Original Article

Pediatric Abdominal and Thoracic Trauma

Pattern of Pediatric Abdominal and Thoracic Trauma, Types of Organ Injury, Biochemical Parameters and Treatment Approaches

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ABSTRACT

Objective: To find out pattern of pediatric abdominal and thoracic trauma, types of organ injury and treatment approaches done at a tertiary care hospital of South Punjab, Pakistan.

Study Design: A descriptive observational study

Place and Duration of Study: This study was conducted at the Department of Pediatric Surgery, Bahawal Victoria Hospital, Quaid-e-Azam Medical College, Bahawalpur, from January 2017 to December 2019.

Materials and Methods: A total of 112 patients aged less than 15 years, having history of abdominal and/or chest trauma were enrolled. Demographic data along with mechanism, site, mode and nature of injury was gathered. Biochemical markers for acute abdominal trauma, serum alanine amino transferase (ALT), serum creatinine kinase (CK) and serum lipase were obtained. Definitive treatment in terms of conservative or surgical treatment was noted. All cases were handled using standard "Advance Trauma Life Support (ATLS)" protocols.

Results: Among of a total of 112 patients, mean age was noted to be 6.8+2.9 years. There were 68 (60.7%) boys and 44 (39.3%) girls. Road-traffic accidents were the commonest mode of trauma noted in 51 (45.5%) children, followed by fall 40 (35.7%), thermal injuries in 14 (12.5%) and assaults in 7 (6.3%). Abdomen was involved most frequently as seen in 54 (48.2%) children, thoracic trauma in 23 (20.5%) while combined thoraco-abdominal injuries were noted in 35 (31.2%). Among 82 (73%) patients, a very high serum ALT ≥ 100IU/L was found, similarly, 41(36%) patients were having raised serum CK (≥575U/L), and 26 (23%) were found with raised serum lipase (≥ 61U/L). There were 65 (58.0%) patients who were managed adopting conservative approach, minor interventions needing local anesthesia were done in 31 (27.7%), while major interventions were needed in remaining 16 (14.3%) cases. Mortality was reported in 3 cases.

Conclusion: Majority of the cases having thoraco-abdominal trauma were boys. Road-traffic accidents were the commonest mode of trauma followed by fall injuries and thermalinjuries. Abdomen was the most frequently involved anatomical site followed by combined thoraco-abdominal injuries. The most frequently raised biomarkers observed in acute abdominal injury were serum ALT, CK, and Lipase. Most of the patients were managed adopting conservative approach.

Key Words: Thoraco-abdominal trauma, road-traffic accidents, biochemical parameters conservative approach.

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INTRODUCTION

Pediatric trauma is known to be an important cause of death and disability especially in the developing countries.[1] Globally, around 5 million deaths are reported annually due to pediatric trauma.[2] Pediatric trauma is estimated to be the reason of more than 50% deaths in children between 1 to 14 years of age while after infections, it is also the 2nd most frequent cause of hospital emergency visits. [3] Regional data suggest that 15-20% of trauma deaths are reported in the pediatric age groups. [4]

Abdominal trauma is estimated to be the third leading cause of mortality among children. The reported incidence calculated blunt abdominal injury occurring in ~9/100000 children. [5] Blunt abdominal injuries seem to be more prevalent as compared to penetrating abdominal injuries whereas mechanisms behind these injuries differ in different pediatric age groups. [6] Paediatric thoracic injuries are estimated to account for 4-6% of hospital trauma cases while mortality rates are around 5% but when combined with abdominal injuries,

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the mortality rates starch around 25%.[7,8] Blunt as well as penetrating injuries among children can occur due to variety of reasons but most frequent cause is noted to be motor vehicle accidents. Most common sites of injuries are observed to be rib cage, lung parenchyma and other mediastinal structures. Frequently raised serum biomarkers in acute abdominal injury are serum ALT, CK and lipase [9].

It is vital to find out pattern and knowledge about paediatric abdominal and thoracic trauma to plan, implement and manage these types of trauma so that management can be done at initial levels to minimize the mortality and morbidity related to these injuries.[10,11] This study was planned to find out pattern of pediatric abdominal and thoracic trauma, types of organ injury and treatment approaches done at a tertiary care hospital of South Punjab, Pakistan.

MATERIALS AND METHODS

This descriptive observational study was done at Department of Paediatric Surgery, Bahawal Victoria Hospital, in collaboration with Pathology Department, Quaid-e-Azam Medical College, Bahawalpur, from January 2017 to December 2019. A total of 112 patients aged less than 15 years, having history of abdominal and chest trauma were enrolled. Patients having head, spine, facial, upper or lower limb trauma, poisoning or drowning were not included in this study. Children having any psychiatric illness were also not enrolled. Thoracic injury was labeled as injury between clavicles superiorly and the 12th rib inferiorly which resulted in clinically significant or suspected intra-thoracic injury.

A total of 112 patients fulfilling inclusion and exclusion criteria during the study period were analyzed and all the study information was noted on a predesigned proforma specifically made for this study. Demographic data along with mechanism, site, mode and nature of injury was gathered. Relevant laboratory investigations like blood complete examination, serum ALT, CK, Lipase were done. Definitive treatment in terms of conservative or surgical treatment was noted. X-ray skeletal survey, "focused assessment with sonography for trauma (FAST)" or "computed tomography (CT)" were done as per requirement. All cases were handled using standard "Advance Trauma Life Support (ATLS)" protocols.

RESULTS

Among of a total of 112 patients, mean age was noted to be 6.8+2.9 years ranging from 1 month to 14 years. There were 68 (60.7%) boys and 44 (39.3%) girls. Road-traffic accidents were the commonest mode of trauma noted in 51 (45.5%) children, followed by fall 40 (35.7%), thermal injuries (scalds, burns or electrical injuries) in 14 (12.5%) and assaults in 7 (6.3%) as shown in Figure 1. Thermal burns were referred to burn unit for further evaluation and management.

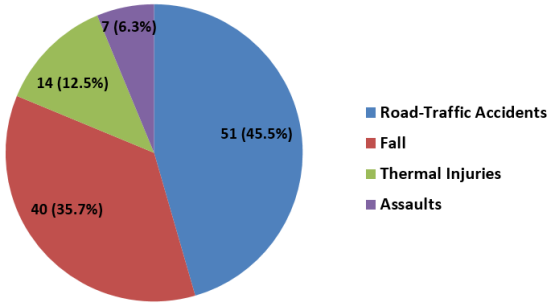

Figure 1: Mode of Trauma (n=112)

In terms of anatomical sites of thoraco-abdominal trauma, abdomen was involved most frequently as seen in 54 (48.2%) children while thoracic trauma was seen in 23 (20.5%). Combined thoraco-abdominal injuries were noted in 35 (31.2%).

Table No.1: Types of Injury in Isolated Thoracic Trauma (n=112)

Anatomical Sites of Trauma	Types of Injury / Organs Involved	Number (%)
Isolated Thoracic Trauma (n=23)	Lung Contusion	8 (34.8%)
	Pleural Laceration	6 (26.1%)
	Rib Fractures	5 (21.7%)
	Clavicle Fracture	3 (13.0%)
	Sternal Injury	1 (4.3%)
	Pericardial Hematoma	1 (4.3%)
Isolated Abdominal Trauma (n=54)	Liver	20 (38.9%)
	Spleen	11 (20.4%)
	Hollow Viscus	10 (18.5%)
	Kidney	6 (11.1%)
	Pancreas	4 (7.4%)
	Urinary Bladder	3 (5.6%)
Thoraco-Abdominal Trauma (n=35)	Chest and Liver	11 (31.4%)
	Chest and Spleen	10 (28.6%)
	Chest, Liver and Spleen	9 (25.7%)
	Chest, Spleen and Bowel Perforation	3 (8.9%)
	Chest, Diaphragm and Liver	1 (2.9%)
	Chest and Gastric Perforation	1 (2.9%)

Table 1 is showing details of anatomical sites of trauma along with types of injuries or organs involved. In patients having isolated thoracic trauma (n=23), lung contusions with hemo-pneumo-thorax was the commonest types of injuries noted in 8 (34.8%) patients, followed by pleural laceration 6 (26.1%) and rib fractures 5 (21.7%). In patients having isolated abdominal trauma (n=54), liver was the most frequently involved organ seen in 20 (38.9%) cases followed by spleen 11 (20.4%) and hollow viscus injuries 10 (18.5%). Among patients having thoraco-abdominal

trauma (n=35) as validated by X-ray skeletal survey, FAST and CT, combined chest and liver injuries were the most frequent seen 11 (31.4%) followed by chest and spleen involvement in 10 (28.6%), and chest, liver and spleen involvement in 9 (25.7%) cases.

In terms of management, 65 (58.0%) patients were managed adopting conservative approach (intravenous fluids, non-steroidal anti-inflammatory drugs and rest), minor interventions needing local anaesthesia were done in 31 (27.7%), while major interventions were needed in remaining 16 (14.3%) cases. Mortality was reported in 3 cases, out of which, 1 was due to grade-5 renal injury where nephrectomy was done while the 2 deaths were recorded in a children having thoraco-abdominal trauma involving multi-organ damage.

DISCUSSION

Trauma injuries account for nearly 12% of disease burden globally.[12] Researchers have pointed out towards estimating epidemiological aspects of trauma among pediatric age groups as most of these injuries are perceived to be preventable.[10,11] In the last few decades, incidence of paediatric thoraco-abdominal trauma has raised significantly all around the world.[3]

In the present study, majority of the cases (60.7%) were boys. Our results are aligned with the findings of Wabada S et al from Nigeria who evaluated 33 cases with abdominal trauma and found a male to female ratio of 3:1.[13] Kundal VK et al from India revealed 64.6% of their cases of thoraco-abdominal trauma to be male which is close to what we noted.[14] Being physically more involved in routine and outdoor activities could be major reasons for this male predominance in thoraco-abdominal trauma cases.

Road-traffic accidents were the commonest mode of trauma observed in 45.5% cases followed by fall (35.7%) injuries. Data from findings of Peclet MH et al[15] in 1990 revealed that 36% cases of thoracic trauma were due to pedestrian injury while recent studies show that road-traffic accidents to be most common cause of pediatric thoraco-abdominal injuries.[16] Study from Kundal et al found road-traffic accidents to be the most frequent mode of thoraco-abdominal trauma while some authors have noted fall injuries to be most prevalent in children but inclusion criteria involving children of younger age (less than 12 years) could be one reason for that.[14] Hyder et al analyzing children aged less than 5 years revealed that 36% of the cases were due to fall injuries.[17] Road-traffic injuries can occur as a passenger, driver, bicyclist or pedestrian. Generally, road-traffic accidents are more prone to induce blunt trauma while falls and outdoor recreational activities are more related with abdominal injuries.[18] Specific injury modes can help in early prediction about the presence of thoraco-abdominal injuries. Among paediatric age groups, distinctive anatomy having more labile physiologic reserve, less protective adipose and connective tissues as well as muscle mass.[19] We also know that bones of a child are not fully calcified which make them more flexible. Intra-abdominal organs are also more closely situated to each other that increase chances of multi-organ trauma. In this study, abdominal trauma was seen in 48.2% children, thoracic trauma in 20.5% while combined thoraco-abdominal injuries were noted in 31.2%. This is well aligned with the recently published regional data where authors found abdominal trauma to be the commonest anatomic site of trauma followed by combined thoraco-abdominal trauma.[14] Management of thoraco-abdominal trauma has seen significant shift from surgical to conservative management because of improvement in evaluation and grading of the trauma especially due to enhancement in USG and CT utilization.[20] Majority of the blunt injuries are managed conservatively but the decision to non-operative approach depends upon trauma surgeons depending upon hemodynamic status and CT findings assisted by standard ATLS guidelines.[14,20]

Our study had some limitations as well. We only included cases having chest and abdominal trauma presented at emergency department of our tertiary care health facility. We did not enrolled patients that had polytrauma like head-and-neck trauma. Patients having drowning or poisoning were not included while missing information about the exact mode of injury in some cases could possibly have influenced the true representation of thoraco-abdominal trauma in this study. We were also unable to document duration of hospital stay as, this was a single center study, more studies involving multiple centers and different sets of population will further add to what is known about the pattern, mode, types and outcomes of thoraco-abdominal trauma in children.

CONCLUSION

Majority of the cases having thoraco-abdominal trauma were boys. Road-traffic accidents were the commonest mode of trauma followed by fall injuries and thermal injuries. Abdomen was the most frequently involved anatomical site followed by combined thoraco-abdominal injuries. Most of the patients were managed adopting conservative approach.

Author's Contribution:

Concept & Design of Study:	Muhamamd Saddique
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Conflict of Interest: The study has no conflict of interest to declare by any author.

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