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Outcome of Traumatic Abdominal Surgeries, Aden, January 1st– December 31st, 2023

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Abstract

Introduction: The abdomen is the most frequently injured body region, and about 25% of all abdominal trauma cases require abdominal exploration. Abdominal traumas are associated with significant morbidity, disability and mortality worldwide. This study aimed to analyze the outcome of surgery for abdominal traumas in operated patients in Aden Hospitals, Yemen.

Methods: This is a descriptive prospective study included 130 patients with abdominal traumas underwent surgical intervention, during January 1st through Dec. 31st, 2023. Sociodemographic, clinical and operative data of patients were collected, and patients were followed for 30 days postoperatively to assess their short-term outcome.

Results: The studied abdominal traumas were predominantly observed among male patients (85.4%), with a mean age of 32.4 ± 12.4 years. Seventy percent of them were Qat chewers, 46.2% were current smokers, and 17.7% were using Shammah. Comorbidity was reported among 38.5%, as arterial hypertension 29.2%, diabetes mellitus 16.1%, and cardiovascular diseases 3.1%. Penetrating abdominal traumas were more common than blunt (83.8% vs. 16.2%), with gunshot wounds as the common mechanism (70.8%) followed by road traffic accidents (16.2%), stab wounds (6.9%) and bomb explosion (6.2%). Penetrating traumas affected mainly small bowel (41.3%), large bowel (39.4%), liver (26.6%) and stomach (24.8%), while blunt traumas affected mainly liver (57.1%), spleen (28.6%), and stomach (19.0%). At presentation, most of them (86.2%) were hemodynamically stable. Morbidity was observed in 43.1% of patients, and mortality among 10.0% of them. Postoperative morbidity and mortality were not significantly associated with patients' sex, age or type of trauma, but significantly associated with hemodynamic instability.

Conclusion: Surgeries for abdominal traumas were associated with significant postoperative morbidity and mortality depending on the hemodynamic state at presentation of patient.

Keywords: Abdominal trauma, Surgery, Penetrating, Blunt, Morbidity, Mortality.

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نتـائج جـراحات إصـابات الـبطـن في عدن، 1 ينـاير إلى 31 ديسمبر 2023

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ملخص الدراسة

المقدمة: تعتبر منطقة البطن هي المنطقة الأكثر تعرضًا للإصابة في الجسم، حيث تتطلب حوالي 25% من حالات إصابات البطن استكشاف البطن. وترتبط إصابات البطن بمضاعفات صحية وإعاقات ووفيات كبيرة في جميع أنحاء العالم. تم إجراء هذه الدراسة بهدف تحليل نتائج العمليات الجراحية لإصابات البطن لدى المرضى الذين أجريت لهم عمليات في مستشفيات عدن باليمن.

المنهجية: تمت هذه الدراسة بصورة وصفية مستقبلية وشملت 130 مريضًا يعانون من اصابات في البطن خضعوا للتدخل الجراحي، خلال الفترة من 1 يناير إلى 31 ديسمبر 2023م. تم جمع البيانات الديموغرافية والاجتماعية والسريرية والجراحية للمرضى، وتمت متابعتهم لمدة 30 يومًا بعد الجراحة لتقييم النتائج على المدى القصير.

النتائج: لوحظت الإصابات البطنية الخاضة للدراسة بشكل رئيسي بين المرضى الذكور (85.4٪)، بمتوسط عمر 32.4 ± 12.4 سنة، 70.0٪ منهم يمضغون القات، و46.2٪ كانوا من المدخنين الحاليين، و17.7٪ كانوا يستخدمون الشمة. تم تسجيل الأمراض المصاحبة بين 38.5٪ منهم، مثل ارتفاع ضغط الدم الشرياني 29.2٪، ومرض السكري 16.1٪، وأمراض القلب والأوعية الدموية 3.1٪. كانت الإصابات البطنية النافذة أكثر شيوعًا من الإصابات غير النافذة (83.8٪ مقابل 16.2٪)، وكانت الجروح الناجمة عن طلقات نارية هي الآلية الشائعة (70.8٪) تليها حوادث المرور (16.2٪)، وجروح الطعن (6.9٪) وانفجار قنبلة (6.2٪). أثرت الإصابات النافذة بشكل رئيس على الأمعاء الدقيقة (41.3٪) والأمعاء الغليظة (39.4٪) والكبد (26.6٪) والمعدة (24.8٪). في حين أثرت الاصابات غير النافذة بشكل رئيسي على الكبد (57.1٪) والطحال (28.6٪) والمعدة (19.0٪). عند حضور المرضى كان معظمهم (86.2٪) بوضع دموي ديناميكي مستقر. لوحظت المضاعفات في 43.1% من المرضى، والوفيات في 10.0% منهم. لم تكن المضاعفات والوفيات بعد الجراحة مرتبطة بشكل كبير بجنس المرضى أو أعمارهم أو نوع الاصابة، ولكنها ارتبطت بدلالة إحصائية هامة بعدم استقرار ديناميكية الدم عند حضور المريض.

الخلاصة: خلصت هذه الدراسة إلى أن العمليات الجراحية لإصابات البطن كانت مرتبطة بإرتفاع كبير في معدل المضاعفات والوفيات بعد الجراحة اعتمادًا على الحالة الدموية الديناميكية عند حضور المريض.

كلمات مفتاحية: إصابات البطن، الجراحة، الإصابات النافذة، الإصابات غير النافذة، المضاعفات، الوفيات.

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Introduction

Trauma becomes life threatening community health problem associated with significant morbidity, disability and mortality worldwide [1]. According to the World Health Organization (WHO), trauma kills more than 5.8 million people every year and accounts for 16.0% of the global burden of diseases [2]. It is the commonest cause of mortality in the first 40 years of life and the third most common cause of death overall [3].

The abdomen is the most frequently injured body region [4], and about 25% of all abdominal trauma cases require abdominal exploration [5]. Blunt and penetrating traumas are the main types of abdominal injuries. Penetrating abdominal trauma (PAT) is mostly diagnosed reliably and easily, whereas the majority of abdominal injuries occur due to blunt abdominal trauma (BAT) is often missed because clinical signs are less obvious [6]. On the other hand, abdominal trauma varies from civilian and military practices. In civilian practice, approximately 20% of trauma injuries requiring surgery involve the abdomen; blunt trauma is more common than penetrating and usually follows a road traffic crash. Blunt trauma accounts for 80–90% of the trauma seen in most civilian trauma centers [7]. However, trauma management in the developing world is faced with many challenges. The observed rising trend of injuries, especially in politically unstable countries, has been linked to poor infrastructure and urbanization [6,8].

Yemen is one of the politically unstable countries. With the current civil conflicts, associated with social and economic instability; increased traumas were recognized in Aden, especially with the random use of guns. This provides the justification to conduct this study in Aden, to investigate the outcome of surgeries for abdominal traumas operated in Aden Hospitals, where most surgeries for trauma are conducted.

Methods

This study is a descriptive prospective study conducted at major hospitals in Aden for a period of one year, from January 1st to December 31st, 2023, included 130 patients with abdominal trauma underwent surgical interventions. Sociodemographic, clinical and operative data of patients were collected, and patients were followed for 30 days postoperatively to assess their short-term outcome.

Inclusion criteria

1. Adult patients of any sex in the age of 18 years or more presented with abdominal traumas and managed surgically.
2. Patients who gave an informed consent to participate in the study.

Exclusion criteria

1. Pregnant with abdominal trauma.
2. Patients who declined the informed consent.
3. Polytrauma patients.

Statistical analysis

Data collected were analyzed by the SPSS program version 24. Qualitative data were presented as frequency distribution and percentages and tested by the Chi-square test or Fisher exact as appropriate. Quantitative data were first tested for normality distribution by the Kolmogorov-Smirnov test, which revealed parametric distribution, and accordingly data were presented as means and standard deviations, and tested by parametric tests (t-test for 2 means). All tests were applied at the 95% confidence limits and a level of significance ($\alpha = 0.05$) and p-values of ≤ 0.05 were considered statistically significant.

Ethical considerations

This study was ethically approved by the Research Ethics committee of in the Faculty of Medicine and Health Sciences, University of Aden.

Results

The baseline data in Table indicate predominance of males (85.4%) with a mean age of 32.4 ± 12.4 years. Seventy percent of patients were Qat chewer, 46.2% were current smokers, and 17.7% were using Shammah. Comorbidity was detected among 38.5% of them, as arterial hypertension (29.2%), diabetes mellitus (16.1%), cardiovascular diseases (3.1%) and chronic kidney diseases (1.5%).

Penetrating abdominal traumas were more common than ones (83.8% vs. 16.2% respectively), and the common mechanism were gunshot wounds (70.8%), road traffic accidents (16.2%), stab wounds (6.9%) and bomb explosion (6.2%). Most of them (86.2%) were hemodynamically stable. Morbidity was observed among 43.1% and mortality among 10.0% as illustrated in Table 1.

In relation to the type of abdominal traumas, the commonly involved abdominal organs in penetrating traumas were small bowel (41.3%), large bowel (39.4%), liver (26.6%) and stomach (24.8%). In blunt abdominal traumas, the commonly involved abdominal organs were liver (57.1%), spleen (28.6%), and stomach (19.0%). Statistically, penetrating abdominal traumas were found significantly affecting small bowel and large bowel, while blunt abdominal traumas were found significantly affecting the liver ($p<0.05$) as shown in Table 2.

Table 1: Baseline Characteristics of the Studied Patients (n = 130)

Item	№.	%
Male gender	111	85.4
Mean age ± SD (Min.-Max.)	32.4 ± 12.4 (18 – 70)	
Qat chewing	91	70.0
Current smoking	60	46.2
Using Shammah	23	17.7
Comorbidity	50	38.5
Arterial hypertension	38	29.2
Diabetes mellitus	21	16.1
Cardiovascular diseases	4	3.1
Chronic kidney diseases	2	1.5
Penetrating abdominal trauma	109	83.8
Blunt abdominal trauma	21	16.2
Gunshot wound	92	70.8
Road traffic accidents	21	16.2
Stab wound	9	6.9
Bomb explosion	8	6.2
Hemodynamic stability	112	86.2
Postoperative morbidity	56	43.1
Postoperative mortality	13	10.0

Table 2: Involved Organs in Relation to the Type of Abdominal Traumas (n=130)

Involved organ	Type of trauma				*p*
	Penetrating (n=109)		Blunt (n=21)		
	№.	%	№.	%	
Small bowel	45	41.3	1	4.8	**0.001***
Large bowel	43	39.4	2	9.5	**0.006***
Liver	29	26.6	12	57.1	**0.007***
Stomach	27	24.8	4	19.0	0.401
Diaphragm	20	18.3	2	9.5	0.262
Spleen	18	16.5	6	28.6	0.159
Kidney	17	15.6	2	9.5	0.370
Urinary bladder	9	8.3	1	4.8	0.582
Mesentery	4	3.7	2	9.5	0.249
Pancreas	5	4.6	0	0.0	0.999
Ureter	4	3.7	0	0.0	0.998
Gall bladder	3	2.8	1	4.8	0.510
Appendix	3	2.8	0	0.0	0.997

* *p*-value ≤0.05 is statistically significant.

In Table 3, there was no significant statistical association between the mean age, sex, and type of abdominal trauma and postoperative morbidity. However, a significantly higher percentage of unstable patients developed morbidity compared to those without morbidity (21.4% vs. 8.1%, respectively, *p*=0.028).

Table 3: Morbidity of the Studied Patients with Abdominal Trauma in Relation to some variables (n=130)

Variable	Morbidity				*p*
	Yes (n= 56)		No (n= 74)		
	№.	%	№.	%	
Age (years)[a]	31.6 ± 12.0		33.0 ± 12.7		0.530
Sex					
Male	50	89.3	61	82.4	0.200
Female	6	10.7	13	17.6	
Type of trauma					
Blunt	7	12.5	14	18.9	0.230
Penetrating	49	87.5	60	81.1	
Hemodynamic stability					
Stable	44	78.6	68	91.9	**0.028***
Unstable	12	21.4	6	8.1	

[a] Values are mean and standard deviation. * Statistically significant.

In relation to postoperative mortality, there, Table 4 shows significant statistical association with the mean age, sex of patients and type of abdominal traumas. On the other hand, he association was statistically significant in relation to hemodynamic stability, where the percentage of unstable patients who died was higher than those who survived (46.2% vs. 10.3% respectively).

Table 4: Mortality of the Studied Patients with Abdominal Trauma in Relation to some Variables (n=130)

Variable	Mortality				*p*-value
	Yes (n= 13)		No (n= 117)		
	№.	%	№.	%	
Age (years)[a]	30.5 ± 14.8		32.6 ± 12.1		0.568
Sex					
Male	10	76.9	101	86.3	0.289
Female	3	23.1	16	13.7	
Type of trauma					
Blunt	3	23.1	18	15.4	0.351
Penetrating	10	76.9	99	84.6	
Hemodynamic stability:					
Stable	7	53.8	105	89.7	**0.003***
Unstable	6	46.2	12	10.3	

[a] Values are mean and standard deviation. * Statistically significant.

Discussion

Yemen has been known for the long-standing history of its unsettled political scene. On March 20th, 2015, the country witnessed one of the deadliest days in the modern history of Yemen. Such situations cause disruption in daily life and led to damage in property, injuries and loss of life. Since that time, a lot of abdominal traumas were reported in Yemen and mainly in Aden city where civil unrest is common [9,10].

The abdomen is the third most commonly injured part of the body in civilian trauma, and in about 25% of cases, surgery is required [6]. In civilian practice, there is often a predominance of blunt trauma, whereas in war, there is a greater incidence of penetrating abdominal trauma [11]. In the current study, penetrating abdominal traumas (83.8%) were observed more common than blunt abdominal trauma (16.2%). This finding was expected because the current study included patients with abdominal traumas who were managed surgically and excluding those managed conservatively. In addition, the current civil conflicts in Aden are the main cause for increasing incidence of penetrating abdominal traumas.

This study showed that the common mechanism of abdominal trauma was gunshot wounds followed by road traffic accidents, stab wounds and Bomb. Similar to these findings were reported by the previous study of Bux *et al*.[12], in Aden, where the common mechanism of abdominal trauma was gunshot wounds followed by stab wounds and road traffic accidents.

The commonly involved abdominal organs in penetrating traumas among our patients were small bowel and large bowel, while in blunt abdominal traumas; the commonly involved abdominal organs were liver and spleen. A similar finding was reported by a recent Nigerian study [13], where they found the small bowel being the most frequently injured organ in penetrating trauma, while in blunt abdominal injury, the spleen was the most commonly injured. Other studies reported similar findings as the recent study of Muche *et al*.[14], in Ethiopia (2023), who reported the bowel (62.1%) as the highly injured hollow viscous organ in penetrating abdominal trauma and the liver (38.9%) as the commonest injured solid organ in blunt abdominal trauma. As well as the study of Ntundu *et al*.[15], in Tanzania, who reported the commonly injured organ in blunt abdominal trauma as the spleen (91.7%) and in penetrating abdominal injuries as the small bowel (46.1%).

At presentation, most patients (86.2%) were hemodynamically stable. This is in alignment with what was reported by Solanki and Patel in India [16], who reported that 90.0% of abdominal trauma patients presented with hemodynamic stability. It is also consistent with Bux *et al*.[12] findings for abdominal trauma at Al-Gamhouria General Modern Hospital in Aden, where 71.4% of abdominal trauma presented with hemodynamic stability.

In the present study, the short-term follow-up depicted postoperative morbidity among 43.1% of patients. Postoperative morbidity is differing between studies depending on the situation where the study was conducted. It was 38.6% in the study of Adenuga and Adeyeye [13], in Nigeria during 2023, with minor local conflicts. It was higher reaching 59.0% as reported by Payravi *et al*. [17], in Iran, during the war between Iran and Iraq (2001). However, morbidity rate was lower (12.5%) in the study of Traoré *et al*.[18], in Mali, during usual stable situations.

The current study reported postoperative mortality of 10.0%. This figure is not far from that reported by Agbroko *et al*.[19] in Nigeria, with 8.0% mortality, or by Sincavage *et al*.[20] in USA, with an overall postoperative mortality of 14.8% as well as the finding of Aldemir *et al*.[21] in Turkey, who reported an overall postoperative mortality of 11.2% among patients with penetrating abdominal traumas. On the other hand, this study did not show any significant association between patients' mean age or sex with postoperative morbidity or mortality after surgery for abdominal traumas. This finding is similar to that reported by Ay *et a*l.[22], in Turkey (2023), who reported that no statistically significant relationship between age or gender and morbidity or mortality.

Morbidity and mortality in the present study was observed higher among penetrating abdominal traumas when compared to blunt abdominal traumas. In contrary to our finding, the study of Agbroko *et al*.[19], in Nigeria, showed that mortality rate was predominantly more among blunt trauma as compared to penetrating abdominal trauma. However, they reported similar finding in regard to morbidity.

The present study showed that postoperative morbidity and mortality were significantly associated with the hemodynamic instability of the studied patients. This finding is similar to that reported by Abebe *et al*.[23], in Ethiopia (2022), who reported that patients with hemodynamic instability showed significantly higher percentages of postoperative morbidity and mortality. Trauma patients who are hemodynamically unstable as a result of their injuries require early recognition of shock in order to prevent the most common causes of mortality from trauma; hemorrhage, multiorgan dysfunction, and cardiopulmonary arrest. Recognizing the physiologic state of shock and initiating treatment takes priority over the definitive determination of the extent of injury [24].

Conclusion

This study concluded that surgeries for abdominal traumas are associated with significant postoperative morbidity and mortality depending on the hemodynamic state at presentation of patient. The study recommends that patients with hemodynamic instability at presentation after trauma should be managed as soon as possible without delay to decrease the rate of postoperative morbidity and mortality.

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