

**A CLINICAL STUDY AND MANAGEMENT OF ABDOMINAL INJURIES**Sreenidhi G. M<sup>1</sup>, Venugopal K<sup>2</sup>, Nandeeshkumar G. N<sup>3</sup>**HOW TO CITE THIS ARTICLE:**

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**ABSTRACT: OBJECTIVE:** 1. to evaluate the impact of blunt abdominal trauma on the Solid abdominal viscera's, hollow viscera's, mesentery and Retroperitoneal structures and various modes of presentation in early diagnosis. 2. To evaluate various modalities of management and complications.

**BACKGROUND DATA:** Blunt abdominal trauma is one of the most common injuries caused mainly by road traffic accidents. They are usually not obvious. Hence, often missed unless, strong suspicion. In view of increasing number of motor vehicles and consequently road traffic accidents, this study has been chosen to study the cases of injury to solid organs in blunt abdominal trauma. **MATERIAL AND**

**METHODS:** This is a prospective study of blunt injury abdomen during the period from September 2010 to September 2013. Number of cases studied is 100. Data were collected from the Patients by their clinical history, examination and appropriate investigations. Post-operative follow-up was done to note for complications. Documentation of patients, which included, identification, history, clinical findings, diagnostic test, operative findings, operative procedures, complications during the stay in the hospital and during subsequent follow-up period, were all recorded on a proforma specially prepared. The decision for operative or non-operative management depended on the outcome of the Hemodynamic status and Computed Tomography. **RESULTS:** The majority of the patients belonged to 11 to 20 years age group, followed by 21-30 years age group. 91 cases were males, with females accounting for only about 9 cases. 74 patients were operated and 26 patients were subjected for non-operative management. Road traffic accident was responsible for 62% of blunt abdominal trauma cases, while fall from heights accounted for 27% of cases and blow with blunt object was responsible for 11% of injuries. Majority of the patients presented with abdominal pain (90%) and abdominal tenderness (82%). Average latent period was between 11-20 hours. Majority of patients (40%) were taken for surgery between 11-15 hours of latent period. Associated extra abdominal injuries were found in 61 cases. Apart from routine investigations, abdomen x ray was done in 96 cases. 81 patients under went four quadrant aspiration. 21 patients under went diagnostic peritoneal lavage. DPL was done in patients who had equivocal signs or obscured by adjacent soft tissue injury. Ultrasound of abdomen was done in 62 cases. CT scan was done in 8 cases. **CONCLUSION:** Road traffic accidents form the most common mode of injury. Males are predominantly affected. A thorough and repeated clinical examination leads to successful treatment in these patients. Plain X ray abdomen, ultrasound scan, four quadrant aspiration and diagnostic peritoneal lavage are valuable investigations. Multiple organs are usually involved in most of the cases rather than an isolated organ injury. Associated extra abdominal injuries greatly influence the morbidity and mortality. Post-operative complications like wound infection, dehiscence and respiratory complications are common in blunt abdominal trauma. The present study shows a mortality of 16%.

**KEYWORDS:** Blunt abdominal trauma; Focused assessment with sonography for trauma; Diagnostic peritoneal lavage; scan; Mortality.

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**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<sup>1</sup>. 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<sup>1</sup>. Blunt abdominal trauma is usually not obvious. Hence, often missed, unless, repeatedly looked for. Due to the inadequate treatment of the abdominal injuries, most of the cases are fatal. The knowledge in the management of blunt abdominal trauma has progressively increasing due to the in-patient data gathered from different parts of the world. In spite of the best techniques and advances in diagnostic and supportive care, the morbidity and mortality remains at large. The reason for this could be due to the interval between trauma and hospitalization, delay in diagnosis, inadequate and lack of appropriate surgical treatment, post-operative complications and associated trauma especially to head, thorax and extremities. In view of increasing number of vehicles, rampant increase in construction work and consequent road traffic accidents, this topic has been chosen to study the cases of blunt abdominal trauma, its different modes of presentation and to study the different modalities of its management with reference to the patients presenting to our hospital.

### **MATERIALS AND METHODS:**

**SOURCE OF DATA:** This study is a prospective study of blunt abdominal injuries during the period from September 2010 to September 2013 in our hospital.

**METHODS OF COLLECTION OF DATA:** Data were collected from the patients by their clinical history, clinical examination with appropriate investigations on those patients who were admitted. Post-operative follow up was done to note for complications. After initial resuscitation of the trauma victims, a careful history was taken to document any associated medical problem. Routine blood and urine tests were carried out in all the patients. Documentation of patients, which included, identification, history, clinical findings, diagnostic test, operative findings, operative procedures, complications during the stay in the hospital and during subsequent follow-up period, were all recorded on a proforma specially prepared. Demographic data collected included the age, sex, occupation and nature and time of accident leading to the injury. After initial resuscitation and achieving hemodynamic stability, all patients were subjected to careful examination, depending on the clinical findings; decision was taken for further investigations such as four quadrant aspiration, diagnostic peritoneal lavage, x ray abdomen and ultrasound. The decision for operative or non-operative management depended on the outcome of the clinical examination and results of diagnostic tests. Patients selected for non-operative or conservative management were placed on strict bed rest, were subjected to serial clinical examination which included hourly pulse rate, blood pressure, respiratory rate and repeated examination of abdomen and other systems. Appropriate diagnostic tests especially ultrasound of abdomen was repeated as and when required. CT scan was done in 8 patients in our study. Apart from routine investigations, abdomen X ray was done in 96 patients. 64 patients under went four-quadrant aspiration. An aspiration of blood, which did not clot, was taken as positive. When the aspirate clotted, the test was taken as negative. 21 patients under went diagnostic peritoneal lavage. Ultrasound of abdomen was done in 33 cases.

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### OBSERVATIONS AND RESULTS:

#### 1. Age Incidence:

AGE GROUP (yrs)	NO. OF PATIENTS	PERCENTAGE (%)
1-10	2	2%
11-20	36	36%
21-30	29	29%
31-40	21	21%
41-50	4	4%
51-60	5	5%
61-70	2	2%
71-80	1	1%

**Table 1: Age Distribution**

In this series, the majority of the patients belonged to 11-20 years age group, followed by 21-30 years age group.

#### 2. Sex Incidence:

GENDER	NO OF PATIENTS	PERCENTAGE
Male	91	91%
Female	9	9%

**Table 2: Sex Incidence**

In the 100 cases studied, 91 cases were males, with females accounting for only about 9 cases.

#### 3. Ratio of Operative to Conservative Treatment:

	NO OF PATIENTS	PERCENTAGE
Operative	76	76%
Conservative	24	24%

**Table 3: Ratio of Operative to Conservative Treatment**

After a detailed clinical evaluation and suitable investigations, 76 patients with pneumoperitoneum or hemoperitoneum with hemodynamic instability underwent exploratory laparotomy. 24 patients were selected for non-operative management because they had no signs of peritonitis or they had hemoperitoneum without hemodynamic instability. Out of patients, 2 patients required a delayed laparotomy after 48 hours of deterioration in their hemodynamic status and development of signs of peritonitis and 2 patients died while being resuscitated.

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### 4. Mode of Injury

CAUSATIVE AGENT	NO.OF CASES	PERCENTAGE (%)
Road traffic accident	63	63
Fall from height	27	27
Blow to abdomen with blunt objects	10	10

Table 4: Mode of injury

Road traffic accident was responsible for 62% of blunt abdominal trauma cases, while fall from height accounted for 27% of cases and blow with blunt object was responsible for 11% of injuries.

**5. Latent Period:** Latent period is the interval between the times of injury to the time of surgery.

HOURS	NO. OF CASES	PERCENTAGE
0-10	36	36%
11-20	37	37%
21-30	14	14
31-40	9	9%
41-50	2	2%
51-100	2	2%

Table 5: Latent period

Average latent period seen in the present study is between 11-20 hours. Majority of patients (40%) were taken for surgery between 11-15 hours of latent period.

### 6. Symptoms and Signs:

SYMPTOMS AND SIGNS	NO. OF PATIENTS
Abdominal pain	90
Vomiting	15
Abdominal distension	56
Hematuria	6
Pallor	60
Pulse>90/min	90
BP<90mm of Hg systolic	65
Abdominal guarding and rigidity	75

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Abdominal tenderness	82
Rebound tenderness	40
Free fluid	60
Absent bowel sounds	66

**Table 6: Symptoms and signs**

Majority of the patients presented with abdominal pain (90%) an Abdominal tenderness (82%).

### 7. Associate Injuries:

	NO. OF CASES	PERCENTAGE
Head	12	12%
Thoracic	5	5%
Orthopedic	19	19%
Soft tissue	9	9%
Combination	10	10%

**Table 7: ASSOCIATED INJURIES**

Associated extra abdominal injuries were found in 61 cases. The common extra abdominal injuries were chest injuries including rib fractures, extremity fractures, pelvic fractures and head injuries. Of these associated injuries, there were 6 cases of rib fractures with considerable amount of hemopneumothorax which was managed by insertion of water sealed inter costal drainage tube to avoid pulmonary complications. 2 cases of fracture of ethmoid bone (1) and fracture of frontal bone (1) were met and managed satisfactorily in consultation with ENT and facio maxillary specialties.

### 8. INVESTIGATIONS:

#### 8.1 Plain X-Ray Abdomen:

FEATURE	NO. OF PATIENTS	PERCENTAGE
Gas under diaphragm (GUD)	22	22%
Enlarged soft tissue shadow (ESTS)	20	20%
Ground glass appearance (GGA)	14	14%
No radiological abnormality (NRA)	30	30%
Not done (ND)	4	4%

**Table 8: Plain X-ray Abdomen**

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Plain x ray of abdomen was done in 96 cases, out of the total 100 cases. This was not done in 4 patients as the patient's condition did not permit to shift them to the X ray room or they died while being resuscitated for shock. Gas under diaphragm was found in 22 cases out of 25 bowel perforations detected at laparotomy. The above table shows the abnormal findings detected in x ray erect abdomen and their percentage.

### 8.2 FOUR QUADRANT ASPIRATION:

RESULT	NO. OF CASES	PERCENTAGE
Positive	60	60%
Negative	21	21%
Total	81	

**Table 9: Four quadrant aspiration**

Four quadrant aspirations was done in 81 patients, among which 60 cases were positive and 21 cases were negative. Out of the 21 negative cases, 6 cases were false negative. On laparotomy, they were found to have hemoperitoneum. The above table shows the percentage of these cases

### 8.3 ULTRASOUND EXAMINATION:

ORGAN INJURED	NO. OF PATIENTS	PERCENTAGE
Liver	15	15%
Spleen	17	17%
Kidney	3	3%
Free fluid without solid organ injury	4	4%
Bladder	2	2%
Not Done	41	41%
No Abnormalities Detected	21	21%

**Table 10: USG Abdomen**

A total of 62 patients were subjected for ultrasound examination, out of which 35 patients had scan detected solid organ injuries for which they underwent laparotomy and found to have significant injuries. 2 patients had bladder injury which was repaired. 21 patients had scan detected normal solid organs, 4 with free fluid and found to have hollow viscus injury at laparotomy. Pattern of abdominal injuries detected by ultrasound in 33 patients is shown in the above table.

**9. ORGANWISE INJURIES:**

ORGAN INJURED	NO. OF CASES	PERCENTAGE
Stomach	3	3%
Small bowel	33	33%
Colon	5	5%
Spleen	21	21%
Liver	18	18%
Kidney	3	3%
Mesentery	4	4%
Omentum	1	1%
Bladder	5	5%
Urethra	2	2%
Retroperitoneum	10	10%

Table 11: Organs Injured

In the present series, small bowel was the most commonly involved organ. It was involved in 33% of cases, spleen in 21% and liver in 18% of cases.

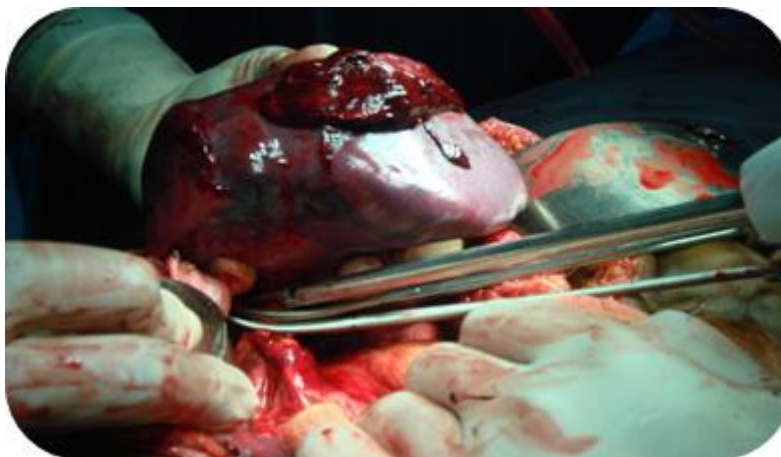


Figure 1: Splenic Laceration

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### 10. MULTIPLE ORGANS INJURED:

ORGANS INJURED	NO. OF CASES
Liver & spleen	1
Spleen & stomach	2
Intestine & mesentery	4
Spleen & retroperitoneum	4
Liver & retroperitoneum	4
Liver & intestine	2
Kiney & Spleen	1

**Table 12: Multiple Organ Injured**

The above table shows the incidence of the multiple organ injuries in the present series.

### 11. OPERATIVE PROCEDURE:

PROCEDURE	NO. OF PATIENTS	PERCENTAGE
Closure of perforation	25	25%
Splenectomy	13	13%
Splenorrhaphy	5	5%
Hepatorraphy	10	10%
Repair of mesentery	2	2%
Resection & anastomosis	11	11%
Bladder repair	5	5%
Colostomy	2	2%
Gastric perforation repair	1	2%

**Table 13: Operative procedure**

The above table shows the various operative procedures carried out among the patients who underwent exploratory laparotomy. Liver injuries were usually graded as I and II. Out of the 18 patients with liver injury, only 6 patients underwent hepatorraphy with spongistan packing and rest of them were treated with spongistan packing alone. Out of 21 patients with splenic injury, 13 patients underwent splenectomy, 5 patients were treated by spleenorrhaphy and 2 were managed conservatively. Bowel perforation was treated with 2 layered closures, with 11 patients requiring resection and anastomosis. Omental and mesenteric injuries were treated by simple suturing and ligating the bleeding points. Bladder injuries were repaired by 2 layered closures under the supervision of the urologist. In the present series of 100 cases, one case of duodenal perforation was found which was simple and was closed by 2 layered closures. We could not find any case of disruption of biliary tract and pancreatic injuries in this series.



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### 12. POST OPERATIVE COMPLICATIONS:

POST OPERATIVE COMPLICATION	NO. OF CASES	PERCENTAGE
Wound dehiscence	13	13%
Wound infection	24	24%
Fecal fistula	5	5%
Respiratory complication	7	7%
Intra-abdominal collection	5	5%
Duodenal fistula	2	2

Table 14

The above table shows the postoperative complications and their relative incidence in patients who underwent exploratory laparotomy.

### 13. MORBIDITY AND MORTALITY:

#### 13.1 MORBIDITY

NO. OF DAYS	NO. OF PATIENTS	PERCENTAGE
1-10	29	29%
11-20	34	34%
21-30	10	10%
31-40	8	8%
41-50	4	4%
51-60	2	2%

Table 15: Hospital Stay

The mean range of stay of patients in the hospital ranged from 11-20 days (15 days). The range varied from 2 days to 60 days.

The above table shows the duration of stay of patients with blunt abdominal trauma including those who died.

#### 13.2 MORTALITY:

Mortality	Operative	Non-Operative
16	10	6

Table 16: Mortality

A total of 16 patients died in the present study. 10 patients belonged to operative group and died in the post-operative period, majority of them due to peritonitis and septicemia. One patient died before surgery due to severe head injury. 5 patients died while being managed conservatively. This shows the disadvantages of conservative management like missed injuries and delayed treatment. Therefore the mortality in the present study is 16%.

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### DISCUSSION:

- AGE INCIDENCE:** The following table compares the incidence of blunt abdominal trauma in various age groups in the present series to that of the Davis et al<sup>5</sup>

AGE GROUP (yrs)	PRESENT SERIES	DAVIS ET AL <sup>5</sup>
1-10	2%	-
11-20	36%	19%
21-30	29%	24%
31-40	21%	15%
41-50	4%	13%
51-60	5%	6%
61-70	2%	3%
71-80	1%	-

**Table 17: Age incidence**

It can be seen from the above table that the majority of patients belonged to 11-20 years of age group, followed by 21-30 years age group. In Davis et al<sup>5</sup> study the majority of patients belonged to 21-30 years age group. Therefore it can be concluded that the young and the productive age group people are the usual victims of blunt abdominal trauma.

- SEX INCIDENCE:**

GENDER	PRESENT STUDY	DAVIS ET AL <sup>5</sup>
Male	91%	70%
Female	9%	30%

**Table 18: Sex Incidence**

From the above table, it can be seen that the males are the more common victims of blunt abdominal trauma. When compared to other studies the incidence of males is much more than those of the females, as, in India males are the chief bread earner for the family and are involved in outdoor activities most of the times.

- RATIO OF OPERATIVE TO CONSERVATIVE MANAGEMENT:**

TREATMENT	PRESENT STUDY (2003-06)	DAVIS ET AL <sup>5</sup>	KHANNA ET AL <sup>6</sup> (1992-97)
Operative	74%	77%	58%
Conservative	26%	23%	42%

**Table 19: Ratio of operative to Conservative Management**

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The above table shows that there is an increasing trend towards conservative management; however the present study shows that 26% of patients were subjected for non-operative management. Davis et al<sup>5</sup> showed 23% and Khanna et al<sup>6</sup> showed that 43% of patients were subjected for conservative management. Non operative management is gaining increasing acceptance mainly because of the easy availability of CT scan. With the aid of CT scan it is possible to accurately grade the extent of injury to solid organs like liver and spleen. Minor lacerations and capsular tears, difficult to diagnose clinically can be easily demonstrated by CT scan and selected for non-operative management. The disadvantages of non-operative management are those of missed injuries and delayed treatment resulting in excessive morbidity and even mortality.

#### 4. MODE OF INJURY:

CAUSATIVE AGENT	PRESENT STUDY (2003-05)	DAVIS ET AL <sup>5</sup>	KHANNA ET AL <sup>6</sup> (1992-97)
Road traffic accident	63%	70%	57%
Fall from height	27%	6%	15%
Blow to abdomen with blunt objects	10%	17%	33%

Table 20: Mode of injury

The above table clearly depicts that the road traffic accident is the most common mode of injury. This is due to the rapid development in technology, in all fields including automobile industry where the first priority has been given to speed rather than safety.

#### 5. SIGNS AND SYMPTOMS:

In the present study, abdominal pain was the most common presenting complaint accounting for 82% and abdominal tenderness was the most common sign accounting for 90% of cases. But the signs and symptoms in abdominal injuries are notoriously unreliable and are often masked by concomitant head injuries, chest injuries and pelvic fractures. Significant injuries to the retroperitoneal structures may not manifest signs and symptoms immediately and be totally missed even on abdominal x rays and DPL predisposing the patients to grave consequences of missed injuries. In Davis et al<sup>7</sup> study, 43% of patients had no specific complaints and no signs or symptoms of intra-abdominal injury when they first presented to the emergency room. But 44% of those patients eventually required exploratory laparotomy and 34% of patients had an intra-abdominal injury. This emphasizes the importance of careful and continuing observation and repeated examination of individuals with blunt abdominal trauma.

#### 6. LATENT PERIOD:

Latent period is the interval between the time of injury to the time of surgery. 40% of patients were taken for surgery between 11-20 hours and 20% of patients between 1-10 hours of injury. This time lag is due to the site of accidents, which are usually rural, and the time taken to transport them to the hospital. 2 patients (4%) were taken for surgery after 5 days of injury as they were initially put on conservative management. Since their condition deteriorated on repeated clinical examinations, they had to be taken up for delayed exploratory laparotomy.

## 7. ASSOCIATED INJURIES:

Associated extra abdominal injuries were found in 55 cases. The common extra abdominal injuries were extremity fractures, pelvic fractures, head injuries and chest injuries including rib fractures. The above table shows the comparison of the present study incidences of associated injuries with other studies.

PRESENT STUDY (2003-06)	DAVIS ET AL <sup>5</sup>	KHANNA ET AL <sup>6</sup> (1992-97)
Head 12%	9%	12%
Thoracic 5%	27%	24%
Orthopaedic 19%	15%	27%
Soft tissue 9%	12%	
Combination 10%	6%	

Table 21: Associated injuries

## 8. INVESTIGATIONS:

**8.1 PLAIN X RAY ABDOMEN:** Plain x ray of abdomen was done in 96 cases, out of the total 100 cases. Gas under diaphragm was found in 22 cases out of 25 bowel perforations detected at laparotomy. So the sensitivity of plain x ray abdomen in detecting the pneumoperitoneum is 76% in the present study. Davis et al<sup>8</sup> reported that in their series, abdominal x ray was abnormal in 21% of cases; pneumoperitoneum was detected in 6% of cases and dilated bowel loops in 6% of cases.

**8.2 FOUR QUADRANT ASPIRATION:** In the present study 85% of patients were subjected for four quadrant aspiration as against 44% in Davis ET al<sup>10</sup> study. 64 cases were found to be positive and 21 cases were negative. Out of these 64 cases, 4 cases were false negative in the present study. Therefore the sensitivity of this investigation in the present study is 90%. Correct results (positive or negative), as determined by subsequent laparotomy, were obtained in 86% of cases in Davis ET al<sup>9</sup> study.

**8.3 DIAGNOSTIC PERITONEAL LAVAGE:** Diagnostic peritoneal lavage was done in 21 cases, out of which 13 were positive and 8 were negative. All positive cases showed significant injury at laparotomy. When compared to four quadrants aspiration this yielded better results. The sensitivity of DPL in the present study is 100%. But the sample is very small to compare the results with other studies.

**8.4 ULTRASOUND EXAMINATION:** A total of 62 patients were subjected for ultrasound examination, out of which 35 patients had scan detected solid organ injuries for which they underwent laparotomy and found to have significant injuries. 21 patients had scan detected normal solid organs with free fluid and found to have hollow viscus injury at laparotomy. Therefore ultrasound is more reliable in detecting solid organ injuries and free fluid in the

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abdomen. In Yoshi H et al study, the sensitivity of ultrasound in detecting injuries in blunt abdominal injury patients is about 94.6%.

### 9. ORGANWISE INJURY:

ORGAN INJURED	PRESENT SERIES	CUSHERI <sup>7</sup>	DAVIS ET AL <sup>5</sup>	COX ET AL <sup>8</sup>	KHANNA ET AL <sup>6</sup>
Stomach	3%	1%	1%	7%	
Small bowel	33%	9%	8%	8%	57%
Colon	5%				
Spleen	21%	25%	25%	46%	26%
Liver	18%	15%	16%	33%	37%
Kidney	3%				
Mesentery	4%	5%	4%	10%	47%
Omentum	1%				
Bladder	5%	6%	4%		
Urethra	2%	2%			
Retroperitoneum	2%				

**Table 22: Organ**

The above table compares the incidences of the organs involved in blunt abdominal trauma in the present study to that of the international series. Contrary to these international series<sup>11</sup> where spleen is the most common viscera injured, in the present series, GIT is the most commonly involved organ. Small bowel was involved in 33% of cases, followed by spleen (21%), and followed by liver (18%).

### 10. MULTIPLE ORGANS INJURED:

ORGANS INJURED	NO. OF CASES
Liver & spleen	1
Spleen & stomach	2
Intestine & mesentery	4
Spleen & retroperitoneum	4
Liver & retroperitoneum	3
Liver & intestine	2
Kidney & Spleen	1

**Table 23: Multiple organ injuries**

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The following table shows the incidence of the multiple organ injuries in the present series.

In Michael L Nance et al<sup>26</sup> study, 1.9% of kidney injuries, 9% of liver injuries, 26.2% of pancreatic injuries and 7.9% of splenic injuries had associated hollow viscus injuries.

### 11. OPERATIVE PROCEDURES:

In the present study closure of bowel perforation was done on 25 patients, colostomy in 2 patients, repair of mesentery in 2 patients, splenectomy in 13 patients, splenorrhaphy in 5 patients, hepatorrhaphy in 10 patients and resection and anastomosis in 11 patients.

In Khanna et al<sup>12</sup> study closure of bowel perforation was done in 13 patients, colostomy in 2 patients, repair of mesentery in 9 patients, splenectomy in 4 patients, splenorrhaphy in 1 patient and hepatorrhaphy in 6 patients.

### 12. MORTALITY:

A total of 14 patients died in the present study. 10 patients belonged to operative group and died in the post-operative period, majority of them due to peritonitis and septicemia. 2 patients died before surgery due to severe head injury. 2 patients died while being managed conservatively. This shows the disadvantages of conservative management like missed injuries and delayed treatment. Therefore the mortality in the present study is 14%. This is comparable with other series published in our country (Khanna et al<sup>6</sup>). The mortality rate in Davis et al<sup>13</sup> study is 13.3%, Di Vincenti et al<sup>14</sup> study (1968) was 23%. Cox et al<sup>15</sup> study reports a mortality rate of 10%.

**SUMMARY AND CONCLUSIONS:** This was a prospective study of 100 cases of blunt abdominal trauma in our Hospital from September 2010 to September 2013. From this study, the following conclusions can be made.

- Males are predominantly affected. It is mostly seen in the age group of 11-20 years which form the young and reproductive group. These patients are usually from lower socio economic income group.
- Road traffic accident forms the most common mode of injury. Hence measures should be taken to prevent these accidents and care of the victims at the accident site. Well established trauma care centers should be established at least at every District hospital. Measures for early transport of the patients from the accident site to the trauma center should be undertaken.
- A thorough and repeated clinical examination and appropriate diagnostic investigations lead to successful treatment in these patients.
- Though conservative management is successful in carefully selected patients, operative management remains the main stay of treatment.
- Plain erect x ray abdomen is a valuable investigation taken for gastrointestinal injuries. Ultrasound examination gives a clear picture of solid organ injury and free fluid. Four quadrant aspiration is a simple and an important tool for diagnosis. But better results are given by Diagnostic peritoneal lavage.
- The most common injured viscera in the present study are small bowel and they were managed by simple suturing. Splenic injury is the second most commonly injured organ and majority of them were managed by splenectomy. Few of them were managed by splenorrhaphy. Liver injuries occupy the third position and were managed by hepatorrhaphy and spongistan packing.

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- Retroperitoneal hematoma was seen in a small proportion of patients associated with renal injuries and pelvic fracture. Only minor renal injuries that were encountered were treated conservatively.
- Multiple organs were involved in most of the cases rather than an isolated organ injury.
- Associated extra abdominal injuries like head, thoracic and orthopedic injuries were found in 61 cases in the present study. These greatly influenced the morbidity and mortality of the patients.
- Post-operative complications like wound infection, dehiscence, respiratory infections and fecal fistula are common in blunt abdominal trauma. The present study showed a mortality of 16%.

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### AUTHORS:

1. Sreenidhi G. M.
2. Venugopal K.
3. Nandeesh Kumar G. N.

### PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of General Surgery, KIMS, Bangalore.
2. Associate Professor, Department of General Surgery, KIMS, Bangalore.
3. Junior Resident, Department of General Surgery, KIMS, Bangalore.

### NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Sreenidhi G. M,  
Associate Professor,  
Department of General Surgery,  
KIMS, V.V. Puram, Bangalore.  
E-mail: nidhikims@gmail.com

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