Epidemiological evaluation and outcome of pure abdominal trauma victims who underwent surgical exploratory laparotomy

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Objective
The aim of this study was to evaluate the epidemiological profile, surgical treatment, and outcome of patients suffering from pure abdominal injuries who underwent exploratory laparotomy in the emergency department of Aswan University Hospital, Egypt.

Patients and methods
This was an evaluation and assessment of observational and descriptive study with prospective approach through interviews of 80 patients with pure abdominal trauma who were subjected to surgical treatment in the form of exploratory laparotomy and evaluation of their medical records.

Results
The most affected individuals were male patients younger than 49 years, most of them with low educational level and single. There was a predominance of trauma in the rural areas that mostly occurred at night-time and evening. Blunt trauma was the most common type of abdominal trauma, and road traffic accidents were the most frequent mechanism of trauma. The upper abdomen was the most affected region. Pain was the most common presenting symptom, and the spleen was the most affected organ. The hospital stay ranged from 1 to 11 days. Most patients were discharged with permanent sequelae; there were six deaths.

Conclusion
Blunt trauma was the most common type of abdominal injury. Road traffic accidents were the most common mechanism of blunt trauma, and stab wounds were the most common type of penetrating injuries. A number of risk factors were identified in this study, which include the type of abdominal trauma, presence of chronic diseases, delay in early transport from the site of trauma to the emergency department, and age of patient. Despite the magnitude of traumas, the outcome was satisfactory.

Keywords: abdominal injuries, emergency laparotomy, epidemiology

Introduction
Trauma is the study of medical problems associated with physical injury. The injury is the adverse effect of a physical force upon a person. There are a variety of forces that can lead to injury, including mechanical, thermal, ionizing radiation, and chemical. Trauma is recognized as a serious public health problem. In fact, it is the leading cause of death and disability in the first four decades of life and is the third most common cause of death overall [1].

The abdomen is the third most commonly injured region, with surgery required in about 25% of civilian cases [2].

In civilian life, the majority of abdominal injuries are due to blunt trauma secondary to high-speed automobile accidents. Penetrating injuries, although often associated with wartime combat, are seen with increasing frequency in hospital emergency departments, particularly in urban areas. The failure to manage abdominal injuries successfully accounts for the majority of preventable deaths following multiple injuries. Failure to recognize occult abdominal hemorrhage and to successfully control bleeding from intra-abdominal organs leads to significant morbidity, and such injuries account for ~10% of traumatic deaths that occur annually in the USA. Even today, with the development of trauma systems, failure to manage abdominal injuries continually accounts for significant morbidity [3].

Abdominal trauma is classified as either blunt or penetrating. Penetrating abdominal trauma can usually be diagnosed easily and reliably, whereas blunt abdominal trauma is often missed because clinical signs are less obvious. Blunt abdominal injuries predominate...
in rural areas, whereas penetrating ones are more frequent in urban settings. Penetrating abdominal trauma is often subdivided into stab wounds and gunshot wounds, which require different methods of treatment [4].

To decrease mortality in cases of abdominal trauma, risk factors for mortality need to be systematically identified and studied. In recent years, studies have identified a number of risk factors, including presence of warning signs, the length of the interval between abdominal injury and surgery, shock at the time of admission, presence of chronic disease, and hemoglobin level in addition to age [5].

The goal of this study was to evaluate the epidemiological reports and clinical data that aim to illustrate the mechanisms of injury, etiology, warning signs, sequelae, and frequency of deaths resulting from pure abdominal injuries that underwent laparotomy in the emergency department of Aswan University Hospital, Egypt.

**Patients and methods**

This was a prospective study of all pure abdominal trauma victims (without other trauma) who were subjected to surgical treatment from any age and sex and admitted to the emergency department of Aswan University Hospital, Egypt, during a period from 1 January to 31 October 2014. The number of cases was 80 patients and included patients who underwent exploratory laparotomy and analyses of their records. Data were collected by us and our residents in the emergency department of Aswan University Hospital. Consent was obtained from patients or their guardians and relatives. The collected data included sociodemographic and clinical data for each patient in the form of age, sex, marital status, occupation or job, special habits, residence, educational levels, date of admission, time of admission, date of discharge, length of hospital stay, residence (rural or urban), type of trauma (penetrating or blunt trauma), presence of warning signs (pain, hypotension, evisceration, tachycardia, hemoperitoneum, pneumoperitoneum, fever, peritonitis, sweating, oliguria, or level of consciousness), affected regions (epigastrum, thoracoabdominal ‘Rt. or Lt.’, hypochondrium ‘Rt. or Lt.’, lumber ‘Rt. or Lt.’, umbilical region, iliac fossa ‘Rt. or Lt.’, hypogastrum, back, perineal region), affected organs/structures (the liver, spleen, ‘Rt. or Lt.’ kidney, small intestine, large intestine, diaphragm, greater omentum, stomach, mesocolon, mesentery, duodenum, pancreas, gall bladder, urinary bladder, esophagus, great vessels, rectum, urethra), sequelae, discharge from hospital (improved or died), and organ donation. All these data were statistically analyzed.

**Statistical analysis**

Simple analysis was used. Quantitative data were presented using mean, SD, median, and range. Categorical data were presented as number and percentage. The $\chi^2$-test or Fisher’s exact test was used to examine the relation between the outcome and type of trauma.

**Results**

This study included 80 patients, 62 (77.5%) male and 18 (22.5%) female. The mean age was 26.9 years (range 2–75 years). The most common age group was less than 18 years of age and included 26 patients (32.5%), followed by those between 25 and 49 years of age and included 24 patients (30%) (Fig. 1).

As regards the sociodemographic data of the studied populations, 50 patients were single (62.5%) and 30 patients were married (37.5%). In relation to occupation, 24 (30%) patients were students, 16 (20%) patients were workers, 12 (15%) were housewives, eight (10%) were farmers, eight (10%) were children, two (2.5%) were policemen, two (2.5%) were teachers, and two (2.5%) were unemployed. A total of 46 (57.5%) patients had no special habits, 20 (25%) patients were cigarette smokers, and 14 (17.5%) were goza smokers.

As regards educational levels, 22 (27.5%) patients had incomplete primary school education, 14 (17.5%) had incomplete high school education, 12 (15%) patients had complete high school education and the same number had no educational level, eight (10%) patients had complete primary school education and the same number had incomplete college education, and four (5%) patients had complete college education.

**Figure 1**

Age groups of studied populations.
As regards residence, 42 (52.5%) patients were from rural area, whereas 38 (47.5%) were from urban area. During the period from 6 p.m. to midnight, 32 (40%) patients were admitted and treated, 18 (22.5%) patients from noon to 6 p.m., 16 (20%) from 6 a.m. to noon, and 14 (17.5%) from midnight to 6 a.m.

As regards mechanisms of trauma, 62 (77.5%) patients presented with blunt abdominal trauma and 18 (22.5%) patients with penetrating abdominal trauma.

Motor car accidents were the most common cause of trauma, affecting 38 (47.5%) patients of all studied patients and also represented 61.29% of blunt trauma patients, whereas falls and assault (direct blow) were accounted together for 38.71% of blunt trauma patients. Stab wounds were the common cause of penetrating trauma, affecting 12 patients (66.67%), followed by gunshot wounds, affecting six patients (33.33%) (Fig. 2).

Pain, tachycardia, hemoperitoneum, and hypotension were the most common warning signs in the studied populations (Fig. 3).

The areas most affected by trauma were the left thoracoabdominal, the left hypochondrium, and the epigastrium region (Fig. 4).

The spleen was the most affected solid organ, and the most affected hollow viscous was the small intestine (Fig. 5).

Hospital stay ranged from 0 to 7 days in 44 (55%) cases and 8–15 days in 36 (45%) cases [Table 1].

As regards the outcome of studied populations, 44 (55%) individuals were discharged with permanent sequelae (30 splenectomies, eight nephrectomies, four cholecystectomies, and two distal pancreatectomies). There was a highly significant difference between blunt and penetrating trauma as regards permanent sequelae (67.74 vs. 11.11%, respectively; \( P < 0.0001 \)), 32 (40%) without sequelae and four (5%) with transient sequelae (three colostomies and one ileostomy). There were six (7.5%) cases of hospital death without organ donation (four of them were suffering from decompensated liver cirrhosis and two were referred from other hospitals with disseminated intravascular coagulation). There were no significant differences between blunt and penetrating trauma as regards death (9.68 vs. 0.0%, respectively; \( P = 0.33 \)) [Table 2].

### Discussion

In the present study, the male-to-female ratio was 3.6: 1 (77.5 vs. 33.5%). In another study, the male-to-female ratio was 12.3: 1 [6]. Moreover, other investigators reported a male-to-female ratio of 4.4: 1 among abdominal trauma patients [7]. Young male

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**Table 1** Length of hospital stay of studied populations

<table>
<thead>
<tr>
<th>Variables</th>
<th>Summary statistics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of stay</td>
<td></td>
</tr>
<tr>
<td>Mean (SD)</td>
<td>6.75 (2.21)</td>
</tr>
<tr>
<td>Median (range)</td>
<td>7 (1-11)</td>
</tr>
<tr>
<td>Length of stay (days) (( n ) (%) )</td>
<td></td>
</tr>
<tr>
<td>0-7</td>
<td>44 (55.00)</td>
</tr>
<tr>
<td>8-15</td>
<td>36 (45.00)</td>
</tr>
</tbody>
</table>

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[Figure 2](#) Mechanisms of trauma in the studied populations.

[Figure 3](#) Warning signs in studied populations.

[Figure 4](#) The area most affected by trauma in studied populations.
The organs and structures most affected by trauma in studied populations.

Table 2 Outcome by type of trauma

<table>
<thead>
<tr>
<th>Variables</th>
<th>Penetrating trauma (N=18) (n (%))</th>
<th>Blunt trauma (N=62) (n (%))</th>
<th>Total</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sequelea</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Permanent</td>
<td>2 (11.11)</td>
<td>42 (67.74)</td>
<td>44 (55.00)</td>
<td>&lt;0.0001*</td>
</tr>
<tr>
<td>Transient</td>
<td>4 (22.22)</td>
<td>0 (0.00)</td>
<td>4 (5.00)</td>
<td></td>
</tr>
<tr>
<td>Without</td>
<td>12 (66.67)</td>
<td>20 (32.62)</td>
<td>32 (40.00)</td>
<td></td>
</tr>
<tr>
<td>Fate</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Death</td>
<td>0 (0.00)</td>
<td>6 (9.68)</td>
<td>6 (7.50)</td>
<td>0.33*</td>
</tr>
<tr>
<td>Improve</td>
<td>18 (100)</td>
<td>56 (90.32)</td>
<td>74 (92.5)</td>
<td></td>
</tr>
</tbody>
</table>

*, significant; #, non significant.

patients, most of them aged 20–30 years, have been reported to be the most frequent victims [8]. Moreover, other investigators found that abdominal trauma is most common in active segment of populations globally and the incidence is the highest in those between 21 and 40 years of age [9]. In our study, the most affected patients were those younger than 18 years and those between 25 and 49 years of age (32.5 and 30%, respectively). The large population of male involvement is attributed to occupational hazards and other socioeconomical activities that predispose them to injuries. They are more likely to have reasons for moving from one place to another; men also represent the active group in any society that takes part in high-risk activities. The traumatic injuries occurred more frequently at night-time and evening [10]. In our study, most of the traumatic injuries occurred from 6 p.m. to midnight (40%) and from noon to 6 p.m. (22%). Blunt trauma was the most common pattern of the abdominal injuries [11]; this concurs with the finding in our study, in which blunt trauma was more common compared with penetrating trauma (77.5 vs. 22.5%). Blunt injuries have been reported to predominate in rural areas [4]. This concurs with the finding in this study, in which blunt trauma was more in rural than in urban areas (52.5 vs. 47.5%). Vehicle accidents were a common cause of blunt abdominal trauma [2]. Moreover, others reported that, in civilian life, the majority of abdominal injuries were due to blunt trauma secondary to high-speed automobile accidents [3]. This concurs with our study results in which road traffic accidents were predominant compared with other mechanisms of blunt trauma such as falls and assault (61.29 vs. 38.71%). This predominance of traffic accidents may be related to adoption of less cautious attitude in traffic, overcrowding of roads, bad roads and bridge network, and also a positive association between external events and the consumption of psychoactive substances. Moreover, in our study, the second most common cause of blunt trauma was assault or direct blow, and the third most common cause was falling from height; this concurs with the findings of other investigators who found that the main causes of blunt abdominal injuries were road accidents, interpersonal violence (assault), and falls [12]. In the presenting study, the most common cause of penetrating abdominal trauma was stabbing (66.67%) versus gunshot wounds (33.33%), whereas in other studies gunshot wounds were the most common cause (77.65%) [8]. The upper abdomen was the most affected area, and pain was the most frequently reported symptom [12,13]. This concurs with our results, in which the upper abdomen was the most affected area (47.5%) and pain was the most frequently reported symptom (87.5%). A predominance of wounds to the left upper quadrant, lower right quadrant, and epigastrium was reported; when evaluating blunt trauma, the spleen was the most affected organ, followed by the liver and the pancreas [14]. Moreover, others observed that the small intestine and splenic injuries were the most frequently affected organs both in penetrating and blunt traumas [15]. In our study, we observed a predominance of wounds to left thoracoabdominal region (47.5%), left hypochondrium (47.5%), and epigastrium (37.5%), and the spleen was the most affected organ (37.5%), followed by the right kidney (20%) and the liver (12.5%), small intestine (12.5%), and stomach (12.5%). As regards the outcome, in some studies, most patients were discharged without sequelae [10], whereas in our studied populations most patients were discharged with permanent sequelae (55%), 40% without sequelae and 5% with transient sequelae. Permanent sequelae were significantly higher with blunt trauma than with penetrating trauma patients (67.74 vs. 11.11%, respectively; P < 0.0001). Mortality rate of 9.2 and 8.2% in penetrating and blunt injuries, respectively, was reported [7]. In our study, the overall mortality rate among pure abdominal trauma victims was 7.5%; there was no significance as regards mortality between blunt and penetrating trauma (9.68 vs. 0.0%, respectively; P = 0.33).
Conclusion
There was a striking association between abdominal trauma and male patients, from both rural and urban areas; most of them were students and of a productive age without formal or regulated employment and mostly of low educational level. Blunt trauma was the most common type of abdominal injury. In blunt trauma, road traffic accidents predominated other mechanisms of blunt trauma. Stab wounds were the most common mechanism of penetrating trauma. It was observed that the traumatic injuries occurred more frequently at night-time and evening. The upper abdomen was the most affected area and the pain the most frequently reported symptoms. The spleen was the most frequently injured organ in our studied populations. There were a number of risk factors for fatality in our study, including type of abdominal trauma (blunt or penetrating), presence of chronic diseases such as liver cirrhosis, presence of warning signs, and delay in transportation of injured patients to emergency departments.

Recommendations
This study calls for improving motor vehicle safety, development of roads and bridge network, activation of traffic laws, and raising the educational level of drivers and general populations. Moreover, the general population should have good knowledge about traffic laws. Rapid emergency transport of victims and rapid intervention should help to reduce the mortality and morbidity associated with the public health problem.

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Nil.

Conflicts of interest
There are no conflicts of interest.

References