) was the commonest cause which contributed for 82.8% followed by stab or cutting wound in 10.3%, other causes were least frequent. These findings were not unexpected and in line with that reported in previous Iraqi studies in Diyla and Ramadi [15,17]. So as other studies in our region, reported close results of ours; in Qatar, Arumugam found that more than 60% of blunt injuries were sue to RTA [18], in Iran, Mirzamohamadi found that RTA caused more than 70% of blunt traumas [12]. It is well-known that vast majority of penetrating injuries are caused by bullet injuries, we also support this fact where 82.8% of penetrating injuries among our cases linked to gunshot or stabbing [9,19].

We observed that the liver and spleen were the most commonly damaged organs in blunt trauma, consistent with existing literature, whereas the intestine and colon were primarily affected in penetrating cases. [13].

Notably, most cases of blunt trauma and almost all cases with penetrating injuries were managed operatively and urgent laparotomy performed in 91.3% of cases, negative laparotomies were more frequent in cases with penetrating injuries. However, our findings suggest that penetrating injuries predominantly necessitate operative treatment Conservative treatment was administered in only 7.1% of our cases. In our study, we observed that blunt trauma was associated with higher Injury Severity Scores (ISS), greater blood transfusion needs, increased mortality rates, and more frequent admissions to the Intensive Care Unit (ICU). On the other hand, the admission to ICU was associated with

higher ISS, lower Glasgow Coma Scale (GCS) scores, and septicemia. From other point of view, when patients with blunt trauma are stable, literature suggested and support delayed operative management and favoring non-operative management as a primary approach [20,21]. While it is undisputed that patients with peritonitis or hemodynamic instability require prompt laparotomy following penetrating abdominal injury, it is evident that some stable patients without peritonitis can be treated non-operatively, hence both surgical and non-surgical options may be appropriate for penetrating injuries [22,23]. Additionally, a study from Germany indicated that penetrating trauma was linked to higher rates of unstable hemodynamics, mortality, and the need for emergency surgery compared to blunt injuries [24]. The trend toward non-operative management is increasing due to shorter hospital stays, reduced costs, and fewer negative laparotomies, especially in patients with stable hemodynamics and no signs of peritonitis. Some studies advocate for selective non-operative management in cases of shotgun injuries, reporting better outcomes and fewer complications compared to surgical approaches. A U.S. study found that 25% of firearm injury patients and 33% of stabbing victims were treated non-operatively, indicating a growing preference for this approach alongside a reduction in negative laparotomies [25,26]. Victims of blunt trauma tended to have more complications and worse outcomes than those with penetrating injuries [27].

While the mortality rate was slightly higher among blunt trauma patients, this difference was not statistically significant; they also experienced longer hospital stays, greater ICU admissions, and increased blood transfusion requirements. However, the total complication rate and mortality rate in our study was less 13.4% and 4.7%, respectively. Two earlier Iraqi studies documented a complication rates of 20%-29% [15,17], however, the complication rates cannot be compared precisely among different studies because several variable complications can developed in different centers and population. However, the complication rate in our study was low compared to the earlier studies, this may also be due to the inclusion of all complications related to the injuries in these studies while we reported the postoperative only. The mortality rates due to abdominal injuries and their management vary among the centers and studies and based on many factors such as availability of necessary facilities, infrastructures of the hospital and its capacity as primary approached

trauma center, patient's characteristics, time lag between occurrence of assaults and arrival to the hospital and other factors. Abdullah et al. [17] in their study in Diyla reported a mortality rate of 3.7% and most mortalities were due to septicemia, much higher mortality rate reported in Al-Ramadi , Iraq, by AL-Ubaide et al. who reported a mortality rate of 20.3%. In other countries the mortality rates varied between 1%-20% [12,13,28]. It is worth mentioned that blunt trauma patients exhibited lower levels of hypovolemia, a higher shock index, and significantly more blood transfusions compared to those with penetrating injuries. However, blunt trauma itself was not a predictor for transfusion; rather, factors such as operative management, and elevated ISS were more closely associated. Blunt trauma was characterized by a higher ISS, The higher score and lower Glasgow coma scale have shown to be associated with increased chances of ICU admission [12,29,30].

Laparotomy is deemed essential for patients who are hemodynamically unstable, exhibit unreliable abdominal examinations, or display abdominal tenderness. Two main recommendations for laparotomy exist: performing it promptly for patients with suspected abdominal cavity wounds, and following recent guidelines that suggest decisions should be based on clinical findings [29]. Research indicates that laparotomy and surgical repairs of abdominal organs can result in complications such as infections, abscesses, and lacerations [22]. These complications can negatively impact patient outcomes, leading to extended hospital stays, increased ICU admissions, and a higher likelihood of transfusions, intubations, dialysis, or even death. Conversely, non-operative management may result in treatment failures or delayed surgeries that adversely affect outcomes. Therefore, it is crucial to compare the complications associated with both treatment strategies, although our outcome analysis did not take these factors into account.

Our study faced some *limitations* where fatalities occurring before hospital arrival were not recorded in our trauma registry, limiting our mortality rate to those who were admitted.

5. CONCLUSIONS

Traumatic abdominal injuries of blunt or penetrating natures were commonly affected young and middle age individuals and these injuries were about 4-fold more likely to occur in men than women. Road traffic accidents was the most common cause of blunt trauma while gunshots were the commonest causes of penetrating injuries. Liver and spleen were the

more injured organs in cases with blunt injuries while small and large bowels were the commonly affected in penetrating injuries. Urgent laparotomies were the management option in more 91.3% of cases and delayed laparotomy performed in 1.6% of cases. Conservative treatment was the option of management in 7.1%. Overall complication rate was 13.4% and the overall mortality rate was 4.7% and both rates were low considerably compared to previous literatures. Further studies of multiple centers are highly suggested particularly at the national level.

Ethical Approval:

All ethical issues were approved by the author. Data collection and patients enrollment were in accordance with Declaration of Helsinki of World Medical Association , 2013 for the ethical principles of researches involving human. Signed informed consent was obtained from each participant and data were kept confidentially.

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Citation:

Jassim J.K Clinical characteristics and Outcomes of Traumatic Abdominal Injuries among Iraqi Patients in Basrah: Comparison between Blunt and Penetrating Injuries. AJMS 2024; 11 (1): 37-54