

## Conservative Management of Blunt Trauma Abdomen in Pediatric Population; Know When not to Operate

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### ABSTRACT

**Introduction:** The aim of the study was to evaluate the outcome of conservative management of blunt trauma injury in pediatric population presenting to Holy Family Hospital.

**Materials and Methods:** An analytical cross sectional study of all the pediatric patients of Blunt trauma abdomen of both genders above 1 year of age presenting to department of pediatric surgery, Holy Family Hospital prospectively during the period of Nine months from January 2020 to September 2020.

**Results:** During a period of nine months, a total of 33 patients presented to pediatric surgical emergency, Holy family hospital having female predominance. 57.6% had isolated liver injury making it the most injured organ of blunt trauma abdomen followed by isolated renal injury which came out to be 18%, while 9.1% of the patients, each, suffered from splenic and pancreatic injury. 90% (30) of the patients were successfully managed conservatively while 6% (2) had to undergo exploratory laparotomy after failure of conservative management.

**Conclusion:** Non operative conservative management is associated with lower morbidity and less hospital stay in pediatric patients with abdominal blunt trauma.

**Key words:** Blunt abdominal trauma; Pediatric population; Conservative management; Liver injury; Kidney injury; Spleen injury

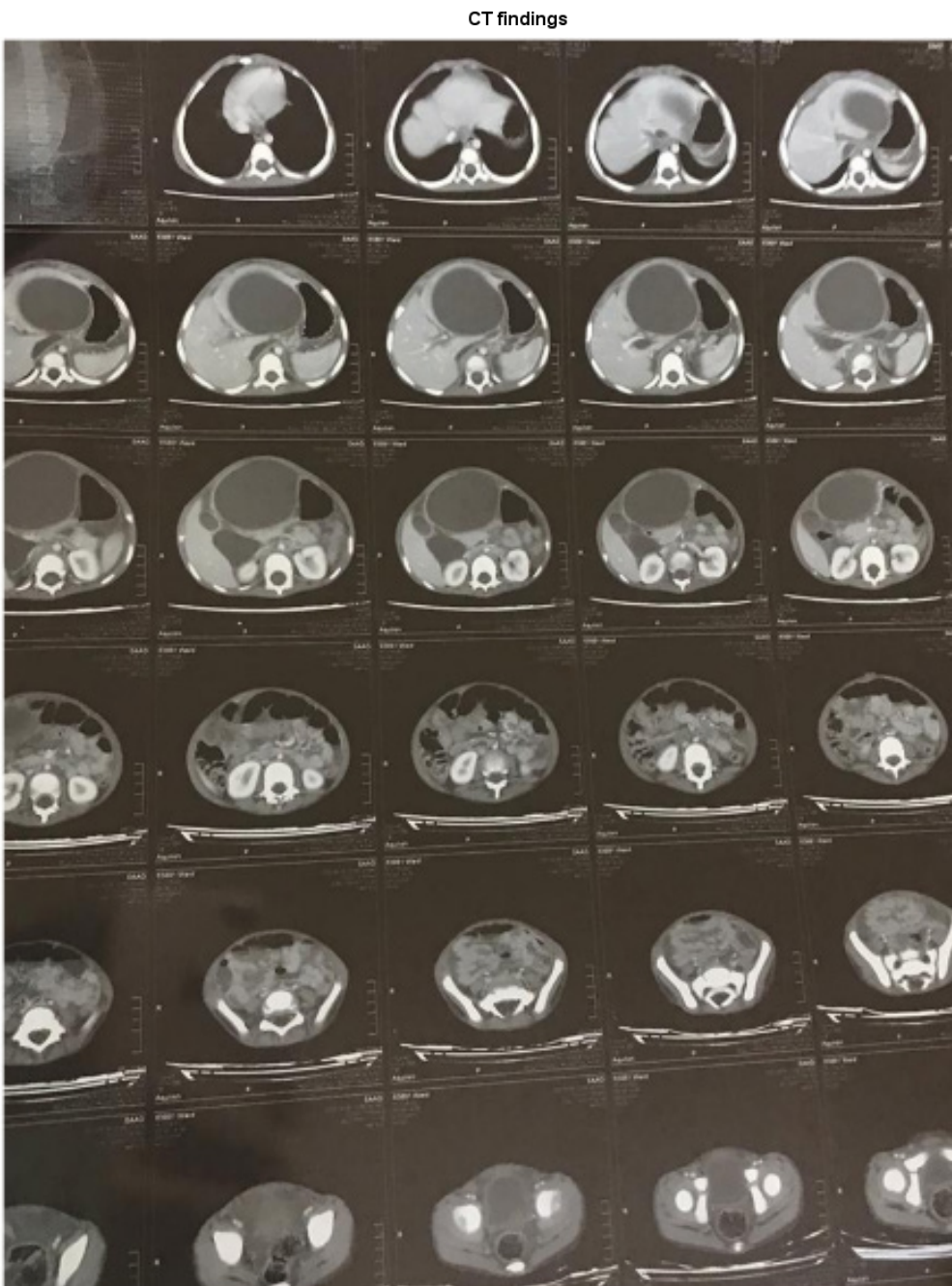
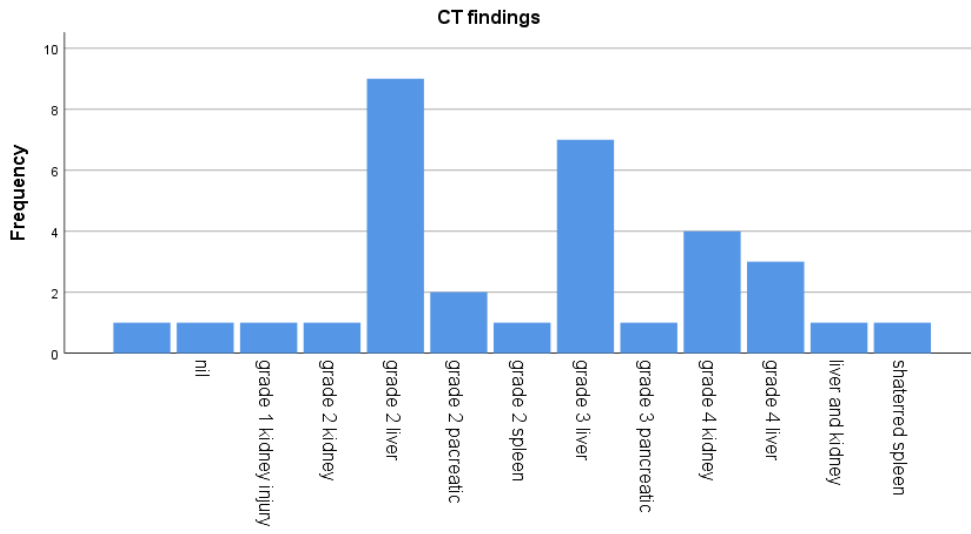
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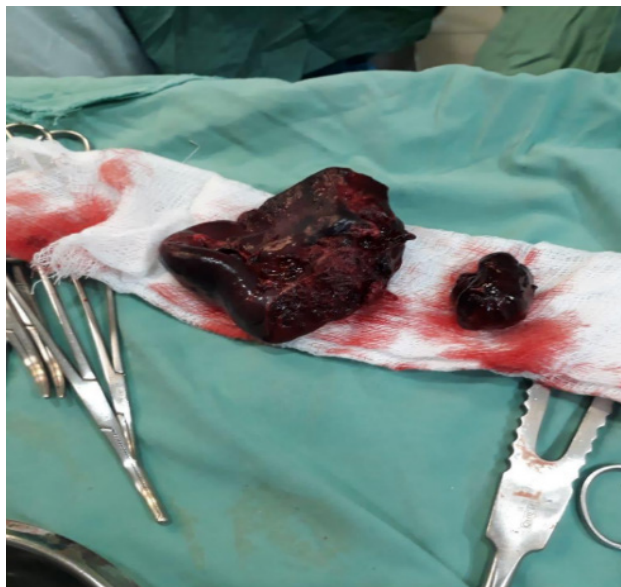
### INTRODUCTION

Pediatric population due to inherently curious and carelessness is more prone to accidental injuries. The accidental injuries are usually as a result of trauma. Trauma is traditionally divided into Blunt and penetrating trauma<sup>[1]</sup>. The mode of injuries may vary but blunt trauma is considered to be the leading cause of mortality and disability amongst younger children<sup>[2]</sup>. Head and extremity trauma are the most common amongst pediatric population followed by abdominal trauma constituting about 25% of the injuries<sup>[3,4]</sup>.

The main reason behind these abdominal injuries comparatively more than adults has to do with the fact that children weigh less with less fat coverage and weak muscles, also their rib cage provides less protection with force dissipating on small area making the impact even more greater<sup>[5]</sup>.



**Figure 1and 2** Coronal section of CT scan showing hepatic biloma.



**Figure 3** Shattered Spleen in a patient who underwent Exploratory laparotomy.

The fatality associated with blunt trauma injuries are mainly because of solid visceral bleeding, vasculature compromise and secondary peritonitis associated with perforated gut viscos<sup>[6]</sup>. Conservative management in blunt trauma injury has been a practice accepted for quite a long time around the globe<sup>[7]</sup> while it's still under study in a newly developed department of pediatric surgery, Holy Family hospital. The aim of the study was to evaluate the outcome of conservative management of blunt trauma injury in pediatric population presenting to Holy Family Hospital. In an underdeveloped country like Pakistan, there is dearth of data on such pediatric patients being managed conservatively. A limited number of studies have actually been carried out on the relevant topic in our setups.

## MATERIALS AND METHODS

After approval from Ethical Review Board of Rawalpindi Medical University, we conducted an analytical cross sectional study of all the pediatric patients of Blunt trauma abdomen of both genders above 1 year of age presenting to department of pediatric surgery, Holy Family Hospital prospectively by their demographic details, mode of presentation and detail of injury, initial condition, surgical intervention, and their outcome during the period of Nine months from January 2020 to September 2020.

Rather than conventional methodology, advanced analytical study was performed, because of which we were able to predict the association between different variables with Blunt trauma abdomen. Moreover the study also provides details regarding the types of injuries, solid organ effected , its grading and long term outcome.

The patients who had sustained multiple injuries, whose FAST scan was positive for fluid, those who were vitally unstable were included in the trial. Modality of Contrast Enhanced Computerized Tomography abdomen and pelvis was an essential for all these patients. The patients with minor injuries with negative FAST scan, vitally stable, discharged after initial assessment were excluded from the study.

Duration of study is short, sample size is limited due to the fact that it is newly developed unit which started emergency services in November 2019. The study was undertaken with the aim to continue it as a project in case the results were significant.

**Table 1** Demographic details, presentation, management, and outcome of pediatric population with blunt trauma abdomen.

Variables		Mean (Standard Deviation) (Maximum - Minimum) Frequency (Percentage)
Gender	Male	11(35.5%)
	Female	20(64.5%)
Mode of injury	Blunt Trauma Abdomen	26(78.8%)
Mode of presentation	Road Traffic Accident	5(15.2%)
	Self rescued	16(48.5%)
	Rescue 1122	5(15.2%)
Nature of injury	Referred	10(30.3%)
	Isolated renal injury	6(18.2%)
	Isolated liver injury	19(57.6%)
	Isolated splenic injury	3(9.1%)
	Liver and Renal Injury	1(3%)
Management Received	Pancreatic Injury	3(9.1%)
	Nil	1(3%)
	Primary/secondary	4(12.1%)
Management Plan	No	7(21.2%)
	First Aid	21(63.6%)
Follow up	Conservative	30(90.9)
	Operative	2(6.1%)
Significant findings	Unremarkable	29(87.9%)
Age		2(6.1%)
Day of discharge		6.46±2.92
Mean Hgb levels		4.66±1.15
		7.55±1.63

**Table 2** Linear regression analysis for association of mode of injury (blunt trauma abdomen) with different variables

Variables	R2, p value
Age	0.14, 0.56
Nature of injury	0.12, 0.05
Day of discharge	0.077, 0.145
Mean Hgb levels	0.003, 0.805
Gender	0.001, 0.871

## RESULTS

During a period of nine months, a total of 33 patients presented to pediatric surgical emergency, Holy family hospital, 64.5% were females while 35.5% were male with majority of patients falling in between ages 3 and 10 with a mean of 6.447 with a standard deviation of 2.922.

Using frequency distribution for our qualitative variables, what was worrisome about the mode of presentation of these patients, only 16% patients were brought in by Rescue ambulance 1122, while majority 51% brought in by guardians and 32% were referred by basic health units, Rural health centers with only 12% of them having received proper primary trauma care while 65% received first aid at nearby clinics or at home.

The mode of injury in these patients were mainly blunt trauma due history of fall from height, being hit by a sibling by blunt object, unfortunate incident of falling of school wall constituting about 83.9% of the patients while the remaining 16.1% had a history of Road traffic accident.

The FAST scan findings and CECT abdomen findings were

accurate and accurately correlated. 93% of the patients had isolated visceral injuries while the rest 7% had multiple injuries after major traumatic event including head and extremity injuries, some had multiple visceral injuries as well. 57.6% had isolated liver injury making it the most injured organ of blunt trauma abdomen followed by isolated renal injury which came out to be 18%, while 9.1% of the patients, each, suffered from splenic and pancreatic injury. One of the patient suffered from liver and kidney injury both with significant morbidity.

Amongst the isolated liver injury, 27.3% patients had Grade 2 liver injury, 21.2% had grade 3 liver injury and 9.1% had grade 4 liver injury.

About the second most common organ, the kidneys were more susceptible to grade 4 injuries constituting about 12% amongst the 18%. While only 1 patient endured grade 1 and grade 2 kidney each. Only 1 patient presented with shattered spleen while the remaining two had grade 2 splenic injury. 2 patients (6.1%) had grade 2 pancreatic injury while only 1 patient (3%) had grade 3 pancreatic injury. All three of these patients had signs and symptoms correlating with acute pancreatitis.

90% (30) of the patients were successfully managed conservatively while 6 % (2) had to undergo exploratory laparotomy after failure of conservative management. 1 patient operated immediately in emergency succumbed to injuries on first post-operative day. The patient presented on fourth day of injury in profound state of shock. Per op the patient had shattered spleen ( $n = 1$ )

93.5% ( $n = 29$ ) patients were unremarkable clinically and radiological on two weeks follow up while 6.3% ( $n = 2$ ) presented with on and off abdominal pain and positive radiological findings as well.

Amongst these 8 year old male presented with bicycle handlebar injury .with pancreatic injury, vitally stable and was discharged at seventh day of life, presented with complaint of epigastric pain and fullness on follow up, on examination there was a mass palpable in the epigastrium.

Further workup and follow up computerized tomography showed he had pancreatic pseudo cyst of head of pancreas of about 7\*7 cm abutting the Superior Mesenteric artery. Patient underwent elective laparotomy and cystogastrostomy was performed.

Another three year old male with grade III liver injury initially discharged at third day of admission presented again at four weeks post trauma with epigastric swelling and vomiting, further work-up revealed hepatic biloma in left lobe of liver of about 8\*10cm with 315ml collection. He was planned for surgical drainage and drain was kept for one week after that it was removed.

Using descriptive analysis, the average day of discharge amongst these patient were between day three and day five with a mean of 4.66%. The hemoglobin levels were recorded at the time of admission in emergency department which showed the values to fall between as low as 3.90 to 10.9mg/dl with a mean value of 7.52%.

Simple linear regression was used to test if mode of injury (blunt trauma abdomen) is significantly associated with different variables. The only significant factor was the nature of injury (renal injury, hepatic injury,liver injury).The overall regression was statistically significant  $R^2= 0.12$ ,  $F(11.47, 83.88) = 3.965$ ,  $p = 0.05$ . It was found that mode of injury significantly predicted nature of injury  $\beta = 0.827$ ,  $p = 0.05$ .

## DISCUSSION

An organized and methodical approach for patients presenting with blunt trauma abdomen is required in order to identify and manage

their injuries. Abdominal trauma can result in fatal injuries specially when the mechanism of injury has associated with high energy followed by direct trauma to abdomen<sup>[8,9]</sup>. The more subtle injuries can be detected with a systematic approach to the patient combined with a high index of suspicion. Initial FAST followed by abdominal computed tomography are important in the evaluation of the seriously or critically injured patient. Computerized tomography is highly specific in the detection and grading of solid visceral injury with less specificity for gut related pathology which requires close liaison with radiologist<sup>[10]</sup>.

Hemodynamically stable patients can be successfully managed by appropriate non operative management. More than 96% of isolated injuries can be managed without surgery with emphasis being given on hemodynamic stability specifically in the first 48 hours rather than grade of injury<sup>[11]</sup>.

The patients in our study trial showed female predominance with female to male ratio of 1.81:1 while Lal permeshwar et al concluded in his latest study published in 2020 that blunt trauma from their had male predominance with the ratio being 1:4.26<sup>[12]</sup>. Same observations were noted by a trial by Kumar Abdul Rashid which showed  $n = 192$  for males and  $n = 59$  for females<sup>[8]</sup>, the mean age was 6.4 +/- 2.992 which was comparable with the observational trials of Lal permeshwar et al and Kumar Abdul Rashid et al respectively. Both these studies emphasized that school going children were more prone to blunt trauma abdomen injury<sup>[8,12]</sup>.

While our trial concluded that the most common mode of injury was due to blunt trauma due to history of fall constituting 83.9% while 16.1% had history of Road traffic accidents. This is in contrast to the study trials done in India by Lal permeshwar et al making Road traffic accidents (41.3%) vs history of fall (27.27%), the leading mode on injury. Another study by Rashid Abdul karim et al had the similar findings (154 out 251) followed by history of fall (72)<sup>[8,12]</sup>.

The most commonly injured organ according to our analysis was liver (57.6%) followed by kidneys (18%) and spleen (9.1%). This finding is consistent with the findings of garg D et al from North India<sup>[13]</sup>. While Borse N et al, Gaines BA et al, Grazino KD et al, Qadri AI et al<sup>[14,2,6,3]</sup>. had reported otherwise making spleen the most commonly injured organ. According to our study the second most common injured organ is kidney which might not be consistent with the results by Lal permeshwar which stated that second most injured organ is spleen<sup>[12]</sup>, but is supported by the fact that children are more susceptible to renal injuries than adults because of anatomical aspects<sup>[15]</sup>.

The mortality rate of our study was 3% ( $n = 1$ ) while the rest 90% were managed successfully on conservative management and the rest 6.1% ( $n = 2$ ) underwent delayed exploratory laparotomy on follow-up. Our results were comparable and related to the studies done on the same topic by Lal permeshwar et al and Garg et al from India whose success rate was above 85% both<sup>[12,13]</sup>.

The average day of discharge amongst these patient were between day three and day five with a mean of  $4.66 \pm 1.15$  days in our study which was relatively less than the average duration of hospital stay was 8.31±3.54 days as stated by Lal permeshwar et al<sup>[12]</sup>. The less duration of stay supports the fact that non operative management reduces the hospital stay and offers prompt return to day to day life.

## CONCLUSION

Blunt trauma abdomen still poses a great threat to our pediatric population all around the globe when associated mortality and morbidity as taken into account. There was female predisposition according to our study with school going children to be the most

effected. The most common organ associated is liver followed by kidneys and spleen. FAST scan and Computerized Tomography are the modalities best sensitive and specific for the detection of solid visceral injuries. Non operative conservative management is associated with lower morbidity and less hospital stay in pediatric patients with abdominal blunt trauma. Operative management may be required in patients in a state of profound shock non responsive to resuscitation and initial treatment, those who have developed peritonitis secondary to gut perforation. Delayed exploratory laprootomy may be planned if the patient presents with persistence of symptoms and radiological findings. A weak association is thought to exist between mode of injury (blunt trauma vs Road traffic accidents) with nature of injury (liver vs kidney vs spleen).

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## LIMITATIONS

Duration of study is short, sample size is limited due to the fact that it is newly developed unit which started emergency services in November 2019.

## REFERENCES

1. I Djordjevic, A Slavkovic, Z Marjanovic, D Zivanovic. Blunt Trauma in Pediatric Patients - Experience from a Small Centre West Indian Med J. 2015; 64(2): 126-126. [PMID: 26360685]; [PMCID: PMC4696632]; [DOI: 10.7727/wimj.2014.069]
2. Qadri AI, Ahmad Y, Bhat GA, Khan AA, Bashir K. Epidemiology and injury pattern in blunt trauma abdomen in pediatric population: a two year experience in a tertiary care institute of Kashmir, India. International Surgery Journal. 2018; 5(11): 3713-3713. Available from: [DOI: 10.18203/2349-2902.isj20184650].
3. Gaines BA. Abdominal and pelvic trauma in children. Crit Care n Med. 2002; 35: 1002-423. [PMID: 12528783]; [DOI: 10.1097/00003246-200211001-00006]
4. Bixby SD, Callahan MJ, Taylor GA. Imaging in Pediatric Blunt Abdominal Trauma. Seminars in Roentgenology. 2008; 43(1): 72-82. [PMID: 18053830]; [DOI: 10.1053/j.ro.2007.08.009]
5. Anderson RN, Smith BL. Deaths: leading causes for. Natl Vital Stat Rep. 2001; 52(9): 1-85. [PMID: 14626726]
6. Graziano KD, Juang D, Notrica D, Grandsoult VL, Acosta J, Sharp SW, et al. Prospective observational study with an abbreviated protocol in the management of blunt renal injury in children. Journal of Pediatric Surgery. 2014; 49(1): 198- 201. [PMID: 24439609]; [DOI: 10.1016/j.jpedsurg.2013.09.053]
7. Lynch T, Kilgar J, Shibli AA. Pediatric Abdominal Trauma. Current Pediatric Reviews. 2018; 14(1): 59-63. [PMID: 28814248]; [DOI: 10.2174/1573396313666170815100547]
8. Rashid KA, Khanday ZS, Samie AU, Hamid R, Ahmad S, Samie AU. Diagnosis and Management of Blunt Abdominal Trauma in Children: Experience from a Newly Established Facility. New Indian J Surg. 2018; 9(4): 474-78.
9. Sivit CJ. Imaging Children with Abdominal Trauma. American Journal of Roentgenology. 2009; 192(5): 1179-1189. [PMID: 19380540]; [DOI: 10.2214/AJR.08.2163]
10. Castellanos A, Diego ED, Fernández I, Trugeda M. Evaluación inicial y tratamiento del traumatismo abdominal infantil. Bol Pediatr. 2001; 41: 106-114.
11. Gaines BA, Ford HR. Abdominal and pelvic trauma in children. Critical Care Medicine. 2002; 30(Supplement): S416-S423. [PMID: 12528783]; [DOI: 10.1097/00003246-200211001-00006]
12. Lal P, Kumar A, Lal M, Gupta R, Raipuria G, Barolia DK, Singh AP, Gupta AK. A Prospective Study of Blunt Trauma Abdomen in Pediatric Patients - Our Institutional Experience. Innovative Journal of Medical and Health Science. 2020; 1402-1410. [DOI: 10.15520/ijmhs.v10i11.3150]
13. Garg D, Singh AP, Barolia DK. Significance of Ultrasound Finding of Minimal Free Fluid in Pelvis in Pediatric Blunt Trauma Abdomen Patients: A Retrospective Study and Review of Literature. Int J Med Sci and Inno Research. 2018; 3(6): 250-254.
14. Borse N, Sleet DA, Moffett DB. Cdc childhood injury report: Patterns of unintentional injuries among 0- to 19-year olds in the united states. Fam Commun Heal. 2000; 32: 189-189.
15. Moore EE, Shackford SR, Pachter HL, Meaninch JW, Browner BD, Champion HR. Organ injury scaling: Spleen, liver, and kidney. J Trauma Inj Infect Crit Care. 1989; 29: 1664-1670.