Journal of Cardiovascular Disease Research

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 11, 2023

Original research article

Identification of risk factor leading to mortality in blunt abdominal trauma

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Abstract

Aim: The aim of the present study was to identify risk factors leading to mortality in cases of blunt abdominal trauma.

Methods: The Hospital based Ambispective observational study was conducted in the Department of General surgery, PBMH, Kalinga Institute of Medical Sciences, Bhubaneswar with blunt abdominal trauma during the period September 2019 to August 2021. 81 patients were included in the study.

Results: There were 46% (n=37) of the participants belonged to the age group 16 to 30 years and 22% (n=18) belonged to age group 46 to 60 years. Majority (n=94%, n=76 were males and rest 6% were females. There were 83% RTA cases, 10% fall from height cases, 5% fall from cycles and 2.5% assault cases. Almost 88% (n=71) were alive at the end of the study and 12% (n=10) died during the study period. About 36% (n=29) admitted between 6 to 12 hours of trauma, 24% admitted between 12 to 24 hours and 26% admitted after one day (>24hours). Among those had fell from height, 38% died and among those hand RTA, 11% died. There was no significant association between mode of injury and mortality (p=0.125). Among those who died (n=10), majority (60%, n=6) died due to septic shock and MODS, 20% (n=2) died due to hypovolemic shock and MODS. There was one death each (10%) due to brain damage and severe metabolic acidosis. Nearly 26% were grade 1 or 2 liver injuries, and 12% were grade 3 and above type of liver injury. About 15% were grade 1 or 2 splenic injury and 11% were grade 3 and above splenic injury. About 5% were grade 1 or 2 renal injury and 4% were grade 3 or above renal injury.

Conclusion: BAT is most commonly caused by RTA in younger age group with male preponderance. Diagnosis and early intervention remains a key in saving lives in BAT. Most patients can be managed conservatively especially solid organ injury, it is the hollow viscus injury or haemodynamic instability due to ongoing hemorrhage require operative intervention.

Keywords: blunt abdominal trauma, risk factors, mortality

Introduction

The abdominal cavity is the third most common site affected in trauma [1]. The abdominal region is affected in 1/3rd of the cases. One-fourth of the cases undergo explorative surgery for evaluation of the abdominal injury [2]. Although the majority of the abdominal trauma requires conservative management, and only a small fraction requires surgery, the overall mortality rate ranges from 10–36% [2, 5].

Management of abdominal trauma is a challenging task for there are blunt, penetrating and mixed mechanisms involving the development. The reported incidence of blunt abdominal trauma is 90% [6]. Ozpek *et al* [7] have reported the most frequent causes of blunt abdominal trauma as motor vehicle accidents in 62% and fall from heights as 27% of the cases. Mortality is seen in nearly 10% of the cases. The causes of mortality are mainly occult extra-abdominal injuries involving the central nervous system and thorax, which was present in 96% of the cases reported by Pimentel *et al* [3] On the other hand, penetrating abdominal trauma, including gunshot wounds, are more common in regions where terrorism or crime levels, including interpersonal conflicts, are high [8]. The mortality rate in penetrating abdominal trauma is around 2–13% [2]. The causes of mortality in penetrating abdominal trauma are either immediate death at the crime scene due to exsanguination or septic complications and multiorgan failure in the late postoperative period [2, 9]. Iflazoglu *et al* [9] have analyzed 120 gunshot wounds and the reported mortality rate as 39%. Risk factors of mortality were a shock at admission, the number of injured organs and the number of transfusions required to the patient.

Accurate and timely diagnosis of blunt abdominal injury is a common dilemma. The accuracy of the physical examination has been questioned by many, while others have suggested that the best method of diagnosis is done through "serial tests performed by an experienced surgeon [10]. The abdomen is the

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 11, 2023

third most affected region in blunt trauma and major traumatic injury may not be recognized quickly enough and it becomes a cause of preventable death [11].

In order to minimize the mortality in cases of abdominal trauma, risk factors for mortality must be identified and systematically studied. In recent years, risk factors including gender, the time interval between injury of and abdominal surgery, shock upon admission and head trauma were revealed. The aim of the present study was to identify risk factors leading to mortality in cases of blunt abdominal trauma.

Materials and Methods

The Hospital based Ambispective observational study was conducted in the Department of General surgery, PBMH, Kalinga Institute of Medical Sciences, Bhubaneswar with blunt abdominal trauma during the period September 2019 to August 2021. 81 patients were included in the study.

Criteria for sample collection

All the patients who were admitted to PBMH, KIMS after initial resuscitation & haemodynamic stability are subjected to careful examination. Depending on history & clinical findings these are then subjected to radiological investigations (FAST/e-FAST, x-ray, CT scan). All cases confirmed of BAT based on the result of investigations done and after applying inclusion & exclusion criteria are subjected to:

1. Evaluation
   - Age and sex distribution.
   - Mode and type of trauma.
   - Presenting symptoms.
   - Associated injuries.
   - Organs involved.
   - Risk factors contributing most to overall mortality.
2. Non-operative vs operative intervention.
3. Final outcome:death or survival.

Inclusion criteria

- Allpatients presenting with history of blunt trauma abdomen (BAT)
- BAT patients diagnosed by FAST/eFAST, XRAY ABDOMEN (ERECT/SUPINE), CTSCAN

Exclusion criteria

- Penetrating injuries of abdomen
- Brought dead patients
- Patients who are not willing to participate in the study
- Those who were found to have no evidence of intra-abdominal injury on basis of imaging

Methods of data collection

All Patients admitted to Department of General Surgery with Blunt abdominal trauma was subjected to:

- Initial resuscitation
- Detailed history of the patient
- Clinical examination of patient
- Routine investigations - complete blood count, blood sugar, blood urea and creatinine, serum electrolyte, viral marker (HIV, HBsAg & HCV) and Liver function Tests.
- USG abdomen and pelvis/FAST/e-FAST,X-Ray of Chest/Abdomen, CT Scan of Chest/Abdomen
- Pre-operative informed consent was taken and explanation regarding the possible complications was done to the patient and relatives

Data analysis

Data were entered in to Microsoft excel sheets and analysed using STATA version 14. Categorical variables such as age, gender, mortality, cause of death, type of injury, grade of injury, associated injury, duration of hospital stay, type of treatment given time between trauma and admission, haemodynamic stability, presence of chronic illnesses, mode of injury and types of surgery were summarized as frequency and percentages. Association of type of injury, time between admission, haemodynamic stability chronic illness and mode of injury with mortality was analysed using Chi-Squared test. Association of type of injury with duration of stay was evaluated using Chi-Squared test. A p value less than 0.05 was considered as statistically significant.

Results

Table 1: Socia-demographic characteristics

Age (in years)	N	%
0-15	11	13.6
16-30	37	45.7

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31-45	11	13.6
46-60	18	22.2
61-75	3	3.7
76-90	1	1.2
Gender		
Male	76	93.8
Female	5	6.2
Mode of injury		
RTA	67	82.7
Fall from height	8	9.8
Fall from cycle	4	5.0
Assault	2	2.5
Mortality		
Death	10	12.4
Alive	71	87.6
Time between trauma and admission (in hours)		
<6	12	14.8
6-12	29	35.8
12-24	19	23.5
>24	21	25.9
Total	81	100

There were 46% (n=37) of the participants belonged to the age group 16 to 30 years and 22% (n=18) belonged to age group 46 to 60 years. Majority (n=94%, n=76 were males and rest 6% were females. There were 83% RTA cases, 10% fall from height cases, 5% fall from cycles and 2.5% assault cases. Almost 88% (n=71) were alive at the end of the study and 12% (n=10) died during the study period. About 36% (n=29) admitted between 6 to 12 hours of trauma, 24% admitted between 12 to 24 hours and 26% admitted after one day (>24hours).

Table 2: Association of mode of injury with mortality

Mode of injury	Mortality		P value
	Alive N (%)	Death N (%)	
RTA	60	7	0.125
	(89.5)	(10.5)	
Fall from height	5 (62.5)	3 (37.5)	
Fall from cycle	4 (100.0)	0 (0.0)	
Assault	2	0	
	(100.0)	(0.0)	
Total	71	10	
	(87.7)	(12.3)	

Among those had fell from height, 38% died and among those hand RTA, 11% died. There was no significant association between mode of injury and mortality (p=0.125).

Table 3: Cause of death distribution

Cause of death	N	%
Septic shock and MODS	6	60
Hypovolemic shock and MODS	2	20
Brain damage/ cerebral oedema	1	10
Metabolic acidosis	1	10
Total	10	100

Among those who died (n=10), majority (60%, n=6) died due to septic shock and MODS, 20% (n=2) died due to hypovolemic shock and MODS. There was one death each (10%) due to brain damage and severe metabolic acidosis.

Table 4: Grade distribution of injuries, hospital stay

Type of injury	N	%
Liver injury (Grade 1or 2)	21	25.9
Liver injury (Grade 3 or above)	10	12.3
Splenic injury (Grade 1 or 2)	12	14.8

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Splenic injury (Grade 3 or above)	09	11.1
Renal injury (Grade 1 or 2)	04	4.9
Renal injury (Grade3 or above)	03	3.7
Hollow viscous injury	23	28.4
Others	11	13.6
Duration of hospital stay (in weeks)		
<3	68	83.9
>3	13	16.1

Nearly 26% were grade 1 or 2 liver injuries, and 12% were grade 3 and above type of liver injury. About 15% were grade 1 or 2 splenic injury and 11% were grade 3 and above splenic injury. About 5% were grade 1 or 2 renal injury and 4% were grade 3 or above renal injury. There were 28% (n=23) hollow viscous injuries and 14% (n=11) other types of injuries among the study participants. About 84% (n=68) stayed at hospital for less than 3 weeks and 16% stayed more than 3 weeks.

Table 5: Type of surgery distribution

Type of surgery	N	%
Exploratory laparotomy	31	38.3
Ileostomy/Colostomy/Resection anastomosis/primary repair of small/large gut	21	25.9
Splenectomy	3	3.7
Mesenteric repair	3	3.7
Bladder repair	2	2.5
Lap/open diaphragmatic repair	1	1.2
Not applicable	50	61.7

The distribution of type of surgery is depicted in table 19. About 38% were exploratory laparotomy for any reason, 26% were ileostomy/colostomy/resection anastomosis/primary repair of small/large gut, 3.7% were splenectomy/mesenteric repair, 2.5% were bladder repair and 1.2% were lap/open diaphragmatic repair.

Discussion

Abdominal trauma is conventionally categorized as either blunt type or penetrating type. Penetrating abdominal trauma can be diagnosed with no difficulty, while blunt abdominal trauma is frequently missed because clinical signs are less apparent [12]. Blunt abdominal injuries are more common in rural areas, while penetrating ones are more frequently encountered in urban situations [13]. Penetrating abdominal trauma is often subdivided into stab wounds and gunshot wounds, which require different methods of treatment [12]. The principal causes of blunt trauma abdomen are road traffic accidents followed by fall from height or fall of object over body and assault. In order to reduce mortality in cases of abdominal trauma, risk factors for mortality need to be consistently identified and analyzed.

There were 46% (n=37) of the participants belonged to the age group 16 to 30 years and 22% (n=18) belonged to age group 46 to 60 years. Gad MA *et al* [13] found 20-30Years (69.74%) in the study. Majority (n=94%, n=76 were males and rest 6% were females. PIMENTEL SK *et al* (2012) [14] had 77% male in their study. There were 83% RTA cases, 10% fall from height cases, 5% fall from cycles and 2.5% assault cases. Vehicle accidents are a common cause of blunt abdominal trauma [13]. Others have found that the main causes of blunt abdominal trauma were road accidents, interpersonal violence, and falls.[15] Blunt trauma in the present study was strongly related with other co-morbid injuries whereas penetration trauma was less strongly associated with such injuries. Almost 88% (n=71) were alive at the end of the study and 12% (n=10) died during the study period. This suggests that although females are infrequent victims of abdominal, trauma-related mortality developed more frequently in female patients. It has been reported that females are vulnerable to brain injury due to various reasons [16].

About 36% (n=29) admitted between 6 to 12 hours of trauma, 24% admitted between 12 to 24 hours and 26% admitted after one day (>24hours). Among those had fell from height, 38% died and among those hand RTA, 11% died. There was no significant association between mode of injury and mortality (p=0.125). Among those who died (n=10), majority (60%, n=6) died due to septic shock and MODS, 20% (n=2) died due to hypovolemic shock and MODS. There was one death each (10%) due to brain damage and severe metabolic acidosis. However, Júnior GA *et al* [17], Sanchez *et al* [18] hypovolemia of unexplained cause was found to be the most common cause leading to mortality. Most of the patients with only solid organ injury survived with 94.3% survival rate, followed by hollow viscus injury with 70% survival rate, followed by least in both solid and hollow viscus with survival rate of 67%,the result is in consistency with Hildebrand *et al* [19] and Swaid *et al*. [20] Wani M *et al* [21] which also reported an incidence of hollow viscus injury to be 28%,however most common organ involved in their study was spleen in 29% followed by liver in 21%,in both the studies the involvement of kidney, diaphragm n isolated mesentric tear remained almost the same.

Median duration of hospital stay in patients with blunt trauma abdomen was 10 days with IQR ranging

ISSN:0975 -3583,0976-2833 VOL14, ISSUE 11, 2023

from 6-17 days which is in consistence with Wani M *et al* [21] with 16.1%patients requiring prolonged stay of >3wks, seen in 67% patients with both solid and hollow viscus injury this is in consistensy with PIMENTEL SK *et al* study [14].

Nearly 26% were grade 1 or 2 liver injuries, and 12% were grade 3 and above type of liver injury. About 15% were grade 1 or 2 splenic injury and 11% were grade 3 and above splenic injury. About 5% were grade 1 or 2 renal injury and 4% were grade 3 or above renal injury. There were 28% (n=23) hollow viscous injuries and 14% (n=11) other types of injuries among the study participants. We explored risk factors for fatalities in this sample of penetrating and blunt abdominal injuries. The biggest risk factor for all abdominal cases was deferral before treatment. In all cases, the type of abdominal trauma, RTS, and co-morbid injuries predicted higher mortality [22]. An increased age was an extra risk factor among those with blunt injuries. Penetrating trauma had a much higher rate of fatality in general, and the type and site of penetration injury mattered a great deal.

Conclusion

BAT is most commonly caused by RTA in younger age group with male preponderance. Diagnosis and early intervention remains a key in saving lives in BAT. Most patients can be managed conservatively especially solid organ injury, it is the hollow viscus injury or haemodynamic instability due to ongoing hemorrhage require operative intervention. Most BAT patients have hospital stay less than 3weeks, it is a combination of solid and hollow viscus or any other associated injury which requires a long hospital stay. Most associated injury in BAT patients were rib and extremity fractures fractures. Isolated hollow viscus injury had a better outcome, with a shorter hospital stay. A better understanding of mechanisms, pathophysiology, manifestations and prompt diagnosis and treatment will help us bring down mortality rate in BAT. A need of improved & state of the art facilities for first aid and emergency services for quick response and early hospital transfer is required.

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