

ABDOMINAL TRAUMA- CLINICAL STUDYVanaja Ratnakumari Billa¹, Rakesh Pradeep²¹Assistant Professor, Department of General Surgery, Government General Hospital, Guntur.²Senior Resident, Department of General Surgery, Government General Hospital, Guntur.**ABSTRACT****BACKGROUND**

In the recent times there has been increased incidence of abdominal trauma cases due to several causes. Quick and prompt intervention is needed to decrease the mortality of the patients. So we conducted a study to assess the cause and the management of abdominal trauma cases in our institution.

The aim of this study was to know the incidence of blunt and penetrating injuries and their causes, age and sex incidence, importance of various investigations, mode of treatment offered and post-operative complications. To study the cause of death and evolve better management.

MATERIALS AND METHODS

The present study comprises of patients admitted to and operated in various surgical units in the Department of Surgery at Government General Hospital, attached to Guntur Medical College Guntur, from August 2014 to October 2016.

RESULTS

Increase incidence seen in age group 20-29 years (30%). Male predominance 77.5%. Mechanism of injury—road traffic accidents 65%. Isolated organ injury—colon and rectum 40%. Other associated injuries—chest injuries with rib fractures 7.5%. Complications—wound infection 17.5%. Duration of hospital stay 8–14 days. Bowel injury management—closure of perforation 84.6%. Resection anastomosis 15.38%.

CONCLUSION

Thorough clinical examination, diagnostic paracentesis, plain X-ray erect abdomen and ultrasound proved to be very helpful in the diagnosis of intra-abdominal injuries. Spleen is the commonest organ involved in blunt trauma and colon is the commonly injured organ in penetrating abdominal trauma, many patients have associated extremity and axial skeleton injuries. With advances in diagnosis and intensive care technologies, most patients of solid visceral injuries with hemodynamic stability can be managed conservatively. Surgical site infection is the most common complication following surgery. The mortality is high; reason might be patient reaching the hospital late, high incidence of postoperative septic complications.

KEYWORDS

CT- Computed Tomography, CECT – Contrast Enhanced Computed Tomography, USG-Ultrasound.

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BACKGROUND

Injury 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. In India communicable diseases continue to take the major share even now, still injury is responsible for 7% of all deaths. About 1 in 40,000 individuals die in India every year, whereas approximately double the number is disabled and this number is increasing. By convention, injury is classified into several categories—Penetrating, Blunt or Non-penetrating, Blast overpressure, Thermal, Chemical and others including crush and barotrauma. In blunt injuries, the

damage may be caused by acceleration, deceleration, rotational or shearing forces.

Trunkey has classified death attributable to trauma, broadly into three groups, giving a distinct trimodal pattern.

1. Immediate deaths (50%).
2. Early deaths (30%).
3. Late deaths (20%).

It is among those cases represented by second and third peaks that potentially preventable deaths occur. Of one fourth to one third of the deaths from trauma could be prevented by effective initial care. The primary aids like airway management, restoration of circulation, care of cervical spine, cardiopulmonary resuscitation is carried out in the initial stages. Roughly 10% have life threatening injuries where rapid diagnosis and therapy is crucial for survival. Scoring systems have been developed to facilitate triage, research and quality assurance. More recently their ability to predict morbidity and mortality particularly septic complications has been studied. Abdominal trauma is one of those subjects where the skills of the surgeon is judged,

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both in correct diagnosis of the associated visceral injuries and in treating them, promptly and skilfully, since the morbidity and mortality is very high if not treated adequately. With the increase in the number of motor vehicle accidents, there is rising incidence of abdominal trauma. The abdomen is the third most commonly injured body region, with injuries requiring operation in about 20% of civilian trauma victims. Abdominal injuries can be particularly challenging because it is often difficult to assess the intra-abdominal pathology in the multiple injured victim. There is also masking of abdominal injuries by associated conditions like head injuries, fractures, alcoholism, drug abuse, shock etc. Initial clinical assessment of the abdomen in blunt trauma is accurate in only 70-80% of cases. Penetrating abdominal trauma can usually be diagnosed easily and reliably, whereas blunt abdominal trauma is often missed because clinical signs are less obvious.¹ Clinical examination of the abdomen has previously been shown to be highly sensitive for the diagnosis for blunt abdominal injury.²⁻⁶ In recent prospective study smith et al³ concluded that clinical examination was sensitive in ruling out serious injuries. Several authors suggest that pan scanning of trauma patients is an effective method of identifying injuries that have potential to impact mortality and morbidity.⁷⁻¹⁰ Laparotomy should be done in a patient with multiple injuries where all clinical and other investigations have failed to exclude the abdomen as a source of shock syndrome. With the surge of advancing technology in the field of diagnostic modalities for abdominal trauma, conservative therapeutic approach has been increasing with decreased operative intervention especially for solid organ injuries. The object behind my study is to present a comprehensive picture of the recent concepts in assessment and management of abdominal injuries in our setup and to highlight upon the diagnostic difficulty it poses and the distressing high mortality it carries. This study is conducted at Government general hospital, Guntur during the period August 2014 to October 2016.

Aims and Objectives

1. To know the incidence of blunt and penetrating abdominal injuries and the aetiology of abdominal trauma.
2. To find out the age and sex incidence.
3. To study the mode of presentation of various types of abdomen trauma.

OBSERVATIONS AND RESULTS

	Blunt Injury Abdomen	Penetrating Injury Abdomen	Total	Percentage
Cases associated with intra-abdominal injury	30 (15.3%)	10 (46.2%)	40	61.5%
Cases without intra-abdominal injury	25	0	25	38.5%
Total Number of Cases	55	10	65	100%

Table 1. Association with Intra-Abdominal Injury

4. To assess the importance of the various investigations.
5. To study the nature and incidence of injury to different intra-abdominal organs.
6. To find out the incidence and nature of associated injuries.
7. To study the mode of treatment offered.
8. To study the post-operative complications.
9. To study the cause of death and evolve better management.
10. To analyse the results.

MATERIALS AND METHODS

Source of Data and Period of Study- The present study comprises of patients admitted to and operated in various surgical units in the Department of Surgery at Government General Hospital, attached to Guntur Medical College Guntur, from August 2014 to October 2016.

Collection of Data, Sample Size and Mode of Selection-

65 patients with blunt abdominal injuries and penetrating trauma admitted in surgical wards included in the study. A detailed history as to the mode of injury, thorough clinical examination and necessary investigations like routine investigations, special investigations including ultrasound and CT scan were done.

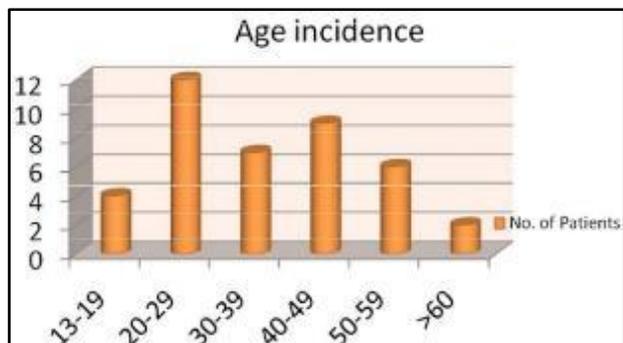
Inclusion Criteria- All patients with blunt and penetrating, abdominal injury with intra-abdominal injuries (40) were included in the study.

Exclusion Criteria- Those patients admitted with injury to external genitalia and those without any intra-abdominal injuries without gaining admission into the department of surgery were excluded from the study. Patients who died before confirmation of definitive diagnosis were also excluded from this study.

Methods- The management was individualized and each case was assessed on its own. In patients where laparotomy was performed after resuscitation, the details regarding the viscera injured and nature of surgery performed were recorded. Each case was carefully followed up to evaluate the progress of patient and to note the development of complications, if any and its management.

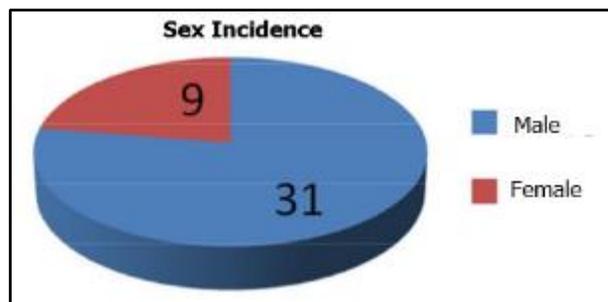
Age in Years	Number of Blunt Injury Patients	Number of Penetrating Injury Points	Total	Percentage
13-19	3	1	4	10.0
20-29	9	3	12	30.0
30-39	4	3	7	17.5
40-49	7	2	9	22.5
50-59	5	1	6	15
>60	2	0	2	6.6

Table 2. Age Incidence



Graph 1. Age Incidence

The most common age group in Ambara Dodiya-Manuel et al¹¹ is 21- 30 years. In Suresh Anumunyam et al¹² study the age group is 30-35 years. In Mousami Singh et al¹³ study the most common age group is 20 -29 years.



Graph 2. Sex Incidence

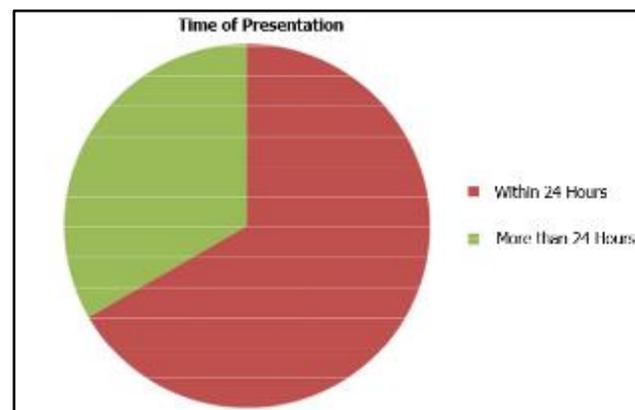
Sex	Blunt injury	Penetrating Injury	Total Number of Patients	%
Male	22	9	31	77.5%
Female	8	1	9	22.5%

Table 3. Sex Incidence

In this study majority were male. In several other studies also male are the leading cases in blunt injury abdomen. In Mohammed A Gao et al study majority were male 87.1%. In Mousami Singh et al¹³ study male-78.18% and females 21.82%. In Suresh Anumunyam et al¹² study males- 93%.

Time of Presentation	Blunt Injury	Penetrating Injury	Total Number of Patients	%
Within 24 hours	20	8	28	70%
More than 24 hours	10	2	12	30%

Table 4. Time of Presentation

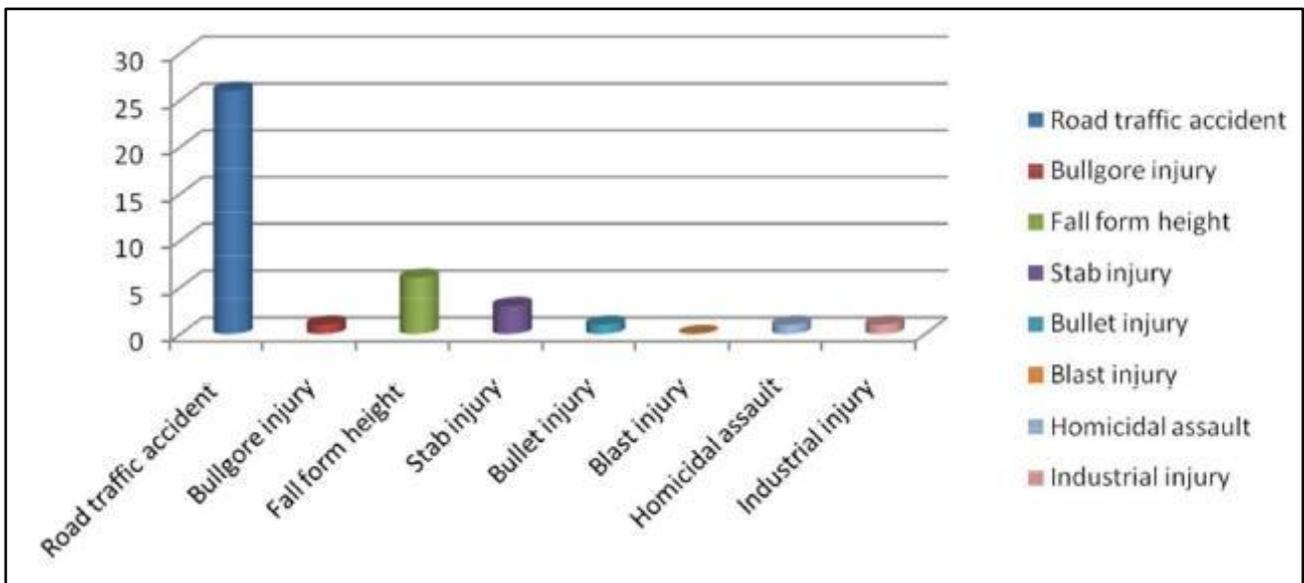


Graph 3. Time of Presentation

28 out of 40 patients were presented to emergency department within 24 hours.

Mechanism of Injury	Blunt	Penetrating Injury	Number of Patients	Percentage
Road traffic accident	26	0	26	65%
Bullgore injury	0	1	1	2.5%
Fall form height	4	2	6	15%
Stab injury	0	3	3	7.5%
Bullet injury	0	1	1	2.5%
Blast injury	0	0	0	-
Homicidal assault	0	1	1	2.5%
Industrial injury	0	1	1	2.5%

Table 5. Mechanism of Injury

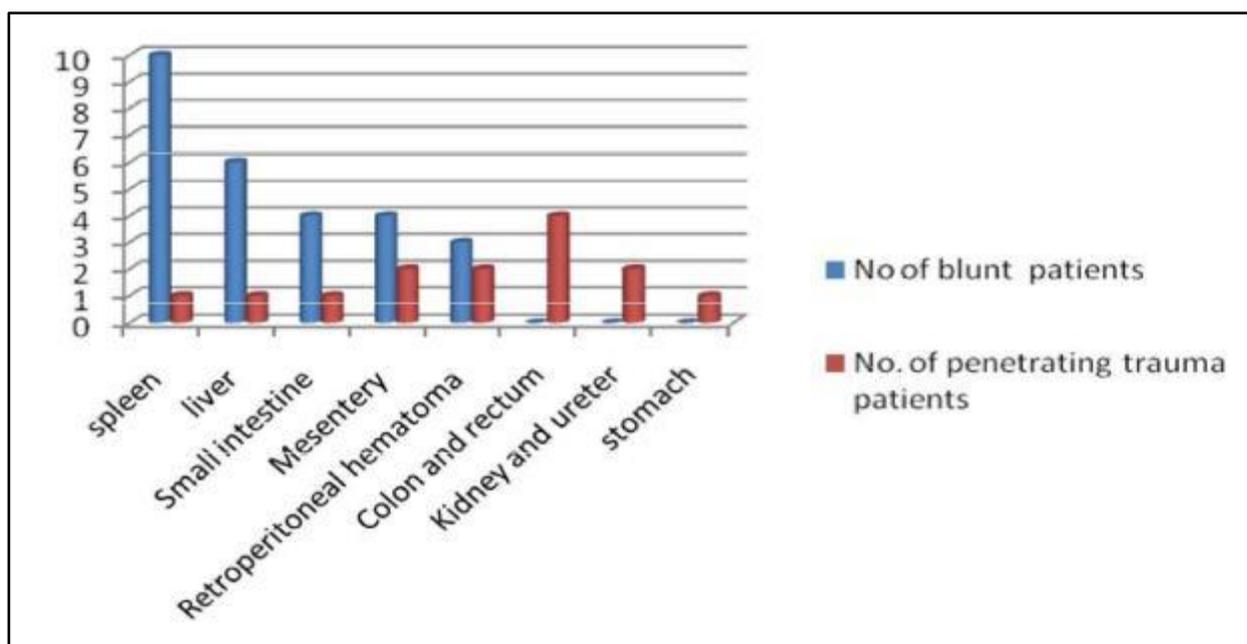


Graph 4. Mechanism of Injury

Most common mechanism of injury is road traffic accident followed by fall from height. In Mohammed A Gao et al mechanism of injury is road traffic accidents 62.8%. Most of the studies showed that most common cause is road traffic accidents.

Organ Injured	Number of Blunt Patients	Percentage of blunt trauma pts	Number of Penetrating Trauma Patients	Percentage of Penetrating Trauma Patients
spleen	10	33.3%	1	10%
liver	6	20%	1	10%
Small intestine	4	13.3%	1	10%
Mesentery	4	13.3%	2	20%
Retroperitoneal hematoma	3	10%	2	20%
Colon and rectum	-	-	4	40%
Kidney and ureter	-	-	2	20%
stomach	-	-	1	10%

Table 6. Isolated Organ Injury



Graph 5. Isolated Organ Injury

Most commonly injured organ was spleen followed by liver in blunt abdominal trauma, in penetrating trauma colon is the most commonly injured organ in my study.

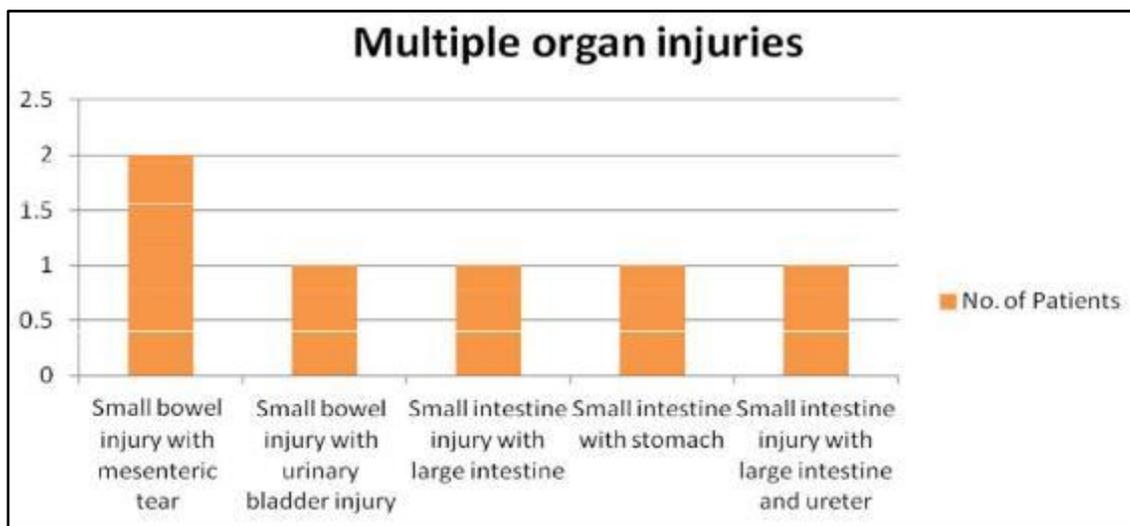
In Suresh Anumunyam et al¹² study the most common organ involved is liver 36%, spleen 32%... in Mousami Singh et al¹³ study the most common organ involved is liver 67.27%, spleen 30.9%.

Multiple Organ Injuries	Number of Patients
Small bowel injury with mesenteric tear	2
Small bowel injury with urinary bladder injury	1
Small bowel injury with stomach	1
Small bowel injury with large intestine	1
Small bowel injury with large intestine and ureter	1

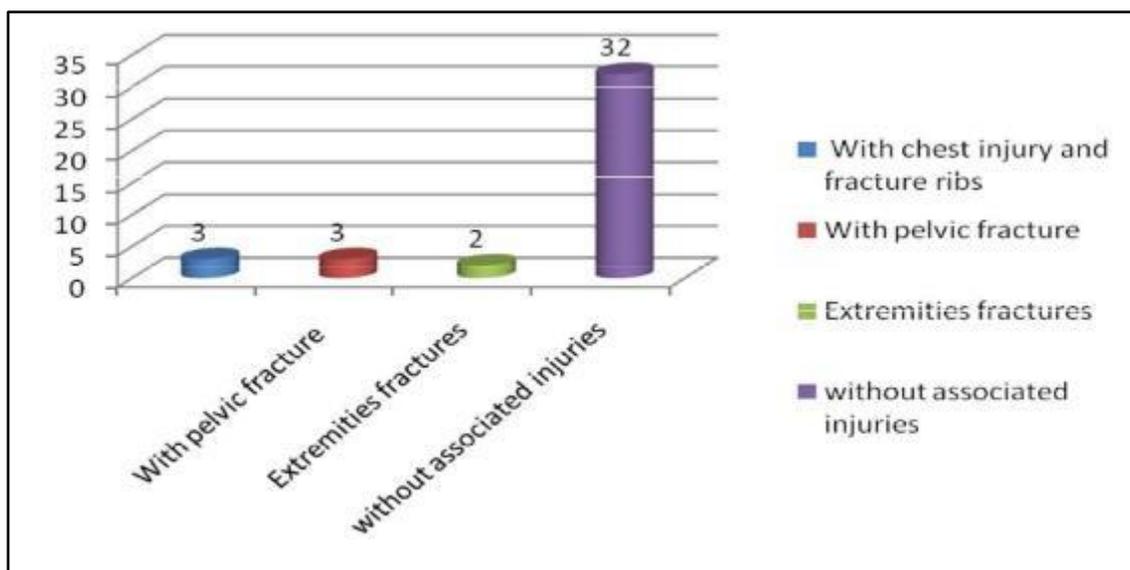
Table 7. Multiple Organ Injuries

Associated Injuries	Number of Patients	Percentage
With chest injury and fracture ribs	3	7.5%
With pelvic fracture	3	7.5%
Extremities fractures	2	5%

Table 8. Associated Injuries



Graph 6. Multiple Organ Injuries



Graph 7. Management

In Mohammed A Gao et al study other associated injuries extremities 51.2%, chest 34.1%.

In Suresh Anumunyam et al¹² study chest injuries 35%, musculoskeletal 32%.

Management	Blunt Trauma pts	Penetrating trauma pts	Total Number of Patients	Percentage
Surgical	25	10	35	87.5
Conservative	5	0	5	19.5

Table 9. Management

35 cases were managed by surgery and only 5 cases were managed conservatively of which 4 cases are blunt trauma liver and one case of spleen trauma.

Management	Blunt Injury	Penetrating Injury	Total Number of Patients	Percentage
Splenectomy	9	1	10	90.9
Conservative	1	0	1	9.1

Table 10. Splenic Injury Management

1-Splenectomy, 10-Conservative.

Splenic injury was most common, 11 of which only 1 case was managed conservatively.

In a recent review, El Matbouly et al¹⁴ found that 25% of blunt abdominal trauma accounted for splenic injury, proper selection of these patients based on the clinical and radiological findings for Operative management or conservative treatment will decrease morbidity and mortality.

Management	Blunt Injury	Penetrating Injury	Number of Patients
Surgical	2	1	3
Conservative	4	0	4

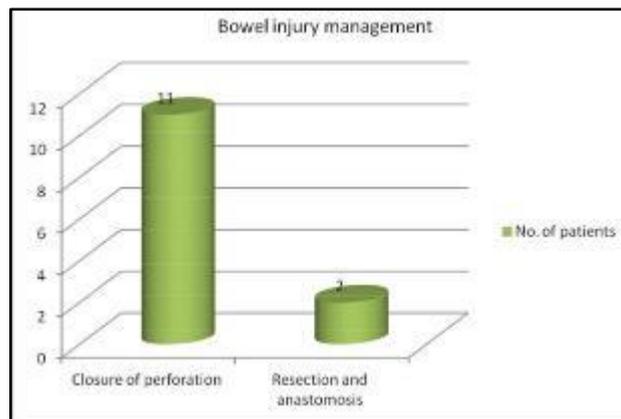
Table 11. Liver Injury Management

57% of the liver injury patients were managed conservatively which are mostly grade 1 and 2. In my study no biliary injury was associated with liver trauma. Right lobe of the liver is the most commonly involved lobe in liver trauma.

Norrmann et al¹⁵ reported that the curative ratio for non-operative therapy was 89%. Besides the adults, non-operative therapy also presents beneficial outcome for children.¹⁶

Type of Bowel Injury	Blunt Injury	Penetrating Injury	Total Number of Patients	Percentage
Closure of Perforation	6	5	11	84.6%
Resection and anastomosis	1	1	2	15.38%

Table 12. Bowel Injury Management



Graph 8. Bowel Injury Management

Type of Complication	Blunt Injury	Penetrating Injury	Total Number of Patients	Percentage
Wound Infection	4	3	7	17.5%
Respiratory Infection	3	2	5	12.5%
Intra-abdominal Abscess	2	0	2	5%
Septicemia	2	0	2	5%
Wound dehiscence	1	1	2	5%
Reactionary hemorrhage	1	0	1	2.5%
Enterocutaneous Fistula	1	1	2	5%

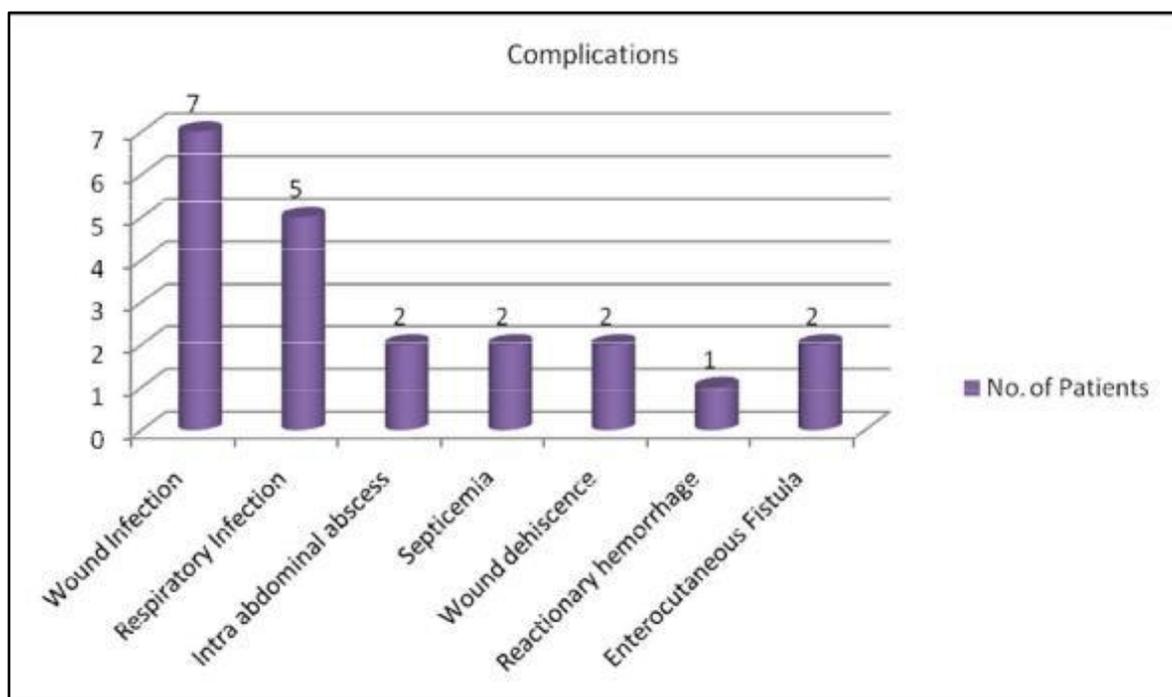
Table 13. Complications

Wound infection was the common complication followed by respiratory infection.

In Amabra Dodiya et al¹¹ study showed surgical site infection is the most common complication.

		Blunt Injury		Penetrating Injury	
		With Bowel Perforation	Without Bowel Perforation	With bowel Perforation	Without Bowel Perforation
Total no of cases		4	1	4	0
Depth of SSI	SSSSI	3	1	3	0
	Organ space infection	1	0	1	0
Most common organism		E. coli, Klebsiella	Staphylococcus aureus	E. coli, Klebsiella	Pseudomonas
Sensitive pattern		Amikacin, Gentamycin	Cephalosporins	Amikacin, gentamycin	Ceftazidime, Cefoperazone - Sulbactam
Resistance pattern		Ciprofloxacin, Cefotaxime	Ciprofloxacin	Ciprofloxacin	Cefotaxime

Table 14. Wound Infection

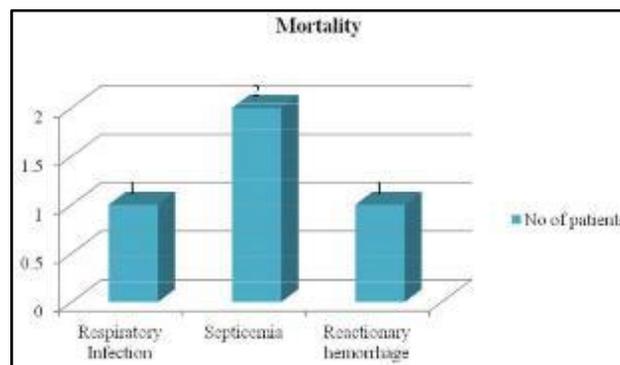


Graph 9. Complications

Escherichia coli is the most common organism isolated from superficial surgical site infection and commonly sensitive to amikacin and gentamycin. Wound infection is most commonly associated with bowel perforation.

Duration in Days	Blunt injury	Penetrating injury	Total Number of Patients (n=36)
0-7	5	2	7
8-14	16	5	21
15-29	3	2	5
>30	2	1	3

Table 15. Duration of stay in hospital



Graph 10. Mortality

In my study 2 deaths were due to septicemia, 1 due to respiratory infection and one due to reactionary haemorrhage.

Cause of Death	Number of Patients
Respiratory Infection	1
Septicemia	2
Reactionary hemorrhage	1

Table 16. Mortality

DISCUSSION

In this study 65 cases of abdominal trauma who were admitted at Government General Hospital, Guntur during August 2014 to October 2016, were included and studied 40 cases. The following observations were made in the present study. Various results of the study have been analysed in detail.

Age Incidence -In our study, the age of the patient varied from 13 to 70 years. The maximum incidence of abdominal trauma was observed in the age group of 20 to 29 years (30%) followed by the age group of 40 to 49 years (23.5%) 15% belonged to the age group of 50-59 years. 17.5% belonged to the age group of 30-39 years and 10% belonged to the age group of 13-19. Only 2 case was found in the age group of more than 60 years (6.6%).

Sex Incidence- In our study 31 (77.5%) were males and 9(27%) were females; male to female ratio was 3.44% which depicts male predominance.

Cause of Injury- In our study it was found that the most common mechanism of blunt injury abdomen was road traffic accidents 65.5% followed by fall from height 10% and most common cause of penetrating injury was stab injury(7.5%) followed by fall from height(5%).

The higher incidence of trauma in the group of young adult males associated with an increased risk behaviour in this age group due to exposure to alcohol and illicit drugs.¹⁷ The lack of a stable relationship and low educational level are often associated with alcohol.¹⁸

Symptoms- The commonest symptom was pain abdomen present in all patients (100%) followed by vomiting (40%). Other modes of presentation were abdominal distension (35%), retention of urine (20%), chest pain (10%), haematuria (7.5%), hematemesis (5%) and loss of consciousness (5%).

Physical Signs- In our study, generalized tenderness was present in 77.5% of patients, guarding or rigidity in 67.5%, distension of abdomen in 52.5%, absent bowel sounds in 37.5% and localize tenderness in 22.5%.

Injury and admission time interval- Early presentation to hospitals and definitive treatment of these injuries has been reported to reduce mortality and morbidity associated with the disease. In our study 70% of patients were brought to the hospital within 24 hours after injury, 30% were brought 24-48 hours. The delay in reaching the hospital by majority of the patients may be because of difficulty in transport, poor socio- economic status of the people and lack of proper guidance. Inadequacies in the organization of trauma care, paucity of means of communication and lack of well-equipped ambulance facilities also add to the problem.

Investigations- Routine investigations like haemoglobin %, bleeding time, clotting time, blood grouping and Rh

typing, and urine examination were done in all cases. Liver function test, serum amylase, serum electrolytes and chest X- ray were done whenever warranted. Plain X- ray erect abdomen was done in all patients which helped in diagnosing hollow viscus injury by showing gas under the diaphragm. Diagnostic paracentesis was done in 22 patients; in 19 cases it was true positive, true negative in 1 case and false negative in 2 cases. Hence accuracy rate of diagnostic paracentesis in our study was 90.9%. Ultrasound of abdomen was done in all patients. In one case, ultrasound failed to show splenic injury which was found at laparotomy. Hence, accuracy rate of ultrasound abdomen in blunt injury abdomen in our study was 96.15%. Retrograde cystourethrogram was done in a case of suspected bladder injury, where it helped to diagnose the same. Chest and axial skeleton X-ray were done in case of associated chest injury and extremities injury. CECT abdomen was done in stable patients.

Organs Involved- In our study, commonest organ involved was spleen (33%) followed by liver (20%) mesentery (13%), small intestine (13%) in blunt abdominal trauma and colon and rectum (40%) was the most common organ involved in penetrating trauma. Spleen is most commonly involved solid in blunt injury abdomen because of its mobility, its attachment to many of the structures in the left upper quadrant and its position and intimate contact with 9th, 10th and 11th ribs. Organs involved in blunt injury abdomen in various studies are shown in the following table (comparative study)

Multiple Organ Injury- In our study 6 patients showed multiple intra-abdominal visceral injuries Involvement of small bowel along with mesentery was seen in 2 patients and small bowel injury along with urinary bladder injury in patient, small bowel injury with stomach in one case, small and large bowel injury with ureter injury in one case.

Associated Injuries- In our study, 80% of the patients had only isolated abdominal injuries; 20% cases had associated injuries like chest injury, rib fractures, long bone fractures and pelvic fracture.

Management- Out of 30 cases of blunt trauma 25 patients were managed surgically and 5 patients were managed conservatively. Guidelines for conservative treatment were-

1. Hemodynamic Stability of the patient
2. Minimal intra Peritoneal collection
3. Class I Injury of Solid organs.

Most of the blunt abdominal patients managed conservatively are those with low grade splenic injury. One patient had combined grade I spleen and grade I liver injury. Surgical management decisions were taken based on the results of physical examination, ultrasound abdomen and diagnostic paracentesis. All the penetrating abdominal trauma patients' cases were managed surgically.

Admission and Surgery (Interval In hours)- In our study, 63% (19) of the patients managed surgically were operated upon within 13 to 24 hrs after admission; 30% (10) were operated upon 7 to 12 hours after admission; most of the patients 70% were operated upon within 13 to 24 hours after admission. This denotes the time delay in the necessary investigations causing loss of precious time.

Splenic Injury Management- In our study, Splenectomy was done in 10 (90.9%) patients (9 blunt trauma, 1 penetrating trauma), conservative Management was done in 1 (9.1%) patient, the patient which managed conservatively was hemodynamically stable and presented with pain and tenderness. Ultrasonography of the abdomen and pelvis showed minimal collections. The size of the laceration was less than 1 cm.

Liver injury Management- In our study, 42.9% (2 blunt injury, 1 penetrating) cases of liver laceration were managed surgically, conservative management was done in 57.1% (4 blunt trauma) of liver injury patients. There are no detected biliary tract injury in this study.

Bowel Injury Management- Large and small bowel injuries were 11 (9 blunt, 1 penetrating) perforations which were closed primarily. One case of blunt trauma with ileal perforation, mesenteric involvement with compromised blood supply due to which the segment had become gangrenous was managed by resection with end to end anastomosis. One case of penetrating trauma with multiple proximal jejunal perforations was managed by resection with end to end anastomosis.

Bladder Injury- In our study, we had 1 case of extra peritoneal rupture of bladder which were managed by closure of rent in two layers with suprapubic bladder drainage.

Retroperitoneal Hematoma- We had 5 cases of retroperitoneal hematoma all cases were without major vascular injury.

Complications- In our study, postoperative minor wound infection (superficial surgical site infection) was the commonest complication 17.5% and most infections were associated with bowel injury with peritonitis and in those cases that were brought to the hospital late. Three cases 12.5% developed respiratory infection which subsided with antibiotics and chest physiotherapy. Two cases (5%) developed septicaemia, all of whom expired as a result of multiple organ failure. Two case (5%) developed intra-abdominal abscess and two cases (5%) developed wound dehiscence; two case developed intestinal fistula and one case developed reactionary haemorrhage all of which were managed conservatively. One of the patient with wound dehiscence required secondary suturing. Escherichia coli is the most common organism isolated from superficial surgical site infection and commonly sensitive to amikacin and

gentamycin. Wound infection is most commonly associated with bowel perforation.

Mortality- We had a mortality of 10%, 4 out of 40 patients, 3 deaths were in the late postoperative period, one case expired in the early postoperative period whom expired as a result of reactionary haemorrhage. The mortality was high; reason might be patient reaching the hospital late, high incidence of postoperative septic complications.

CONCLUSION

Majority of the victims involved in blunt injury abdomen are young males involved in outdoor work. Road traffic accident is the commonest cause of injury.

The delay in patients of trauma reaching the hospital may be because of lack of an efficient emergency trauma service.

Thorough clinical examination, diagnostic paracentesis, plain X-ray erect abdomen and ultrasound proved to be very helpful in the diagnosis of intra-abdominal injuries. Spleen is the commonest organ involved in blunt trauma and colon is the commonly injured organ in penetrating abdominal trauma, many patients have associated extremity and axial skeleton injuries. With advances in diagnosis and intensive care technologies, most patients of solid visceral injuries with hemodynamic stability can be managed conservatively. Surgical site infection is the most common complication following surgery. The mortality is high; reason might be patient reaching the hospital late, high incidence of postoperative septic complications.

SUMMARY

1. Maximum numbers of cases were in the age group of 20 to 39 years.
2. 77.5% of injured were males.
3. Road traffic accident was the commonest mode of injury in blunt injury abdomen accounting for 65% of the cases, stab injury was the commonest mode of injury in penetrating trauma accounting for 7.5%
4. Pain abdomen was the commonest symptom (100%) followed by vomiting in 40% of cases and distension of abdomen in 35% of cases.
5. Generalized tenderness was the commonest physical sign present in 77.50% of cases followed by guarding/rigidity present in 37% of cases.
6. 70% of cases came to the hospital within 24 hours of the injury.
7. Accuracy rate of plain X- ray erect abdomen was 88.9% and ultrasound abdomen was 96.15%
8. Spleen was the commonest organ involved in blunt abdominal injury (33%) followed by liver (20%). Colon and rectum was commonest organ involved in penetrating trauma (40%)
9. 7.5% had associated chest injury with fracture ribs.
10. Majority of intestinal injuries were perforations.
11. 87.5% of the cases were managed surgically 19.5% conservatively.

12. 63% of the patients managed surgically were operated upon within 13 to 24 hrs after admission and 30% were operated upon 7 to 12 hours after admission.
13. 70% of patients stayed for a period of 8 to 14 days in the hospital.
14. 9.1% of splenic injury cases were managed conservatively.
15. 57.1% of liver injury cases were managed conservatively
16. Most of bowel injury cased managed by closure of perforation, 2 cases resection & end to end anastomosis was done.
17. 1 cases of extra peritoneal rupture of bladder were managed by closure of rent in two layer with suprapubic bladder drainage.
18. 6 cases of retroperitoneal hematoma, all of them managed conservatively.
19. Wound infection was the commonest complication 17.5% followed by respiratory infection 12.5%.
20. Overall mortality rate in our study was 10%.

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