



MANAGEMENT OF GASTROINTESTINAL INJURIES IN ABDOMINAL TRAUMA- A CROSS SECTIONAL STUDY

General Surgery

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ABSTRACT

Introduction: Gastrointestinal (GI) injuries in abdominal trauma are a significant concern due to their complexity and potential for life-threatening complications. This study aims to explore the demographic profile, clinical presentation, and management modalities in patients with GI injuries. **Materials And Method:** A cross-sectional study was conducted among 51 patients with GI injuries who underwent surgery at Rohilkhand Medical College and Hospital. Patients were managed according to Advanced Trauma Life Support (ATLS) protocols, and surgical interventions were tailored based on injury severity and location. **Results:** The study found a male predominance (74.5%) and a high incidence of road traffic accidents (41.2%) as the primary cause of injury. The ileum and jejunum were the most commonly injured organs. Loop/diversion ileostomy and seromuscular closure were the most common surgical procedures. Postoperative complications occurred in 41.2% of patients, with electrolyte imbalance and wound dehiscence being the most common. The mortality rate was 7.8%, with all deaths occurring within the first 10 days of hospital stay. **Conclusion:** The management of GI injuries requires a comprehensive approach, including prompt resuscitation, timely surgical intervention, and intensive postoperative care. Understanding the demographic profile and clinical presentation of patients with GI injuries can help develop evidence-based protocols to improve patient outcomes and reduce trauma-related morbidity and mortality.

KEYWORDS

Gastrointestinal injuries, abdominal trauma, surgical management, postoperative care, trauma-related complications.

INTRODUCTION

Gastrointestinal (GI) injuries in abdominal trauma represent a critical concern in emergency surgery, given their complexity and potential for life-threatening complications. Abdominal trauma, resulting from either blunt or penetrating injuries, is a major cause of morbidity and mortality worldwide.¹ Trauma involving the GI tract is often encountered in road traffic accidents, assaults, falls from heights, and workplace injuries. The diverse nature of trauma, ranging from minor serosal contusions to full-thickness perforations, underscores the need for timely diagnosis and management to prevent severe complications such as peritonitis, sepsis, and multi-organ failure.²

Mesenteric trauma, often resulting from abdominal injuries, poses diagnostic and management challenges due to potential life-threatening hemorrhage or bowel necrosis. Signs include abdominal pain, peritoneal irritation, and hemodynamic instability. CT scans are crucial for diagnosis, and prompt surgical intervention is often necessary to repair damage and restore bowel viability.

The management of gastrointestinal (GI) injuries follows Advanced Trauma Life Support (ATLS) principles, prioritizing prompt resuscitation and stabilization of vital parameters.³ Treatment strategies depend on the severity and location of the injury, with options including primary repair, resection and anastomosis, or diversion procedures like ileostomy or colostomy. The choice of procedure depends on the extent of injury and contamination, with complex injuries potentially requiring advanced procedures like Whipple's operation or total colectomy.⁴

Postoperative care is critical to prevent complications such as surgical site infections, anastomotic leaks, and intra-abdominal abscesses. Patients require close monitoring in the intensive care unit, focusing on fluid management, infection control, and nutritional support. Routine administration of thromboprophylaxis, analgesia, and proton-pump inhibitors improves recovery outcomes. Wound care and sterile dressing are essential to minimize infection risks. The complexity of GI injury management is compounded by factors like pre-existing conditions, delayed presentation, and contamination extent contributing to high morbidity and mortality rates (postoperative complication rates of 22-29%).⁵ Comprehensive management strategies are crucial to mitigate these risks.

Research into GI injuries from abdominal trauma focuses on improving diagnostic accuracy, refining surgical techniques, and optimizing postoperative care to reduce complications. This study aims to explore the demographic profile of patients presenting with GI injuries, analyse their clinical presentation, and evaluate the different diagnostic and management modalities employed. A better grasp of these aspects can aid in developing evidence-based protocols to enhance patient outcomes and reduce the burden of trauma-related morbidity and mortality.⁶ Through a cross-sectional study design, the findings will contribute to the growing body of knowledge on managing GI injuries, ultimately benefiting both surgical practice and patient care.

MATERIALS AND METHOD

The present cross-sectional study was conducted among 51 patients with gastrointestinal injuries who underwent surgery in the Department of General Surgery at Rohilkhand Medical College and Hospital, Bareilly, Uttar Pradesh over a period of 1 year, from August 1, 2023, to July 31, 2024. Ethical clearance was obtained from the institutional ethics committee prior to commencement and informed consent was taken from study participants.

Participants included all adult trauma patients (above 18 years) presenting with gastrointestinal injury, excluding those with isolated solid organ injury. Upon arrival, each patient underwent detailed clinical history-taking and physical examination.

Emergency management adhered to Advanced Trauma Life Support (ATLS) protocols, involving insertion of two wide-bore cannulas, initiation of IV fluids, and Extended Focused Assessment with Sonography for Trauma (E-FAST) followed by chest and pelvic X-rays. Laboratory investigations included CBC, LFT, RFT, RBS, serum electrolytes, viral markers, ECG, ABG, and blood grouping, with appropriate blood arrangements. Ryle's tube and Foley's catheter were inserted per age requirements. Stable patients underwent contrast-enhanced CT of the whole abdomen, and the treatment approach was determined based on the quadrant and severity of abdominal injury. Surgical interventions began with exploratory laparotomy under general anesthesia with a long midline incision extending from the xiphisternum to the pubic symphysis, followed by a thorough assessment of peritoneal cavity and viscera.

Depending on injury type and contamination, several surgical techniques were employed. Primary repair was performed for small perforations with minimal contamination in organs like the duodenum, small bowel, colon, and rectum, involving a two-layer suture technique using polyglactin 2-0 and silk 2-0.

Loop ileostomy was indicated for multiple bowel perforations and extensive contamination, with the stoma site marked 5 cm lateral to the midline and 4 cm below the umbilicus. The ileal loop was exteriorized and secured using polyglactin and silk sutures, and an appropriate stoma bag was placed.

Resection and anastomosis were carried out in cases of gangrenous bowel, complete intestinal transection, or mesenteric tear. The procedure involved bowel mobilization, mesenteric division, resection, and end-to-end anastomosis with polyglactin for the inner layer and silk for the outer layer, followed by mesenteric defect closure and insertion of 32Fr drains in Morrison's pouch and pelvic cavity.

Loop colostomy was performed for distal colon or rectal injuries, with a horizontal 6 cm incision in the right hypochondrium. After mobilizing the transverse colon and creating a mesocolonic window, the colon was opened longitudinally and secured with sutures to the abdominal wall. Right hemicolectomy was conducted for extensive injuries involving terminal ileum to the proximal transverse colon, involving mobilization of the colon along the avascular Toldt's plane, release of hepatic flexure, mobilization of duodenum and Gerota's fascia, and ileocolic anastomosis after resection.

Left hemicolectomy was reserved for descending and sigmoid colon injuries, involving midline incision, splenic flexure mobilization, omental detachment, resection between clamps, and colo-colic anastomosis.

Hartmann's procedure was adopted in select cases requiring resection of the sigmoid colon and creation of end colostomy, involving ligation of vessels below the left colic artery, dissection of the rectum, use of TA 55 stapler for rectal transection, and placement of abdominal drains. The surgical closure involved layered suturing with absorbable material to prevent future herniation, and final skin closure with nylon. Post-operative care was intensive, involving ICU management with vital signs monitoring, input-output charting, RBS checks, oral care for ventilated patients, CVP monitoring, intravenous fluid resuscitation, and administration of broad-spectrum antibiotics and proton pump inhibitors to ensure optimal recovery.

RESULTS

The results indicate that the highest number of abdominal trauma cases (35.3%) occurred in the 18–25-year age group, emphasizing the vulnerability of young adults. The occurrence progressively declined with age, with the least frequency (2%) noted in patients over 64 years. Out of 51 cases, 74.5% were male and 25.5% were female, demonstrating a strong male predominance in abdominal trauma. Road traffic accidents accounted for the largest share (41.2%) of injuries, followed by blunt trauma from blows to the abdomen (21.6%) and falls (13.7%). Penetrating trauma was rare (2%). This highlights that blunt trauma is the predominant mechanism of abdominal injury, particularly from road incidents (table 3).

The ileum (37.3%) and jejunum (23.5%) were the most commonly injured organs, suggesting small bowel injuries are more prevalent (table 4). Less commonly affected organs included the rectum and stomach (2% each). These findings reflect the vulnerability of the small bowel in blunt abdominal trauma.

Loop/diversion ileostomy (23.5%) and seromuscular closure (25.5%) were the most common procedures, followed by primary repair (15.7%) and resection-anastomosis (11.8%) (table 5). This reflects the need for individualized surgical approaches based on injury severity, with a mix of conservative and radical surgeries.

A majority (62.7%) of cases underwent emergency surgery, indicating the acute presentation of abdominal trauma and need for urgent intervention (table 6). Only 37.3% were elective, suggesting some injuries allowed for stabilization before surgical repair.

While most patients (58.8%) had uneventful recoveries, electrolyte imbalance and wound dehiscence were the most common

complications (13.7% each), followed by respiratory complications (5.9%) (table 7). Serious complications like septicemia and fistula formation were rare (2–4%), but clinically significant.

Out of 51 patients, 45 (88.2%) were discharged, 4 (7.8%) died, and 2 (4%) were lost to follow-up. All deaths occurred within the first 10 days of hospital stay, pointing to early post-trauma complications as a critical risk period (table 8). The p-value <0.001 underscores a statistically significant association between hospital stay duration and outcomes.

Table 1: Gender Distribution Of Patients With Abdominal Trauma.

Gender	Frequency	Percentage
Male	38	74.5 %
Female	13	25.5 %
Total	51	100.0%

Table 2: Mode Of Injury Amongst Patients With Abdominal Trauma.

Mode of Injury	Frequency	% Of Total
Road traffic accident (Blunt)	21	41.20%
Blow to abdomen with Blunt objects (Blunt)	11	21.60%
Fall from height (Blunt)	7	13.70%
Assault (Blunt)	6	11.80%
Stab injury in abdomen (Penetrating)	1	2.00%
Gynaecological injury	4	8.00%

Table 3: Distribution Of Patients As Per Organ Injured

Organ Injured	Frequency	Percentage
Ileum	19	37.3 %
Jejunum	12	23.5 %
Large bowel	5	9.8 %
Rectum injury	1	2.0 %
Mesenteric injury	10	19.6 %
Duodenal injury	3	5.9 %
Gastric injury	1	2.0 %
Total	51	100%

DISCUSSION

The study titled "Management of Gastrointestinal Injuries in Abdominal Trauma" conducted at Rohilkhand Medical College and Hospital presents an in-depth clinical investigation into the diagnosis, surgical treatment, and outcome patterns of gastrointestinal injuries sustained due to abdominal trauma. This prospective study contributes meaningfully to the existing literature by dissecting demographic characteristics, mechanisms of injury, types of organ involvement, surgical modalities, and recovery metrics among 51 patients. The demographic analysis illustrates a notable dominance of younger adults in abdominal trauma presentations, with 35.3% of the patients aged between 18 to 25 years. This skew toward a younger population aligns with established trauma epidemiology, reinforcing previous observations made by Yakshiboyevich et al.⁸ and Giuffrida et al.⁹ who emphasized the susceptibility of young individuals, particularly males, to road traffic accidents and high-energy blunt trauma due to their increased mobility, occupational exposure, and risk-taking behaviors. Such demographic vulnerability underscores the need for age-targeted trauma prevention strategies and education, particularly around road safety and occupational hazard awareness. Complementing the age-related findings, the gender distribution also revealed a strong male predominance (74.5%), supporting previous findings from Kuza et al.⁹ Sorenson et al.¹⁰ and Yakshiboyevich et al.⁸ who found that men, due to their social roles and physical exposure, are disproportionately affected by trauma, particularly involving the abdomen. However, unlike many other studies, this research included a subset of female patients who sustained gynecological injuries (8%), pointing to a dimension of trauma that is often overlooked in the broader gastrointestinal injury literature. Researchers such as Shaabath and Kadhem¹¹ have pointed out the importance of incorporating gynecological considerations in trauma protocols, which this study subtly affirms.

Analyzing the etiology of trauma, the current study found that blunt trauma, primarily from road traffic accidents (41.2%), was the leading mechanism of injury. This is in accordance with Fakhry et al.¹² and Aboobakar et al.¹³ who highlighted that motor vehicle collisions are the most common causes of blunt abdominal trauma globally. Secondary

causes in this cohort included blunt force from blows to the abdomen (21.6%) and falls from height (13.7%), as well as assault (11.8%), all contributing to the injury profile. Only 2% of injuries were due to penetrating trauma (stab wounds), reflecting that such injuries are less prevalent in the Indian context, unlike some Western studies where gunshot and stab wounds may be more frequent. Gynecological injuries, though limited in number, were distinctly noted, comprising 8% of the trauma cases, and these injuries broaden the diagnostic and therapeutic spectrum that surgeons must consider during evaluation. Their inclusion enriches the dataset, adding granularity that is often missing in other studies which solely focus on hollow viscus injuries. Staab et al¹⁴ emphasize this point by calling for broader diagnostic frameworks in trauma surgery that encapsulate pelvic and gynecological injuries.

The distribution of internal organ damage identified the ileum as the most frequently injured organ (37.3%), followed by the jejunum (23.5%) and mesentery (19.6%). These findings mirror the observations of Kuza et al⁹ and Aboobakar et al,¹³ who also found the small intestine, especially the ileum, to be particularly susceptible to trauma due to its mobility and anatomical positioning. Mesenteric injuries are clinically significant because they can precipitate secondary ischemia, leading to bowel necrosis, and the 19.6% rate of mesenteric involvement in this study highlights the need for thorough intraoperative vascular assessment, as advocated by Yakhshiboyevich et al.¹⁵ Large bowel (9.8%), duodenal (5.9%), and gastric (2%) injuries were less common, reinforcing anatomical protection as a possible factor, given the retroperitoneal position of the duodenum and the high vascularity of the stomach, which might resist perforation. Rectal injuries (2%) were rare but important, requiring procedures such as colostomy, indicative of the gravity and complexity of lower gastrointestinal tract trauma.

The management of these injuries was primarily surgical, and the study recorded various procedures performed during exploratory laparotomy. The most common interventions included loop or diversion ileostomy (23.5%), seromuscular repair for bowel lacerations (25.5%), and primary repair of small bowel perforations (15.7%). The use of ileostomy, particularly in contaminated fields, aligns with practices outlined by Yakhshiboyevich et al¹⁵, who suggested that fecal diversion is beneficial in minimizing postoperative sepsis and supporting recovery in complex bowel injuries. Resection and anastomosis, employed in 11.8% of cases, is typically reserved for patients with irreparable bowel segments or gangrene, as emphasized by Dobeli K et al.¹⁵ Seromuscular closure and primary repair approaches, used in less severe cases, show that many injuries were manageable without extensive resection, reflecting timely diagnosis and relatively less tissue compromise. Additional procedures like right hemicolectomy (2%), mesenteric repair (9.8%), and peritoneal lavage (9.8%) underscore the need for a broad surgical skillset and preparedness to adapt based on intraoperative findings. This surgical diversity echoes the experience of Giuffrida et al⁸ and Aboobakar et al,¹³ who documented similar operative versatility in trauma settings.

The classification of surgeries into emergency (62.7%) and elective (37.3%) emphasizes the urgency and severity with which trauma patients present. Emergency surgeries dominate the treatment profile, consistent with findings from Kuza et al,⁹ who reported that trauma-induced gastrointestinal injuries often necessitate immediate operative management to prevent fatal outcomes. Elective surgeries in this study were typically reserved for stabilized patients or those requiring follow-up interventions, indicating an effective triaging and stabilization protocol within the hospital system.

Postoperative outcomes reveal that while most patients (58.8%) recovered without significant issues, complications such as electrolyte imbalance and wound dehiscence were noted in 13.7% of patients each. Respiratory complications (5.9%), septicemia (3.9%), fecal fistula (2%), and stoma-related leaks (2%) were less frequent but carry considerable clinical importance. The occurrence of these complications underscores the delicate nature of gastrointestinal recovery and are in consistent with the observations of Yakhshiboyevich et al¹⁵ and Aboobakar et al,¹³ who also reported similar postoperative challenges in trauma care. Effective management of such complications requires a multidisciplinary team including surgeons, intensivists, and nutritionists to ensure adequate postoperative support.

Outcome data further revealed that the majority of patients (66.7%) were discharged within 11-20 days, suggesting a moderate recovery period in most cases. Significantly, all four deaths in the study (7.8%) occurred within the first 10 days, emphasizing the critical nature of early postoperative care. The fact that no deaths occurred beyond this period suggests that once patients survived the initial post-surgical phase, the prognosis improved significantly. This trend is well-documented in the trauma literature, including by Fakhry et al¹² and Dobeli K,¹⁵ who found that early deaths in abdominal trauma are often due to hemorrhagic shock, sepsis, or multiorgan failure, all of which require rapid identification and intervention. The statistical correlation between hospital stay duration and outcome ($p < 0.001$) validates these observations and reinforces the imperative of early surgical intervention and close postoperative monitoring.

Two patients were lost to follow-up, both within the first 10 days of hospitalization. This raises concerns about continuity of care and suggests a need for improved discharge planning and community outreach, particularly in lower-resource settings. Staab et al¹⁴ and Fakhry et al¹² have both noted the importance of long-term follow-up in trauma patients for evaluating chronic complications such as adhesions, incisional hernias, and psychological effects, thereby emphasizing a gap that this study also identifies.

Altogether, the study enriches the current understanding of gastrointestinal injuries in abdominal trauma by providing a multidimensional analysis that incorporates demographic trends, injury mechanisms, organ involvement, surgical choices, complication rates, and patient outcomes. It aligns with and expands upon findings from a range of landmark studies and presents compelling evidence for prioritizing early diagnosis, individualized surgical approaches, and comprehensive postoperative care. Moreover, the statistical significance of observed trends adds robustness to its conclusions. Importantly, the study emphasizes that trauma management must not be viewed through a one-size-fits-all lens; instead, each case demands tailored intervention strategies depending on the nature of the injury, patient stability, and resource availability. The inclusion of diverse injury patterns, such as gynecological and rectal injuries, and various surgical responses, from conservative repairs to major resections, makes the study a valuable addition to trauma surgery literature. The findings offer practical implications for trauma surgeons, emergency physicians, policymakers, and healthcare planners aiming to reduce trauma-related morbidity and mortality through evidence-based, context-sensitive, and multidisciplinary strategies.

CONCLUSION

The management of gastrointestinal injuries in abdominal trauma requires a multidisciplinary approach, emphasizing early diagnosis, timely surgical intervention, and comprehensive postoperative care. This study highlights the critical nature of prompt intervention, with a significant association found between early surgery and improved outcomes. The moderate recovery period for most patients underscores the need for extended monitoring and specialized care in high-risk trauma cases. With a mortality rate of 7.8% and challenges in post-discharge care, the study emphasizes the importance of collaboration between surgeons, radiologists, and rehabilitation specialists to enhance patient survival and recovery outcomes. The findings offer valuable recommendations for improving trauma management protocols and patient care.

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