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Prospective study of blunt abdomen injury

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Abstract

Background: Blunt Abdominal trauma is one of the most common injury due to various causes of which road traffic accident was found to be the most common cause followed by assault and Fall from height. Concealed hemorrhage and missed abdominal injuries are found to be the cause of increase in morbidity and mortality.

Aims: To evaluate the impact of blunt abdominal trauma on solid and hollow viscera, etiology, various modes of presentation, treatment modalities and outcome.

Study design: This is a Prospective study done between October 2019 to September 2021 which includes 50 patients admitted in RMMCH Chidambaram Detailed clinical history, examination, various modalities of investigations, appropriate treatment and follow up was done in these patients.

Results: Male population between 26-40 years were the most affected among all. Most common cause was road traffic accident. Majority of the patients had small bowel injury. Conservative management was done for 46% patients and 54% patients underwent operative management.

Conclusion: As a result of continuous serial monitoring and appropriate management, many patients recovered without any complications. This implies that early transportation, diagnosis and initiation of treatment will result in better outcome of the patient.

Keywords: blunt abdominal trauma, USG, solid organ injury, hollow viscus injury, road traffic accident

Introduction

Abdominal trauma is one of the most common causes among injuries caused mainly due to road traffic accidents. The rapid increase in motor vehicles and its aftermath has caused rapid increase in number of victims to blunt abdominal trauma. Motor vehicle accidents account for 75 to 80% of blunt abdominal trauma. Blunt injury of abdomen is also a result of fall from height, assault with blunt objects, sport injuries, industrial mishaps, bomb blast and fall from riding bicycle ^[1]. India is the leading country in the number of deaths due to Road traffic accidents ^[2].

Abdominal trauma due to a blunt force is a common presentation in the emergency room and is the leading cause of mortality and morbidity in children and adults ^[3]. Due to the delay in diagnosis and inadequate treatment of the abdominal injuries, most of the cases are fatal. Hence, accurate diagnosis and avoidance of needless surgery are an important goal of evaluation ^[4].

Physical examination of abdomen alone is unreliable for decision making in blunt trauma abdomen ^[5, 6]. The greater availability of computed tomography and ultrasound in emergency departments has contributed to changes in practice ^[7]. Surgery is required in about 25% of the civilians who suffer abdominal injury ^[8].

Concealed hemorrhage is the second most common cause of death after trauma, and missed abdominal injuries are a frequent cause of morbidity and late mortality in patients who survive the early period after injury ^[9].

Blunt abdominal injuries can damage the liver, spleen, pancreas, bowel, and intestines and may result in bleeding or contusions. Some of the risk factors determining the mortality rates are sex, age, and the interval between the time of injury and management ^[10]. In view of increasing number of vehicles and consequently RTAs, this research has been chosen to study the cases of blunt abdominal trauma with the aim, to evaluate the incidence of blunt injury abdomen, clinical presentation, morbidity, and mortality in tertiary care center in RMMCH.

Aims and Objectives

To evaluate the impact of blunt abdominal trauma on solid viscera like liver, spleen and hollow viscera like stomach, small and large intestine, mesentery and retroperitoneal structures of the

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abdomen. To evaluate the etiology and various modes of presentation. To evaluate various treatment modality and outcome.

Study Design: This is a Prospective study done between October 2019 to September 2021 which includes 50 patients admitted in RMMCH Chidambaram with blunt injury abdomen

Methodology

Study was conducted among the patients who is diagnosed to have blunt abdominal injuries and admitted at Rajah Muthiah Medical College Hospital, Chidambaram during the study period.

After initial resuscitation, a detailed history is taken from all those patients with possible history of blunt abdominal trauma who were admitted in RMMCH which includes mode and mechanism of injury, time of injury and admission, presenting complaints, associated injuries and a careful history of preexisting illness etc. A thorough clinical examination of the patient is done which includes general physical examination, abdomen examination in detail, all other systems examination and examination of all external injuries.

After initial resuscitation and achieving hemodynamic stability, investigations including Plain X-ray Abdomen Erect, Four Quadrant Aspiration, Focused Assessment with Sonography for Trauma, Computed Tomography of abdomen and Pelvis, Complete hemogram and other Routine Blood investigations, Chest X-ray & ECG.

Based on the clinical history, examination and diagnostic tests, the treatment modality which includes conservative management and operative management is made

Patients was advised strict bed rest, were subjected to serial clinical examination which included hourly pulse rate, blood pressure, respiratory rate, oxygen saturation, input output charts were maintained and repeated examination of abdomen and other systems. Diagnostic tests including blood investigations and imaging studies especially FAST or ultrasound of abdomen was done in all patients and repeated whenever required. CT scan was done in selected patients in whom probable diagnosis could not be arrived and those conservatively treated hemodynamically stable patients.

In general, cases are taken up for surgery if there is evidence of significant hemoperitoneum, pneumoperitoneum, peritonitis,

refractory to conservative management and those deteriorating despite of adequate resuscitation and treatment, if the associated injury require operative management Following the definitive management, patients are monitored serially for the dangers signs and signs of recovery. Complications during the conservative management, during operative period or the post-operative period are managed appropriately. All associated injuries are evaluated and treated accordingly.

Observations and Results

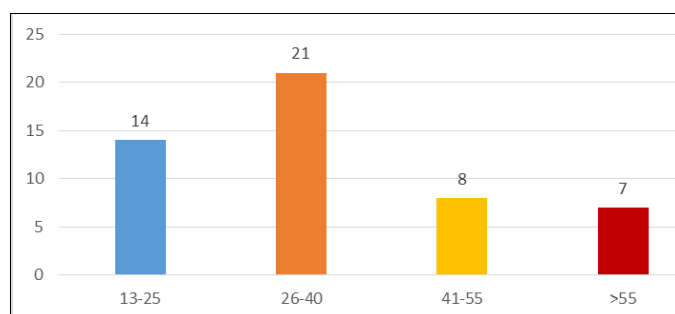
The following observations are made from this study done on blunt abdominal trauma patients admitted in RMMCH, during the period October 2019 to September 2021. Total number of patients in this study is 50.

Age distribution

The distribution of the age of the patients who suffered from blunt abdominal trauma in this study is tabulated below. It is noted that 42% of the patients affected are in the age range 26-40 years. Also 70% of the patients are below 40 years of age.

Table 1: Age distribution

Age incidence	No of cases	Percentage
13-25	14	28%
26-40	21	42%
41-55	8	16%
>55	7	14%



Graph 1: Age distribution

Sex Distribution

The distribution of sex is tabulated below. Majority of them are Males which is 76%.

Table 2: Gender distribution

Sex	Number of cases
Male	38
Female	12

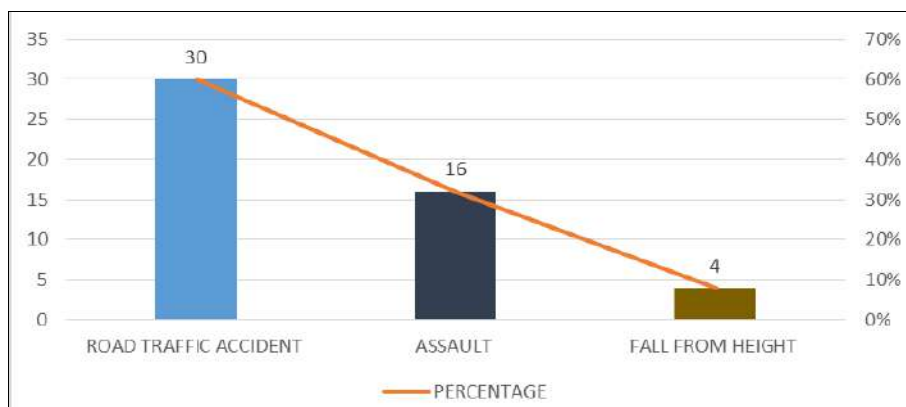
Mode of injury

The distribution of mode of injury in this study is tabulated below. It shows that road traffic accidents accounts for most of

the blunt abdominal trauma. About 60% of the cases admitted were due to road traffic accidents and 32% were from assault.

Table 3: Mode of injury

Mode of injury	No. of cases	Percentage
Road traffic accident	30	60%
Fall from height	4	8%
Assault	16	32%

**Graph 2:** Mode of injury**Influence of alcohol**

In this study, 22 cases which is 42.6% were under the influence of alcohol while sustaining injury. Thus it is an important factor influencing blunt abdominal trauma.

Table 4: Alcohol intake

H/o alcohol intake during The injury	Yes	No
NO. OF CASES	22	28

Latent Period

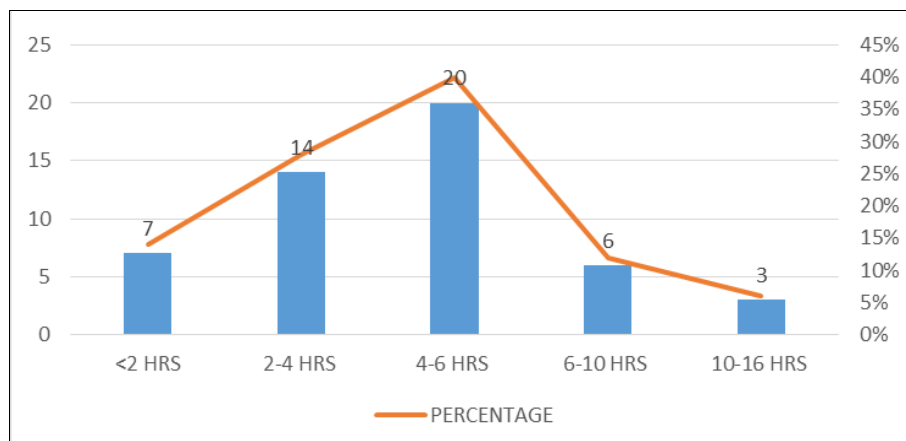
Latent period is the duration between the time of injury and the time of admission. In this study 41 (82%) cases out of 50 cases presented within 6 hours of injury however, 3 (6%) cases

presented after a period of 10 hours.

It has been found that more the latent period, results in poor outcome and postoperative complications of the patient. The increased morbidity was seen in those patients who presented late to the hospital.

Table 5: Latent period

Latent period in hrs	No. of cases	Percentage
<2 HRS	7	14%
2-4 HRS	14	28%
4-6 HRS	20	40%
6-10 HRS	6	12%
10-16 HRS	3	6%

**Graph 3:** Latent period**Presenting Symptoms**

The most common symptom of blunt trauma was abdominal pain which was presented by all the 50 patients, which was followed by vomiting presented in around 14 patients (24%). Abdominal distension was presented by 7 patients which accounted for 14% and 1 case presented with hematuria.

Table 6: Presenting symptoms

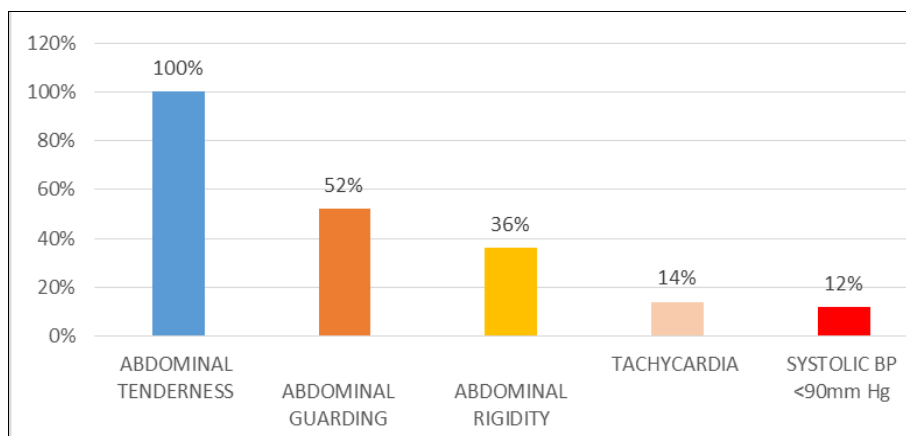
Symptoms	No. of cases (%)
Abdominal pain	50(100%)
Vomiting	12(24%)
Abdominal distension	7 (14%)
Hematuria	1(2%)

Presenting Signs

All the 50 patients presented with abdominal tenderness which is the most common sign followed by abdominal guarding seen 26 (52%) cases. Abdominal rigidity being seen in 18 (36%) cases. 7 cases which is 14% presented with tachycardia. Clinically significant pallor is seen in 15 cases. Around 6 cases presented with systolic BP < 90mm Hg which is 12%.

Table 7: Presenting signs

Signs	No. of cases
Abdominal tenderness	50(100%)
Abdominal guarding	26 (52%)
Abdominal rigidity	18(36%)
Tachycardia	7(14%)
Systolic BP <90mm Hg	6 (12%)

**Graph 4:** Presenting signs**Associated Injuries**

According to this present study, 15 cases has presented with associated minor soft tissue injuries. 3 cases was associated with thoracic rib fracture. Minor orthopaedic injury was seen in 1 case.

Table 8: Associated injuries

Associated injuries	No. of cases	Percentage
Orthopaedic	1	2%
Thoracic	3	6%
Soft tissue injuries	15	30%

X-ray findings

X-ray abdomen is one of the important diagnostic imaging technique in cases of abdominal trauma. The Air under diaphragm is an important characteristic feature in patients with hollow viscous injury that is seen in 40% of cases in this study. However, 30 out of 50 cases had no detectable abnormality.

Table 9: X-ray findings

Findings	No. of cases	Percentage
AUD	20	40%
NDA	30	60%

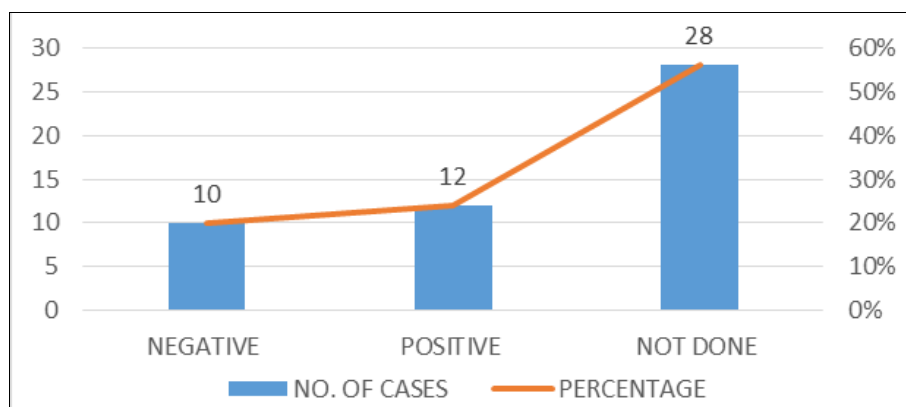
(AUD – Air Under Diaphragm, NDA – No Detectable Abnormality)

Four Quadrant Aspiration

Four Quadrant Aspiration method was done to diagnose hemoperitoneum. It was done in 22 cases out of which it was positive only in 11 cases (24%). 10 cases (20%) showed negative tapping.

Table 10: Four quadrant aspiration

Findings	No. of cases	Percentage
Positive	12	24%
Negative	10	20%
Not done	28	56%

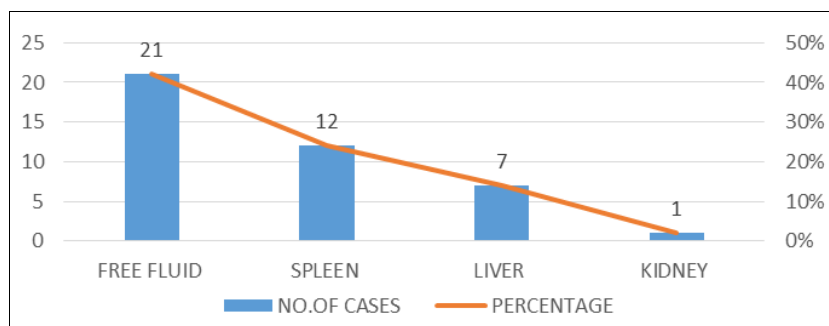
**Graph 5:** Four quadrant aspiration**Fast**

Focused Assessment with Sonography for Trauma (FAST) scan is a ultrasound examination of the abdomen performed at the time of presentation (2-5mins) of a trauma patient to detect abdominal injury. It helped to diagnose splenic injuries in 12

Patients (24%), followed by free fluid detection in abdomen in around 21 Patients (42%). The percentage of liver injuries diagnosed is found to be 7 patients (14%), with kidney injury 1 case (2%).

Table 11: Fast

Organ involved	No. of cases	Percentage
Spleen	12	24%
Free fluid	21	42%
Liver	7	14%
Kidney	1	2%

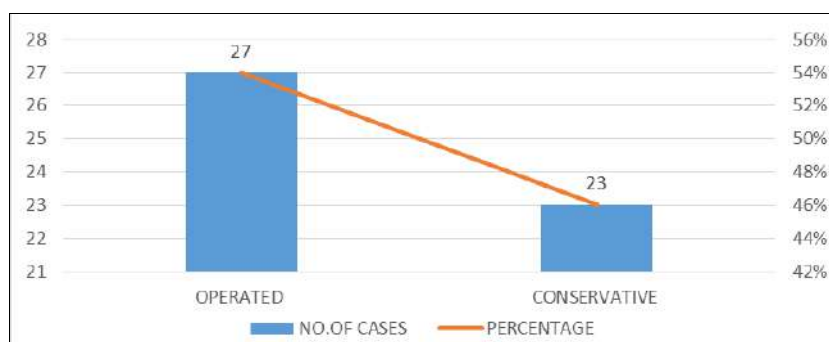
**Graph 6:** USG abdomen**Management – Operative Vs Conservative**

The management modality is the important factor deciding the outcome of the patient. After considering the clinical presentation, mode of injury, clinical examination and further evaluation of the patient, 27 out of 50 cases were operated involving 54% and the remaining 23 out of 50 cases (46%) were treated conservatively who presented with minor injuries and

stable condition.

Table 12: Management modality

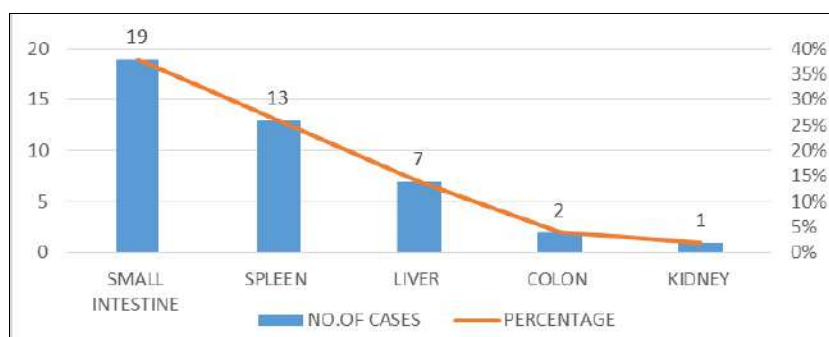
Planned modality	No. of cases	Percentage
Operated	27	54%
Conservative	23	46%

**Graph 7:** Management modality**Organ wise Distribution**

In this study, Out of 50 patients 19 cases were identified with small intestine injury, which is the most common organ injured comprising about 38% which is followed by spleen which is the next common organ to be injured in 13 cases comprising about 26%. Liver injuries was seen in 7 patients (14%). Only 2 patients were identified with colon injury which is 4%. Least number of patients had kidney injury which was only 2%.

Table 13: Organs Injured

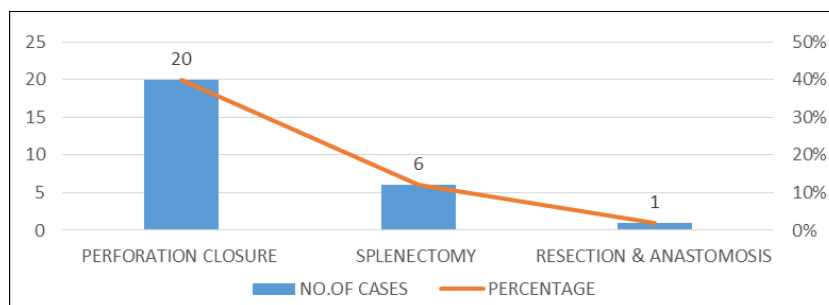
Organ injured	No. of cases	Percentage
Small intestine	19	38%
Spleen	13	26%
Liver	7	14%
Kidney	1	2%
Colon	2	4%

**Graph 8:** Organ injured**Surgical Procedure Performed**

Closure of intestinal perforation was done in 20 cases which was 40% of total patients and it was the most common procedure performed which was followed by splenectomy which was done for 6 cases which is 12%. Resection and anastomosis was done for 1 patient with small intestine injury.

Table 14: Surgical Procedure

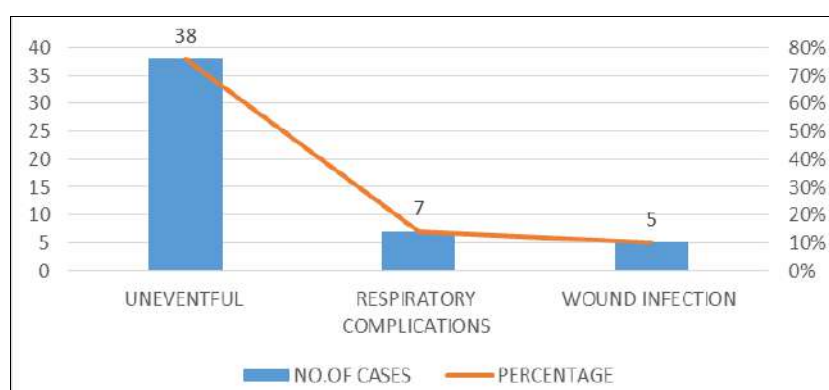
Procedure	No. of cases	Percentage
Perforation closure	20	40%
Splenectomy	6	12%
Resection & anastomosis	1	2%

**Graph 9: Procedure****Post operative period and immediate complications**

Out of 50 patients, 38 cases had no complications and their postoperative period was uneventful which is 76%. Respiratory complications, including ARDS was the leading complications was seen in 7 cases (14%). Wound infection was seen in 5 cases (10%).

Table 15: Post-operative period

Post operative period	No. of cases	Percentage
Uneventful	38	76%
Respiratory complications	7	14%
Wound infection	5	10%

**Graph 10: Post operative period****Discussion****Age distribution**

The most common age group sustaining blunt abdominal injury in the present study were among the age 26-40 years accounting to 42%, which is almost close to the 39% group of 21-40 years in the study conducted by Davis *et al.*^[12] and 37.2% group of 11-20 years in the study conducted by Rigved *et al.*^[11].

Table 16: Age distribution

Incidence	Present Study	Davis <i>et al.</i> [12]	Rigved <i>et al.</i> [11]
Most common age	26-40	21-40 years	11-20
Percentage	42%	39%	37.2%

Gender distribution

Gender difference in blunt injury to abdomen is significant with men being the major victims in almost all of the studies with 76% in the present study, 70% in the study done by Davis *et al.*^[12] and 90% in the study done by Rigved *et al.*^[11].

Table 17: Gender distribution

Gender	Present study	Davis <i>et al.</i> [12]	Rigved <i>et al.</i> [11]
Male	76%	70%	90%
Female	24%	30%	10%

Mode of injury

Road traffic accidents are the leading cause for blunt abdominal injury accounting for 60% in this study. It is in accordance with the other 3 studies which is quoted below, where they also had the traffic accidents as the 1st important cause.

Table 18: Mode of injury

Mode of Injury	Present Study	Davis <i>et al.</i> [12]	Khanna <i>et al.</i> [13]	Rigved <i>et al.</i> [11]
RTA	60%	70%	57%	61%
FFH	8%	6%	15%	27%
Assault	23.4%	21%	33%	12%

Table 19: Latent period

Latent period in hrs	Percentage
<2 hrs	14%
2-4 hrs	28%
4-6 hrs	40%
6-10 hrs	12%
10-16 hrs	6%

Decreased duration of latent period is important as it will lead to early diagnosis and treatment of the patient. Due to better transport modalities and facilities, latent period has been significantly reduced which is shown in the above mentioned table. 82% of cases has presented early within 6 hours in this study which has resulted in less complications followed by injury due to early intervention and treatment, where as the 12% and 6% of the case which presented between 6-10 hours and 10-16 hours showed more complications compared to the patients who presented early which has also been promptly treated.

Presenting signs and symptoms

The most common presenting symptom was diffuse abdominal pain which was a chief complaint in all patients which was similar to results produced by study conducted by Rigved *et al.*

al.^[11] followed by vomiting. But in the study of Davis *et al.*^[12], 43% of the cases did not present with any complaints following injury have any significant symptoms, however 34% of them had intra abdominal injuries.

In this study most common sign presented was abdominal tenderness followed by abdominal guarding and rigidity which was also similar to results of study done Rigved *et al.*^[11] and by Davis *et al.*^[12]. Abdominal guarding (52%) and rigidity (36%) were the next common sign during presentation which was similar to result of Rigved *et al.*^[11] 34% of the cases. But study in conducted by Davis *et al.*^[12] only 28% had this sign which was also the second most common sign in both the studies. 12% of the patients presented with systolic BP less than 90mmHg which is similar to Rigved *et al.*^[11] and by Davis *et al.*^[12].

X-ray abdomen

In this study 40% of the patients had finding of air under diaphragm when they were subjected to x-ray followed by injury. All these patients, had positive findings which was consistent with findings of the laparotomy. In Davis *et al.*^[12] had 13% of the patients and the study conducted by Rigved *et al.*^[11] 27% of the patients had the similar findings

Four quadrant aspiration

In the present study, 22 patients were subjected to four quadrant aspiration out of which only 12 cases (54%) resulted in positive tap, which is similar to Rigved *et al.*^[11] study where four quadrant aspiration was done in 41 patients, among which 27 cases (66%) were positive whereas in Davis *et al.*^[12] study where 44% cases were subjected to FQA out of which 86% showed positive results.

Associated injuries

In this 38% of the patient had associated injuries which is lesser than the results produced by Davis *et al.*^[12] which showed about 48% and Rigved *et al.*^[11] study showed that 49% of the patients had associated injuries. Thoracic injury was seen in 6% of the patients in this study which is similar to Rigved *et al.*^[11] which had 7% of patients but much lesser than the result shown by Davis *et al.*^[12] which showed 27%. Soft tissue injury was seen in 30% of the patients in this study which was more than Davis *et al.*^[12] study which was 12% and Rigved *et al.*^[11] which was 10%.

Mode of management

The main modality of the treatment was found to be operative management in all the below mentioned studies. In this study 54% cases were operated, which is similar to 58% of Khanna *et al.*^[13] It is also similar in terms of mode of management but slightly reduced number of operatively managed cases seen in this study compared to Davis *et al.*^[12] study and Rigved *et al.*^[11] which showed operative management in 77% and 74% respectively.

Table 20: Mode of management

Management	Present Study	Davis <i>et al.</i> ^[12]	Khanna <i>et al.</i> ^[13]	Rigved <i>et al.</i> ^[11]
Operated	54%	77%	58%	74%
Conservative	46%	23%	42%	26%

Different organs involvement

The most common organ involved in this study is the small intestine (38%), followed by spleen (26%). These results are similar to that of Khanna *et al.*^[13] and Rigved *et al.*^[11] with

small bowel being the most common organ injured. In Davis *et al.*^[12] splenic injury (25%) seems to be commonest organ to be injured. Colon injury was present 4% of the patients in this study which is similar to Davis *et al.*^[12] and Rigved *et al.*^[11]. And kidney was the least common organ to be injured in this study which accounted for 2% whereas Davis *et al.*^[12] showed 13% of kidney injury.

Table 21: Different organs involvement

Organ Injured	Present study	Davis <i>et al.</i> ^[12]	Khanna <i>et al.</i> ^[13]	Rigved <i>et al.</i> ^[11]
Small intestine	38%	8%	57%	27%
Spleen	26%	25%	26%	25%
Liver	14%	16%	37%	22%
Kidney	2%	13%	-	-
Colon	4%	4.5%	-	3%

Operative procedure

The commonest procedure done in the present study is intestinal perforation closure in about 40%, followed by splenectomy in 12% of the patients. This is similar to the Rigved *et al.*^[11] study which showed that 35% underwent intestinal perforation closure which was found to be the commonest procedure followed by splenectomy which was done in 23% cases and Khanna *et al.*^[13] study which also showed intestinal perforation closure to be commonest procedure which was done in 13 cases, closely followed by 9 mesenteric repair and then 4 splenectomy.

Conclusion

Following were the conclusions which resulted from this present study that was conducted on 50 blunt abdominal injury patients who were admitted in admitted in RMMCH.

- Most affected age group was found to be of 26-40 years and male patients. Therefore the economically contributing and most working population of the society has been found to be more affected.
- Most common mode of injury was Road Traffic Accident according to this study.
- Alcohol consumption has been found to be a major influencing factor leading to injury.
- Most patients presented to hospital with short latent period, which was able to achieve due to improved facility of transport communication modalities, that resulted in early diagnosis and management
- A detailed history and proper clinical examination along with four quadrant aspiration, plain X-ray findings, USG aided in accurate diagnosis of the patients.
- Computed Tomography aided in grading of solid organ injury, identifying and grading hollow viscus injuries which helped in deciding the modality of the treatment that includes conservative and operative management.
- Small Intestine was found to be the most commonly injured organ followed by splenic injury.
- Most common procedure done in this study was intestinal perforation. Splenectomy was the next common surgery performed.
- Most of the patients had uneventful post operative period and recovered completely.
- Some patients who presented with increased latent period had postoperative complications. Most common was respiratory complications followed by wound infection

As a Conclusion

Providing awareness and education to public regarding safety

driving, following proper traffic guidelines and avoiding consumption of alcohol during driving can result in significant decrease in incidence of blunt abdominal injury. Appropriate care for all the trauma patients should be given which includes providing first aid, early transportation that aids in early diagnosis and treatment which results in healthy recovery of the patient.

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