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"Evaluation of Prognostic Factors In Management of Blunt Abdominal Trauma (Bat)"

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ABSTRACT – *Evaluate and Analyze and recommend data for prognostic factors and management in BAT.*
Aims and Objective *- TO evaluate and analyze the clinical data for prognostic factors in BAT.To formulate recommendations for management of BAT cases in clinical practice.*
Material and Methods *– This prospective observational study was carried out at department of Surgery at Subharti Medical College, Swami Vivekanand Subharti University, Meerut. Patients of all age group presented in the Emergency of CSSH hospital of blunt trauma abdomen (BAT) were included in the study. During July 2015 to Aug 2017, first 100 cases (n=100) of blunt abdominal trauma who had presented to the casualty were included in this study.*
Statistical analysis *- Data was analyzed using Statistical Package for Social Sciences, version 23 (SPSS Inc., Chicago, IL). Results for continuous variables are presented as mean ± standard deviation, whereas results for categorical variables are presented as number (percentage). The level P < 0.05 was considered as the cutoff value or significance*
Results *- Evaluation of patients with blunt abdominal trauma is a challenging job for a surgeon. Proper early diagnosis and initial resuscitation is beneficial in having a good outcome.Physical examination remains the initial step in diagnosis but due to its proven inconsistency especially in children, patients under the effect of alcohol, or in patients with concomitant injuries to head and spine, various diagnostic modalities have been employed to assist the trauma surgeon in diagnosis of abdominal injuries.Conservative treatment offers advantage for solid organ injuries in hemodynamically stable patients. The suspected or confirmed hollow organ injury requires surgery.*
Keywords*-Abdominal trauma,Road traffic accident,Blunt trauma,Assault injury.*

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I. Introduction

Trauma has been called the neglected disease of modern society, despite its close companionship with man. Trauma is the leading cause of death and disability in developing countries and the most common cause of death under 45 years of age. World over injury is the 7th cause of mortality and abdomen is the third most common injured region of human body. Abdominal injuries require surgery in about 25% of cases. 85% of abdominal traumas are of blunt character. It is a major cause of morbidity and mortality.Data from the different study had shown a high mortality in patients with BAT especially when patients is having multiple solid organ injury. During surgery risk of death increases by 4.4 times in patients with solid organ injury. In order to salvage patients from such abdominal trauma, rapid resuscitation is needed.**Error! Bookmark not defined.** Several old studies have recommended an observation period of 23 hours following BAT; nevertheless, the optimal observation duration is still unknown.

Aim and Objective – TO evaluate and analyze the clinical data for prognostic factors in BAT.To formulate recommendations for management of BAT cases in clinical practice.

II. Material and Methods

This prospective observational study was carried out at department of Surgery at Subharti Medical College, Swami Vivekanand Subharti University, Meerut. Patients of all age group presented in the Emergency of CSSH hospital of blunt trauma abdomen (BAT) were included in the study. During July 2015 to Aug 2017, first 100 cases (n=100) of blunt abdominal trauma who had presented to the casualty were included in this study

INCLUSION CRITERIA

- All aged male and female patients with history of recent assault by blunt and heavy object over abdomen.
- Road traffic accident with suspected blunt abdominal injury
- History of fall from height.
- Injuries occurring during natural calamities like earth quakes and landslides.
- Patient on whom there is clinical suspicion of blunt trauma to abdomen.
- Blunt trauma abdomen in sport injury.

EXCLUSION CRITERIA-

- Patients with penetrating and stab and gunshot injuries.
- Patients transferred to this hospital after surgery in another institution.
- Not consenting to participate in the study

- **INSTRUMENTS REQUIREMENT**-
- Predesigned proforma for data collection
- Informed consent form
- Ultrasonic equipment for sonography

Blood pressure measurement equipment (Mercury Sphygmomanometer)

DEFINITION OF VARIABLE- A written informed consent was taken from the patients and/or their attendants, followed by detailed history and brief clinical examination findings and subjects excluded from the study if they were not matched with inclusion criteria of the study.

- Patient's Proforma was prepared in English and local language (Hindi working proforma) was used during interview to make it convenient for the population.
- Demographic data collected included the age, sex, occupation and nature and time of accident leading to the injury.
- In this study we enrolled 100 cases of blunt abdominal trauma with mean age of 29.26±15.80 years.
- Maximum 74 (74%) incidence of blunt abdominal trauma is observed in Males.
- Documentation of all 100 patients, which included, identification, history, clinical findings, general conditions, blood pressure, pulse rate, diagnostic tests, operative findings, operative procedure, complications during the stay in the hospital and during subsequent follow-up period, were all recorded on a proforma (annexure 1) specially prepared.
- The cases were followed and complications noted.
- Patients selected for serial clinical examination which included hourly pulse rate, blood pressure and respiratory rate for first 24 hours and repeated clinical examination of abdomen and other systems.
- Abdominal ultrasonography was done in every case during the hospital stay within 24 hours.
- The mechanism of injury (multiple trauma patients with blunt abdominal trauma or simple BAT), the presence of shock at admission (systolic BP<90 mmHg and a HR>100 bpm), initial Glasgow Coma Scale (GCS), time from admission to operation, associated abdominal injuries, other associated injuries, length of total hospital stay, were recorded for statistical analysis.
- We defined stability and hemodynamic status with the revised trauma score (RTS), one of the most widely used physiological rating systems: The RTS, the glasgow coma scale (GCS), systolic blood pressure, and respiratory rate (RR).
- The degree of dysfunction in each parameter is scored from 1-5 and the RTS is determined by adding each of the coded values together; therefore, RTS scores range from 0 to 12.
- An attempt was made to establish the reasons for delay between the time of injury and the time of laparotomy in excess of 6 hrs.
- Investigations: Two types of investigative data were analyzed:
  - **Laboratory investigations:** These included complete blood count, blood typing, and cross matching and coagulation profile.
  - **Radiographic investigations :** Plain chest X-ray, pelviabdominal ultrasound, and, in some stable cases, computed tomography.
- Major associated injuries of the head, face, solid abdominal viscera, thorax, pelvis, axial skeleton, major blood vessels and long bones were also recorded.

- The indications for laparotomy were considered if one or more of the following prognostic factors are present like, hemodynamic instability with reasonable clinical suspicion of an intraabdominal cause, diagnostic CT scan, positive diagnostic peritoneal lavage, positive abdominal signs or positive contrast study.
- Hemoglobin levels were also acquired 24 hours after ICU admission in order to detect possible bleeding situations.

Ultra sound was done by: Ultrasound machine of Siemens Acuson S 2000 having Grey Scale display & real-time facilities with 3.5 MHz Convex sector and 5 & 7.5 MHz liner transducer by ultrasonologist on call / on duty.

Siemens Acuson S 2000

Blood pressure was measured in both arms using a mercury sphygmomanometer after a 15 minute rest. The average value was recorded as the patient's BP.

Mercury Sphygmomanometer

Blood sugar: Random or fasting Blood Sugar and/ or Post-prandial Blood Sugar: **by ortho-toluidine method.Random is defined as** without regard to time since the last meal. Fasting is defined as no caloric intake for at least 8 hour.

Blood Sample Collection and Storage

Fasting blood samples were obtained by venipuncture in the early morning. Five milliliters of blood was collected in a tube without anticoagulant (Becton-Dickinson). The samples were immediately centrifuged for 15 minutes at 1100 g. The serum samples were immediately isolated, and the aliquots were stored at -70°C for batch-wise analysis. Following biochemical parameters were measured:

Outcome parameters

- Analysis of patients demographics information,
- clinical characteristics,

- mechanism of injury,
- vital signs,
- Glasgow Coma Score for mortality prediction,
- Associated injuries,
- Laboratory investigations (hemoglobin levels),
- CT scan findings,
- splenic injury grades,
- management (conservative, or surgical),
- intra-operative findings,
- length of hospital and ICU stay
- Mortality
- Prognostic factors (like gender, length of interval between injury and medical intervention, presence of shock at admission, presence of cranial injury.

III. Results And Discussion

In present study, about 100 patients were admitted to the hospital almost patients were suffered from BAT injury and majority of subjects were in the age group between 21- 40 (51%) years and were male (74%) out of total admitted. The median age of the study sample was 29.26 years with standard deviation ±15.80 years while mean age for male patient was 28.51 years with standard deviation ±16.36 years. These results are in correlation with the above mentioned studies. This group represents the economically active age and portrays an economic loss to the family and the nation and the reason for their high incidence of splenic injuries reflects their high activity levels and participation in high-risk activities.

Study	Mean age (in years)
Ting-Min Hsieh et al**Error! Bookmark not defined.**	31.9 ± 16.3
John L. Kendall et al**Error! Bookmark not defined.**	31.0
Gaby Jabbour et al**Error! Bookmark not defined.**	26.9±13.1
Present study	29.26±15.80

In present study, majority of patients were construction workers 29 (29%) followed by student 28 (28%), shopkeeper 22 (22%). Study conducted by Ting-Min Hsieh et al**Error! Bookmark not defined.** the most common causes of high-grade BHI were motorcycle collision 55 (60.4%), motor vehicle collision 18 (19.8%), falls from greater height 7 (7.7%) or from own height 4 (4.4%), pedestrian struck 3 (3.3%), assaults 2 (2.2%), and bicycle collision 2 (2.2%).

Similarly in present study, 23 (23%) patients were injured in RTA, 18 (18%) patients were fallen from construction site, 16 (16%) patients were fallen from home or office or building, 15 (15%) were from motor bike collision or fall from bike and only 13 (13%) were fallen from stairs. There was 49 (49%) patient's general condition recorded as critically poor at the time of admission in this study.

Table no 01 shows distribution of all studied patients with their age group. Majority 28 (28%) patients were between 31-40 years of age followed by 23 (23%) of 21-30 years. There were least 9 (9%) patients in 11-20 years of age. Total mean age of all patients was 29.26±15.80 years recorded.

Table No.01: Distribution of patients with age group

Age group(years)	Frequency (n=100)	Percentage
2-10	19	19.0
11-20	9	9.0
21-30	23	23.0
31-40	28	28.0
41-50	10	10.0
51-60	11	11.0
Total	100	100.0
Total Mean±SD age (in years)	29.26±15.80	

Table No.02: Distribution of BAT patients according to mode of trauma

Mode of Trauma	Frequency (n=100)	Percentage(%)
RTA	23	23.0

Fall From Construction Site	18	18.0
Fall From Building	16	16.0
Fall From Bike	15	15.0
Fall From Stairs	13	13.0
Fall From Ladder	8	8.0
Fall From Balcony	7	7.0

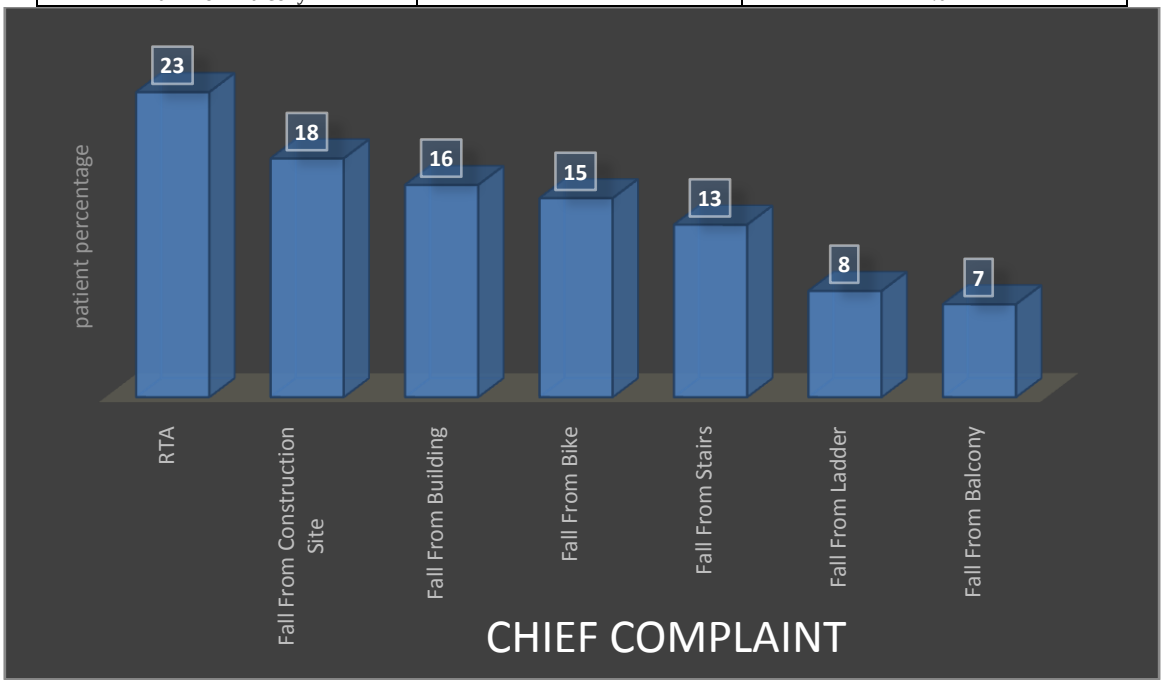

Chart No.02: Distribution of BAT patients according to mode of trauma

Table no 3 shows out of 100, majority 32 (32%) patients had injury from lateral side of body while 28 (28%) patients had injury directly on head.

Table No. 03: Distribution of site of primary impact of injury

Site of primary impact	Frequency (n=100)	Percentage(%)
Lateral side of Body	32	32.0
Head	28	28.0
Feet	19	19.0
Head And Abdomen	12	12.0
Abdomen	9	9.0

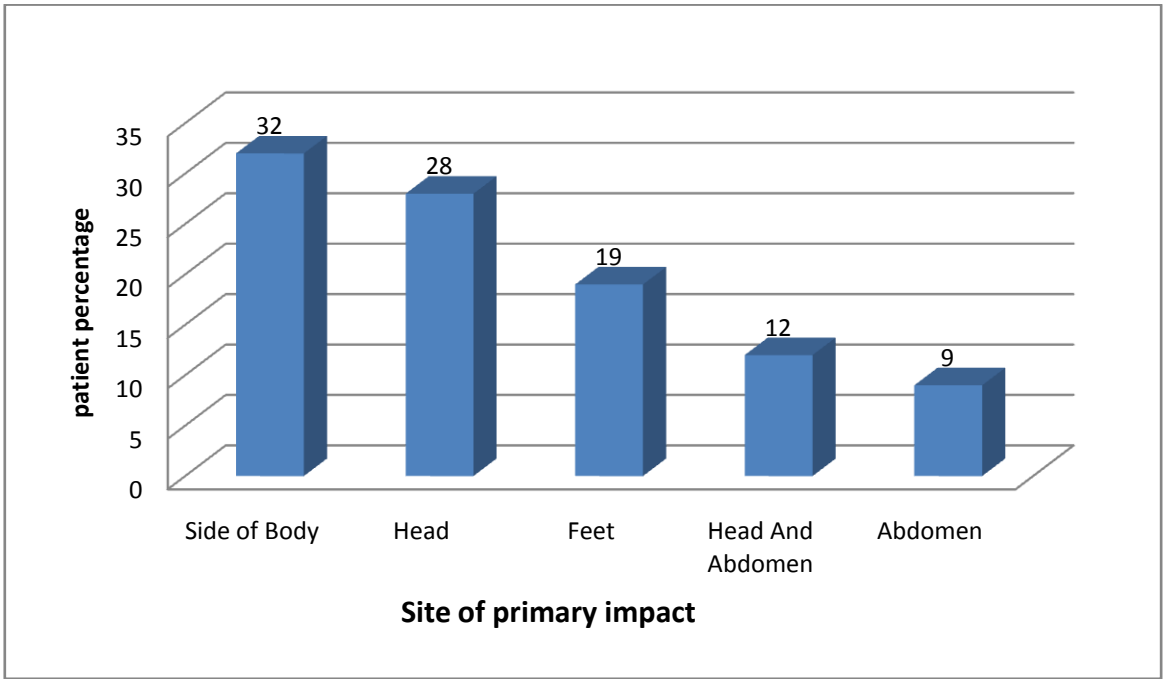

Chart no.03:Distribution of Site of primary impact of injury

Table no 4 shows mean blood pressures of all studied patients and pulse rates. 79 (79%) patients had pulse rate >100/min but only 26 (26%) patients had systolic blood pressure<90mmHg.

Table No.04: Distribution of cases according tomean blood pressure

	Mean±SD
Diastolic blood pressure	60.24±6.2
Systolic blood pressure	92.58±6.4
Pulse rate	111.2±15.2
Pulse Rate>100/min	79 (79.0)
S. Blood Pressure<90mmHg	26 (26.0)

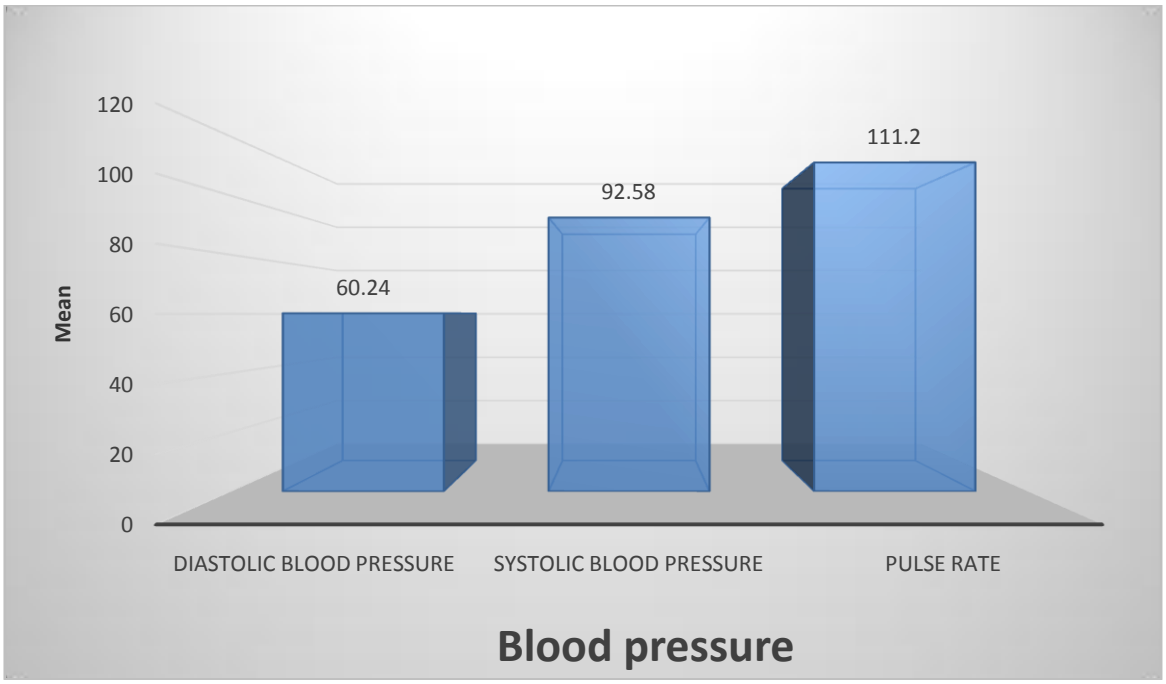

Chart no.04: Mean blood pressure and pulse rate of patients

Table no 5 recorded mean hemoglobin and blood sugar level with Glassgow Coma Scale Score of all patients. Mean hemoglobin value recorded for patients was (8.1±2.9 gm/dL) with mean GCS score of 11.04±2.9.

Table No.05: Distribution of cases according to mean blood findings & Glasgow coma scale

Variables	Mean±SD
Hemoglobin (gm/dL)	8.1±2.9
Random blood sugar (mg/dl)	100.1±20.1
Glasgow Coma Scale	11.04±2.9

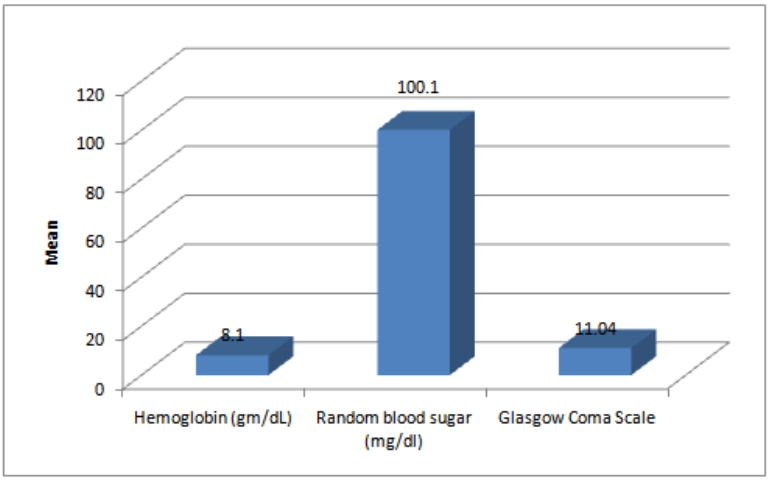

Chart no.05: Mean blood findings & Glasgow coma scale score in patients.

Table no 6 shows symptoms and signs of patients and it was depicted that injury was more commonly associated with abdominal pain 85 (85%), Abdominal distension 53 (53%) followed by history suggestive of loss of consciousness in 59 (59%), signs of peritonitis 52 (52%), vomiting in 30 (30%) and pallor of 34 (34%).

Table No.06: Distribution of cases according to symptoms and signs

Symptoms and Signs	Present (%)
Abdominal pain	85 (85.0)
Abdominal distension	53 (53.0)
H/O LOC	59 (59.0)
Signs of peritonitis	52 (52.0)
Vomiting	30 (30.0)
Pallor	34 (34.0)

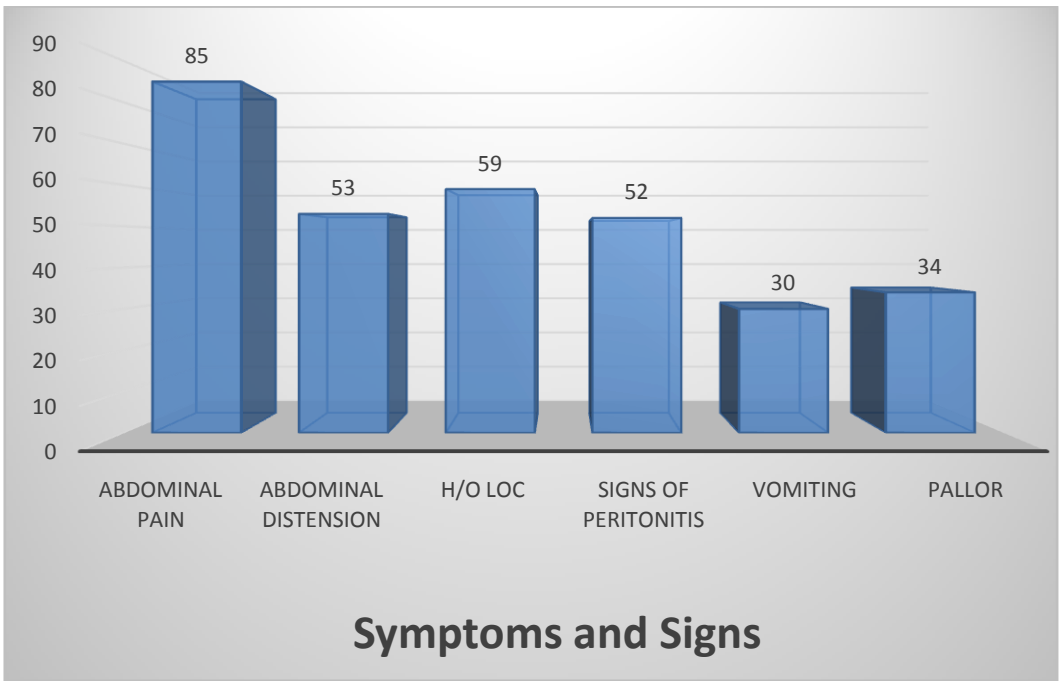

Chart no.06: Symptoms and Signs of presented patients

Table no 10 recorded Ultrasonographic findings, 56 (56%) patients diagnosed with haemoperitoneum followed by 15 (15%) with moderate amount of free fluid in pelvis, 6 (6%) with mild amount of free fluid in pelvis. USG findings in 16 (16%) patients were found normal.

Table No.7: Distribution of cases according to Ultrasonographic findings

USG-W/A findings	Frequency (n=100)	Percentage (%)
Haemoperitoneum	56	56.0
Moderate amount of free fluid in pelvis	15	15.0
Mild amount of free fluid in pelvis	6	6.0
Moderate amount of free fluid in pelvis with haemoperitoneum	4	4.0
Mild haemoperitoneum	3	3.0
Normal study	16	16.0

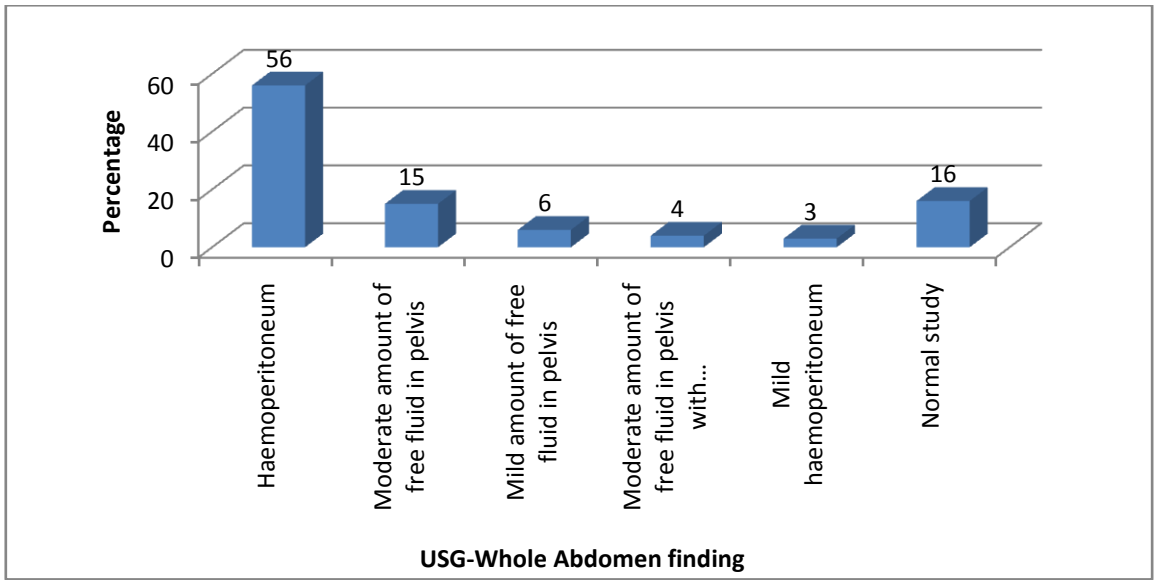

Chart No.7:Distribution of cases according to Ultrasonographic findings

Table no 8 recorded distribution of patients according to CECT grading - majority were found in Grade I with 36 (36%) patients followed by 24 (24%) in Grade II with No patients in grade V.

Table no 8: Distribution of cases according to Grading of CECT Whole Abdomen

Grade	No of patient of Liver injury	No of patient of splenic injury	No of patient of Bowel injury	No of patient of Kidney injury	No of patient of mesentery injury	Total no of patients (n=100) (%)
Grade I	16	16	0	4	0	36 (36.0)
Grade II	20	0	1	3	0	24 (24.0)
Grade III	9	17	1	3	2	32 (32.0)
Grade IV	4	2	0	1	0	7 (7.0)
Grade V	0	0	0	0	0	0 (0.0)
Total	49 (49%)	35 (35%)	2 (2%)	11 (11%)	2 (2%)	100.0 (100.0)

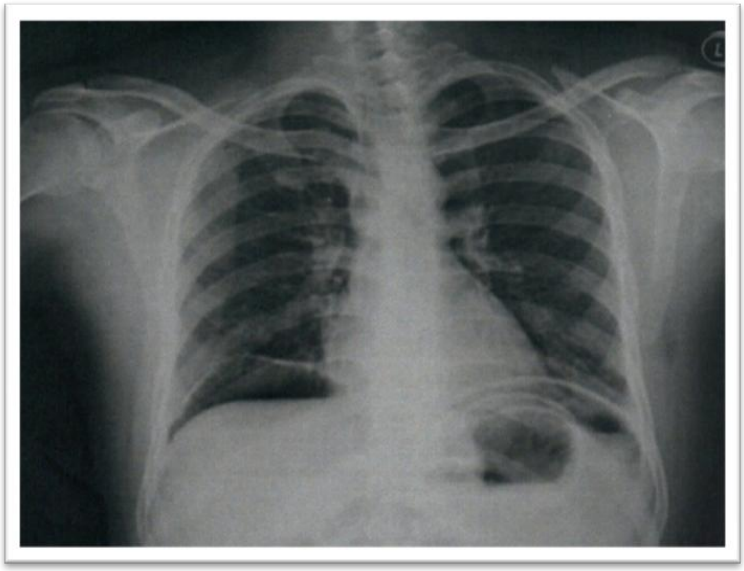

Figure 1: Show gas under right diaphragm

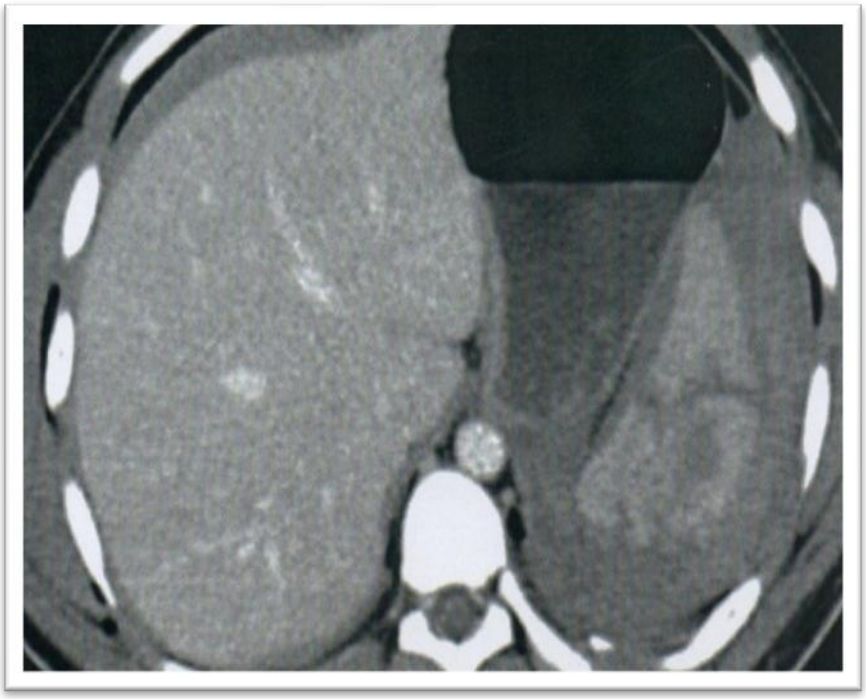

Figure 2: Shows CECT whole abdomen of splenic laceration with haematoma

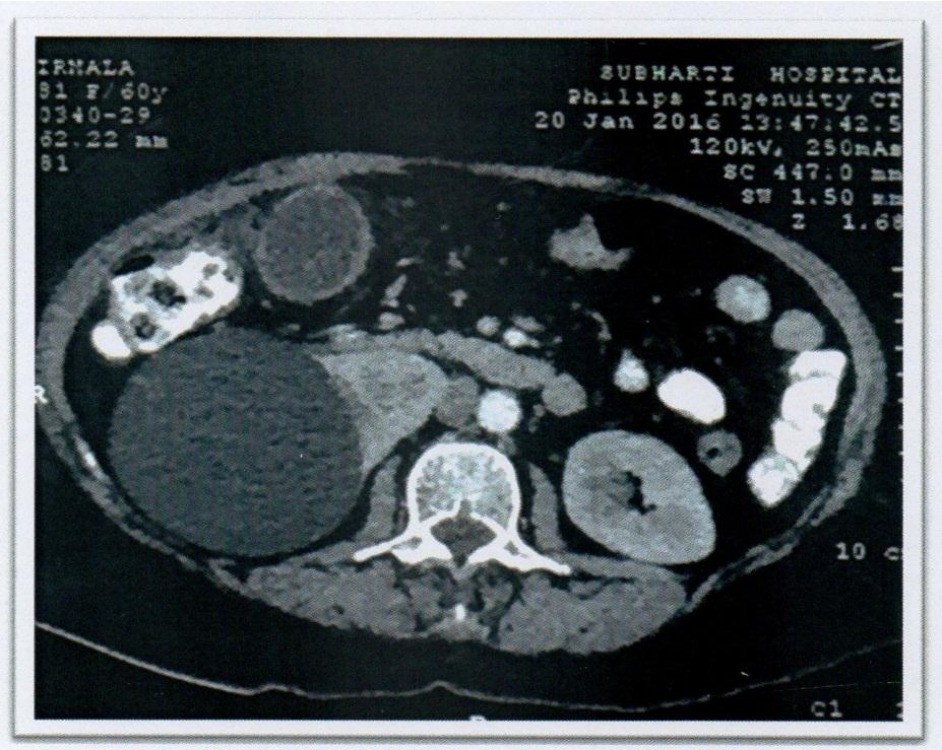

Figure 3: CECT whole abdomen shows Haematoma of the right kidney

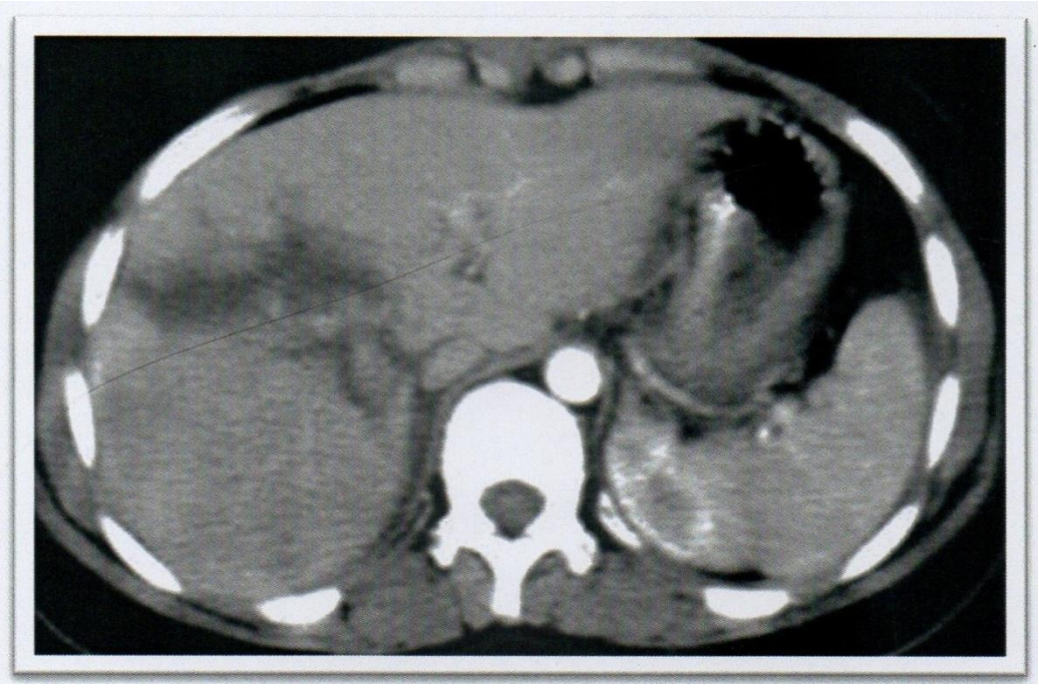

Figure 4: CECT whole abdomen shows liver laceration with haematoma

Figure 5: CECT whole abdomen shows urinary bladder rupture

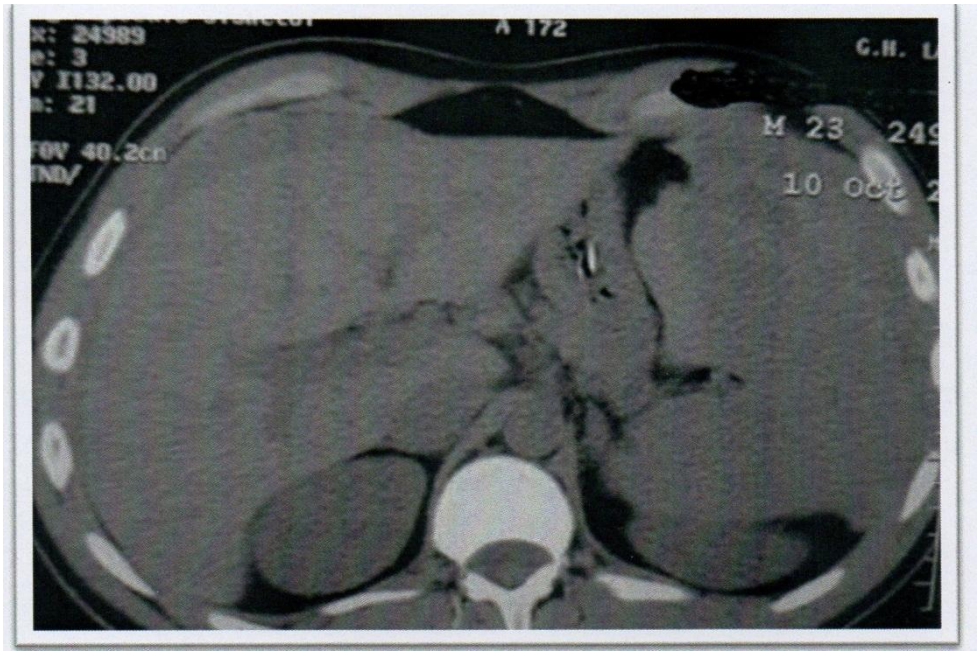

Figure 6: CECT whole abdomen shows haemoperitoneum

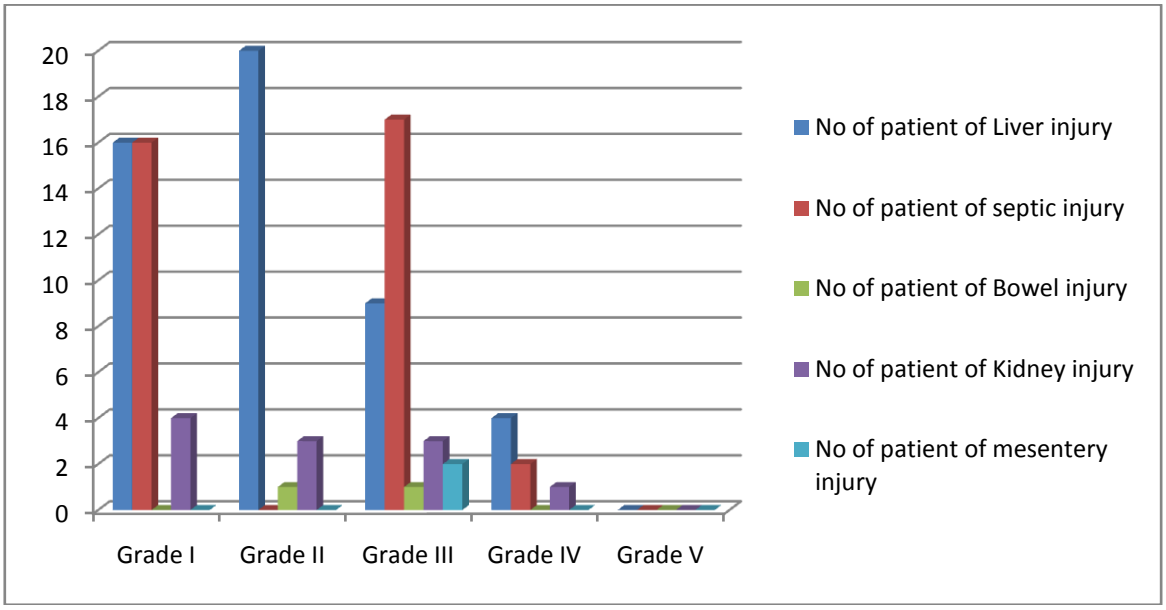

Table No.9: Distribution of cases according to diagnosis of type of injury

Diagnosis	Frequency (n=100)	Percentage(%)
Head injury with abdominal injury	56	56.0
Abdominal injury	18	18.0
Abdominal injury with spinal injury	8	8.0
Head injury with spine injury with abdominal injury	9	9.0
Abdominal injury (duodenal perforation)	1	1.0
Abdominal injury (appendicular perforation)	1	1.0
Abdominal injury (hollow viscus)	1	1.0
Abdominal injury (ileal perforation)	1	1.0
Abdominal injury/jejunal	2	2.0
Head injury with abdominal injury (ileal with mesenteric tear)	1	1.0
ABDOMINAL WITH CHEST INJURY	1	1.0
Abdominal injury with pelvic injury	1	1.0

Table No.10: Distribution of patients on the basis of cause of death

Cause of death	Frequency (n=34)	Percentage
Haemorrhagic Shock	23	67.65
Hypovolemic Shock	7	20.59
Multiple Injuries	4	11.76

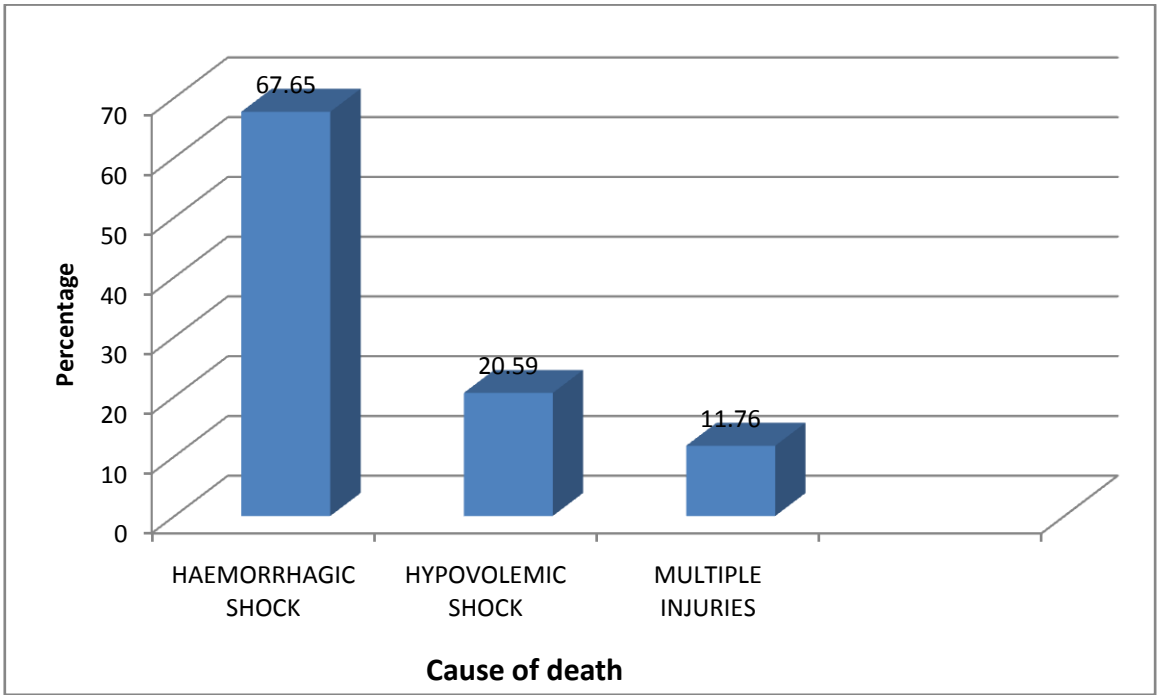

Chart no.10: Distribution of patients according to cause of death

Table 11 shows correlation between different variable with mortality. It was observed that hemoglobin was a factor of mortality in patients of BAT when compared to patients who survived. (p<0.05)

Table No.11: Association of different variable with mortality

Variable	Outcome	No of patients	Mean±SD	P value*
AGE	**Death**	34	30.91±16.2	0.147
	Survive	66	26.06±14.6	
GCS	**Death**	34	10.41±3.2	0.093
	Survive	66	11.45±2.8	
Hb	**Death**	34	7.32±2.2	0.005
	Survive	66	8.76±2.4	
Blood transfused	**Death**	34	2.65±1.7	0.468
	Survive	66	2.39±1.6	

*p<0.05= statistically significant; p>0.05= statistically non-significant

Table No. 12 shows correlation between different methods of management with mortality. It was observed that conservative mode of management in BAT patients offers more survival.(p<0.05) However other prognostic factors do play a role for higher mortality in patients managed surgically.

Table No.12: Association of different method of management with mortality

Management	Patients (n=100)	Outcome		P value*
		Expired	Survived	
Conservative	**35**	1	34	<0.001
Surgery	**65**	33	32	
Total	**100**	**34**	**66**	

*p<0.05= statistically significant; p>0.05= statistically non-significant;p<0.01=highly significant

Table No. 13 shows correlation between different causes of deathwith mortality. (p<0.05)

Table No.13: Association of different causes of death with mortality

Cause of death	Outcome		Total	P value*
	Death	Survived		
Not recorded	0	66	66	<0.001
Haemorrhagic shock	23	0	23	
Hypovolemic shock	7	0	7	
Multiple injuries	4	0	4	
Total	**34**	**66**	**100**	

*p<0.05= statistically significant; p<0.01=highly significant

Table No. 21 shows correlation with units of blood transfusion to patients and mortality. ($p<0.05$)

Table No.14: Association of No of Units of Blood transfused with mortality

Blood transfused (in units)	Outcome		Total
	Death (n=34)	Survive (n=66)	
0	5	7	12
1	4	10	14
2	9	23	32
3	3	13	16
4	8	6	14
5	3	5	8
6	2	1	3
8	0	1	1
Mean±SD*	**2.65±1.8**	**2.39±1.6**	**0.468**

*$p<0.05$= statistically significant; $p>0.05$= statistically non-significant

IV. Conclusion

This was a prospective study of 100 cases of blunt abdominal trauma (BAT) patients admitted in CSSH Hospital attached to Subharti Medical College , Meerut.

1. Majority 28 (28%) patients were between 31-40 years of age followed by 23 (23%) of 21-30 years. There were only 9 (9%) patients in 11-20 years of age group with total mean age of all patients as 29.26 ± 15.80 years.
2. There were 74 (74%) of males and only 26 (26%) of females patients. Maximum 74 (74%) incidence of BAT is observed in Males. Mean age for male patients was 28.51 ± 16.36 years and for female was 31.38 ± 14.16 years.
3. Of BAT is observed in patients, majority of 29 patients (29%; n=100) were construction workers followed by students 28 (28%), shopkeeper 22 (22%), sanitation worker 4 (4%), preschool 3 (3%) and only one was driver. There was 9 (9%) patients were housewives and 4 (4%) were retired person.
4. Mostly patients were injured in road traffic and at construction site or buildings.
5. 32 (32%) patients had injury from lateral side of body while 28 (28%) patients had injury directly on head.
6. Out of 100 general condition of the patient at the time of admission, 49 (49%) patients were in poor general condition (unstable cases) and 51 (51%) patients were in average condition.
7. There were 79 (79%) patients who had pulse rate >100/min and only 26 (26%) patients had systolic blood pressure <90mmHg.
8. The mean hemoglobin value recorded for patients was (8.1±2.9 gm/dL) with mean GCS score of 11.04+2.9.
9. Injury was more commonly associated with abdominal pain 85 (85%), Abdominal distension 53 (53%) followed by H/O LOC of 59 (59%), signs of peritonitis 52 (52%), vomiting in 30 (30%) and pallor of 34 (34%).
10. 56 (56%) patients were diagnosed as haemoperitoneum followed by 15 (15%) of moderate amount of free fluid in pelvis, 6 (6%) of mild amount of free fluid in pelvis whereas 16 (16%) patients had normal USG findings.
11. Patients according to CECT grading majority were found in Grade I with 36 (36%) patients followed by 32 (32%) patients in Grade III and 24(24%)patients in Grade II, followed by 7 (7%) patients in Grade IV with no patients in Grade 5.
12. Head injury with abdominal injury was found 56% among studied patients while only 18% patients had abdominal injury, 8% no cases were found of abdominal injury with spinal injury and 9% head injury with spine injury with abdominal injury.
13. Out of 34 deaths, majority of patients 23 (67.65%) died due to haemorrhagic shock followed by hypovolemic shock 7 (20.59%) and, with multiple injuries 4 (11.76%).
14. Out of 100, 44 (44%) patients stayed for more than 7 days in hospital for treatment while 26 (26%) patients stayed for less than 7 days and 30(30%) patients stayed for more than 14 days for treatment.
15. Majority 65 (65%) patients of BAT were managed by surgical procedures while 35 (35%) were by conservative management.
16. Majority 87 (87%) patients were not having X-Ray abdomen AP erect and only 13 (13%) had undergone this imaging with significant findings.
17. Different factors like age, glasgow coma scale, Hemoglobin, Blood transfusion, method of management, cause of death, CECT grading ≥3 were significantly associated with outcome. However, only four of these prognostic factors were independently associated with increased mortality after multivariate analysis i.e. Hemoglobin, method of management, cause of death and CECT grading. ($p<0.05$)

V. Summary

1. The most common injuries associated with BAT injury in the present study were head injury and abdominal injury.
2. Mortality rate is 34 (34%) for this study in patients who were hemodynamically unstable and expired.
3. 35(35%) of total patients were managed conservatively by clinical monitoring, investigations and radiological evaluations with mortality rate of 2.8%(n=35).
4. 65(65%) patients were managed surgically out of which 33(33%) patients did not survive with mortality rate of 50.77(n=65) due to hemodynamically unstable vitals because of solid organ injury with multiple intraabdominal associated injuries with shock.
5. Different factors like age, Glasgow coma scoring, hemoglobin level, blood transfusion units, methods of management, cause of death, CECT grading > 3 were significantly associated with outcome. In BAT patients only 4 of these prognostic factors were independently associated with increased risk of mortality after multivariate analysis i.e. hemoglobin, methods of management, cause of death and CECT grading ($p<0.05$).

Finally, we are heavily in favor of NOM of patients over operative management except in hemodynamically unstable patients, given the various sophisticated and highly accurate and non invasive imaging tools at the trauma surgeons disposable today.

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