INTRODUCTION
Blunt abdominal trauma is one of the commonest cause of morbidity and mortality among all age group in modern era. Road traffic accidents, fall from height, assault are the common modes of blunt abdominal trauma. Identification of serious intra-abdominal pathology is often challenging. Many injuries may not manifest during initial assessment and treatment period. The aim of this study is rapid diagnosis work up, early decision and treatment to ensure patient survival to decrease mortality and morbidity. A retrospective analysis of 110 patients of blunt injury abdomen who were. Admitted at NIMS Medical College and Attached Hospital, Jaipur during three years was done. Demographic data, mechanism of injury, management and outcome were studied. Most of the patients in our study were in the age group of 21-30 years with the M:F ratio 3.23:1. Motor vehicle (72%) was the most common mechanism of injury. Liver (38.18%), Spleen (36.36%), Kidney (14.54%), small bowel, pancreas, mesenteric tear etc were in descending order. Out of the 110 patients 58 were operated and rest treated conservatively. Mortality rate was 9%. Wound infection was a common complication.

Keywords: Blunt abdominal trauma, ultrasonography, CT (Computed tomography), Visceral organ, Hemoperitoneum, Road traffic accident.

A clinical study of blunt abdomen trauma

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Abstract
Blunt abdominal trauma is one of the commonest cause of morbidity and mortality among all age group in modern era. Road traffic accidents, fall from height, assault are the common modes of blunt abdominal trauma. Identification of serious intra-abdominal pathology is often challenging. Many injuries may not manifest during initial assessment and treatment period. The aim of this study is rapid diagnosis work up, early decision and treatment to ensure patient survival to decrease mortality and morbidity. A retrospective analysis of 110 patients of blunt injury abdomen who were. Admitted at NIMS Medical College and Attached Hospital, Jaipur during three years was done. Demographic data, mechanism of injury, management and outcome were studied. Most of the patients in our study were in the age group of 21-30 years with the M:F ratio 3.23:1. Motor vehicle (72%) was the most common mechanism of injury. Liver (38.18%), Spleen (36.36%), Kidney (14.54%), small bowel, pancreas, mesenteric tear etc were in descending order. Out of the 110 patients 58 were operated and rest treated conservatively. Mortality rate was 9%. Wound infection was a common complication.

Keywords: Blunt abdominal trauma, ultrasonography, CT (Computed tomography), Visceral organ, Hemoperitoneum, Road traffic accident.

INTRODUCTION
In 1990, about 5 million people died as a result of injury. It is estimated that by the year 2020, 8.4 million people will die every year from injury and injuries from road traffic accidents will be third common cause of disability worldwide and second most cause in the developing world. Though the pattern of injury from human interaction with motor car have somewhat modified by crash protection devices such as helmet, seat belts, and Air bags but the injuries due to road traffic related trauma are worsening each year. The use of motor vehicles is growing worldwide, a particular concern in emerging economies, where increasing urbanization, over crowding and poor follow up of rules of the road is prevalent. Blunt injury trauma generally leads to high mortality according to various series reported. Rapid resuscitation is necessary to save the unstable but salvageable patients with abdominal trauma. Accurate diagnosis and avoidance of needless surgery is all important. The diagnosis and decision for surgery depends mainly on careful and repeated clinical examination with basic investigation. The management must be individualized. A systemic approach to pre operative diagnosis and preparation, intra operative inspection, decision, post operative care and observation for complication is essential for successful management of each case. This study is based on mechanism and pathological basis of abdominal trauma by blunt injury, its diagnosis and management were briefly discussed. A detailed study and analysis of 110 cases of abdominal trauma admitted in Nims Hospital, Jaipur in the preceding three years was undertaken with the review of medical literature.

MATERIAL AND METHOD
A clinical study was conducted over a period from March 2012 to February 2015.

- The initial clinical assessment of patients with blunt abdomen trauma is often difficult and notably inaccurate. The most reliable sign and symptoms in alert patient are.
  - Pain.
  - Tenderness.
Gastrointestinal hemorrhage-paller, Tachycardia. Drop in Hb%. Hypovolaemia (Hypovolaemic shock).
Evidence of peritoneal irritation.
However, large amount of blood can accumulate in the peritoneal and pelvic cavity without any significant or early changes in physical examination findings. Bradycardia may indicate the presence of intra peritoneal blood.
On physical examination, the following injury pattern predicts the potential for intra abdominal trauma.
Lap belt marks-correlate with the small intestine injury.
Steering wheel shaped contusion.
Ecchymosis involving the flanks (Grey turner signs) or the umbilicus (Cullen sign), indicate retroperitoneal hemorrhage but usually delayed for several hours to days.
Abdominal distension.
Auscultation of bowel sound in the thorax may indicate a diaphragmatic injury.
Abdominal bruit may indicate underlying vascular disease or traumatic arteriovenous fistula.
Local or generalized tenderness, rigidity, guarding or rebound tenderness suggest peritoneal injury.
Fullness and daughy consistency on palpation may indicate intra abdominal hemorrhage.
Crepitation or instability of lower thoracic cage indicates the potential for splenic or hepatic injuries.

All cases were evaluated with plain radiographs, routine ultrasound scanner with corrected C.T. Operative finding were noted wherever laparotomy was performed. Patients having solid organ injury, hemoperitoneum and air under diaphragm are subjected to C.T. Scan or laparotomy, wherever needed. Statistical evaluation includes the sensitivity, specificity, accuracy and negative predictive value of plain radiograph and ultrasonography in blunt abdominal trauma. AAST grading of solid organ injuries were used for classification and grouped in to low grade injuries include grade I and II, high grade injury includes III, IV and VI for management purpose.

Inclusion Criteria
- Patient presenting with blunt abdominal injury.
- Clinical suspicion of intra abdominal injury.
- Hemo dynamically stable patient.
- Multi trauma patients.

Exclusion Criteria
1. Associated orthopaedic injury.
2. Associated with severe Head injury.
4. Associated with severe chest injury.

After conventional radiography and sonography patients were monitored clinically. Clinically and hemo dynamically stable patients (as indicated by hourly recording of normal vital signs, urine output of 30-50 c.c./hr.) for 6 hours. Normal finding on radiological and sonological evaluation were chosen for CECT abdomen. Patients were taken for laparotomy based on one or more of the following finding.
1. Clinical deterioration with increasing abdominal distension.
2. Unexplained sustained hypotension (systolic B.P.<90 m.m. of Hg.) and not responding to I.V. fluid infusion.
3. Signs of continuing intra abdominal hemorrhage with drop in Hb% by 1.5 gm% or progressive falling hematocrit on hourly examination.
4. Free air on erect abdominal radiograph.
5. Gross free peritoneal fluids on abdominal USG with no solid organ injury.
6. Hemo peritoneum finding on FAST or DPL.

OBSERVATIONS
Highest number of cases of blunt injury occurred in the age group of 21-30years (28.18%), followed by 31-40years (26.38%) and (16.36%) in the age group of 11-20years respectively (TABLE. I). Males and females victims of blunt abdominal trauma were in ratio 3.23.1.

Table 1: Age Distribution

<table>
<thead>
<tr>
<th>Age in years</th>
<th>Number</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-10</td>
<td>02</td>
<td>1.81</td>
</tr>
<tr>
<td>11-20</td>
<td>18</td>
<td>16.36</td>
</tr>
<tr>
<td>21-30</td>
<td>31</td>
<td>28.18</td>
</tr>
<tr>
<td>31-40</td>
<td>29</td>
<td>26.38</td>
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<tr>
<td>41-50</td>
<td>18</td>
<td>16.36</td>
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<tr>
<td>51-60</td>
<td>08</td>
<td>7.27</td>
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<tr>
<td>61-70</td>
<td>03</td>
<td>2.72</td>
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<tr>
<td>71-80</td>
<td>01</td>
<td>0.90</td>
</tr>
<tr>
<td>Total</td>
<td>110</td>
<td>100</td>
</tr>
</tbody>
</table>

Most common cause of blunt abdominal trauma was road traffic accidents 72.72% followed by assault 16.36%, while fall height and crushing injury were least common (table-2). Among road traffic accident cases majority of the victims were hit by motor Car/Bus/Truck etc.
Among abdominal organs, liver was most commonly injured. Spleen, Kidney and Small Intestine were injured in reducing numbers followed by Pancreas, Mesentric tear, Stomach and Genito-urinary organ injuries.

**Table 3: Distribution Abdominal Visceral injury**

<table>
<thead>
<tr>
<th>Abdominal Visceral organ</th>
<th>Number</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Liver</td>
<td>42</td>
<td>38.18</td>
</tr>
<tr>
<td>Spleen</td>
<td>40</td>
<td>36.36</td>
</tr>
<tr>
<td>Kidney</td>
<td>16</td>
<td>14.54</td>
</tr>
<tr>
<td>Small intestine</td>
<td>15</td>
<td>13.65</td>
</tr>
<tr>
<td>Pancreas</td>
<td>5</td>
<td>4.54</td>
</tr>
<tr>
<td>Mesenteric tear</td>
<td>6</td>
<td>5.54</td>
</tr>
<tr>
<td>Urinary bladder</td>
<td>4</td>
<td>3.63</td>
</tr>
<tr>
<td>Stomach</td>
<td>2</td>
<td>1.81</td>
</tr>
<tr>
<td>Genitals</td>
<td>3</td>
<td>2.72</td>
</tr>
</tbody>
</table>

In the present study, out of 110 patients 58 cases were managed surgically.

**Table 4: Grade Specific Solid Organ Injury with Management**

<table>
<thead>
<tr>
<th>Injury</th>
<th>Con Opr</th>
<th>Liver</th>
<th>Spleen</th>
<th>Kidney</th>
<th>Pancreas</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grade</td>
<td>I</td>
<td>5</td>
<td>00</td>
<td>5</td>
<td>00</td>
</tr>
<tr>
<td></td>
<td>II</td>
<td>15</td>
<td>00</td>
<td>20</td>
<td>00</td>
</tr>
<tr>
<td></td>
<td>III</td>
<td>8</td>
<td>8</td>
<td>5</td>
<td>7</td>
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<tr>
<td></td>
<td>IV</td>
<td>2</td>
<td>4</td>
<td>00</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>V</td>
<td>0</td>
<td>00</td>
<td>00</td>
<td>00</td>
</tr>
<tr>
<td>Total</td>
<td>30</td>
<td>12</td>
<td>10</td>
<td>12</td>
<td>4</td>
</tr>
</tbody>
</table>

**DISCUSSION**

As reported the most common mode of blunt abdominal trauma were motor collisions, assault, fall from height and sports injury etc. Considerable forces are usually required to injure solid and hollow viscera in abdomen. Three basic mechanism explains the injury to abdominal organs i.e. deceleration, external compression and crushing injuries. Sudden deceleration movement of mobile organs against the fixed organs that causes tear at the point of fixation, such as vascular pedicles and mesenteric attachments. In crushing injuries, massive forces crush the abdominal contents between the abdominal wall, the spine or the bones of the chest wall. Sudden increase in intra abdominal pressure possibly resulting in rupture of hollow viscera. Most commonly injured abdominal organs and structure are spleen, Liver, Kidney, Small Bowel and/or mesentry, bladder, disphragm, pancreas and major vessels and multiple organs are often affected simultaneously. Several factors determine injury to specific organ such as the energy delivered at the time of impact, the part of body struck first, the body habits, the height of fall and in case of motor vehicle accidents, site of impact of injuries, the organ tear to the site of impact. Knowledge of common pattern of injury, site of impact and association of organs involved are helpful when evaluating clinically and interpretation of imaging studies. In our study, the most vulnerable age group noted was 21-30 years (28.18%), followed by 31-40 years (26.38%) and 11-20 years (16.36%) as shown in TABLE - 1. This is in accordance with the study of Khichi et al. (2012) who reported the highest incidence in 21-30 years (40%), followed by 11-20 years (21.1%), while Singh et al. noted that the maximum number of cases of blunt trauma abdomen belonged to age group of 20-29 years, but the second age group was 30-39 years. Thus partially agreeing with our findings. Our study showed male predominance of victims 76.36% with male to female ratio of 3.23:1 which is also observed by other author. The male predilection is due to the fact adult male are the earning member of family and are most exposed to outdoor activities in contrast to females, who tend to stay at home engaged in house hold activities. The most common cause of blunt injury abdomen was road traffic accidents followed by impact by blunt objects. Very few cases were due for fall from height and crush injuries. Hanumantha et al and Simpson are of same opinion that accidental crash injuries due to motor vehicle were more common. It can be said that increase in population and vehicle are leading to increased congestion on roads can directly related to the number of traffic accidents. Our research showed that two wheeler occupants are commonest victims followed by pedestrians. These finding can be attributed to involvement of young age group who use two wheelers as more common mode of transport. Assessment of hemodynamic stability is most important initial concern in the evaluation of patient with blunt abdominal injury. In the haemo dynamically unstable patient, a rapid evaluation of hemoperitoneum can be accomplished by means of diagnostic peritoneal lavage or the focused assessment with sonography for trauma (FAST). Radiographic studies of the abdomen are indicated in stable patient when physical examination are inconclusive. Plain abdominal radiograph in erect position is helpful in hollow visceral injury. Hollow visceral injury shows free air doom of diaphragm. This was seen in our all 15 small bowel injury cases. Plain radiograph is useful in chest injury, liver injury and splenic injury where right and left lower rib were associated in our 54 patients. Mahapatra et al in their study showed that plain abdominal radiography accurately diagnosed all the three cases of intestinal injury. Our findings match with Mahapatra's study. In patients with pelvic fracture, extra peritoneal rupture of bladder were more common than the intra peritoneal rupture. Extra peritoneal rupture was seen in our all four cases. It appears that the compressive forces that deforms and fracture the pelvis exerts a shearing force in the bladder.
base resulting in extra peritoneal injury to bladder. USG on the other hand, is safer, simpler to perform relatively cost effective and rapid to find significant hemo peritoneum and simultaneously evaluate the thorax, pleural collection and retro peritoneum in addition to abdomen and helpful in unstable patient. We performed USG in all hemodynamically stable and unstable patients. Boulanger et al in 1999 revealed that USG based algorithm for blunt abdominal trauma was more rapid, less expensive and the USG machine being portable. The current FAST examination protocol consist 4 acoustic window (peri cardiac, peri hepatic, peri splenic and pelvic) with the patient in supine. An examination is interpreted as positive if free fluid is found in any of the 4 acoustic windows, negative if no fluid is seen and indeterminate if any of the windows cannot be adequately assessed. FAST can be completed in 3 to 4 minutes. The minimum threshold for detecting hemoperitoneum is unknown but remains a subject of interest. Kawaguchi and collegues found that 70 ml. of blood could be detected as where as Tiling et al found that 30 ml. is the minimum requirement for detecting with ultrasound. Generally FAST diagnostic accuracy is equal to the that of DPL sensitivity and specificity of these fast ranges from 85% to 90% . Computed tomography is the standard for detecting solid organ injuries C.T. can provide excellent imaging of pancreas, duodenum and genito-urinary system. C.T. scanning often provides the most detailed images of traumatic pathology and may assist in determination of operative intervention. Unlike DPL or FAST, C.T. can determine the source of hemorrhage. We performed C.T. in all the hemodynamic stable patients. The most frequently injured organs in blunt abdominal trauma are liver, spleen, retro peritoneum organs. In present study, liver was the most common injured organ. Out of the 42 cases, 30 liver injury patients were managed conservatively and 12 were operated. The present study is comparable to Mausami et al who showed that liver was the commonest organ involved (62.27%) and spleen (30.91%). Small intestine (18.8%) and Kidney (18.8%) cases. Singh at al and Hanumantha et al who had reported 67% and 32.6% incidence in their study. This is because liver is largest of all organs and more anteriorly placed, thus more susceptible to injury in blunt trauma. In present study splenic injury was found in 40 cases. 30 were treated conservatively and 10 patients were operated. In three cases splenectomy was performed in grade 4 while splenorrhaphy was done in 7 cases. This study is comparable to study done by Davis et al which reported 24.7% of cases had splenic injury, out of which 10.7% were operated and 14% were managed conservatively. Another study of R. curie et al reported 27.5% of cases had splenic injury out of which 15% were operated and splenorrhaphy was done in all. In the present study renal injury was 3rd most common injured organ. Total cases were 16 out of which 12 were of grade I, II and four were of grade 3rd and 4th. All were detected by USG. Low grade injury of grade I, II were treated conservatively. Two cases of grade IV and two were operated for other solid organ injury. Pancreatic injury was detected in 5 cases. Three were treated conservatively. Pancreatic injury cases were diagnosed by FAST and CECT helped in the management. In our study small bowel was most common injured organ (15 cases). And jejunum was involved in 12 cases. Mesentric tear was seen in 6 cases and they were treated operatively. This study is comparable to study done by Devis et al showed 3.4% cases of mesenteric tear. Large bowel was injured in 4% of the cases which were operated. In present series two cases of stomach injury, 4 cases of urinary injury and three cases of genital injury were encountered which were operated. Our study is comparable to Devis et al who also operated most of the hollow organ injury. Out of 110 cases 52.7% cases were management surgically while 47.3% cases were treated conservatively. Our study closely correlating with Navin et al study which shows 48% patient's were treated conservatively. Solid organ injuries with low grade (AAST I and II) can be managed conservatively with closed monitoring of clinical vitals, based USG and plain radiography which has high sensitivity. In present study wound infection was the most common complications in 16 cases after undergoing surgery followed by pneumonia, pelvic abscess, Intestinal obstruction, Bed sores, wound dehiscence and DIC. Ten death occurred out of 58 cases operated due to chest and wound infection and sepsicaemia. Another study by Devis et al showed 15% mortality with septicaemia, the most common cause of death.

**CONCLUSION**

Road traffic accidents forms the most common mode of injury. Measures must be taken to prevent these accidents and care of victims at the accident site. A thorough and repeated examination and appropriate diagnostic investigations leads to successful treatment in these cases. Early transportation, rigorous measures of resuscitation, early diagnosis and decision for surgery, good trauma centres, good radiological and blood bank facilities. Careful exploration, perfect technique of surgery and meticulous postoperative follow up will aid in reducing mortality. In present study we concluded that operative procedure was the best method of treatment option if patient is unstable and early operation decreases the mortality in blunt trauma patient.
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