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BLUNT ABDOMINAL TRAUMA: AN OBSERVATIONAL STUDY

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ABSTRACT

Abdominal trauma caused by blunt force is a common presentation in the emergency This study confirmed the well known fact that predominantly younger population of 21- 30 years which form the reproductive age group is affected by trauma with a marked male preponderance.

Road traffic accidents form the most common mode of injury. Hence measures should be taken to prevent these accidents and care of the victim at the accident site.

Spleen and liver were the common organs involved in Blunt abdominal trauma, found in 66 % and 20 % cases respectively. Associated injuries were present in 36 % cases and included head injury, chest injury and bony fractures. The complication rate was 22 % with chest infection being the commonest complication.

There is an increasing trend towards conservative management. Non operative management is gaining increasing acceptance mainly because of the easy availability of Ultrasound and 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.

Though conservative management is successful in carefully selected patients, Operative management remains the mainstay of treatment.

INTRODUCTION

Trauma literally means wound or injury, whether physical or psychic. Abdominal trauma caused by blunt force is a common presentation in the emergency room seen in adults and children.[1,2]

Trauma is essentially a man made health problem of the modern era, which has assumed epidemic proportions. It 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 our country.[3]

Trauma is characterised by a structural alteration or physiological imbalance that results when energy is imparted during interaction with physical or chemicals agents. Injuries are observed in civilian settings or military settings. In civilian settings injuries are classified as Homicidal, Suicidal and Accidental, considering the medico-legal

aspects. Homicidal injuries result from assault which can be blunt force by fists, low velocity penetrating objects like pistol bullets and knife, High velocity penetrating objects like machine gun bullets or blast injuries following terroristic attacks. In the civilian settings, negligence or lack of safety culture is the most important cause of manmade injuries. The Accidental injuries commonly result from Road or Railway traffic accident, fall from height or industrial accidents. Human error and machine error resulting out of negligence or lack of safety culture are important contributing factors to preventable accidental injuries.

Abdominal trauma is an important cause of internal bleeding and sepsis in Trauma patients. The mechanism involved are Blunt, Penetrating or Blast trauma. Abdomen is the third most commonly injured region.[4]

The greatest difficulty in blunt trauma is the diagnosis because of masking of symptoms by other injuries like head injury, chest injury and fractures.

The evaluation of any trauma patient begins with evaluating the airway, accessing the breathing, and managing the circulation. The diagnosis of intra-abdominal injury following blunt trauma depends primarily on the hemodynamic status of the patient. If the patient is hemodynamically stable, CT scan is the ideal test to look for solid organ injury in the abdomen and pelvis. For unstable patients, one may perform an ultrasound (Extended Focused Assessment with Sonography for Trauma (EFAST)) or diagnostic peritoneal lavage, both of which are associated with a high rate of false negatives and false positives.[5,6,7]

In comparison to Blunt abdominal trauma, Penetrating trauma, can be easily diagnosed because of the presence of the entry wound and/or exit wound. In Blunt abdominal trauma, the number of solid organ injuries are more as compared to hollow viscus injuries. It has been observed that number of solid organs stop bleeding spontaneously without any intervention. Thus for last two decades management of blunt abdominal trauma has changed from early surgical intervention to non operative management. The advent of Interventional radiology, Endoscopy and minimal access intervention have further enhanced the scope of non operative management. This study was undertaken to study clinical profile, diagnosis, severity and management of blunt abdominal trauma in current setup.

This Is a retrospective observational study of cases of Blunt abdominal trauma in a tertiary teaching institute. We conducted this study in January 2020 to November 2021 we included the Adult (age>18yrs) of either sex, Patients with Blunt Abdominal Trauma with radiologically diagnosed solid organ as well as hollow viscus injuries, Patients with Blunt abdominal trauma with other associated injuries like head injuries or long bone fractures. We excluded the cases Age < 18 years. Convenient, continuous, consecutive and clinic based sampling method was used. For collection of the retrospective data waiver of consent was obtained from the institutional Ethics board.

METHODOLOGY

Emergency surgery department register were screened for diagnosis of blunt abdominal trauma written in the column of diagnosis.

Accordingly the data was collected from the medical records of the hospital diagnosed to have 'Blunt abdominal trauma with solid organ or hollow viscus injury'.

The data of the patients so enrolled was collected in the prescribed proforma and was tabulated. Identity of patients enrolled in the study was not be revealed.

Following data was recorded:

- Demographic details of the patient Age/Sex/Address History: pain in abdomen/distension/vomiting/hematuria/(loss of consciousness) LOC/ ENT bleed
- Clinical examination

a) General examination: - pulse/Blood pressure/signs of shock

b) Systemic examination: - Emphasis on abdominal examination. In abdominal examination, special relevance was given to palpatory findings; findings of per rectal examination was also recorded in each one of them. A provisional diagnosis of Blunt Abdominal trauma was made.

The severity of other associated injuries were assessed by computing Glasgow coma scale, Revised Trauma score. Simultaneously resuscitative measures were started. Patients with poor GCS <8 and those unable to maintain saturation were intubated & airway was secured. Patients were kept nil by mouth and administered intravenous fluids, intravenous antibiotics and injectable analgesics. At the same time for the patients in hypovolemic shock, oxygen was administered, a central venous cut down and urinary catheterization (except in urethral injuries) was done.

- Hematological investigations: Hemoglobin with complete blood count, Renal function tests were documented
- Radiological investigations:

a) X ray: Chest X ray portable were done and findings were noted. Few showed air under right dome of diaphragm diagnostic of hollow viscus perforation. Findings of other X-rays for associated long bone injuries, pelvis, spine were recorded.

b) USG abdomen and pelvis: Focused assessment of Sonography for trauma (FAST) The findings of free fluid were noted

c) CT Scan abdomen and pelvis with intravenous contrast: investigation was carried out in all the hemodynamically stable patients. The organ injury score –AAST grade was noted. In cases of other associated injuries, CT brain, HRCT Thorax, Ct spine was done to assess the severity of injury.

Further management was planned depending on the organ involved.

- Pneumothorax and hemothorax were managed by intercostal drainage tube insertion, if required
- Liver injuries and splenic injuries grade I, II, III, some IV were conserved.
- Rest of the patients were subjected to exploratory laparotomy after a written, informed, valid consent is taken. A standard midline approach was used for laparotomy in all the patients.
- Indications for laparotomy:

1) Local abdominal signs of peritonitis such as presence of guarding and rigidity.
2) Patients with no abdominal signs but abdominal organ injury suspected due to severe pallor and shock with hemodynamic instability evaluated by ultrasound and examination of the abdomen and were taken up for exploration if findings were positive on sonography.
3) Other radiological evidence of intra abdominal injury such as free gas under diaphragm.

The findings at laparotomy were noted as follows –

1. Amount of hemoperitoneum or pus and faecal and biliary contamination.
2. Organ injured and the site and extent of injury.
3. The state of viscera and any other incidental findings.

The procedure done varied as per the findings:

- Some Grade IV and V splenic injuries were subjected to splenectomy.
- In small intestinal tears either edges were fashioned and primary suturing done or resection or anastomosis was done.
- Mesenteric tears were sutured.
- In urinary bladder injuries primary suturing with suprapubic cystostomy was carried out.

A monolayer closure with non-absorbable suture material was done in all cases after peritoneal wash. Two tube drains were left in the peritoneal cavity.

Post operatively, patients were given IV fluids, blood transfusions, antibiotics and analgesics. Drains were removed on 5th post-operative day and suture removal was

done after 15 days.

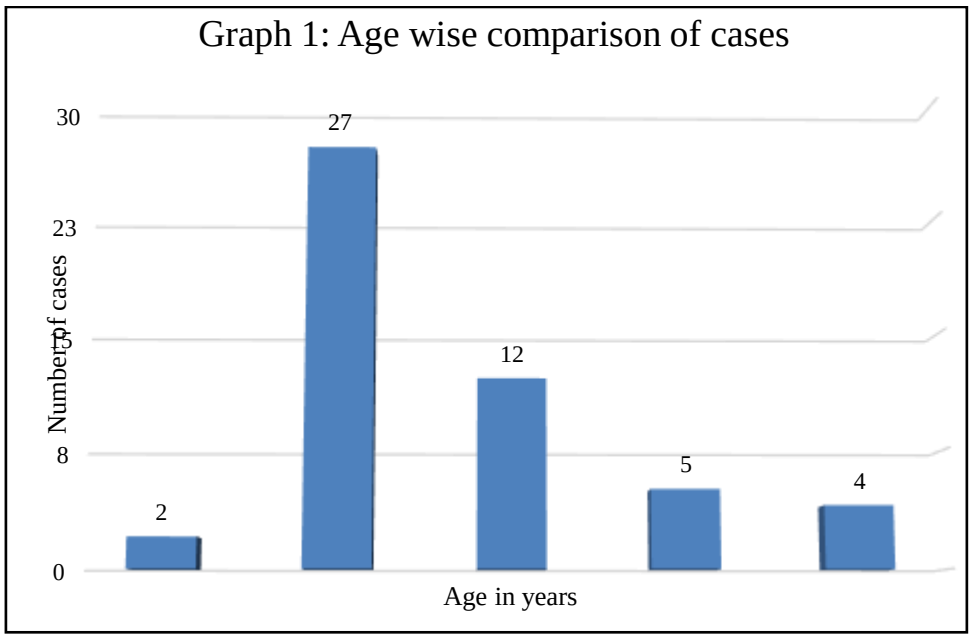
Complications were managed accordingly. In cases of post operative wound infection a swab was taken and sent for culture and sensitivity, and appropriate antibiotic was started; and for respiratory infections chest physiotherapy and antibiotics were given.

The outcome, whether discharged or death were noted.

The data was recorded in Microsoft Excel sheet. Qualitative data studies like gender, organs injured in blunt abdominal trauma, surgical procedures, complications of blunt abdominal trauma were represented in the form of frequency and percentages. Nominal and ordinal were tabulated and non parametric tests like chi square were applied for computing associations wherever appropriate. Description of the various surgical outcomes with respect to above mentioned criterion were given and presented in the form of tables and diagrams whichever are appropriate.

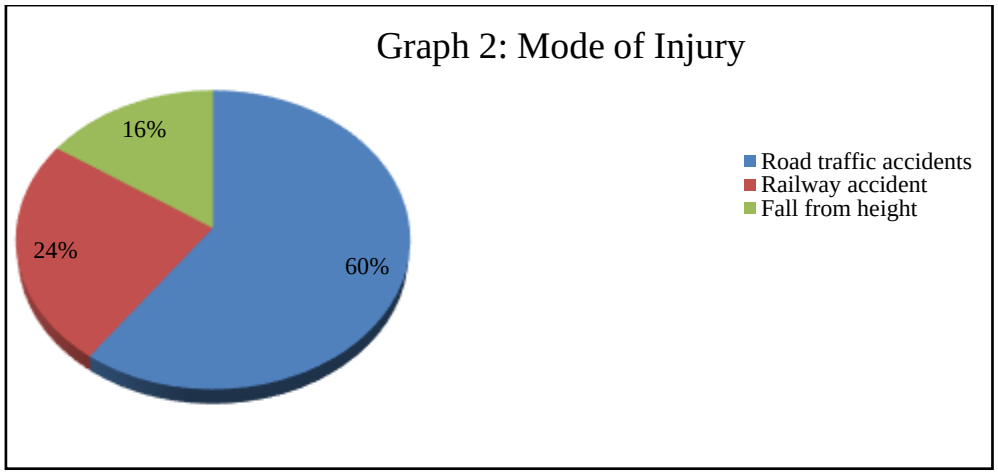
RESULTS

In this study of 50 cases of blunt abdominal trauma causing solid organ injury following observations were recorded. Blunt abdominal trauma was seen at all ages, predominantly in the prime of life between 21-30 years (54%). The mean age of the patients was 32.34 with standard deviation 10.26 years. The youngest patient was of age 19 years and oldest patient was of age 62 years (Graph 1)

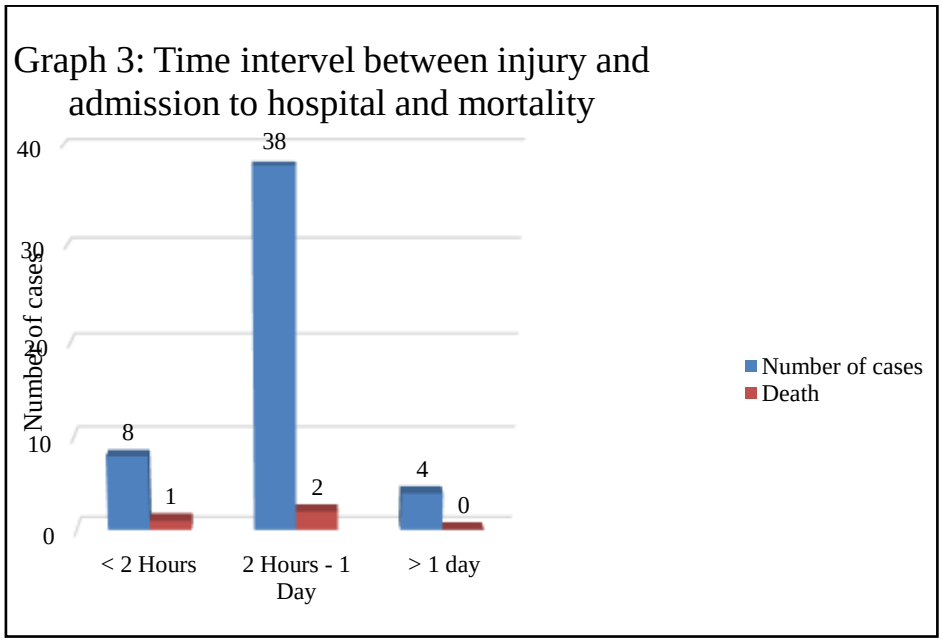


Out of total cases 43 (86%) were males and only 7 (14%) were female**.** The Gender distribution has male dominance with a male: female ratio of 6: 1. The modes of injury were also evaluated viz. road traffic accidents,

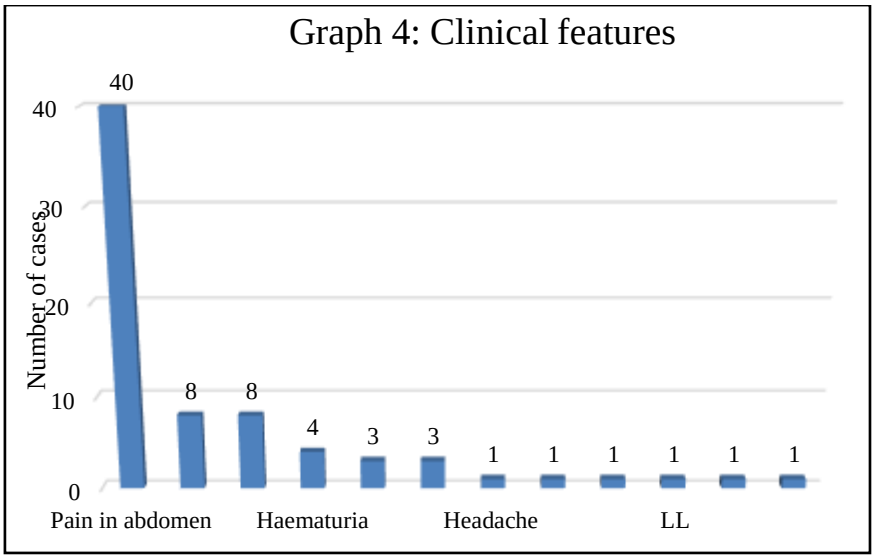
Railway accidents, Falls form heights and assaults. As expected, road traffic accidents have been the major cause of trauma. In our study they contribute 54 % followed by Railway accidents 22 % (Graph 2)



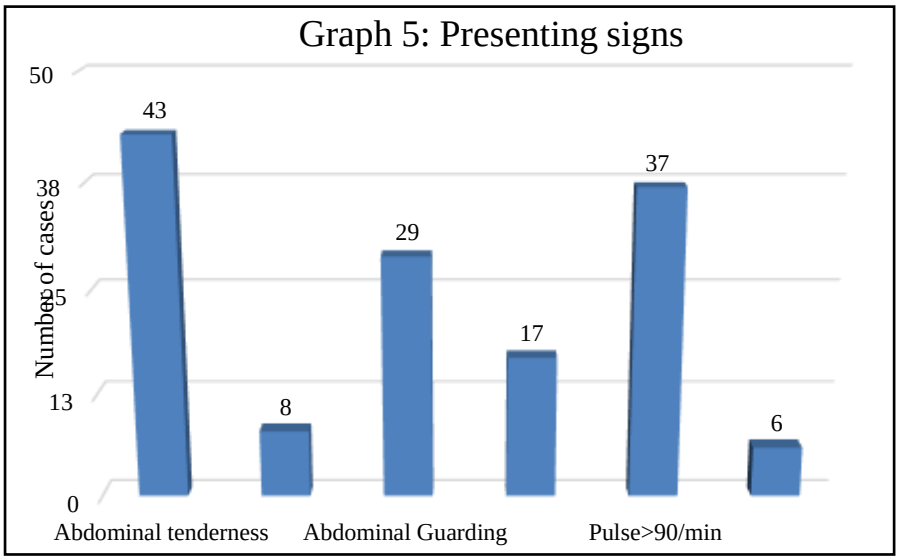
Out of total cases 76% cases arrived in the hospital between 2 hours to 1 day, following to that 16% cases visited hospital within 2 hours and only 8% cases visited hospital after 1 day. (Graph 3)



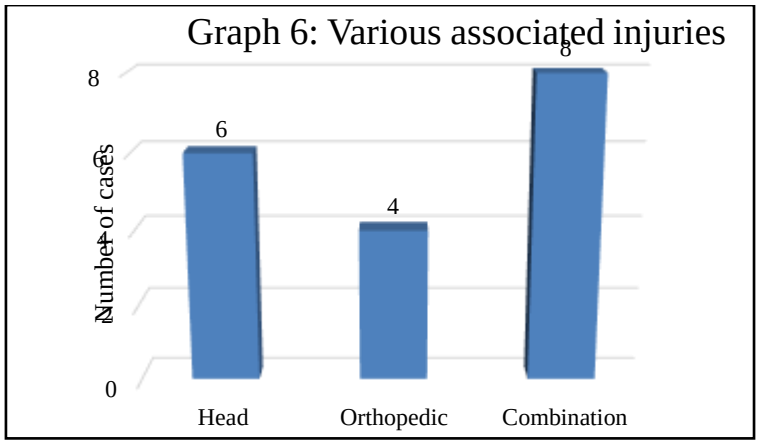
Majority of patients presented with pain in abdomen (80%) followed by vomiting (16%), LOC (16%), hematuria (8%), chest pain (6%), abdominal distension (6%) (Graph 4)



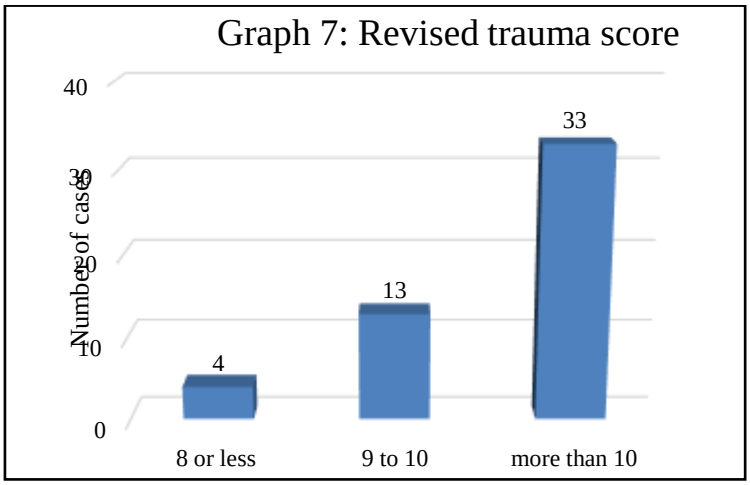
Out of total cases most common clinical sign was Abdominal tenderness (86%), most commonly localized to a particular quadrant depending on the underlying organ injury. 58% cases had abdominal guarding, 34% cases had pallor, 74% cases observed with pulse rate greater than 90 / min and 12% cases observed with systolic BP less than 90 mm of Hg. (Graph 5)



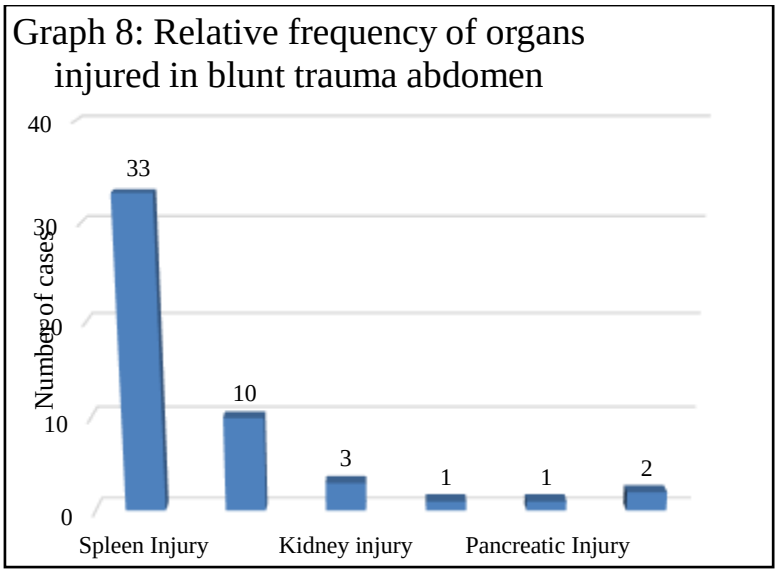
Out of total cases 18 (36%) cases had associated injuries. Out of 18 associated injuries, 6 cases had head injury, 4 cases had orthopedic injury and other 8 cases of combined injury including rib injury, head injury, humerus fracture, pelvis fracture. (Graph 6)



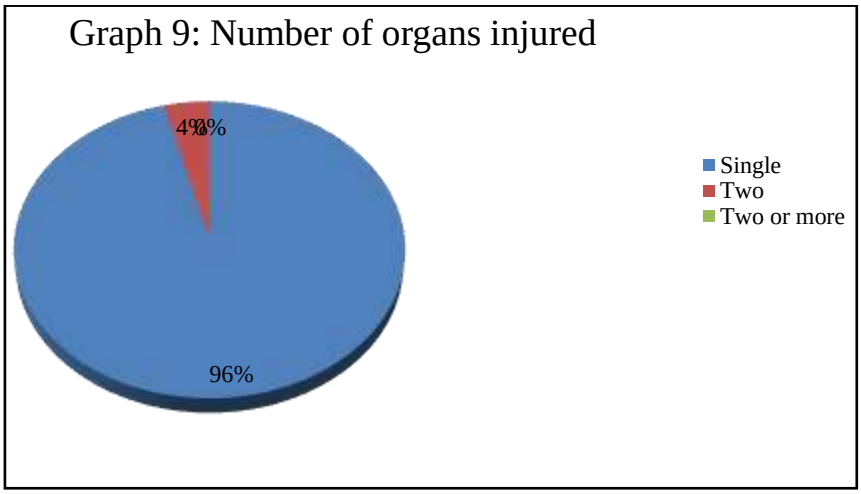
Of the total 50 patients, 33 patients (66%) had a revised trauma score of 10 or more following to those 13 (26%) cases had a revised trauma score between 9 to 10 and 4 (8%) cases had a revised trauma score 8 or less. (Graph 6)



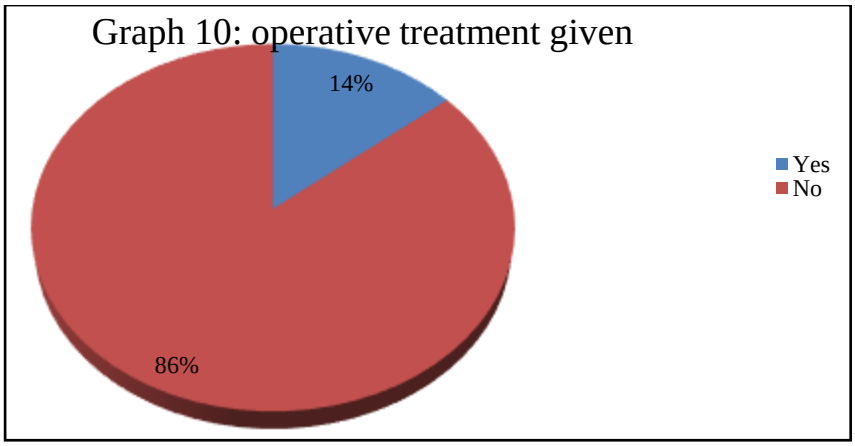
Spleen is the most common organ injured (33 cases, 66%) followed by Liver (10 cases, 20%), Kidney (3 cases, 6%), urinary bladder injury, GI injury and pancreatic injury. (Graph 7)



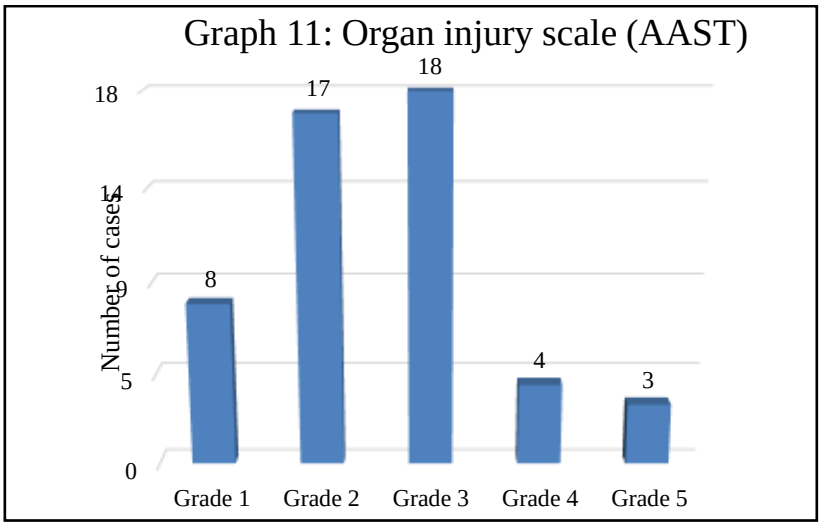
Out of total cases, single organ injured in 48 (96%) cases and two organs injured in only 2 cases out of which in one case both spleen and liver injured and in another pneumoperitoneum and spleen injured. (Graph 8)



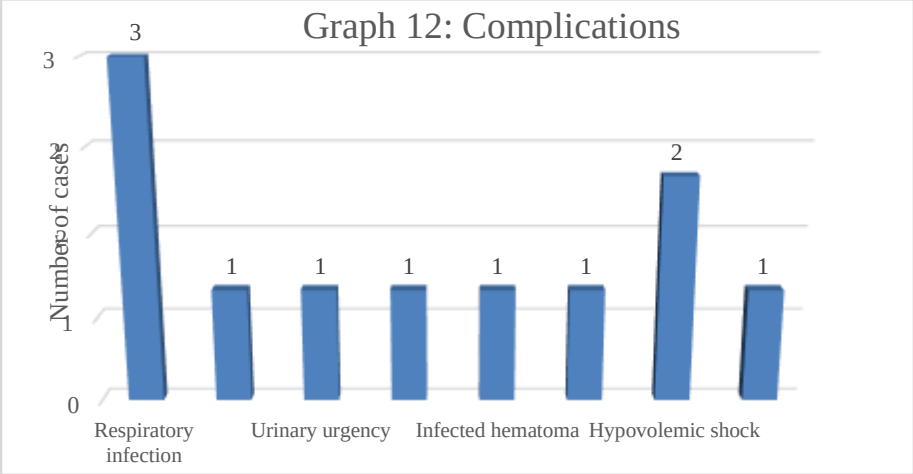
Out of total cases only 7 cases operated while others had non operative management. (Graph 9)



Out of the total 50 patients, 36 % had a AAST Organ injury score grade 3 followed by grade 2 (34%) , grade 1 (16%), grade 4 (8%) and grade 5 (6%).(Graph 10)



Out of total cases, there were no complications in 78%, in the remaining patients, 6% had respiratory infection, 4% had hypovolemic shock, and all other cases includes complications like urinary tract, wound infection, infected hematoma, pleural effusion and intra-abdominal collection. One case had wound infection and UTI both (Graph 11)



The overall mortality observed in this study was 6%. All the Mortalities had associated injuries like liver injury, splenic injuries. There were no deaths in isolated blunt abdominal injuries.

Table 13: Association between OIS and management given

Grade as per AAST OIS	Management		Total	Test Statistic	P value
	Conservative	Operative			

1,2,3	40 (90.91%)	04 (9.09%)	44 (100%)		
4,5	03 (50%)	03 (50%)	06 (100%)	**7.33**	**0.007**
Total	43 (86%)	07 (14%)	50 (100%)		

Of the total 6 cases with AAST- organ injury scale of grade 4 OR more, 3 patients (50% %) were given operative management while remaining 3 patients were conserved. Of the total 6 patients conserved with grade more than 4, only one patient died which had associated liver and spleen injury. All other had uneventful recovery.

Table 14: Association between type of organ injury and management

Type of organ injury	**Management**		**Total**	**Test Statistic**	**P value**
	Operated	**Non operative**			
Solid organ	05 (10.42%)	43 (89.58%)	48 (100%)		
Hollow viscus	02 (100%)	00	02 (100%)	12.79	<0.001
Total	07 (14%)	43 (96%)	50 (100%)		

Out of total cases, 48 cases had solid organ injury out of them 5 cases were operated and 2 cases had hollow viscus type of injury and all of them were operated. Type of organ injury and management were significantly associated. (Table 14)

Table 15: Association between complication and associated injuries

Associated injuries	**Complications**		**Total**	**Test Statistic**	**P value**
	Yes	**No**			
Yes	06 (54.55%)	05 (45.45%)	11 (100%)		
None	04 (10.26%)	35 (89.74%)	39 (100%)	**10.519**	**0.001**
Total	10 (20%)	40 (80%)	50 (100%)		

Out of total cases, 11 cases had associated injuries and out of them 6 cases had complications which includes wound infection, UTI, respiratory infection, pleural effusion, hypovolemic shock. Associated injury and complications were significantly associated. (Table 15)

Table 16: Association between type of organ injury and complications

Type of organ injury	Complications		Total	Test Statistic	P value
	Yes	No			
Solid organ	08 (16.67%)	40 (83.33%)	48 (100%)	**6.786**	**0.009**
Hollow viscus	02 (100%)	00 (0%)	02 (100%)		
Total	10 (20%)	40 (80%)	50 (100%)		

Out of 10 cases with complications 8 cases had Solid organ injury and 2 cases had hollow viscus injury. Type of organ injured and complications were significantly associated.

Table 17: Association between number of organs and outcome.

Single / Multiple	Outcome		Total	Test Statistic	P value
	Death	Discharge			
Multiple	01 (50%)	01 (50%)	02 (100%)	7.151	0.007
Single	02 (4.17%)	46 (95.83%)	48 (100%)		
Total	03 (6%)	47 (94%)	50 (100%)		

Out of 3 deaths 2 deaths had single organ injury and one case had two organs injury which include liver and spleen injury. Number of organs injured and outcome of cases were significantly associated.

Table 18: Association of revised trauma score with outcome

RTS	Outcome		Total	Test Statistic	P value
	Survived	Death			

<10	14 (82.35%)	03 (17.65%)	17 (100%)	6.853	0.009
>10	33 (100%)	00 (0)	33 (100%)		
Total	47 (94%)	03 (6%)	50 (100%)		

Out of 3 deaths all cases had revised trauma score less than 10. Revise trauma score and outcome of cases were significantly associated.

DISCUSSION

Trauma is one among the leading causes of death. The evaluation of patients who have sustained blunt abdominal trauma (BAT) may pose a significant diagnostic challenge to the most seasoned trauma surgeon. Medical management of blunt abdominal trauma (BAT) relies on judging patients for whom laparotomy is mandatory. It has been observed that number of solid organs stop bleeding spontaneously without any intervention. Thus, for last two decades management of blunt abdominal trauma has changed from early surgical intervention to non-operative management. The advent of Interventional radiology, Endoscopy and minimal access intervention have further enhanced the scope of non-operative management.

This study was conducted to see clinical profile, diagnosis, severity and management of blunt abdominal trauma in current setup. In this study of 50 cases of blunt abdominal trauma causing solid organ injury following observations were recorded.

Age distribution of cases:

Blunt abdominal trauma was seen at all ages, predominantly in the prime of life between 21-30 years (54%). The mean age of the patients was 32.34 with standard deviation 10.26 years. The youngest patient was of age 19 years and oldest patient was of age 62 years. In **Davis et al (T3-5)** study the majority of patients belonged to 21-30 years age group.[11] Similar findings are seen in the studies by **Nabachandra H.et al (2006) [T1-9],** Marine **Makanga (2008) [T1-39]** and **Mousami Singh et al (2012) [T1-38]** who stated that in blunt abdominal trauma average age of presentation was 31, 27 and 29 respectively[9,10,12]. The age incidence was shown to be variable in different series. It can be concluded that the young and the productive age group people are the usual victims of blunt abdominal trauma.

Gender distribution of cases:

Out of total cases 43 (86%) were males and only 7 (14%) were female**.** The Gender distribution has male dominance with a male: female ratio of 6: 1. The findings were synonymous with the results of the study conducted by **Marine Makanga in 2008 [3 T1-9],** ratio was 5:1, **Mousami Singh et al 2012 [T1-38]** found the ratio as 4:1,

ratio in the study by **Shojaee M. et al 2014 [T1-8]** and **Nabachandra H.et al 2006 [T1-9]** was 4.2:1 and 3.8:1 respectively[12,10,8,9]. The reason behind the increase incidence in males in our study is due to the fact that in our country males are exposed to trauma as most of the time they remain outdoors and a significant section of females remain indoors and males are the chief bread earner for the family and are involved in outdoor activities most of the times

Mode of injury:

The modes of injury were also evaluated viz. road traffic accidents, Railway accidents, Falls form heights and assaults. As expected, road traffic accidents have been the major cause of trauma. In our study they contribute 54 % followed by railway accidents 22%.

Davis et al (T3-5) reported that road traffic accident contributed 70% of injuries, fall from height in 6% and blow to abdomen with blunt objects was reported in 17% patients. [11] **Khanna et al (T3-6)** (1992-97) also noticed similar distribution, 57% cases had history of road traffic accident, 15% had fall from height and blow to abdomen with blunt objects contributed 33% of injuries.[13] Mode of injuries are also similar in study by **Nabachandra H.et al 2006 [T1-8] , Mousami Singh et al 2012 [T1-38],** revealed that Road Traffic accidents was leading cause for blunt abdominal injury, 86.4 % and 70% respectively.[9,10] 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.

Time interval between injury and admission to hospital:

Out of total cases 76% cases arrived in the hospital between 2 hours to 1 day, following to that 16% cases visited hospital within 2 hours and only 8% cases visited hospital after 1 day. This time lag is due to the site of accidents, which are usually rural, and the time taken to transport them to the hospital. In a study by **Reddy RP et al (R1)**, 52% of our patients presented between 2-4 hours after injury.[14] 82% presented within 6hrs after injury justified that the time lag is due to lack of facility for transport. Many belonged to rural area.

The temporal factor is fundamental in the management of trauma. Studies demonstrate that the concept that the faster the initiation of treatment, the better is the patient's prognosis **(Tallon 2002) (T6)**.[15] Even after arrival at the hospital, the time issue is fundamental. A more recent study **(Clarke et al. 2002) (T6)** showed that in patients with intra-abdominal injuries to probability of death increased by 1% every 3 minutes in the center of emergency. Thus, even after the patient's admission, the need for rapid concatenation of events. Some patients are taken late for surgery as they are initially put on conservative management. Since their condition is deteriorated on repeated clinical examinations, they had to be taken up for delayed exploratory laparotomy.

Clinical Symptoms and Signs:

Our study shows, majority of patients presented with pain in abdomen (80%) followed by vomiting (16%), LOC (16%), hematuria (8%), chest pain (6%), abdominal distension (6%). Most common clinical sign was Abdominal tenderness (86%), most commonly localized to a particular quadrant depending on the underlying organ injury. 58% cases had abdominal guarding, 34% cases had pallor, 74% cases observed with pulse rate greater than 90 / min and 12% cases observed with systolic BP less than 90 mm of Hg.

It is comparable to study by **Tripathi et al (R5-5)** which reported Tenderness as most common sign in 80% of their patients and shock in 37.2% of their patients.[16] Also, in **Davis et al (T1-41)** study generalized abdominal tenderness and abdominal guarding were the most frequent physical findings, both signs being present in more than 75% of all patients. [11]

In a study by **Reddy RP et al (R1),** tenderness was the most common examination finding accounting 98%, abdominal guarding in 52% of cases and rigidity was present in 38% cases.[14] Also mentioned that signs and symptoms are misleading in case of blunt trauma abdomen and are masked by concomitant head injury, chest injury and alcohol consumption.

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.

Associated injury:

Out of total cases 18 (36%) cases had associated injuries. 6 (12%) cases had head injury, 4 (8%) cases had orthopedic injury and other 8 cases of combined injury including rib injury, head injury, humerus fracture, pelvis fracture. This is in accordance with the findings of studies conducted by **Frandon et al 2015 [T1-44], M. Makranga [T1-47] (2008)** which showed an incidence of 50.4 % and 38.2 % respectively in patients having abdominal trauma.[17] **Davis et al (T3-5)** also in their study found that head injuries in 9%, thoracic injuries in 27%, orthopaedic injury in 15%, soft tissue injuries in 12%, and combination of injuries in 6% patients.[11] In a study by **Khanna et al (T3-6) (1992-97),** head injuries in 12%, thoracic injuries in 24% and orthopaedic injuries in 27% patients.[13] The common extra abdominal injuries were extremity fractures, pelvic fractures, head injuries and chest injuries including rib fractures.

Revised trauma score:

Of the total 50 patients, 33 patients (66%) had a low risk score revised trauma score, following to those 13 (26%) cases had a intermediated score and (8%) cases had high risk score. Similar findings were by **TS Subbiah et al (R6),** demonstrated that based on their trauma scores, patients were classified, : 58% had low risk, 14% had intermediate risk score and 28% patients had high Risk score.[18]

Organs injured in blunt trauma abdomen:

Spleen is the most common organ injured (33 cases, 66%) followed by Liver (10 cases, 20%), Kidney (3 cases, 6%), urinary bladder injury, GI injury and pancreatic injury. Our findings are in agreement with **Haan et al 2005 [T1-43],** Spleen was involved in 25% cases, Liver in 16%, GI injury seen in 9% and 4% patients had Urinary Bladder injury.[50] **Armstrong et al 2015 [T1-45]** showed that Spleen was involved in 46% cases, Liver in 33%, Kidney in 10% and GI injury seen in 4% patients. Similarly, **Khanna et al 2008** found Spleen was involved in 57% cases, Liver in 37%, GI injury seen in 10% patients.[13] In **Michael L Nance et al (T3-26)** 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.[21] Spleen and liver are 2 most common organs injured during blunt abdominal trauma in study by **Shah SM et al, Schroeppel TJ et al and Cox EF et al [R3-3,5,6]**[22,23,24]

Operative treatment given:

There is an increasing trend towards conservative management. Out of total cases only 14% cases operated while 86% had non operative management. **Davis et al (T3-5)** showed 23% and **Khanna et al (T3-6)** showed that 43% of patients were subjected for conservative management. Similarly, studies by **Armstrong et al 2018, (T1)** 25% were operated and 75% managed conservatively, **Peitzman et al 2000 (T1)** 31% were operated and 69% managed conservatively and M. **Makranga 2008 (T1)** in their study found 38% patients were operated and 62% managed conservatively. [11,13,20,25]

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.

Organ injury scale (AAST):

Out of the total 50 patients, 36 % had a AAST Organ injury score grade 3 followed by grade 2 (34%) , grade 1 (16%), grade 4 (8%) and grade 5 (6%). In a study by **Reina Khadilkar et al (R2),** 34% patients had grade 2, 32% had grade 3, 18% had grade 1, 12% grade 4 and only 4% patients were found to have AAST Grade 5.[26]

Complications:

Out of total cases, there were no complications in 78%, in the remaining patients, 6% had respiratory infection, 4% had hypovolemic shock, and all other cases includes complications like urinary tract, wound infection, infected hematoma, pleural effusion and intra-abdominal collection. One case had wound infection and UTI both. Comparable to findings by **Ashish R. Sharma et al**, around 20 out of 100 patients develop complications following exploratory laparotomy like fever, jaundice, wound infection, intraperitoneal infections, paralytic ileus or renal failure.[27] In **Gupta et al.** study also, 10 out of 63 (16%) developed infections **(R3-10)**.**Reina Khadilkar et al (R2)** in their study showed, 25% of the patients developed complications, commonest complication seen was the occurrence of pleural effusion and paralytic ileus followed by wound infection while the 76% of the patients had uneventful recovery.[26,27]

The overall mortality observed in this study was 6%. All the Mortalities had associated injuries like liver injury, splenic injuries. There were no deaths in isolated blunt abdominal injuries. This is comparable with other series published in our country **(Khanna et al) [T1-43]** where it was 11.2% . The mortality in **Cox et al [T1-40]** is 10% and **Di Vincenti et al 1998 [T1-42]** was 23 %. The mortality rate in **Davis et al (T3-5)** study is 13.3%.[11,13,24,29]

Association between OIS and management given:

Of the total 6 cases with AAST- organ injury scale of grade 4 OR more, 3 patients (50% %) were given operative management while remaining 3 patients were conserved. Of the total 6 patients conserved with grade more than 4, only one patient died which had associated liver and spleen injury. All other had uneventful recovery. This can be related to the study done by **Frandon et al 2010 [T1-44] ,** where of the total patients operated, 82% had an Organ injury scale of 3 or more, thus indicating a significant association.[17]

Association between type of organ injury and management:

Out of total cases, 48 cases had solid organ injury out of them 5 cases were operated and 2 cases had hollow viscus type of injury and all of them were operated. Type of organ injury and management were significantly associated. This finding is in agreement with the study of **Frandon et al 2010 (T1-44)** where 94 % of hollow viscus injuries were operated, in this study two patients of extraperitoneal bladder rupture were given conservative management.[17]

Association between complication and associated injuries:

Out of total cases, 11 cases had associated injuries and out of them 6 cases had complications which includes wound infection, UTI, respiratory infection, pleural effusion, hypovolemic shock. Associated injury and complications were significantly associated. This is in concordance with the **Armstrong et al 2018 [T1-45]** study

where associated injuries were a major contributing factor (68%) for complications in Blunt abdominal injuries.[19,20]

Association between revised trauma score, type of organ injury, number of organs injured and complications:

Revised trauma score and complications were not significantly associated. Type of organ injured and complications were significantly associated, solid organ injury was more associated with complications. Number of organs injured and outcome of cases were significantly associated, more numbers of organs injured were associated with higher mortality. Revise trauma score and outcome of cases were significantly associated, high risk score was associated with higher mortality.

Increased trend towards conservative management is increasing. This was due to earlier trend of operative management due to unavailability of better imaging and risk of missed injuries.

Non operative management is gaining increasing acceptance mainly because of the easy availability of better imaging modalities like Ultrasound and CT scan. Minor lacerations and capsular tears, difficult to diagnose clinically can be easily demonstrated by CT scan and selected for non-operative management. Though conservative management is successful in carefully selected patients, operative management remains the main stay of treatment.

Delayed presentation, involvement of more than one intra-abdominal organ, presence of extra-abdominal injuries and associated comorbid diseases increases the morbidity and mortality in these patients. Early diagnosis, aggressive resuscitation and timely surgical intervention may improve the outcome in trauma patients.

LIMITATIONS OF THE STUDY

The study was carried out in a tertiary care institute which is a referral center, which is more likely to receive more complex patients and may not be representative of all patients. study was retrospective where data was retrieved from hospital records. The study duration and number of patients is limited to draw any statistical significance. All of the facts and figures mentioned here may considerably vary from those of large series covering wide range of time, but still then, as the cases of this study were collected from a tertiary level hospital in our country, this study has some credentials in reflecting the factors/parameters involved in blunt injury abdomen and their correlation with the outcome and management of the blunt injury abdomen

CONCLUSIONS

Non operative management is gaining increasing acceptance mainly because of the easy availability of Ultrasound and CT scan. Though Non Operative management (NOM) is successful in carefully selected patients, Operative management (OM) remains the mainstay of treatment.

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