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Research Article

ASSOCIATION OF PATIENT DEMOGRAPHICS AND INJURY CHARACTERISTICS WITH OUTCOMES OF ISOLATED ABDOMINAL TRAUMA CASES UNDERGOING EXPLORATORY LAPAROTOMY AT A TERTIARY CARE HOSPITAL

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Abstract:

Background and aim: Abdominal trauma caused by both accidental (motor vehicle collision/road traffic accident) and non-accidental (firearm injury/sharp object penetration) injury is a common cause of patients presenting to the emergency room and undergoing subsequent exploratory surgery. Our aim was to classify patients based on both modifiable (co-morbidities) and non-modifiable (age, sex etc.) characteristics, type and mechanism of injuries and organs affected to evaluate the extent of relationship with outcomes of surgically managed abdominal trauma.

Results: A total of 323 patients who presented from 2014 to 2021 were included in the study, with 209 male (64.7%) and 114 female (35.3%) patients. The sample included patients from the age of 12 to 71 with a mean of 40.1. The majority of patients presented with blunt abdominal trauma 171 (52.9%) followed closely by penetrating injuries 152 (47%). Motor vehicle collision was the leading cause of injuries in 171 (52.9%) patients, followed by firearm injuries 114 (35.2%) patients, and the least number of patients presenting due to sharp object penetrating injuries 38 (11.7%). The common associated co-morbidities were diabetes 76 (23.5%) and hypertension 57 (17.6%). The most commonly affected organs were spleen in 152 (47%) patients, followed by small bowel in 133 (41.1%) patients, and other organs (including liver, stomach, kidneys, colon and pancreas) in 38 (11.7%) patients. More than half of patients 171 (52.9%) recovered without any complications. The overall mortality rate was 38 (11.7%). The most common post-operative complications were shock in 57 (17.6%) patients, surgical site infections (SSI) in 38 (11.7%) patients, and others (adhesions/ paralytic ileus/urinary tract infection/ sepsis etc.) in 19 (5.8%) patients. 133 out of the 171 cases of motor vehicle collisions (77.7%) were reportedly not wearing a seatbelt.

Conclusions: We observed blunt injuries from motor vehicle collisions to be the leading cases of abdominal trauma in the emergency room requiring surgery. The most commonly affected organ was the spleen followed by small bowel. The most common complication was shock due to intra-peritoneal bleeding followed by surgical site infections. Moreover, most patients reported not wearing a seatbelt during the motor vehicle collision.

Key words: Abdominal trauma, exploratory laparotomy, age, sex, comorbidity, cause, mechanism.

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INTRODUCTION:

In developing countries, trauma cases are an everyday presentation and are a leading cause of morbidity and mortality. A multidisciplinary approach is required in the management of abdominal trauma [1]. The contributing factors include not wearing seatbelts, lack of traffic signals, poor road maintenance, abundance of firearms, poverty and lack of education. Moreover, delays in presentation and management contribute to worse outcomes. The diagnostic modality of choice is contrast-enhanced computed tomography (CT) scan, but in cases where time is of the essence, patients are transferred to the operating room after concerning findings on Focused Assessment with Sonography for Trauma (FAST) scan. While FAST is widely regarded as highly specific, its sensitivity may not be reliable and a negative report must be followed by a standard such as CT scan [2]. Patients who are hemodynamically stable can be managed conservatively, however, those with hemodynamic instability/signs of peritonitis/blood per rectum/radiographic pathologic findings are preferably managed through surgery. Shock, peritonitis and evisceration after penetrating trauma are warning signs necessitating urgent laparotomy. Our study highlights the association of outcomes with type of injury, mechanism of injury, organs affected, the correlation with pre-existing health conditions, predisposing factors and other patient characteristics.

MATERIALS & METHODS:**Study sample and design:**

A total of 323 cases were included who presented to the emergency room of a tertiary care hospital in Peshawar, Pakistan with a history of blunt/penetrating abdominal trauma from 2014 to 2021. The sample included both male and female patients from the ages of 12 to 71 with a mean of 40.1. Data was analyzed from hospital records in a retrospective manner.

Exclusion criteria:

To evaluate the attributive complications of abdominal trauma and/or surgery, we excluded 95 patients with

associated thoracic injuries and 38 patients with associated head injuries and 461 patients with associated limb injuries. Furthermore, patients who were hemodynamically stable and managed non-operatively were also excluded. Finally, patients who were deceased upon arrival or before shifting to the operating room were also excluded.

Diagnostic and treatment modalities:

The diagnostic modality of choice was computed tomography (CT) scan with contrast as the risk of contrast induced nephropathy is low and benefits outweigh complications. However, in certain cases where delay due to radiographic imaging would have proven detrimental, patients underwent a Focused Assessment with Sonography for Trauma (FAST) scan and were subsequently transferred to the operating room upon positive findings. The patients with no red flags were managed conservatively while those with obvious signs of peritonitis/blood per rectum/radiographic pathologic findings or hemodynamic instability were operated on.

Results:

The cases included both male and female patients from the ages of 12 to 71 with a mean of 40.1. Male patients presented from the age of 12 to 71 with a mean of 34.9 and female patients from the age of 21 to 69 with a mean of 49.6. Most common interventions during surgery were splenectomy and intestinal resection with end-to-end anastomosis.

The most common post-operative complications were found to be shock in 57 (17.6%) patients, surgical site infections (SSI) were reported and managed in 38 (11.7%) patients, and other complications (including adhesions/paralytic ileus/urinary tract infections/sepsis) were a relatively rare finding accounting for 19 (5.8 %) cases. 171 (52.9%) patients recovered without any complications and the mortality rate was 38 (11.7 %). 133 out of 171 cases of motor vehicle collisions (77.7%) were reportedly not wearing a seatbelt. Figure 1 illustrates these findings.

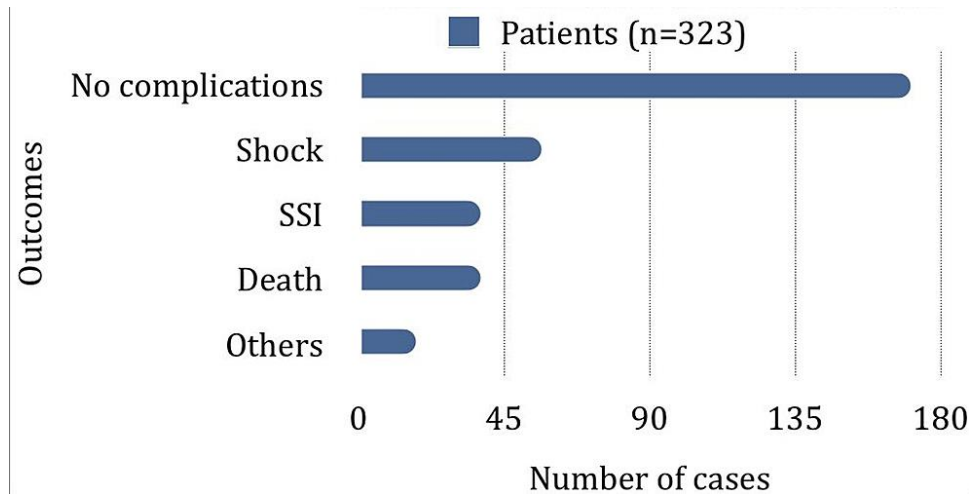


Figure 1: Surgical outcomes of isolated abdominal trauma
SSI: surgical site infection

Correlation of outcomes with sex:

Figure 2 shows the correlation of surgical outcomes with sex. Out of the total 323 cases, 209 (64.7%) were male patients. 76 out of the 209 male patients (36.3%) did not experience any post-operative complications. The mortality rate among male patients was 38 (18.1%) and a similar number of male patients experienced shock and surgical site infections. 19 out of 209 (9%) male patients experienced other

complications including adhesions/paralytic ileus/urinary tract infections/sepsis.

114 out of the total 323 patients were female (35.3%). 95 out of 114 (83.3%) patients did not report any complications and 19 (16.6%) patients experienced shock. None among the female patients developed surgical site infection.

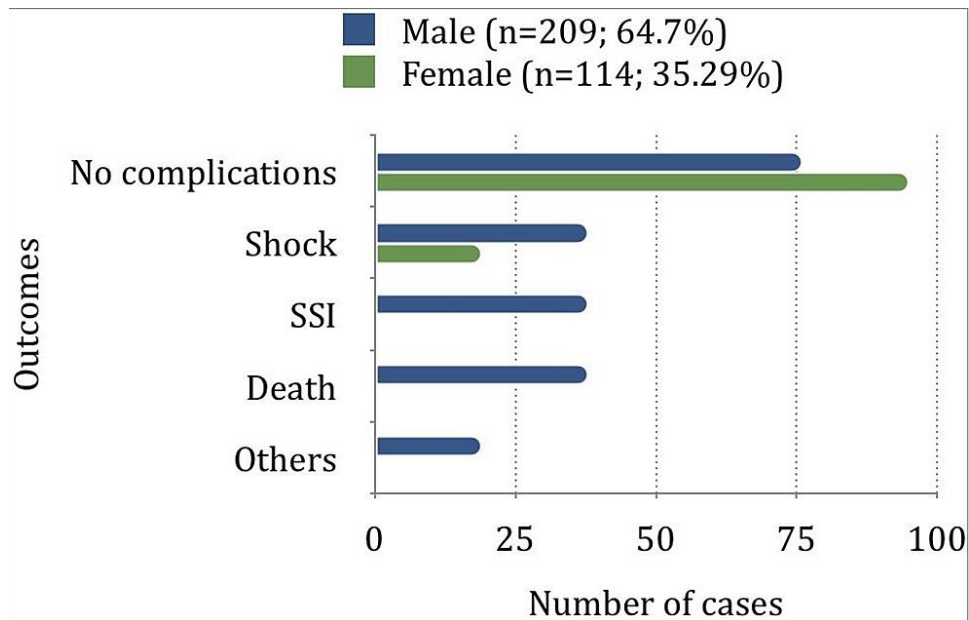


Figure 2: Correlation of outcomes with sex
SSI: surgical site infection

Correlation of outcomes with pre-existing health conditions:

190 out of 323 patients (58.8%) did not have pre-existing health conditions. 38 out of the total (11.7%) had only diabetes, 19 (5.8%) had only hypertension and 38 (11.7%) had both diabetes and hypertension.

The mortality rate among hypertensive patients was 19 out of 57 (33.3%) and no patients with diabetes experienced any morbidity or mortality. A total of 38 patients with anemia and angina experienced shock. Figure 3 illustrates these findings.

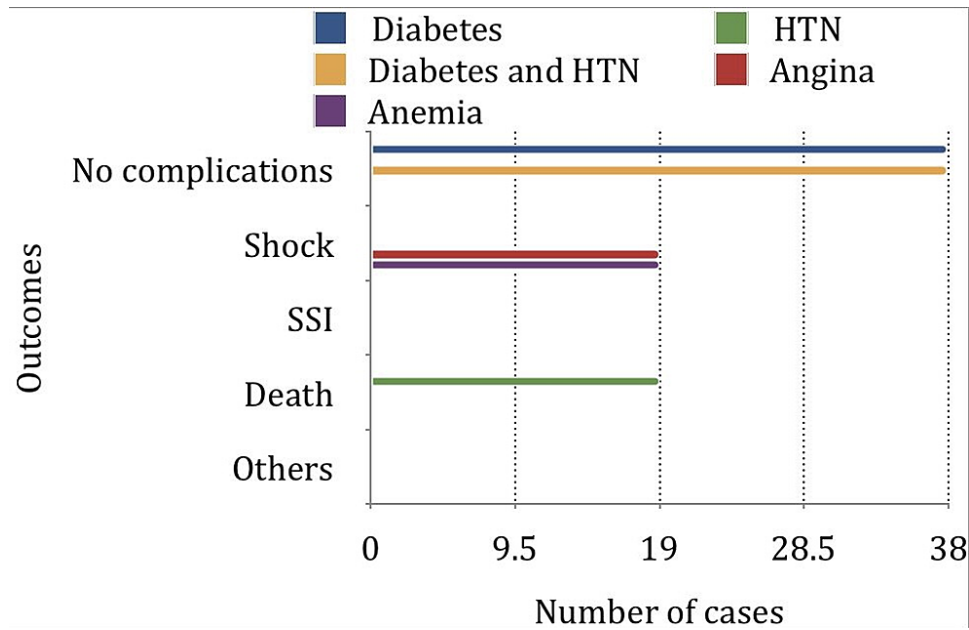


Figure 3: Correlation of outcomes with co-morbidities
HTN: hypertension, SSI: surgical site infection

Correlation of outcomes with mechanism of injuries:

171 out of 323 (53%) patients presented with blunt injury to the abdomen and the remaining 152 (47%) with penetrating injuries caused by both firearms and sharp objects. 76 out of 171 patients with blunt trauma (44.4%) did not report any complications. 57 out of 171 with blunt trauma (33.3%) experienced shock, 19 out of 171 (11.1%) experienced surgical site

infections, and the mortality rate from blunt trauma alone was 19 (11.1%).

95 out of 152 patients with penetrating injuries (62.5%) did not experience any complications. 19 out of 152 (12.5%) experienced surgical site infections, and an equal number experienced other complications including adhesions/paralytic ileus/urinary tract infections/sepsis. The mortality rate for the penetrating injuries was 12.5%. Figure 4 shows these findings.

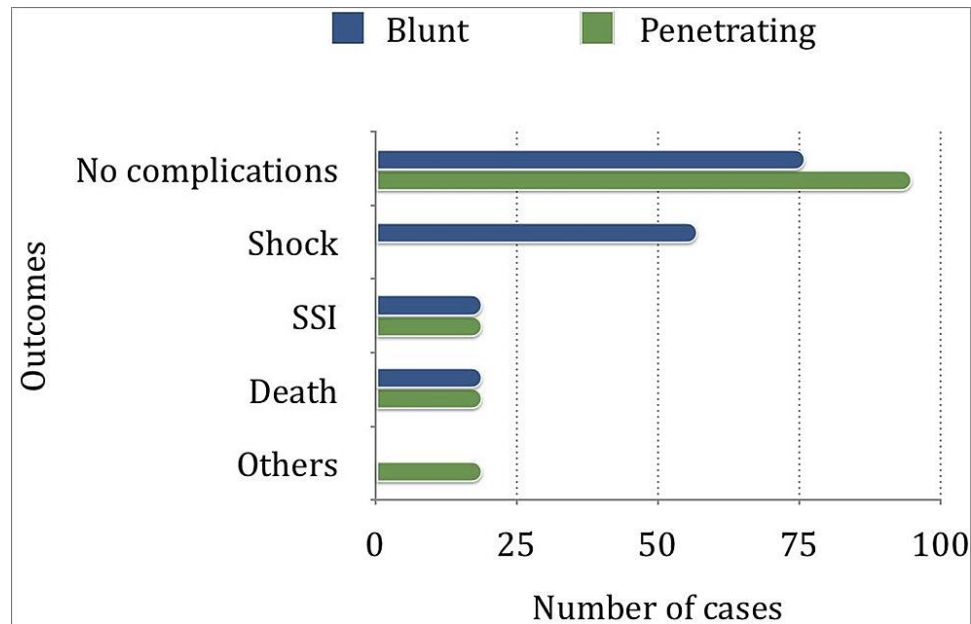


Figure 4: Correlation of outcomes with mechanism of injury
SSI: surgical site infection

Correlation of outcomes with cause of injuries:

171 out of 323 (52.9%) cases were caused by motor vehicle collisions. The remaining 152 patients with penetrating injuries were divided into patients presenting due to firearm injuries, 114 out of 323 patients (35.3%), and patients with sharp object penetrating injuries, 38 out of 323 (11.7%).

Out of the 171 cases of accidental injuries, 76 patients (44.4%) did not experience any complications, 57 (33.3%) patients experienced shock, 19 (11.1%) experienced surgical site infections and 19 (11.1%) was the mortality rate.

Out of the 114 cases caused by firearm injuries, 76 patients (66.6%) did not experience any complications. 19 (16.6%) patients experienced other complications including adhesions/paralytic ileus/urinary tract infections/sepsis. 16.6% was the mortality rate in the group.

Among the relatively smaller number of patients presenting due to sharp object penetrating injuries (11.7%), half experienced surgical site infections and the other half did not report any complications. Figure 5 illustrates the aforementioned findings.

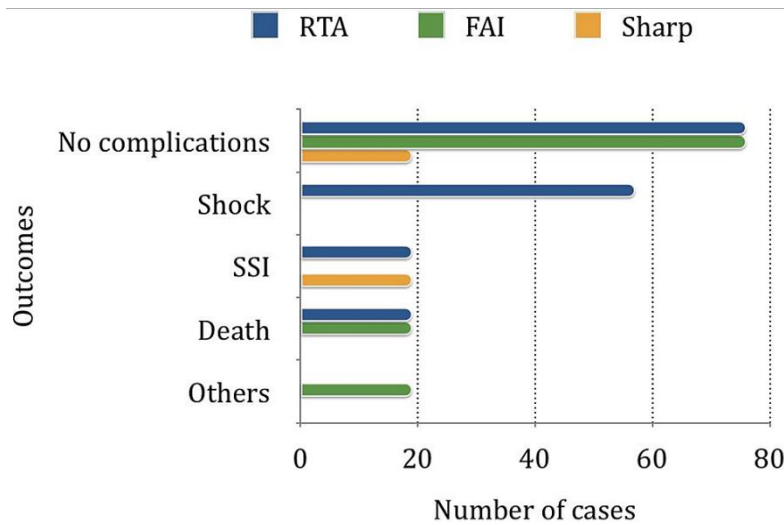


Figure 5: Correlation of outcomes with causes of injury
 RTA: road traffic accident, FAI: fire-arm injury, SSI: surgical site infection

Correlation of outcomes with organs affected:

The most commonly affected organ was spleen in 152 patients (47%). 57 (37.5%) of these experienced shock, 19 (12.5%) experienced surgical site infections and 57 (37.5%) did not develop any complications. The mortality rate was 12.5% in patients with splenic trauma who underwent subsequent splenectomy.

133 patients (41.1%) presented with trauma to the small intestine. 76 out of 133 (57.1%) patients with intestinal trauma did not experience any

complications, followed by 19 cases experiencing surgical site infections and 19 experiencing other complications including adhesions/paralytic ileus/urinary tract infections/sepsis. The mortality rate in this group was 14.2%.

38 patients (11.7%) presented with trauma to other organs including liver, stomach, kidneys, colon and pancreas and there were no reported mortalities in this group. These findings are shown in Figure 6.

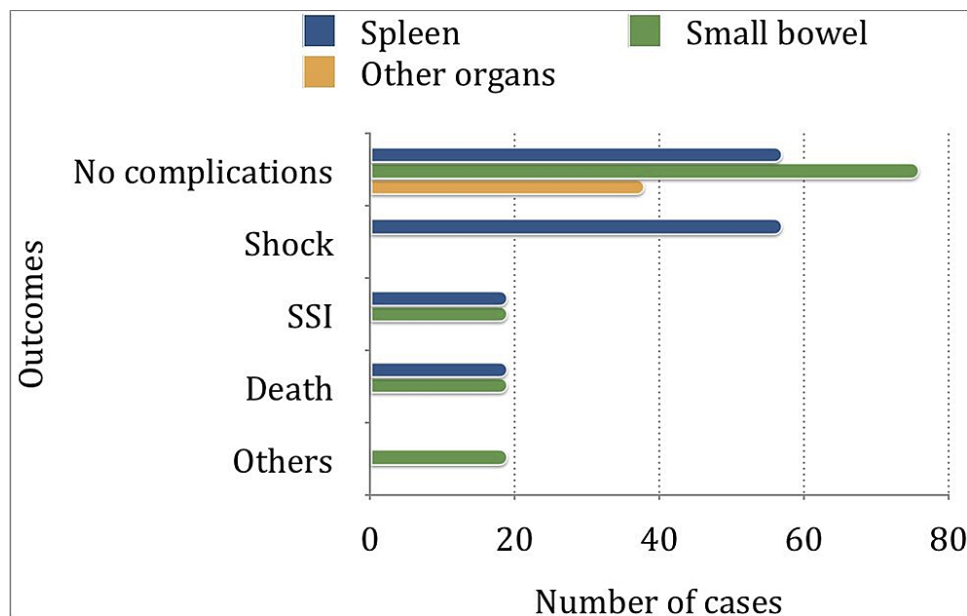


Figure 6: Correlation of outcomes with organs affected
 SSI: surgical site infection

DISCUSSION:

Abdominal trauma accounts for 7-10% of all trauma cases, and in severe trauma cases, often presents in association with orthopaedic, thoracic and central nervous system (CNS) injuries [3]. In our study however, we excluded such patients with additional injuries to prevent any confounding variables. The most common causes of abdominal trauma are blunt injuries from road traffic accidents. Generally, seatbelts reduce the overall morbidity and mortality from road traffic accidents; however, the seatbelt sign is reported to be associated with an increased probability of abdominal and intestinal injuries [4], mandating further evaluation.

An overall inclination for non-operative management in abdominal trauma cases has been shown to rise over the years with a reduction in the adjusted odds of in-hospital mortality [5], specifically in cases of blunt splenic injury (BSI); however this does come with an increased risk of delayed hemorrhage, prolonged hospital stay, transfusion-associated infections and failure [6]. Although, non-operative management may be pursued in selected cases, it is important to exclude any red flags that may worsen outcomes where surgical intervention is necessitated.

In cases of suspected liver injury, increasing levels of alanine aminotransferase (ALT) have been reported as an important risk factor; moreover retroperitoneal injury has also been reported as an important risk factor for mortality in a study on cases from 2009 to 2019 [7]. As a result, in suspected cases of liver injury, routine assessment of liver enzymes is imperative to guide management. On the other hand, In cases of suspected renal injury, the use of revised renal injury grading scale is recommended as it classifies the renal injury more definitively and guides optimum management [8].

In our study, we observed a relatively smaller number of cases of surgical site infections and sepsis potentially due to the patients being administered generous doses of prophylactic broad spectrum antibiotics (which is a common practice in the developing part of the world). We do not recommend this course of action as a routine practice as it is known to be associated with drug resistant bacteria and is harmful in the longer term. The class, dosage and duration of antibiotic therapy should be tailored to the individual needs of the patient. In addition, dedicated trauma centers and experts would potentially reduce complications from abdominal trauma in the developing world [9].

Finally, making a timely diagnosis is pivotal as in one study all patients with intra-abdominal injuries who needed an intervention presented with a sign or symptom of injury within 60 minutes of presentation to the hospital [10].

Abdominal trauma and its sequelae continue to be a major burden in developing countries as a result of systemic issues and scarcity of adequate education. We believe that, in addition to improvement in resources and minimising potential causes, it is imperative to continue to evaluate the different dimensions of abdominal trauma cases via both prospective and retrospective studies. These insights will enable interventions at more focused areas allowing improved outcomes.

Limitations:

Our study did have certain limitations as the sample exclusively included patients who were managed operatively, therefore, the outcomes cannot be representative of cases who should have undergone surgery but did not make it to the operating room in time. In some cases we encountered insufficient documentation of the outcomes and those cases were excluded. These cases could have potentially influenced the ratio of outcomes if they had been accurately documented and included. Due to the retrospective nature of the study, some of our study operations including data collection, entry, and quality assurance were not under the control of the researchers.

CONCLUSIONS:

We calculated motor vehicle collisions to be the leading cause to abdominal trauma cases in the emergency room requiring exploratory laparotomy. The most commonly affected organ was the spleen followed by small bowel. The most common mechanism of injury was blunt injury. Moreover, most of these patients were reportedly not wearing a seatbelt. The most common complication was shock due to intraperitoneal bleeding, followed by surgical site infections. We recommend studies be done to further evaluate the correlation of types and presentation with outcomes of abdominal trauma. Finally, preemptive patient education regarding the risks associated with firearm injuries and not wearing seatbelts can lead to substantial improvements in preventing such incidents.

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