

Intra-Abdominal Solid Visceral Injuries in Adult Patients Presenting with Blunt Abdominal Trauma

Aqsa Ismail¹, M. Hassan-UI-Haque², Muhammad Jamaluddin³,
Bushra Tasneem⁴, Saima Sagheer⁵, Rizwan Ahmed Khan⁶

Abstract

Objective: To determine the frequency of intra-abdominal solid visceral injuries in adults presenting with blunt abdominal trauma (BAT) at a public sector tertiary care hospital in Karachi

Methods: The current descriptive cross-sectional study was carried out at Department of Surgery Abbasi Shaheed Hospital during March 2016 to September 2016 after acquiring ethical approval from Hospital Committee. Total 165 patients were recruited into the study using non-probability consecutive sampling technique. Trauma was managed according to Advance Trauma Life Support (ATLS) guidelines. Laboratory and imaging investigation were done to make diagnosis and manage patients. Patients' characteristics including demographic details such as age, gender and clinical features were recorded on pre-designed proforma.

Results: Out of 165 recruited patients, 133 (80.6%) were males and 32 (19.4%) were female. Average age of study participants was 35.77 ± 13.95 years. Most of the cases occurred in patients having a low socioeconomic status (n=78, 47.3%). In a majority of the cases, mode of injury was road traffic accidents (n=92, 55.7%). 50(30.30%) patients got injury due to fall from height and 23(13.93%) cases occurred due to assault. The most common injured organ was kidney (n=60, 36.36%) followed by liver (n=57, 34.54%), spleen (n=47, 28.48%) and pancreas (n=34, 20.61%).

Conclusion: Careful attention to physical findings and proper sequencing of diagnostic tests is helpful in the appropriate decision making which may prevent associated morbidity and mortality in accordance with Advance Trauma Life Support (ATLS) guidelines.

Keywords: abdominal injuries, hemodynamics, conservative treatment

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Introduction

Trauma refers to the experience of major physical or psychological stress as a reaction to event or circumstances that are physically or emotionally impactful for an individual and have adverse effects¹. Globally trauma is considered as potential cause of morbidity and mortality and a common cause of mortality within 40 years of life². Traumatic events include sudden loss, chronic illness,

violence, disaster, war confrontations and other stressful and disturbing events. Trauma is associated with substantial morbidity and mortality which causes significant deprivation of workforces. In today's world, trauma is recognized as neglected sickness in spite of its close relationship with human being. Regardless of the socioeconomic status of the patients, trauma is considered as a major public health problem across the world.

Road traffic accidents (RTA) are major cause of injuries and associated mortalities contributing to one-fourth to all injury associated mortalities³. According to World Health Organization (WHO), yearly 5 million mortalities occur due to injuries which makes 9% of the global deaths, which is approximately 1.7 times the fatalities that occur on ac-

^{1,3,4,6}Department of Surgery, Abbasi Shaheed Hospital and Karachi Medical and Dental College

⁵Department, Civil Hospital Karachi

Correspondence: Dr. Aqsa Ismail
Department of Surgery, Abbasi Shaheed Hospital
and Karachi Medical and Dental College
Email: aqsasmile@hotmail.com

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count of tuberculosis, malaria and HIV⁴. In developing countries, trauma is considered as the leading preventable cause of mortality. Globally, nearly 1.3 million people die due to RTA annually and 78.2 million injuries occur and the burden is increasing in lower and middle income countries with 6 times higher mortality risk in developing countries⁵. It has been also estimated that annually 8.1 million people will die due to injuries by the year 2020 and worldwide among all causes, RTA will be the third highest causes of disability while it will account for second highest disability causes in developing countries⁶.

Abdominal region is predominantly exposed to injury and thus a frequently experienced challenge in practice of surgery. Literature documents that globally, abdomen is the third most frequently injured organ due to injuries. Among all abdominal injuries 25% of the cases require surgical exploration and 85% of them are cases of blunt abdominal trauma⁷. Solid and visceral organs are injured as a result of BAT. The presentation of these groups widely differ from various aspects. Commonly liver and spleen are involved and manifest with signs of internal haemorrhage. Hollow viscus injury following BAT is rarely diagnosed. There is 4%-15% variation in incidence of hollow viscus injuries following BAT⁸.

BAT is frequently dealt in emergency room that makes 80% of abdominal injuries and cause of considerable morbidity and mortality⁹. Blunt abdominal trauma is an emergency condition in which patient may get an immediate threat to life due to the hemodynamic instability. Males tend to be more affected than females. About 13% cases of intra-abdominal injuries are encountered in emergency department among patients who present with BAT which increases the healthcare cost¹⁰. There is an alarming rise in BAT due to increase in population which relies on motor vehicle for routine transportation. Blunt abdominal trauma (BAT) may also occur due to sports injuries, fall from height, bomb blasts and assault with blunt objects.

There are no anatomical boundaries in traumatic injuries. More than single regions may be involved concurrently, thus extensive examination is

needed for patient management. Patients with BAT are overall considered as a poor group of patients from aspect of management. Commonly, BAT is missed because it is usually not obvious unless examined multiple times. Diagnosis delay and insufficient management of abdominal injuries may become lethal. Presence of other injuries may divert the tension of treating surgeon from appropriate examination and factors such as delay in reaching to the facility, mental status of patient further increases difficulty to diagnose.

Injuries occurring due to BAT are related with substantial morbidity and mortality in spite of advancement in rescue and management techniques. Frequently injured organs are liver and spleen whereas other organs that may also be injured include urinary bladder, kidneys, pelvis, urethra and vascular injuries. A study found that in their series of 35 patients with TBI, the incidence of organ injury in blunt abdomen trauma was liver injury found the most commonest 10 (30.3%), spleen injury 9 (27.27%), gut injury 7 (21.21%) and pancreas 1 (3.03%), respectively.

According to Weiner and Barrett in civilians, blunt trauma is caused primarily by road traffic accidents (75%) and falls (10%). Similarly, in other studies, road traffic accident is also the commonest mechanism of injury as compared to falls and blows to abdomen¹¹. Another study reported that males were predominantly affected in blunt abdominal injuries and road traffic accident (RTA) was the commonest injury mechanism while common injury site was ileum. A local study conducted in Karachi reported that the frequently injured organs were intestine (47.94%), liver (26.4%), spleen (20.7%), mesentery injuries (15%), pancreas (6.4%) and stomach (5.7%)¹². But in other study, this pattern is deviated such that liver (36%), followed by spleen (32%) and kidney (24%)^{13,14}.

In present era of speed and road traffic accidents, there is rise in BAT because of modern industrial age which is leading to growth in high-speed automobiles and their production; and formation of explosive compounds able to produce massive compression forces which have influence

on human bodies. According to World Health Organization (WHO), globally by end of year 2020 trauma will be ranking as top most and second most leading cause of loss in individual's productive years¹⁵.

Unidentified intra-abdominal injury is a frequently occurring cause for preventable death in patients presenting with BAT. In addition to this, assessment of patient with abdominal trauma may be challenging for a surgeon. Therefore, the present study was designed to determine the frequency of intra-abdominal solid visceral injuries in adults presenting with BAT to initiate and plan appropriate interventions required to reduce associated morbidity and mortality.

Patient and Methods

The current descriptive cross-sectional study was carried out at Department of Surgery, Abbasi Shaheed Hospital during March, 2016 to September, 2016. Ethical approval was sought from Hospital Ethics Committee to conduct the research. Study purpose was explained to patients to obtain their consent before enrolling them into the study. Patients of both the gender of age 15 - 65 years who presented to hospital within 3 days of injury due to abdominal trauma were included in the study. Patients presented with penetrating trauma and those who expired during resuscitation were excluded from study. Children with blunt trauma who were already on follow-up were also excluded. Taking prevalence of kidney injury in patients with BAT (7.4%) with population size of 1 million¹⁴, 95% confidence interval and 4% margin of error, the calculated sample size was 165. Non-probability consecutive sampling technique was used to recruit study participants. Sample size was calculated using WHO sample size calculator.

Trauma patients presented to emergency department were firstly resuscitated at trauma management room in accordance with the Advance Trauma Life Support (ATLS) guidelines. All patients were investigated by x-ray examinations & ultrasound FAST scan for diagnosis when admitted to emergency as per standard procedure. After per-

forming first resuscitation and considering the hemodynamic stability, patients were carefully assessed. Further investigations such as diagnostic peritoneal lavage and CT Scan abdomen were done based on clinical finding. Physical examination and abdomen examination findings included abrasions, bruising on abdomen, localized or generalized tenderness. Intra-abdominal solid viscus injuries were documented on ultrasound in hemodynamically stable patients and laparotomy findings in unstable patients. Patients' clinical and demographic characteristics that included age (in years), gender, socio-economic status, mechanism of injury and injured organs were recorded on pre-designed pro forma.

Categorical variables were expressed as frequency with percentage. Mean \pm standard deviation was used to summarize continuous variables. Data analysis was performed on SPSS version 21.

Results

Total 165 patients were recruited into the study with average age of study participants was 35.77 \pm 13.95 years. Out of 165 participants, majority were males (n=133, 80.6%) while females were 32 (19.4%). Blunt trauma was frequent in lower class (n=78, 47.3%). Out of 165, 73 (44.2%) patients were from middle class whereas trauma was less prevalent in upper class (n=14, 8.5%). The most common injured organ was kidney (n=60, 36.36%) followed by liver (n=57, 34.54%), spleen (n=47, 28.48%) and pancreas (n=34, 20.61%). Most of injuries occurred due to road traffic accidents (n=92, 55.7%). Fifty (30.30%) patients got injury due to fall from height and 23 (13.93%) cases occurred due to assault.

Table 1.

Variables	Mean \pm Standard Deviation or Frequency (%)
Age (in years)	35.77 \pm 13.95
BMI	38.37 \pm 6.96
Gender	
Male	133 (80.6)
Female	32 (19.4)
Socio-economic status	
Low	78 (47.3)
Middle	73 (44.2)
High	14 (8.5)

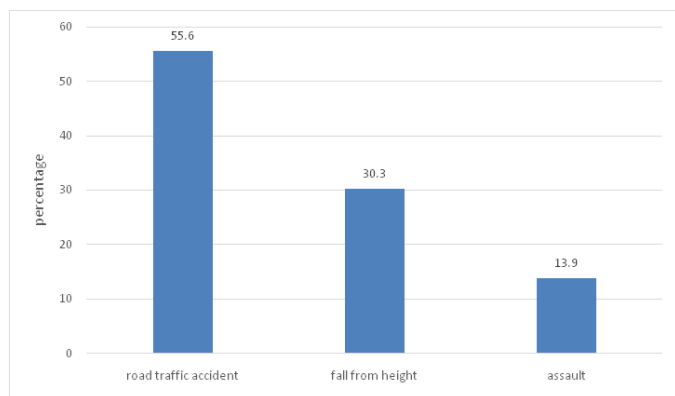


Fig 1. Mode of injury

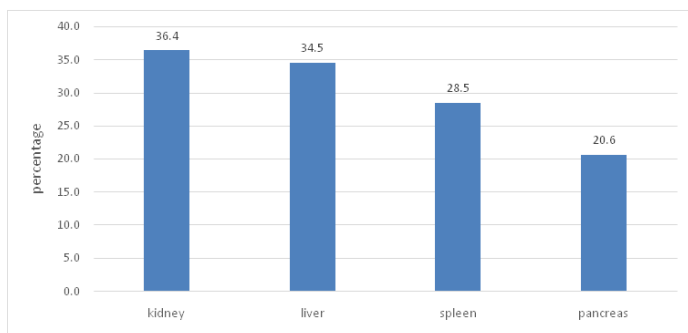


Fig 2. Frequency of injured organs

Discussion

Abdomen ranks as third most frequently injured body region and approximately quarter of such patients need abdominal exploration. Generally abdominal injuries may occur due to penetrating or blunt trauma and about 7% to 10% of deaths occurred as a consequence of these injuries². BAT known as a potential cause of mortality and morbidity in people of any age. A review from Singapore described trauma as the leading cause of death in those aged 1-44 years. Blunt abdominal trauma makes 79% of all cases¹⁵. The same is reflected in our study. Most of the patients had age range of 16-32 years. One possible explanation for affecting young population is that considerable number of industrial and road trauma usually occur in young population in low middle-income countries such as Pakistan. In addition to this, a high proportion of the population in Karachi uses motorcycles that expose them to a higher risk of road traffic injuries. A

study conducted in Qatar enrolled 6888 trauma patients, out of which 15% had abdominal trauma. The commonest injured organ was liver (36%) followed by spleen (32%) and kidney (18%)².

A review from adult trauma databases reveals that blunt trauma is the important basis of intra-abdominal injury and that motor vehicle accidents are the commonest mode of injury. Blunt injuries nearly contributes to two thirds of all occurring injuries¹⁵. In the current study, male gender was dominant with 80% proportion. Predominance of males has been seen in many studies which was alike to our study findings², .

The initial hours after injury are of much significance for time referral and management and hence patient's survival. BAT causes injuries in which single or multiple organs can be affected which are mutilated in nature. The clinical presentation varies from case to case, depending on the mechanism, site and extent of injury, associated extra-abdominal injuries and any underlying co-morbidities. A patient may present with minor complaints of abdominal pain on one extreme and profound shock on the other. Due to variations in presenting symptoms, it becomes difficult to diagnose and manage them. In addition to this, the clinical evaluation is masked by other obvious external injuries.

In our study, all the patients had some degree of abdominal pain, however, shock occurred in 60% of patients. Careful consideration to physical outcomes benefits in decision making and appropriate sequencing of diagnostic tests. The study conducted in India enrolled 100 consecutive cases of blunt abdominal injury. Sharma et al reported in his study that liver was the most affected organ followed by kidney, mesentery, spleen and small intestine¹³. In our study, the most frequent injured organ was kidney followed by liver, spleen and pancreas. However, another similar study conducted in Karachi reported the most frequent injured organs were intestine followed by liver, spleen, kidney, pancreas and stomach¹².

Abdominal pain, peritoneal signs and tenderness were the most consistent findings in awake and hemodynamically stable patients with isolated BAT and almost 90% of such kind of injured patients present with these findings. However, numerous studies reported that even in such patients, substantial injury may be overlooked with physical exam alone. Hence, nonappearance of physical findings does not exclude injury and the prerequisite for further surveillance and diagnostic testing¹⁶.

Salim and co-workers published a study in 2006. They studied 592 cases of significant blunt multisystem trauma with no visible abdomen or chest injuries. They were all hemodynamically stable, and underwent a standard abdominal physical examination. Out of them, 19.6% exhibited clinically meaningful findings on chest computed tomography (CT) and 7.1% on CT abdominal that led to alteration in clinical management plan in nearly 19% of patients¹⁶.

In a study, 772 blunt trauma patients underwent FAST scans, 29% confirmed abdominal injury cases were found to have no hemoperitoneum on FAST or CT scan¹⁷. Hence, the dependence of hemoperitoneum as the exclusive indicator of abdominal visceral injury restricts the usefulness of FAST as a diagnostic screening tool in hemodynamically stable patients having BAT and CT scanning may be essential to additionally display the injuries. For the purpose of identifying patients who could have more advantage of FAST examinations in trauma, it was observed that ultrasound was highly sensitive and specific in patients having hypotensive BAT.

Stable patients exhibiting negative findings on FAST require strict monitoring, serial abdominal examinations, and a follow-up FAST examination (if resources permit). However, an option to CT scan investigation should also be considered, particularly in case of intoxicated patient or having associated injuries.

Hemodynamically unstable patients with negative FAST pose a diagnostic challenge. Other

existing diagnostic choices in this condition are exploratory laparotomy, DPL, repeated FAST and feasibly, a CT scan following aggressive resuscitation. Operative management is not specified in every patient with positive FAST results. Hemodynamically stable patients with positive FAST findings may need a CT scan to define the nature and degree of their injury more appropriately.

It was observed in a study conducted on hemodynamically stable patients that 40% patients required intensive care and complication occurred in 25% of the patients with intra-abdominal abscess as a common complication¹⁸. In another study by Croce M A et al, over a 22 months period, patients with blunt hepatic injury were assessed prospectively¹⁹. A total of 136 had blunt hepatic trauma. Out of these 24 (18%) underwent emergent investigation. Of the remaining 112 patients, 12 (11%) failed observation and underwent laparotomy. The remaining 100 (81%) patients were successfully managed without exploration. Currently, non-operative treatment of isolated blunt hepatic and splenic injury is taken as the standard care for hemodynamically stable individuals²⁰.

Substantial improvement has been made in non-operative treatment of solid organ injuries. Presently, non-operative management of isolated blunt hepatic and splenic injury is taken as the standard care for hemodynamically stable individuals. A prospective study carried out at Imam Khomeini Hospital in Iran, 98 patients were selected for non-operative management of renal, hepatic and splenic injuries. The success rate of non-operative management (NOM) was 93.8%. 51 patients underwent NOM of splenic trauma, 38 patients of hepatic trauma and 9 patients of renal trauma. The success rates of this treatment were 94.1%, 94.7% and 88.8% for spleen, liver and kidney respectively. It was concluded that NOM may be successfully carried out for the hemodynamically stable patients having solid organ blunt trauma²¹.

In another study by Notash A Y et al, 320 consecutive patients with splenic injury were studied retrospectively. Total 188 patients went directly to

operative room and 132 patients were admitted with the aim of non-operative management for strict monitoring. Out of these 31 underwent laparotomy while 101 patients were managed successfully conservatively²². Most studies regarding NOM are, however, are designed and conducted in specialized hospitals with high skilled human resources, surgical ICU and extensive minimally invasive or endoscopic facilities. However, in our study NOM was carried out in a hospital with scarcity of ICU beds, surgical staff not wholly had the experience of working on trauma and inadequate access to percutaneous or endoscopic methods. Thereby, the number of patients with successful NOM would have been more if we had these facilities. Out of 13 patients detected of having splenic injury 5 were managed successfully non-operatively. Out of 2 patients with renal injury, one was operated while the other one was managed conservatively. None of the patient needed conversion from conservative to operative management.

Blunt trauma that occurs due to motor cycle and vehicle accidents, falls, pedestrians struck and assaults is the common mode of injury. It has also been estimated that globally by 2030, injuries associated with road traffic accidents will be fifth potential cause of mortality and third potential cause of disability with 90% cases happening in developing countries with annual global cost of US\$ 51823. In Pakistan, death rate of RTA is 20.22% and is the 15th leading causes of death²⁴. Growing population of the city uses motor vehicles and other heavy vehicles which increases the burden of road traffic accidents. Robberies and social violence is also responsible for rising incidents of trauma in the city. Moreover, injuries associated with gunshots and other penetrating trauma also prevail which increases the burden of such incidents. The similar pattern is reflected in our study as the most common mode of injury was road traffic accident and most of the cases occurred among low socio-economic status. The study conducted in Qatar also reported that the most frequent injury mechanism was RTA (61%).

One of advantages of our study is that this is one of the very few reports on blunt abdominal trauma from our local setting as well as national level. Though this was a descriptive study detailed information on presentation as well as investigations and laboratory work up was collected.

This was a cross-sectional study which has some limitations. The findings could have been more useful with a large trial comparing management modalities or risk factors of complications of blunt abdominal trauma and mortality due to it.

Injury is a very painful and difficult condition for anyone. Blunt abdominal injury is always accidental from various sources including RTAs etc. With advocacy and behavioural education, we can minimize the incidence of injury in the community. Respect for traffic laws can be a helpful change in driver behaviours. Domestic and social violation can be diminished with better and equal education opportunities for all in the society. Well civilized people can be a role model in this regard.

Conclusion

Careful attention to physical findings and proper sequencing of diagnostic tests is helpful in the appropriate decision making which may prevent associated morbidity and mortality in accordance with Advance Trauma Life Support (ATLS) guidelines.

Conflict of Interests

Authors have no conflict of interests and received no grant/funding from any organization.

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