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# Profile of Abdominal Organ Injuries in Polytrauma

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**Abstract:** The aim of this retrospective observational study spanning three years in our tertiary care institute at Institute of Orthopedic Research and Accident Surgery, Madurai, of Devadoss Multispecialty hospital, Madurai, South Tamil Nadu, India was to find the modes of injury to abdomen in polytrauma and frequency of solid and hollow visceral injuries in blunt and penetrating trauma in patients those who underwent laparotomy. 31 patients who underwent laparotomy due to blunt and penetrating injury in polytrauma were included. It is a retrospective study done from 1st January 2014 to 31st December 2017 (36months).Patients below 12 years of age and patients taken against medical advice were excluded from the study. The mode and pattern of abdominal injuries were studied. Out of 31 patients who underwent laparotomy, 26 were due to blunt injury and 5 due to penetrating injury. 5 were female out of 31 cases. Modes of injury were road traffic accident 24 (77.4%), fall from height 3(9.6%), physical violence 2(6.45%), bullgore injury 2(6.45%) cases. In 26 cases of blunt injury abdomen, 20 cases (76.92%) had multiple organ injury and 6 cases (23%) had isolated organ injury. Out of 5 cases of penetrating injury, 4 had multiple organ injury and one case had isolated organ injury. In polytrauma due to combined blunt and penetrating injuries of 31 cases who underwent laparotomy,15 cases(48.38%) had retroperitoneal injury, splenic injury 9 cases (29%), liver injury 7 cases(25.8%), small bowel mesenteric injury 9 cases (29%), small bowel injury 8 cases (25.8%),large bowel injury 6 cases (19.35%), injury to pancreas 5 cases(16%), diaphragmatic injury 2 cases(6.45%), anal sphinter complex injury 3 cases (9.67%),duodenal injury 1case (3.2%). Of 26 cases of blunt injury abdomen, commonest injury noted was retroperitoneal injury with or without other organ injury 15 cases (57.6%) followed by splenic injury 9 cases (34.6%), liver injury 7 cases (26.9%), mesenteric injury 9 cases (34.61%),small bowel injury 8 cases (30.76), colonic injury 6 cases (23%), pancreatic injury 4 cases (15.38%), one case of duodenal injury (3.84%) and one case of diaphragmatic injury (3.84%). Out of 5 cases of penetrating injury, organs injured were stomach 2 cases (40%),liver 1(20%), diaphragm 1(20%), pancreas 1(20%), anal sphinter complex injury 3 cases (60%). In our study, road traffic accident was the commonest mode of injury which required laparotomy. The incidence of abdominal injury in males is more common than female. Blunt injury was very common than penetrating injury to abdomen. Multiple organ injury was more common than isolated single organ injury. In blunt injury abdomen, apart from retroperitoneal injury solid organ injury like spleen followed by liver and small bowel were noted. Strict traffic rules and measures to follow them without deviation would reduce the preventable morbidity and mortality.

**Keywords:** Abdominal organ injuries, polytrauma, profile of injuries.

## INTRODUCTION

Trauma is the main cause of morbidity and mortality worldwide [1, 2] and its importance is that it remains the most frequent cause of death in the first four decades of life [3]. Abdominal trauma ranks next to injury of head and extremities ranking third in order of injuries in polytrauma [4]. 7-10 % of all polytrauma deaths occur due to abdominal injuries [5, 6]. 90% of abdominal injuries are due to blunt abdominal trauma, rest is due to penetrating injury.

In polytrauma, abdominal injuries are very common increasing day by day. 25% of all abdominal trauma require abdominal exploration [4, 7, 8]. Delay in

diagnosis may be dangerous to the patient and can lead to the mortality and morbidity [9]. Major abdominal trauma is difficult to manage due to frequent altered mental status of the patient and severity of associated injuries [10]. Mode of injuries and organs injured varies from place to place. The aim of the study is to observe the frequency of various modes of injuries to abdomen in polytrauma and frequency of abdominal organs injured in blunt and penetrating injuries found at laparotomy in a polytrauma tertiary care centre, at Institute of Orthopedic Research and Accident Surgery, Madurai, at Devadoss multispecility hospital, at Madurai, South Tamil Nadu, India.

## MATERIALS AND METHODS

The patients with polytrauma admitted in private teaching polytrauma centre from 1st January 2014 to 31st December 2017 were studied. Patients taken against medical advice and aged below 12 years were excluded from study group. It is a retrospective study with datas collected from case sheets and database. All datas were entered in master chart and study was conducted meticulously.

## RESULTS

Out of 31 patients who underwent laparotomy, the cause of injury was blunt injury in 26 cases and penetrating injury in 5 cases. Highest incidence of injury was in middle age ranging from 21-40.

Out of 31cases, 5 were females. The rest were males. Male dominance was due to outdoor activity (Table-1).

**Table-1: Age wise distribution**

| Serial no. | Age | Number of patients |
|---|---|---|
| 1 | 13-20 | 1 |
| 2. | 21-30 | 11 |
| 3. | 31-40 | 11 |
| 4. | 41-50 | 5 |
| 5. | 51-60 | 1 |
| 6. | >60 | 2 |
| | TOTAL | 31 |

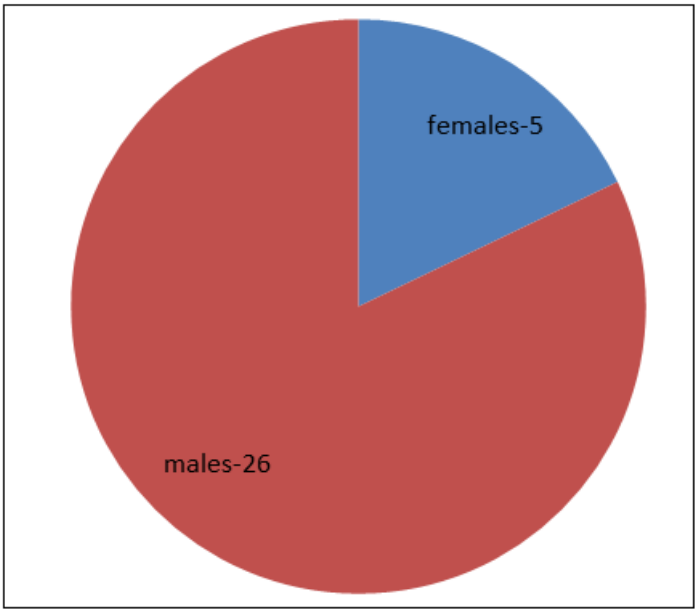


**Fig-2: Sex distribution**

Road traffic accident ranked the top priority in the mode of injury. Out of 31 cases who underwent laparotomy, injuries due to RTA 24 cases (77.4%), next was fall from height 3 cases (9.67%). Physical violence cases reported were 2(6.45%), bullgore injury were 2 cases (6.45%).

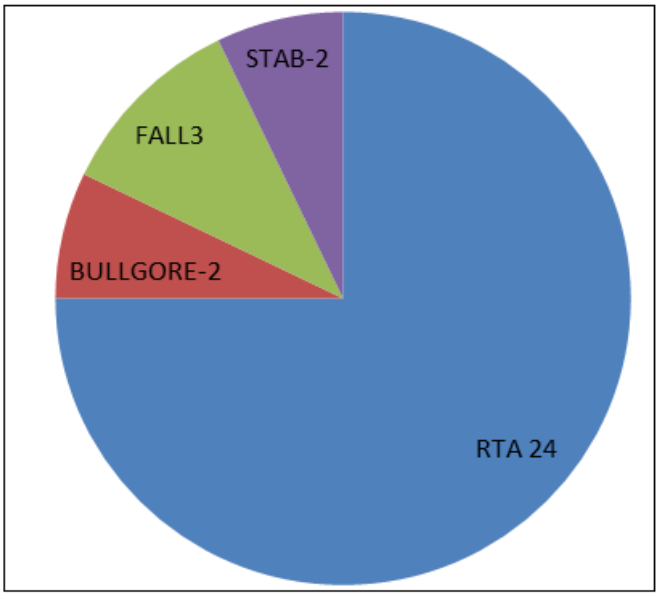


**Fig-2: Modes of injuries of patients.**

There was a seasonal increase in injury during the period of January/February in this part of Tamil Nadu due to brave village sport called "Jallikattu" and December/January during holy pilgrimage walk along the road side "Aayappan padayathra" and "Palani padayathra" to temples far away. At laparotomy, the commonest injury in our study was retroperitoneal injury along with other viscera followed by the injury of spleen and liver. The predominece of retroperitoneal haematoma / bleed might be due to associated high incidence of associated spine and pelvic fractures where bleeding sweeps into retroperitoneal space in majority of cases. Out of 31 cases who underwent laparotomy in polytrauma, 26 cases (83.87%) were due to blunt injury and 5 (16.12%) were due to penetrating injury. Penetrating injuries were relatively uncommon [11, 12].

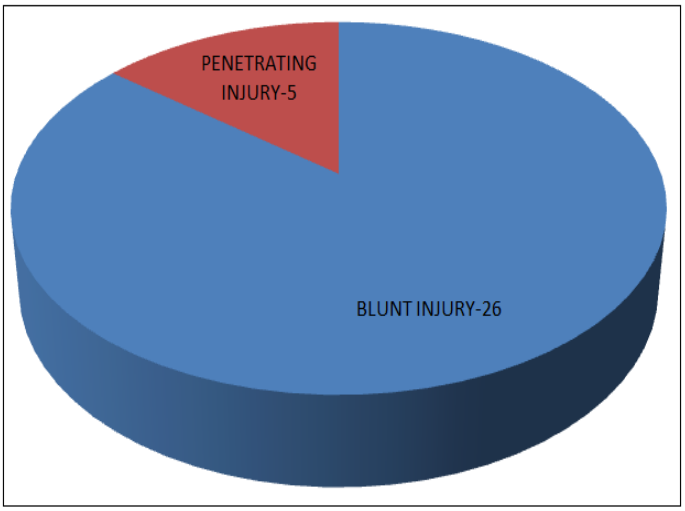


**Fig-3: Incidence of blunt and penetrating abdominal injuries**

**Table-2: Pattern of organ injury at laparotomy (combined blunt and penetrating injury) 31 cases**

| S.no. | Organs injured | No. of cases | Percentage | Severity of injuries |
|---|---|---|---|---|
| 1. | Spleen | 9 | 29% | Haematoma to shattered spleen |
| 2. | Liver | 8 | 25.8% | Haematoma to Grade 4 injury |
| 3. | Retroperitoneum | 15 | 48.38% | Haematoma to slight bleed |
| 4. | Mesentry | 9 | 29.03% | Haematoma to tear |
| 5. | Stomach | 2 | 6.45% | Perforation/laceration |
| 5. | Small bowel | 8 | 25.8% | Serosal tear, perforation, transection |
| 6. | Duodenum | 1 | 3.2% | Transection of 3rd part of duodenum |
| 7. | Large bowel | 6 | 19.35% | Serosal tear, perforation, transection |
| 8. | Pancreas | 5 | 16.1% | Haematoma, transection |
| 9. | Diaphragm | 2 | 6.45% | Diaphragmatic hernia |
| 10. | Anorectal complex | 3 | 9.67% | Deep perineal injury, levator injury |

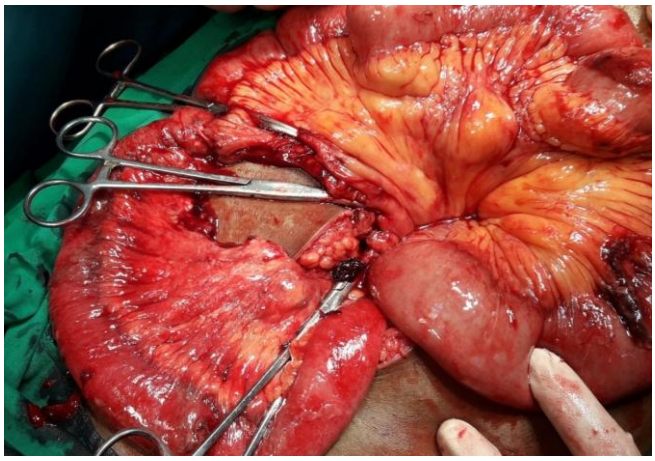

**Fig-4: Mesentric injury**

**Fig-5: Shattered spleen**

**Table-3: Organs injured in blunt injury -26 cases**

| S.no | Organs injured | No. of cases | Percentage |
|---|---|---|---|
| 1. | Spleen | 9 | 34.6% |
| 2. | Liver | 7 | 26.9% |
| 3. | Retroperitoneum | 15 | 57.6% |
| 4. | Mesentry | 9 | 34.61% |
| 5. | Small bowel | 8 | 30.76% |
| 6. | Duodenum | 1 | 3.86% |
| 7. | Large bowel | 6 | 23.07% |
| 8. | Pancreas | 4 | 15.38% |
| 9. | Diaphragm | 1 | 3.8% |

Out of 26 cases of blunt injury, 22 had multiple organ damage and 4 had isolated organ injury (Table-3). Out of 5 cases of penetrating injury, 4 had multiple organ damage and one had single organ injury (Table-3).

**Table-4: Organs injury in penetrating injury abdomen (5 cases)**

| S.no | Organ injured | No. of patients | Percentage |
|---|---|---|---|
| 1. | Stomach | 2 | 40 |
| 2. | Liver | 1 | 20 |
| 3. | Diaphragm | 1 | 20 |
| 4. | Pancreas | 1 | 20 |
| 5. | Anorectum | 2 | 60 |

## DISCUSSION

Due to high speed accidents occurring nowadays in four tract roads, polytrauma involving head, chest, abdomen and pelvis are common. In major abdominal trauma due to frequent altered sensorium of patients in association with severity of other injuries involving chest, pelvis, head, diagnosis becomes difficult in both blunt and penetrating injury [10].

Peak age incidence of injury were middle age [11, 13]. In our study, the peak incidence was 31-40. In a study peak incidence of blunt injury was between 21-30 years [18].Trauma to young adults poses economic burden to family and national economy [14].The victims of brave sport "Jallikattu" were young male of 20-40 and spectators were above 40 years of age of both sexes. Males involved more in polytrauma because of more outdoor activities and vulnerable to accident [15, 13, 8].

Commonest mode of injury in polytrauma was road traffic accident. Out of 31 cases who underwent laparotomy, the cause of injury was road traffic accident in 24 cases (77.4%). Another study also show high incidence of RTA [16]. Next common mode of polytrauma, was fall from height, 3 cases out of 31 cases (9.67%). Other study supporting our data is available [17]. Fall from height injury are common from urban and suburban regions because of multistoried constructions in recent years in South Tamil Nadu. We had 2 cases (6.45%) of abdominal injury due to physical violence. In our study, it was 2 out of 31 cases (6.45%).Some studies have shown physical violence was 17% of polytrauma, next to road traffic accidents [18, 19]. Studies have shown that RTA followed by fall from height are common [11]. We have 2 cases of bullgore injury out of 31 cases (6.45%).

In our study, common reason for penetrating injury were physical violence and road traffic accident with impalement injuries due to sharp objects impinging abdomen and perineum each 2 cases and one case of bullgore injury. In blunt injury abdomen, frequency of organ injured in abdomen varies in various studies. In our study, out of 31 cases who underwent laparotomy, retroperitoneal haematoma with or without bleed was seen in 15 cases, ranking first in injury abdomen. Most of these patients had associated multiple organ damage. The occurrence of trauma causing bleeding into the retroperitoneal space was noted in 14.59% of patient [20]. In our study, solid organ injuries were more common than hollow visceral injury. Most common organ that was injured in polytrauma was spleen 9 cases out of 31 cases (20.03%) had splenic injury of various grades (Fig-5). Out of 9 cases, 2 had isolated splenic injury and rest 7cases had multiple organ injury. One study, it was 42% [14, 21, 22].

Next common organ that was injured was liver 8 cases out of 31 cases (25.8%). In some studies liver injury are more common than splenic injury [17]. We had 5 cases of pancreatic injury out of 31 cases (16.1%).In hollow visceral injury, out of 31 cases , small bowel injury were 8 cases (25.8%), large bowel injury 6 cases (19.35%), duodenum injury 1 case (3.2%).

**Table-5: Incidence of hollow visceral injury in various studies in blunt trauma.**

| s.no | Study | Small bowel injury (%) | Large bowel injury (%) |
|---|---|---|---|
| 1. | Dipak Kr *et al*., [8] | 40.35% | 1.75% |
| 2. | Hildebrand *et al*., [23] | 21% | 21% |
| 3. | Costa *et al*., [16] | 10% | 6% |
| 4. | Watts *et al*., [24] | 3% | 0.9% |
| 5. | Arumugam *et al*., [11] | 12% | 5% |
| 6. | Our study | 30.76% | 23.07% |

In our study, none of the patients with blunt injury abdomen had stomach injury. Duodenal injuries are rare in blunt injury abdomen. Everard F cox reported a single case of duodenal injury in 5 years of

study [25]. In our study, we had one case of duodenal injury with complete transection at level of third part. Almost all of the retroperitoneal injury in our study had associated visceral injury. Retroperitoneal haematomas were usually not opened unless evalution of specific organs in this space was required [25]. Out of 9 cases of small bowel mesentric injury (31.61%), 2 had extensive laceration compromising the vascularity of bowel which required resection of adjacent bowel (Figure-4). One study reports 13% of laparotomy cases had mesentic injury [25].

Nonoperative management (NOM) is nowadays a gold standard in isolated solid organ injuries of low grade in a haemodynamically stable, young, patient without co-morbid illness in ICU setup. But almost all the patients with hollow viscera perforation needs surgery. Since there is always a role for conservative management for solid organ injury when compared to hollow visceral injuries, the incidence of solid organ injury is comparitively lesser at laparotomy [8].

**Table-6: Organs injured at penetrating injury of abdomen**

| s. no | Organs injured | No. of cases |
|---|---|---|
| 1. | Stomach | 2 |
| 2. | Liver | 1 |
| 3. | Diaphragm | 1 |
| 4. | Pancreas | 1 |
| 5. | Anorectal complex | 2 |

Out of 5 cases of penetrating injury of abdomen who underwent laparotomy, 4 patients had multiple organ injuries and one patient had isolated organ injury.

## CONCLUSION

Abdominal injuries rank next to head, chest and limb injuries. Road traffic accidents are the commonest mode of injury followed by fall from height. In abdominal injuries, males are more common than female. Young age groups are injured more than extremes of age. Blunt injury abdomen is more common than penetrating injuries. In blunt injury abdomen, multiple organ were injured more common than isolated organ injury. In penetrating injuries of abdomen, almost all are multiple organ injuries. Besides retroperitoneal injuries, solid organ injuries is common than hollow visceral injury. In solid organ injury, spleen had peak incidence. In hollow visceral injuries, incidence is highest with small bowel injuries followed by large bowel injury. Since road traffic accidents are the commonest mode of injury among the young group of Indians, traffic rules should be strictly implemented and followed to reduce the preventable cause of injury and death in polytrauma and thereby reducing morbidity and mortality.

## REFERENCES


1. Berger LR, Mohan D. Injury Control: A Global view Oxford University Press. New Delhi. 1996.
2. Potenza BM, Hoyt DB, Coimbra R, Fortlage D, Holbrook T, Hollingsworth-Fridlund P. The epidemiology of serious and fatal injury in San Diego County over an 11-year period. Journal of Trauma and Acute Care Surgery. 2004 Jan 1;56(1):68-75.
3. Baker SP, O'Neil B, Giinsberg MJ, Li G. 2nd ed. New York: Oxford university press; 1992. The injury fact book.
4. Townsend Jr CM, Beauchamp RD, Evers BM, Mattox KL. Sabiston textbook of surgery: expert consult premium edition: enhanced online features. Elsevier Health Sciences; 2007 Nov 21.
5. Miller PR, Fabian TC, Croce MA, Magnotti LJ, Pritchard FE, Minard G, Stewart RM. Improving outcomes following penetrating colon wounds: application of a clinical pathway. Annals of surgery. 2002 Jun;235(6):775.
6. Karamercan A, Yilmaz TU, Kamercan MA, Aytac B. Blunt abdominal trauma: Evaluation of diagnostic option and surgical out comes.Turk J Trauma Emerg Surg.2008;14:205-10.
7. Hemmila MR, Wahl WL. Management of injuried patient.In:Dorethy GM, editor.Current surgical diagnosis and treatment. New York: McGraw-hill Medical; 2008.pp.227-8.
8. Pearlman MD, Tintinalli JE, Lorenz RP. Blunt trauma during pregnancy. New England Journal of Medicine. 1990 Dec 6;323(23):1609-13.
9. Vashistha R, Bansal H, Datey S, Charles N, Lazarus A, Gadodia M. Study of the clinical profile of blunt abdominal trauma at a tertiary care centre of central India. Pain. 2015 Nov 19;49:92-45.
10. Negoi I, Paun S, Stoica B, Tanase I, Vartic M, Negoi RI, Hostiuc S, Beuran M. Latest progress of research on acute abdominal injuries. Journal of Acute Disease. 2016 Jan 1;5(1):16-21.
11. Arumugam S, Al-Hassani A, El-Menyar A, Abdelrahman H, Parchani A, Peralta R, Zarour A, Al-Thani H. Frequency, causes and pattern of abdominal trauma: A 4-year descriptive analysis. Journal of emergencies, trauma, and shock. 2015 Oct;8(4):193.
12. Lone GN, Peer GQ, Warn AK, Bhat AM, Warn NA. An experience with abdominal trauma in adults in kasmir.JK Pract.2001;8;225-30.
13. Khichi Z, Afridi HK. Audit of thoracoabdominal injuries in road traffic accidents in Larkana Autopy study; pak.J.Med and health sci 2013;7(4):1109-12.

14. Salmi J, Ghodsi M, Khaji A. Hospital management of abdominal trauma in Tehran, Iran:A review of 228 patients .Chin J Traumatol.2009;12:259-62.
15. Kala SK, Mathur RK, Singh SP. A clinical study of blunt abdominal trauma. International journal of recent trends in science & technology; 2015;15(3):626-30.
16. Costa G, Tierno SM, Tomassini F, Venturini l, Frezza B, Cancrini G. The epidermiology and clinical evaluation of abdominal trauma. An analysis of a multidisciplinary trauma registry. Ann Ital chir. 2010;81:95-102.
17. Smith J, Cadwell E, Amours D. Abdominal trauma: A disease in evaluation. ANZ J Surg. 2005; 75:790-4.
18. Davis JJ, Cohn Jr. I, Nance FC. Diagnosis and management of blunt abdominal trauma .Ann. Surg1976;183(6):672-77
19. Gad MA, Saber A, Farrag S. Incidence, pattern and factors predicting mortality of abdominal injuries in trauma patients. N Am J med Sci.2012 Mar;4(3):129-134.
20. Cox EF. Blunt abdominal trauma. A 5-year analysis of 870 patients requiring celiotomy. Annals of surgery. 1984 Apr;199(4):467.
21. Ponifasia P, Poki HO, Watters DA. Abdominal trauma in urban Papua New Guinea.P NG Med j.2001;44:36-42.
22. Chalya PL, Mabula JB, Dass RM. Injury characteristics and outcome of road traffic crash victims at Bugando medical centre at northwest Tanzania. J Trauma Manag. Outcomes. 2012;6.
23. Hildebrand F, Winkler M, Griensven MV, Probst C, Musahl V, Krettek C. Blunt abdominal trauma requiring laparotomy: An analysis of 342 polytraumatized patients. Eur J Trauma.2006; 32:430-8.
24. Watts DD, Fakhry SM. EAST Multi institutional Hollow Viscus Injury Research Group. Incidence of hollow viscus injury in blunt trauma: An analysis from 275,557 trauma admissions from the East multiinstitutional trial. J Trauma. 2003;54:289-94.
25. Cox EF. Blunt abdominal trauma. A 5-year analysis of 870 patients requiring celiotomy. Annals of surgery. 1984 Apr;199(4):467.