

## A CLINICAL STUDY ON BLUNT TRAUMA ABDOMEN WITH RESPECT TO MANAGEMENT AND OUTCOME

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Received : 27/06/2024  
Received in revised form : 14/08/2024  
Accepted : 29/08/2024

**Keywords:**

Blunt trauma abdomen; Liver; Spleen; Early diagnosis; Road traffic accidents.

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DOI: 10.47009/jamp.2024.6.4.159

Source of Support: Nil,  
Conflict of Interest: None declared

Int J Acad Med Pharm  
2024; 6 (4); 806-811



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### Abstract

**Background:** Trauma is a primary contributor to both disability and mortality on a global scale. Urbanization, motorization, industrialization, and changes in socio-economic values are occurring in countries worldwide. These factors contribute to Road Traffic Accidents (RTAs), which rank as the third most prevalent type of accidents, following orthopedic injuries and brain injuries. The incidence of abdominal blunt trauma is rising in the emergency department, underscoring the criticality of prompt diagnosis and treatment for patients. **Aims:** Study of the mode and nature of injury and involvement of various abdominal organs, examination modalities and their treatment with regard to conservative and surgical modalities in patients with morbidity and mortality among blunt abdominal trauma patients. **Materials & Methods:** This study was conducted in Department of Surgery, Hind Institute of Medical Sciences, Barabanki on 151 patients who sustained abdominal trauma. Patients who have sustained blunt abdominal trauma were admitted and treated in the Hind Hospital with regard to clinical picture, examination, treatment and outcome. The results and outputs are displayed in different tables. **Results:** Demographic data such as age and gender, mode of injury, presenting Hb (in gm%), commonly injured organs, treatment performed and associated mortality were observed and compared in this study. RTAs was found to be the most common mode of injury which involved young men in the 21-30 age group. The spleen was the most frequently injured solid organ followed by Liver. Hollow viscus injuries was less frequent than Liver and splenic injury. Conservative treatment was done in 113 out of 151 patients. Mortality was observed in 11 of 151 cases. **Conclusion:** The study concluded that the most commonly affected group was young men who underwent blunt abdominal trauma because of RTAs. It was also conclusive that the spleen and liver are the most frequently injured organs in blunt abdominal trauma. It is proved beyond doubt that nonoperative management is excellent in hemodynamically stable patients and patients with isolated, low grade solid organ injury with monitoring for symptoms of peritonitis and hemodynamic instability, increases nonoperative management and minimizes undesirable laparotomies and morbidity related to it.

## INTRODUCTION

Currently, trauma has emerged as the primary factor contributing to disability and mortality on a global scale. Nations globally are experiencing significant urbanization, motorization, industrialization, and

shifts in socio-economic values. India is likewise experiencing a similar evolving trend. As a consequence of these modifications, RTAs have emerged as the foremost global peril, posing one of the most significant risks to human lives and

safety.<sup>[1]</sup> India is the leading country in the number of deaths due to road accidents.

RTAs is the most common cause of abdominal injuries. Other causes of abdominal injuries are assault and fall from height. The most commonly injured organ is the spleen, followed by the liver and small intestine.<sup>[2]</sup> In hemodynamically unstable patients, surgical procedures must be performed urgently.<sup>[3]</sup>

An initial assessment of the entire patient is essential before focusing on a specific anatomical area where a traumatic injury is apparent. The initial evaluation concept includes the following components is rapid primary survey, resuscitation, detailed secondary survey (evaluation), and re-evaluation.<sup>[4]</sup>

Ultrasound has become a nearly ubiquitous technology in emergency departments and has found routine application in the assessment of intra-abdominal haemorrhage following blunt trauma. If FAST examination capabilities are unavailable, ATLS recommends performance of diagnostic peritoneal lavage. Technological advancements and increased availability of CT over the past two decades have made it the primary method for comprehensive workup of the blunt trauma patient. This technique provides the necessary visualization of the solid organs to allow the determination of injury severity, including the presence of active bleeding. Imaging findings prompt management decisions, such as the need for operative, nonoperative, or angiographic management.<sup>[5-7]</sup> Severity of organ injury was graded according to the American association for the surgery of trauma (AAST) scale. The injury is classified by imaging, operative, or pathologic criteria.<sup>[8]</sup>

Early mortality after abdominal trauma is usually due to bleeding. Concealed haemorrhage and missed abdominal injuries are a common cause of morbidity and late mortality in patients who survive early period after injury. Strict vigilance and early initiation of proper therapy leads to a reduction in morbidity and mortality.<sup>[9]</sup>

#### **Aim**

To establish the role of early diagnosis and early management in blunt abdominal trauma patient, in improving the outcome.

#### **Objectives**

- To study the mode of injury, pattern of injury and the involvement of various abdominal organs.
- To study the various investigations modalities and their application in the management of blunt abdominal trauma.
- To study the post-traumatic management with respect to conservative and surgical modalities in patients of blunt abdominal trauma.
- To study the morbidity and mortality among blunt abdomen trauma patients.

## **MATERIALS AND METHODS**

**Methods:** This study was conducted in the Department of General Surgery, Hind institute of medical sciences, Barabanki, on the 151 subjects who sustained abdominal injury. Patients who sustained blunt trauma abdomen was admitted and managed at hind hospital. After physical examination, detailed clinical history, X-rays, and laboratory tests, ultrasonography was done to arrive at the diagnosis. Demographic data collected including the age, sex, occupation, and nature, mode of injury and time of injury. Informed consent was obtained from all the participants.

#### **Material**

Hind Institute of Medical Sciences, Safedabad, Barabanki, Up

**Study Design:** Descriptive cross-sectional study

**Study Period:** 1 year

**Sample Size** -151

Sample size is calculated by using Cochran's formula<sup>(10)</sup>

$$n = z^2 \frac{p(1-p)}{E^2}$$

n is sample size z is the Z-score

p is Prevalence of proportion

Z $\alpha/2$ =Critical value of standard normal distribution

$\alpha$  at level of significance E= Margin of error

$$n = z^2 \frac{p(1-p)}{E^2} P = 89.8\% = 0.898$$

$$E = 10\% = 0.10 \text{ (Absolute margin of error)} n = (1.96)^2 \times 0.898 (1-0.898) / (0.1)^2$$

$$n = 151$$

#### **Inclusion Criteria**

Age >12 years, all abdominal trauma case, all gastrointestinal tract injuries (stomach, small intestine, large intestine, liver, spleen, diaphragm, mesentery).

#### **Exclusion Criteria**

Retro-peritoneal injuries, penetrating trauma, associated severe chest/ head/ musculoskeletal injuries which needing emergency surgical intervention.

#### **Statistical Analysis**

The analysis was done using SPSS -26.0. Categorical variation was present in frequencies and percentage was continuous data was present in mean  $\pm$  standard deviation. The chi square test was use to compare the categorical variable. The P value <0.05 was consider as statistical significance.

## **RESULTS**

A total of 151 patients were enrolled and the observations were interpreted in form of charts and tables. Majority of patients sustaining blunt abdominal trauma belonged to 31-40 (out of 151 patients 59 [39.1%]) years of age followed by 21-30 years (out of 151 patients 44 [29.1%]). Mean age was  $32.1 \pm 5.9$  years. This study included 151 patients with blunt abdominal injury out of which 125 patients (82.8%) were males and 26 (17.2%)

were females. Males were most commonly involved.

RTAs was observed to be the most common mode of injury 92 patients (60.9%), followed by fall from height 33 patients (21.9%), then assault 11 patients (7.3%), bull gore injury noted in 6 patients (4%), and other includes trauma by heavy objects 9 patients (6%). The most common presentation at the time of admission was abdominal pain (90.06%) followed by Shock and abdominal distention (30.46%) with haematuria (6.62%) being the least common cause.

It was observed that out of 151 patients, 136 (90.1%) had single organ injury and 15 patients (9.93%) who had multiple organ injuries. Out of 151 patients 113 (74.8%) patients were managed conservatively while 38 (25.2%) patients were managed by surgical intervention. In which 140 (92.7%) patients survived and 11 (7.3%) patients succumbed to death. And hemodynamic instability was seen in 36 (23.8%) patients while 115 (76.2%) patients were hemodynamically stable.

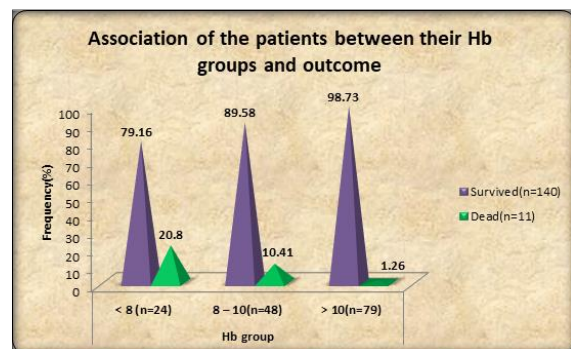
X ray abdomen erect, and FAST was done in all patients enrolled and pneumoperitoneum was observed in 16 (10.59%) patients as X Ray findings and hemoperitoneum was seen in 118 (78.14%) patients while, Solid organ injury was found in 117 (77.48%) patients in FAST. CECT whole abdomen was done in 112 patients which revealed splenic injury in 61 (40.39%) patients, liver injury in 45 (29.80%) patients, hollow viscous injury in 2 (1.32%) patients, bladder injury in 8 (5.29%) patients and multiple injuries in 6 (3.97%) patients.

Out of 113 patients who were managed conservatively, 6 patients died, 4 patients died due to haemorrhagic shock and 2 patients died due to septic shock. And out of 38 patients who were managed surgically, 5 patients died, 3 patients due to septic shock (60%) and 2 patients due to acute respiratory distress syndrome (40%).

Out of 151 patients 38 patients managed surgically. most common complication encountered in this study was SSI in 24 patient (63.2%) of total 38 patients. Wound dehiscence was seen in 12 patients (31.6%) of total 38 patients. Anastomosis was done in 4 patients out of which anastomosis leak was seen in 1 patient (2.6%). Stoma was done in total 9 patients out of which 4 patients (10.5%) had skin excoriation, and other complications such as prolapse (2.6%), retraction (2.6%) and necrosis (2.6%) was observed in other patients.

Out of 11 mortality, significantly higher mortality seen in 6 patients (54.5%) who were admitted after 48 hours of injury followed by 3 patients (27.3%) who were admitted between 24 to 48 hours and no mortality was observed in patients admitted within 24 hours of injury. A mortality rate in 2 patients (18.2%) was seen who were admitted after 1 week of injury. A significant reduction in mortality was observed in patients admitted early post injury. [Table 1]

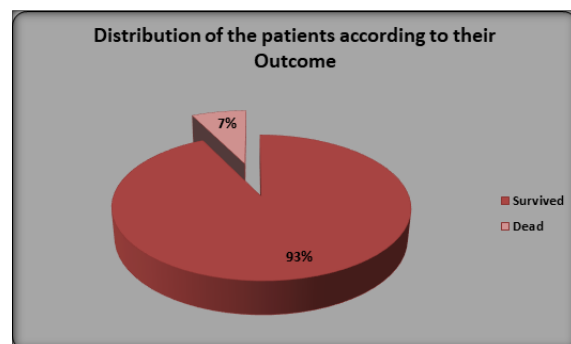
Out of 11 mortality, rate was significantly higher mortality rate was seen in patients with Hb level less than 10 gm% (90.9%). Significant association can be established between Hb levels and outcome of patients. [Table 2]



**Figure 1: Association of the patients between their Hb groups and outcome**

Out of 36 hemodynamically unstable patients, 11 (30.6%) patients had mortality and in stable patients no mortality was observed. Significant association can be established between Hemodynamic condition and outcome of patients. [Table 3]

Out of 151 patients, 140 (92.7%) patients survived and 11 (7.3%) patients succumbed to death. [Table 4]



**Figure 2: Distribution of the patients according to their Outcome**

Out of a total of 11 mortalities Splenic injury patients had the mortality rate of 7.35%, with 5 deaths out of 68 patients. Liver injury patients had a mortality rate of 9.30%, with 4 deaths out of 47 patients. Hollow viscous organ injury patients had the mortality rate of 7.6%, with 1 death out of 13 patients. Multiple organ injuries had a mortality rate of 6.7%, with 1 death out of 15 patients.

Both survival (92.64%) and mortality (7.35%) was highest in single organ injury as the number of cases were significantly high in single organ injury as compared with multiple organ injury. No significant association between organ involved and outcome was found.

[Table 5]

**Table 1: Association between their time of admission and outcome of the patients (n=151)**

Latent time of admission (n=151)		Outcome			
		Survived (n=140)		Dead(n=11)	
		Number	( % )	Number	( % )
	1 - 24 Hrs(n=16)	16	100.0	0	0.0
	24 - 48 Hrs(n=86)	83	96.5	3	3.48
	48 Hrs - 1 week(n=33)	27	81.8	6	18.18
	> 1 week(n=16)	14	87.5	2	12.5

Fisher- Exact Test = 8.240; p = 0.023 [Significant]

**Table 2: Association of the patients between their Hb groups and outcome (n=151)**

Hb group (n=151)		Outcome			
		Survived(n=140)		Dead(n=11)	
		Number	( % )	Number	( % )
	< 8(n=24)	19	79.16	5	20.8
	8 - 10(n=48)	43	89.58	5	10.41
	> 10(n=79)	78	98.73	1	1.26

Fisher- Exact Test = 11.182; p = 0.002 [Significant]

**Table 3: Association of the patients between their hemodynamic condition with outcome (n=151)**

Hemodynamically (n=151)		Outcome			
		Survived(n=140)		Dead(n=11)	
		Number	( % )	Number	( % )
	Stable (n=115)	115	100.0	0	0.0
	Unstable (n=36)	25	69.4	11	30.6

Chi square Test = 37.900; p = 0.000 [Significant]

**Table 4: Distribution of the patients according to their Outcome (n=151)**

Outcome	Number		( % )
	Survived	Dead	
	140	11	92.7
			7.3

**Table 5: Association between organs involved in injury and number of organs involved with outcome of the patients (n=151)**

Organs Involved		Outcome			
		Survived(n=140)		Dead(n=11)	
		Number	( % )	Number	( % )
Organs involved in injury (n=151)	Spleen(n=68)	63	92.64	5	7.35
	Liver(n=47)	43	91.48	4	9.30
	Hollow viscus injury (n=13)	12	92.30	1	7.6
	Urinary Bladder(n=8)	8	100.0	0	0.0
	Multiple organ(n=15)	14	93.33	1	6.66
Fisher- Exact Test = 0.590; p = 1.000 [Not Significant]					
Number of Organs involved	Single(n=136)	126	92.64	10	7.35
	Multiple(n=15)	14	93.33	1	6.66
Fisher- Exact Test; p = 1.000 [Not Significant]					

## DISCUSSION

Trauma is still a leading cause of a significant number of emergency visits globally. Abdominal trauma contributes significantly to the morbidity and mortality of trauma patients. This study on blunt trauma abdomen with respect to management and outcome was carried out to know the nature and mode of injury, organ involvement, clinical presentation, various investigation modalities, operative procedures, post-traumatic management, and the outcome in Blunt Trauma Abdomen. A variety of operative procedures were adopted depending on patient general condition, peritoneal contamination, site of pathology, gut viability, and surgeons' decision.

In our study it was observed that majority of patients presented with blunt abdomen trauma were males with age between 21-40 yrs. This shows that trauma

is more common in young age group. Maximum range between 12-69 years with average age of 34year. Our study was comparable with study done by Goyal et al,<sup>[11]</sup> where maximum number of cases were in the third and fourth decades of life (18-40Yr). Most cases in their study were between 26-40 years age group. Rajkumar P.N et al,<sup>[3]</sup> also found that predominant age group involved were from age group of 31-40 years followed by 21-30 years. In our study Male to female ratio was 4.8:1 (males were 5 times more commonly involved than females).

In our study majority of patients (90%) presented with complaint of abdominal pain which was similar to Tandon et al,<sup>[12]</sup> where 96% patients presented with abdominal pain.

In our study RTAs was the most common cause of injury (60.9%) followed by fall from height (21.9%) and assault (7.3%). This finding was consistent with

study done by Goyal et al,<sup>[11]</sup> where RTAs (62%) was most common cause followed by fall from height (22%) and assault (16%). A study done by Agrawal et al,<sup>[2]</sup> also found RTAs (48%) being the most common cause for blunt abdominal trauma followed by assault (30%) and fall from height (22%).

Early hospitalisation plays a key role in overall outcome of patients. In our study 57% patients presented to hospital between 24-48 hours followed by 21.9% between 48 hours-1 week and about 10.5% in both first 24 hours and after 1 week, on contrary to study done by Rajkumar PN et al,<sup>[3]</sup> where 60% patients presented to hospital within first 4 hours with mean time from injury to surgery being 13 hours 45 mins and made conclusion that earlier presenting time and management resulted in better outcome of patients. This was probably due to differences in proximity of hospital for general population and health awareness among patients.

Various radiological modalities are being utilised for early diagnosis and management of blunt abdominal trauma patients. FAST is portable non-invasive investigation, usually the first line of investigation for quick visualisation of abdominal structures in emergency settings. FAST has shown to be sensitive (79-100%) and specific (95-100%) by several studies. FAST was utilised in all 151 patients where it revealed hemoperitoneum in 78% patients and solid organ injury in 77.5% patients. Other radiological investigation instituted were X-ray abdomen (erect) which showed pneumoperitoneum in 10.6% patients. CECT was done in 112 patients out of 151 patients.

Spleen (45%) was the most common organ injured, with Grade-II being most common (18.6%) and Grade IV being most fatal (45.5% of total mortality). Liver was the second most common organ injured (31%), with Grade II and III (37.2% each) being most common, while maximum mortality (27.3% of total mortality overall) was observed in Grade IV liver injury patients, these findings were consistent with study done by Pallavi et al,<sup>[13]</sup> where splenic injury was noted in 44% followed by liver injury in 36%. While Goyal et al,<sup>[11]</sup> found liver (27%) to be most common organ injured followed by splenic (22%).

Our study revealed hollow viscus injury in 13 patients with most frequent incidence being in Grade-II (7 patients) along with maximum mortality observed in Grade-II hollow viscus injury patients. Urinary bladder injury was noted in 8 patients where no associated mortality was noted.

Assessment of trauma patients starts with Airway, Breathing and Circulation (ABC). For hemodynamically stable patients diagnostic evaluation like CT scan is utilised to assess abdominal and pelvic injuries. While FAST or Extended FAST is utilised for unstable patients. After primary survey fluid resuscitation is done in hypovolemic patients. If clinical signs worsen immediate laparotomy is done.

In our study 76% patients were hemodynamically stable while 24% patients were unstable in contrast to the previous study done by Tandon et al,<sup>[12]</sup> where 83% patients were unstable and 17% patients were stable.

Haemoglobin-level plays a very important role in overall outcome of patient, low haemoglobin levels contribute to poor survival rate in patients with blunt abdominal trauma. Out of 11 mortalities in our study, a cumulative of 91% patients had haemoglobin level below 10 gm%. Patients who had Hb-level below 8 gm% had survival-rate of 79%, those with Hb-level between 8-10 gm% survival rate improved to 89.5% and patients with Hb-level more than 10 gm% had survival rate of 98.7%. Agrawal et al,<sup>[2]</sup> also observed that out of 6% mortality all had haemoglobin level below 8 gm%.

In our study about 75% patients were managed conservatively and 25% required emergency exploratory laparotomy. Similar findings were observed in Rajkumar PN et al,<sup>[3]</sup> where 80.8% patients were managed conservatively and remaining 19% underwent immediate surgery. Goyal et al,<sup>[11]</sup> reported conservative management in 59% patients and 41% were taken for immediate surgery. On contrary Tandan et al,<sup>[12]</sup> study noted 83% patients requiring surgical intervention and rest 17% were managed conservatively. This variation in management can be explained by difference in severity of cases and other factors which ultimately decide the line of management.

Patients with delayed management of blunt abdominal trauma or incorrect diagnosis can lead to poor prognosis. Complications associated with poorly managed blunt abdominal trauma includes Sepsis, Cardiopulmonary failure, splenic rupture, shock and death. In our study the most common complication encountered was SSI (63%) followed by wound dehiscence (31%), which was similar to Rajkumar PN et al,<sup>[3]</sup> where the most common complication was SSI (11.8%).

In our study 92.7% patients were managed well and discharged. Overall mortality of 7.2% was observed, mostly below 40years of age with male predominance, similar results were observed in the study done by Tandon et al,<sup>[12]</sup> with mortality of 8.5%, majority in patients below 30years of age with male predominance. Another study done by Pallavi et al,<sup>[13]</sup> also showed a mortality of 6% with maximum mortality between age 20-30 years although mortality was higher among female patient, however the association between gender and outcome was insignificant.

The most common cause of mortality was found to be Septic shock (45.4%) followed by hypovolemic shock (36.3%) and ARDS (18%) in our study, Rajkumar PN et al,<sup>[3]</sup> also observed septic shock (45%) to be the most common cause of mortality followed by ARDS and hypovolemic shock. Goyal et al,<sup>[11]</sup> demonstrated mortality of 11% with cardiopulmonary failure being the most common cause 45%.

On analysing the data, it was observed that outcome of patients is strongly influenced by certain factors such as Time of admission in hospital ( $p=0.023$ ), Haemoglobin levels ( $p=0.002$ ), and hemodynamic condition of patients ( $p=0.000$ ) all of these factors shows significant association with outcome of patients. While demographic properties of patients, associated organs injury and type of management of patients does not influence the outcome of patients.

## CONCLUSION

Blunt abdominal trauma poses significant economic burden on population as the majority of patients involved belongs from productive age group with male predominance. Increase in blunt abdominal trauma cases are because of motor vehicle accidents which were found to be more common among 21-40 years of age. Latent time of presentation to hospital is another factor that influence the overall outcome of patients and early hospitalization must be encouraged in such patients. Initial resuscitation with appropriate Radiological assessment (FAST, X-ray abdomen and CT scan) for extent of injury and timely management plays crucial role in overall outcome of patient. Clinical presentation of patients can be varied and confusing. Trauma surgeon should rely on his physical findings in association with these modalities for better correlation. Hemodynamically stable patients can be opted for conservative management and is associated with better outcome. Surgical management should be reserved for patients with hemodynamic instability or with significant radiological findings.

Major limitation in this study is that large proportion of patients presented with road traffic accident mainly affecting male population of age group 21-40 years. However, this does not mean that blunt abdominal trauma is having significant association with age or gender as productive age group is more at risk of RTA. Majority of patients in this study presented late to the hospital which posed significant effect on outcome of patients.

Another limitation of this study is that association of multiple organ involvement with outcome was not significant due to more involvement of low-grade injury (grade 1 or 2) which was managed conservatively.

**Acknowledgment:** The authors wish to acknowledge the expresses gratitude to people who contributed to the work.

**Conflicts of interest statement:** Nil.

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