A CLINICAL STUDY AND MANAGEMENT OF NON-PENETRATING ABDOMINAL INJURIES

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KEYWORDS

ABDOMINAL INJURIES, penetration trauma, Blunt abdominal injuries

ABSTRACT:

Introduction: This dissertation examines non-penetrating abdominal injuries in patients at Krishna Hospital Karad, focusing on blunt abdominal trauma due to increasing automobile usage and road traffic accidents in India. The study highlights the importance of early examination, rapid diagnostic methods, and aggressive therapy for patient survival and reduces morbidity. **Aim:** The study evaluates the clinical presentation, frequency of abdominal injuries, treatment roles, morbidity, and mortality associated with non-penetrating abdominal injuries. **Methodology:** The study involved 93 patients with blunt abdominal injuries at Krishna Hospital's Department of Surgery, involving systematic clinical examination, documentation, investigations, and analysis of patient history and diagnostic tests. **Results:** The study reveals 25.8% of cases are aged 21-30, predominantly male, from rural areas, primarily caused by road traffic accidents, with pain, splenectomy, and surgical site infection. **Discussion:** The study reveals that the majority of non-penetrating abdominal injuries are male (84%), predominantly from day laborers and rickshaw pullers in rural areas, requiring prompt diagnosis and appropriate therapeutic interventions. **Conclusion:** The study highlights the high incidence of nonpenetrating abdominal injuries in young adults and males, particularly day laborers and rural residents, highlighting the need for improved trauma care.

INTRODUCTION

Trauma is a neglected illness in society, leading to high mortality rates in underdeveloped nations and under 45-year-olds. India, with rapid urbanization, motorization, and industrialization, is experiencing a surge in road traffic accidents, posing a significant public health risk.[1,2]

The abdomen is the third most frequently injured area, with two main types: penetration trauma and blunt abdominal trauma. Blunt abdominal injuries are more common, causing injuries from road traffic accidents, warfare, falls, sports, martial arts, and mountaineering.[3,4]

Proper examination of blunt abdominal injuries, rapid diagnostic methods, and aggressive therapy are crucial for patient survival. FAST is an effective method, especially when diagnostic modalities are unavailable or expensive.[5]

Concealed haemorrhage is the second leading cause of death after abdominal trauma, with undetected injuries leading to morbidity and late mortality. Early attention and appropriate therapy reduce morbidity.[7]

Abdominal trauma leads to haemorrhage and sepsis, with early death primarily due to nonirritating blood trapped in the abdominal cavity. Blunt trauma often damages solid organs like the spleen and liver.[8]

Sepsis is the leading cause of mortality after 48 hours of injury, often caused by hollow viscus damage and penetrating trauma. Blunt abdominal trauma can also rupture the intraabdominal, retroperitoneal, and pelvic hollow viscera.[9]

The care of blunt trauma abdomen has shifted from urgent explorations to a conservative, selected approach due to improved monitoring and noninvasive technologies. Innovative therapeutic methods and critical care management enhance nonsurgical treatment chances.[10]

India faces high accident rates, with 70% of its population in underserved communities, leading to inadequate treatment for abdominal injuries, particularly among young, economically productive individuals.[11]

This dissertation investigates non-penetrating abdominal injuries in patients at Krishna Hospital Karad, focusing on blunt abdominal trauma due to increasing automobile usage and road traffic accidents.

AIM AND OBJECTIVES

This study aims to evaluate clinical presentation, frequency of abdominal injuries, treatment roles, morbidity, and mortality associated with non-penetrating abdominal injuries.

METHODOLOGY

Study Design: This prospective observational study, conducted from March 2022 to September 2023, was conducted at Krishna Hospital's Department of Surgery.

Source of Data

Study Population: The study population consists of patients presenting with blunt abdominal injuries.
Sample Size: A total of 93 patients were included in the study. The sample size was determined using the formula:

$n = Z^2_{(1-\alpha/2)} (P)(1-P)/\lambda^2$

where (n) is the sample size,

(Z) is the Z value (e.g., 1.96 for a 95% confidence level), (α) is the level of significance,
(P) is the expected proportion of cases with liver injuries were 40% according to a study by Agrawal C et al[91], and
(λ) is the margin of error.

Method of Data Collection

The study involved identifying patients with blunt abdominal injury, conducting a systematic clinical examination, maintaining comprehensive documentation, conducting investigations based on clinical indications, and analyzing their history, physical examination findings, and diagnostic tests. The study also included follow-up data during the post-operative period. The findings were analyzed using various diagnostic tools.

Inclusion Criteria: The emergency department is primarily staffed by adults aged 18 and above who present with non-penetrating abdominal injuries.

Exclusion Criteria: This includes patients with severe abdominal trauma, pregnant women, and those under 18 years old.

The study involved a patient with a heart condition, deciding whether to undergo operative or non-operative management. Surgical intervention was performed when necessary, while non-operative management was pursued for stable patients. Post-operative follow-up was conducted to monitor for complications. The study was ethically approved, with informed consent obtained and patient confidentiality maintained. Procedures were carried out according to standard medical guidelines.

The study used structured database data for analysis, performed statistical analysis using SPSS software, and conducted a comparative analysis using Chi-square test for categorical variables and t-tests or ANOVA for continuous variables, with a p-value of less than 0.05 indicating significant differences.

OBSERVATION AND RESULTS

Table 1 shows age distribution of cases, with 25.8% of cases aged 21-30, followed by 18.3% aged 31-40. Individuals under 20 made up 16.1% of cases, while the elderly aged 71-80 represented the smallest proportion at 4.3%.

Age(years)	Cases	Percentage
<20	15	16.1%
21-30	24	25.8%
31-40	17	18.3%
41-50	15	16.1%
51-60	11	11.8%
61-70	7	7.5%
71-80	4	4.3%
Total	93	100.0%

Table 1: Distribution of cases according to their age

Table 2 displays the gender distribution of 93 cases, with 79.6% being male and 20.4% being female.

Table 2: Distribution of cases according to their gender

Gender	Cases	Percentage
Male	74	79.6%
Female	19	20.4%
Total	93	100.0%

Table 3 shows that day laborers (32.3%) and rickshaw pullers (22.6%) are the primary occupations contributing to 93 cases, while farmers, businessmen, and service holders contribute moderately.

Table 3: Distribution of cases according to their occupation

Occupation	Cases	Percentage
Farmer	18	19.4%
Businessman	11	11.8%
Service holder	13	14.0%
Rickshaw puller	21	22.6%
Day laborer	30	32.3%
Total	93	100.0%

Table 4 shows 93 cases, with 43.0% from rural areas and 53 from urban areas, indicating a higher prevalence in rural regions compared to rural areas (43.1%).

Table 4: Distribution of cases according to their habitat

Habitat	Cases	Percentage
Urban	53	57.0%
Rural	40	43.0%
Total	93	100.0%

Table 5 shows that 89.2% of cases, out of 93, arrived between 4 to 6 hours post-injury, with 10.8% arriving between 2 to 4 hours, and no cases arrived within the first 2 hours.

Table 5: Distribution of cases according to their time of arrival after injury

Time of arrival after injury (hours)	Cases	Percentage
1 - 2 hr	0	0.0%
2 - 4 hr	10	10.8%
4 - 6 hr	83	89.2%
Total	93	100.0%

Table 6 shows that road traffic accidents are the primary cause of 50.5% of cases out of 93, followed by falls and blunt object blows at 20.4% and 29.1% respectively.

Table 6: Distribution of cases according to their etiology

Etiology	Cases	Percentage
Road traffic accident	47	50.5%
Fall	19	20.4%
Blow with blunt object	27	29.1%
Total	93	100.0%

Table 7 reveals that pain is the most common clinical feature in 93 cases, followed by tenderness (97.8%), vomiting (48.4%), and absent bowel sounds (35.5%). Less frequent symptoms include shock (18.3%) and rigidity (4.3%).

Table 7: Distribution of cases according to their clinical features

Clinical features	Cases	Percentage
Pain	93	100.0%

Vomiting	45	48.4%
Distension	35	37.6%
Urinary symptoms	6	6.5%
Tenderness	91	97.8%
Guarding	43	46.2%
Rigidity	4	4.3%
Absent bowel sounds	33	35.5%
Hb<10 g/dl	20	21.5%
Shock	17	18.3%

Table 8 reveals that out of 93 cases, 60.2% were found to have intra-abdominal organ damage, while 39.8% did not, providing valuable insights into the nature and extent of abdominal injuries.

Table 8: Distribution of cases according to their intra-abdominal organ damage

Intra-abdominal organ damage	Cases	Percentage
Organ injured	**56**	**60.2%**
No organ Damage	**37**	**39.8%**
Total	**93**	**100.0%**

Table 9 shows the distribution of cases by organ injured, with the spleen being the most frequently injured (28.0%). Other organs affected included the small intestine (7.5%), large intestine and rectum (6.5%), kidney (6.5%), and mesentery (9.7%), with pancreas, urinary bladder, and retroperitoneum affected in identical proportions (2.2%).

Table 9: Distribution of cases according to their organ injured

Organ injured	Cases	Percentage
Spleen	**26**	**28.0%**
Liver	**17**	**18.3%**
Small intestine	**7**	**7.5%**
Large intestine and rectum	**6**	**6.5%**
Pancreas	**2**	**2.2%**
Kidney	**6**	**6.5%**
Urinary bladder	**2**	**2.2%**
Mesentery	**9**	**9.7%**
Retroperitoneum	**2**	**2.2%**

Table 10 shows that 93 (100.0%) of the sample underwent X-ray and ultrasound examinations, with 55.9% of cases undergoing computed tomography with contrast enhancement, demonstrating a comprehensive diagnostic strategy.

Table 10: Distribution of cases according to investigation

Investigation	Cases	Percentage
X-Ray	**93**	**100.0%**
USG	**93**	**100.0%**
CECT	**52**	**55.9%**

The study reveals that ultrasound (USG) has a high diagnostic utility and accuracy in identifying intra-abdominal organ injuries. In 41 cases where organ injuries were detected, USG findings positively correlated with organ injury, while in 37 cases where organ injuries were not detected, USG results corresponded with the absence of organ injuries. The sensitivity of USG is 73.21%, indicating its ability to accurately identify organ injuries, while its specificity is 100%.

Sensitivity of USG: 73.21%
Specificityof USG:100%

Table11:ComparisonofUSGfindingandpresenceoforganinjuries

USG	Organinjuries Present	%	Noorgan injuries	%	Total
Organinjurydetected	41	73.2%	0	0.0%	41.73
Organinjurynotdetected	15	26.8%	37	100.0%	52.27
Total	56	100.0%	37	100.0%	94

Table 12 reveals that X-ray findings positively correlate with injury detection in 12 cases of hollow viscus injuries, while in 80 cases, they correspond to the absence of injuries. The sensitivity of X-rays is 92.30%, identifying 92.30% of cases, and the specificity is 100%, ruling out hollow viscus injuries without false positives. These metrics highlight the reliability of X-rays as a diagnostic tool for identifying hollow viscus injuries with high confidence.

Sensitivity of X-rays: 92.30%Specificityof X-rays:100%

Table 12: Comparison of X-ray finding and presence of hollow viscus injury

X-rays	Hollow viscus injury present	%	No hollow viscus injury	%	Total
Hollow viscus injury detected	**12**	**92.3%**	**0**	**0.0%**	**12**
Hollow viscus injury not detected	**1**	**7.7%**	**80**	**100.0%**	**81**
Total	**13**	**100.0%**	**80**	**100.0%**	**93**

Table 13 demonstrates the accuracy of contrast-enhanced computed tomography (CECT) in detecting organ injuries. In cases where organ injuries were present, CECT accurately identified them in all instances, representing 100.0% of cases. In cases where organ injuries were not detected, CECT results indicated the absence of injuries in 19 cases, representing 100% of cases. This high sensitivity implies that CECT accurately identifies all cases with organ injuries, while its specificity effectively rules out injuries when not present.

Sensitivity of CECT: 100%
Specificity of CECT: 100%

Table 13: Comparison of CECT finding and presence of organ injuries

CECT (contrast-enhanced computed tomography)	Organ injuries Present	%	No organ injuries	%	Total
Organ injury detected	**33**	**100.0%**	**0**	**0.0%**	**33**
Organ injury not detected	**0**	**0.0%**	**19**	**100.0%**	**19**
Total	**33**	**100.0%**	**19**	**100.0%**	**52**

Table 14 reveals that 55.9% of cases were conservatively managed, with 41.1% managed through operative intervention.

Table 14: Distribution of cases according to their treatment

Treatment	Cases	Percentage

Conservative	**52**	**55.9%**
Operative	**41**	**44.1%**
Total	**93**	**100.0%**

Table 15 shows that splenectomy was the most frequently performed procedure in 93 cases, accounting for 11.8% of cases. Other procedures included splenorraphy, resection anastomosis, pancreatectomy, bowel suturing, and mesenteric tear suturing. Bladder repair, Jejunal serosal patch, Mesenteric tear suturing, and Pancreatectomy were performed in equal proportions.

Table 15: Distribution of cases according to procedures performed

Procedure	Cases	Percentage
Splenectomy	**11**	**11.8%**
Splenorrhaphy	**9**	**9.7%**
Pancreatectomy	**3**	**3.2%**
Resection anastomosis	**6**	**6.5%**
Suturing of bowel	**9**	**9.7%**
Mesenteric tear suturing	**3**	**3.2%**
Jejunal serosal patch	**3**	**3.2%**
Bladder repair	**3**	**3.2%**

Table 16 reveals that surgical site infection was the most common complication in intra-abdominal trauma management, affecting 18.3% of cases. Other complications included respiratory issues, wound dehiscence, sepsis, intra-abdominal bleeding, and pseudocyst formation. However, a majority of cases (72.0%) did not show any complications.

Table 16: Distribution of cases according to their complications

Complications	Cases	Percentage
Respiratory	**7**	**7.5%**
Surgical site infection	**17**	**18.3%**
Wound dehiscence	**6**	**6.5%**
Sepsis	**2**	**2.2%**
Intra-abdominal bleed	**4**	**4.3%**
Pseudocyst	**2**	**2.2%**
No complication	**67**	**72.0%**

Table 17 reveals that out of 93 cases, 46 (49.5%) had a hospital stay of less than 8 days, followed by 28 (30.1%) between 8-14 days, 18.3% for 15-21 days, and 2.2% for a stay exceeding 21 days.

Table 17: Distribution of cases according to duration of hospital stay

Duration of stay (days)	Cases	Percentage
<8	**46**	**49.5%**
8-14	**28**	**30.1%**
15-21	**17**	**18.3%**
>21	**2**	**2.2%**
Total	**93**	**100.0%**

Table 18 shows that out of 93 cases, 87 (93.5%) experienced improvement, indicating successful treatment and recovery. However, 6.5% resulted in fatalities, highlighting the diverse range of outcomes observed in these cases.

Table 18: Distribution of cases according to their outcome

Outcome	Cases	Percentage
Improved	87	93.5%
Death	6	6.5%
Total	93	100.0%

DISCUSSION

Trauma is a significant cause of mortality, with injuries ranking eighth in the world's top causes of mortality. Non-penetrating abdominal injuries are a broad spectrum of trauma-related conditions that pose significant clinical challenges. These injuries, predominantly caused by blunt force trauma from incidents such as motor vehicle accidents, falls, or assaults, range in severity from minor contusions to severe organ damage and life-threatening hemorrhage. Effective management of these injuries hinges on prompt and accurate diagnosis, coupled with appropriate therapeutic interventions tailored to individual patient needs.[12]

The study conducted among 93 cases found that the majority of cases were in the age group of 21-30 years. The majority of patients were male (84%), with a predominance of males affected by blunt abdominal trauma. The majority of cases came from day laborers (25.8%) and rickshaw pullers (16.1%). Farmers, businessmen, and service holders contributed moderately, with percentages ranging from 7.5% to 11.8%.

Out of 93 cases, 39 (41.9%) were from rural areas, followed by 28 (30.1%) urban areas. A significant portion of cases were from rural areas (41.9%) compared to urban ones (30.1%). The majority of cases arrived between 4 to 6 hours post-injury, with 83 (89.2%) of cases arriving within 4-6hours.

In conclusion, non-penetrating abdominal injuries are a significant cause of mortality worldwide, with a higher prevalence in rural areas. Prompt and accurate diagnosis, along with appropriate therapeutic interventions, are crucial for effective management and recovery.

The study analyzed 93 cases of abdominal injuries, with road traffic accidents being the predominant cause, accounting for 47 (50.5%) of cases. Other causes included falls and blows with blunt objects, assault, self-fall, falls from height, and falls of heavy objects. Pain was the most common clinical feature, followed by tenderness, vomiting, and absent bowel sounds. Less frequent symptoms included shock and rigidity.[13]

Out of 93 cases, 56 (60.2%) were found organ injuries, with the spleen being the most frequently injured organ. Other organs affected in similar proportions were the pancreas, urinary bladder, and retroperitoneum. The spleen and liver were the most often damaged organs on USG findings (44%), while the spleen was the second most often damaged organ on CT scans (36%).

The epigastrium was the most prevalent site of external wounds (42%), followed by the right iliac area. The most common finding following laparotomy was jejunal perforation. External wounds were most common in the left upper quadrant, lower chest, and small bowel (20%), followed by the liver (14%).[14]

All cases underwent X-ray and ultrasound (USG) examinations, with computed tomography with contrast enhancement (CECT) conducted in 52 (55.9%) of cases. USG findings positively correlated with organ injury in 41 instances, representing 73.2% of cases where organ injuries were detected. The sensitivity of USG is 73.21%, indicating its ability to accurately identify 73.21% of cases where organ injuries are present. The specificity of X-rays is 100%, indicating its effectiveness in ruling out hollow viscus injuries without yielding false positive results.

In conclusion, the study highlights the importance of X-rays as a diagnostic tool for identifying abdominal injuries, particularly in cases of hollow viscus injuries.

The study focuses on the management of non-penetrating abdominal injuries, focusing on the prevalence of conservative and operative approaches. Hollow viscous injuries were found to be less severe than solid organ injuries, with a higher incidence of liver damage and associated injuries. Contrast-enhanced computed tomography (CECT) was found to accurately detect organ injuries in all instances, representing 33 (100.0%) of cases. In cases where organ injuries were not detected, CECT results corresponded with the absence of injuries in 19 cases, constituting 100% of this group

The study found that contrast-enhanced computed tomography (CECT) had a high sensitivity and specificity in detecting organ injuries, indicating its exceptional accuracy in identifying both the presence and absence of injuries. However, CT was not independently associated with the success or failure of selective non-operative management (SNOM). The majority of cases (54.9%) were managed conservatively, with a substantial portion (44.1%) managed by operative intervention. Splenectomy was the most frequently performed procedure, accounting for 11.8% of cases. Other procedures included pancreatectomy, suturing of bowel, and mesenteric tear suturing.[15]

Conservative management was used in 64% of patients, with bowel perforation repair being performed in more than half of the cases (55.55%), followed by splenectomy (22.77%), and perihepatic packing for liver trauma (16.66%). Other common surgical procedures included splenectomy (28.57%), primary closure of perforation (23.80%), and resection with anastomosis (19.04%).[16]

Surgical site infection was the most prevalent complication, affecting 18.3% of cases, followed by respiratory issues (7.5%), wound dehiscence (6.5%). Other complications were less frequent, with a majority of cases (72.0%) not exhibiting any complications.

The study also highlighted the risk of complications arising from delayed operations due to unnoticed signs of peritonitis, which led to a 24-hour observation period being generally adequate for the majority of patients. Out of 93 cases, 50.5% had a hospital stay of less than 8 days, while 18.3% remained hospitalized for 15 to 21 days.

In conclusion, the study highlights the diverse range of outcomes observed in the examined 93 cases, highlighting both successful interventions and unfortunate instances of mortality.

SUMMARY

The study analyzed 93 cases of abdominal injuries, with the majority aged 21-30 years. Out of these cases, 25.8% were from individuals under 20 years, while 16.1% were from those aged 31-40 years. The majority of cases were from day laborers, rickshaw pullers, farmers, businessmen, and service holders. Out of 93 cases, 41.9% were from rural areas, suggesting a higher prevalence in rural regions.

The majority of cases arrived between 4 to 6 hours post-injury, with road traffic accidents being the predominant cause. Pain was the most common clinical feature, followed by tenderness, vomiting, and absent bowel sounds. Less frequent symptoms included shock and rigidity.

Out of 93 cases, 56 (60.2%) were found to be organ injuries, with the spleen being the most frequently injured organ. Other injuries included small intestine, large intestine and rectum, kidney, and mesentery. Computed tomography with contrast enhancement (CECT) was conducted in 52 (54.9%) cases, demonstrating a complete diagnostic strategy.

USG and CECT examinations were performed in 73.2% of cases where organ injuries were detected, and 92.3% for hollow viscus injuries. CECT accurately detected injuries in all 33 instances (100%),

indicating its exceptional accuracy in identifying the presence and absence of injuries.

The majority of cases were managed conservatively, with a substantial portion (44.1%) managed by operative intervention. Splenectomy was the most frequently performed procedure, accounting for 11.8% of cases. Surgical site infection was the most prevalent complication, affecting 17.3% of cases.

Out of 93 cases, 50.5% had a hospital stay of less than 8 days, while 18.3% remained hospitalized for 15 to 21 days. The majority of cases experienced improvement, indicating successful treatment and recovery. However, a small proportion resulted in fatalities.

CONCLUSION

The study reveals that young adults and males are the most affected groups in nonpenetrating abdominal injuries, with day laborers and rickshaw pullers experiencing the highest injury rates. Rural residents also show a higher prevalence of injuries, emphasizing the need for better trauma care. Most patients arrive 4 to 6 hours post-injury, with road traffic accidents being the leading cause. Pain, tenderness, and vomiting are common symptoms. Diagnostic tools like ultrasound and X-rays are effective, but surgery is often required.

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