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Original Research Article

A Descriptive Study on Hollow Viscus Injury in Abdominal Trauma in a Tertiary Care Centre of Southern Odisha

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Abstract

Background: Hollow viscus injury (HVI) following abdominal trauma is a potentially life-threatening condition associated with significant morbidity and mortality. Early diagnosis remains challenging because clinical manifestations may be subtle, particularly in polytrauma patients. Delayed intervention can result in peritonitis, sepsis, and poor outcomes.

Aim: To evaluate the clinical profile, management strategies, and outcomes of hollow viscus injuries following abdominal trauma.

Objectives: To assess the demographic characteristics, mechanism of injury, clinical presentation, diagnostic findings, operative management, postoperative complications, and factors influencing outcomes in patients with hollow viscus injuries.

Methods: A hospital-based observational study was conducted in the Department of General Surgery, MKCG Medical College and Hospital, Berhampur, Odisha, from November 2023 to October 2025. Eighty-eight patients with hollow viscus injury secondary to blunt or penetrating abdominal trauma were included. Demographic data, clinical presentation, radiological findings, operative details, postoperative complications, duration of hospital stay, and outcomes were recorded and analyzed. All patients underwent exploratory laparotomy following initial resuscitation.

Results: The majority of patients were males (88.6%) and belonged to the 21–30-year age group (55.6%). Blunt abdominal trauma accounted for 72.7% of cases, with road traffic accidents being the most common cause. Abdominal pain (94.3%) and vomiting (92%) were the predominant presenting symptoms. Free gas under the diaphragm was observed in 61.3% of patients. Small bowel injuries were the most common, with jejunal (46.6%) and ileal (45.5%) involvement predominating. Primary repair was performed in 70.5% of patients. Diffuse peritoneal contamination was present in 60.2% of cases and was strongly associated with postoperative complications and mortality. Overall postoperative complication and mortality rates were 42% and 8%, respectively.

Conclusion: Hollow viscus injuries predominantly affect young males following blunt abdominal trauma. Early diagnosis and timely surgical intervention significantly reduce peritoneal contamination, postoperative complications, hospital stay, and mortality. Diffuse peritoneal contamination is a major predictor of adverse outcomes and should prompt aggressive management.

Keywords: Hollow Viscus Injury; Abdominal Trauma; Blunt Abdominal Trauma; Penetrating Abdominal Trauma; Peritoneal Contamination; Exploratory Laparotomy; Small Bowel Perforation; Trauma Surgery.

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Introduction

Abdominal trauma remains a major cause of morbidity and mortality worldwide, particularly in regions with increasing rates of road traffic accidents, interpersonal violence, and occupational injuries. Among abdominal injuries, hollow viscus injury (HVI) involving the stomach, small intestine, or colon represents a relatively uncommon but clinically significant entity because of its potential for delayed diagnosis and serious complications. Hollow viscus injuries may result from either blunt or penetrating abdominal trauma. Penetrating injuries often produce immediate contamination of the peritoneal cavity, whereas blunt trauma can cause bowel wall perforation, mesenteric tears, or devascularization that may initially remain clinically occult. Delayed recognition can lead to peritonitis, sepsis, multiorgan dysfunction, and increased mortality. Despite advances in diagnostic modalities such as focused assessment with sonography for trauma (FAST), contrast-enhanced computed tomography (CECT), and diagnostic laparoscopy, early detection of HVI remains challenging. Clinical signs may be subtle, especially in polytrauma patients, and diagnostic delays continue to adversely affect outcomes. Timely surgical intervention remains the cornerstone of management, with treatment strategies ranging from primary repair to bowel resection and diversion depending on the extent of injury and physiological status of the patient.

The epidemiology, injury patterns, clinical presentation, and outcomes of hollow viscus injuries vary across different populations and healthcare settings. Data from eastern India, particularly Southern Odisha, remain limited. Therefore, this study was undertaken to evaluate the demographic profile, clinical characteristics, diagnostic findings, management strategies, and outcomes of patients with hollow viscus injury following abdominal trauma treated at a tertiary care center. The findings may contribute to improved diagnostic accuracy, timely surgical decision-making, and better patient outcomes.

Materials and Methods

This hospital-based observational study was conducted in the Department of General Surgery, MKCG Medical College and Hospital (MKCG MCH), Berhampur, Odisha, over a period of two years from November 2023 to October 2025.

A total of 88 patients presenting with abdominal trauma and diagnosed with hollow viscus injury were included in the study. Patients with either blunt or penetrating abdominal trauma were eligible if hollow viscus injury was confirmed clinically, radiologically, or intraoperatively. Patients with non-traumatic abdominal pain, abdominal trauma without evidence of hollow viscus injury, pediatric patients, and those with low Glasgow Coma Scale (GCS) scores were excluded.

After obtaining informed consent, demographic and clinical data including age, sex, mechanism of injury, presenting symptoms, and time interval between injury and hospital presentation were recorded. Baseline investigations included complete blood count, blood grouping, serum urea, serum creatinine, random blood sugar, and arterial blood gas analysis. Radiological evaluation included erect abdominal and chest radiographs, ultrasonography, and contrast-enhanced computed tomography (CECT) in hemodynamically stable patients when indicated.

All patients underwent initial resuscitation according to standard trauma protocols, including intravenous fluid administration, blood transfusion when required, nasogastric decompression, urinary catheterization, and broad-spectrum antibiotic therapy. Following stabilization, exploratory laparotomy was performed under general anesthesia in all cases. A systematic intraoperative assessment was carried out to identify the site and extent of injury, associated mesenteric or visceral injuries, degree of peritoneal contamination, and other intra-abdominal findings.

The operative procedure was selected according to the location and severity of injury and included primary repair, resection with anastomosis, or diversion procedures when necessary. Postoperative management consisted of continued supportive care, antibiotics, and regular monitoring for complications. Patients were followed until discharge, and outcomes including postoperative complications, duration of hospital stay, and mortality were documented and analyzed.

Results and Discussion

A total of 88 patients with hollow viscus injury following abdominal trauma were included in this observational study. The study demonstrates that hollow viscus injuries predominantly affect young adult males and are most commonly associated with blunt abdominal trauma, particularly road traffic accidents. Early diagnosis and timely surgical intervention were found to have a significant impact on morbidity and mortality.

The majority of patients belonged to the 21–30 years age group (55.6%), followed by the 31–40 years age group (27.2%). Similar age distributions have been reported in several Indian trauma series, reflecting the greater exposure of economically productive young adults to road traffic accidents, occupational hazards, and interpersonal violence. Male predominance was marked, with males

accounting for 88.6% of cases and a male-to-female ratio of 7.8:1. This finding is consistent with reports by Jain et al. and other trauma studies, where males constitute the majority of trauma victims because of increased outdoor activity, risk-taking behavior, and occupational exposure.

Blunt abdominal trauma accounted for 72.7% of cases, whereas penetrating trauma accounted for 27.3%. Road traffic accidents were the leading cause of blunt trauma, responsible for more than two-thirds of blunt injury cases. Similar findings have been reported by Rose et al. and other Indian studies, emphasizing the continuing burden of road traffic injuries in developing countries. The predominance of blunt trauma in the present study reflects changing epidemiological trends where motor vehicle accidents contribute substantially to trauma-related morbidity.

Three-fourths of the patients presented within 12 hours of injury, suggesting relatively early healthcare access. However, a significant proportion still presented late, resulting in increased contamination and postoperative complications. Clinical presentation was dominated by abdominal pain (94.3%) and vomiting (92%), while abdominal distension was observed in 55.7% of patients. These findings are comparable with previous studies, where abdominal pain remains the most reliable symptom of hollow viscus perforation due to peritoneal irritation following spillage of gastrointestinal contents.

Plain erect abdominal radiography demonstrated free gas under the diaphragm in 61.3% of patients, making it the most common radiological finding. Although computed tomography has become the gold standard for diagnosing hollow viscus injuries in hemodynamically stable patients, plain radiography continues to provide valuable diagnostic information, particularly in resource-limited settings. The presence of pneumoperitoneum remains a strong indicator of bowel perforation requiring surgical intervention.

The small intestine was the most frequently injured segment in both blunt and penetrating trauma. Among blunt trauma cases, ileal injuries predominated, followed by jejunal injuries. In penetrating trauma, jejunal perforation was the most common finding. The vulnerability of the small bowel may be attributed to its relatively long length, mobility, and central location within the abdominal cavity. These observations are consistent with previous reports demonstrating that jejunal and ileal injuries constitute the majority of traumatic hollow viscus injuries.

Primary repair was the most commonly performed surgical procedure, accounting for 70.5% of cases. This finding suggests that a substantial proportion of patients presented with localized injuries suitable for definitive repair. Resection with ileostomy and resection with anastomosis were required in patients with extensive bowel damage, devascularization, multiple perforations, or severe contamination. Similar trends have been reported in contemporary trauma literature, where primary repair is preferred whenever feasible because it avoids stoma-related morbidity and facilitates earlier recovery.

An important observation in the present study was the high incidence of diffuse peritoneal contamination, which was observed in 60.2% of patients. Diffuse contamination reflects delayed presentation, ongoing leakage of bowel contents, and advanced peritoneal inflammation. Previous studies have identified peritoneal contamination as a major determinant of postoperative morbidity and mortality.

The contamination rate in the present study was slightly higher than that reported in most published series, where rates generally range from 30–50%. A strong association was observed between duration of symptoms and degree of peritoneal contamination. All patients presenting after 12 hours had diffuse contamination, whereas patients presenting earlier had significantly lower contamination rates. This finding highlights the critical importance of early diagnosis, timely referral, and prompt surgical intervention. Delayed treatment allows progression from localized contamination to generalized peritonitis, significantly increasing the risk of septic complications.

Postoperative complications occurred in 42% of patients, while 58% experienced an uncomplicated recovery. Surgical site infection was the most frequent complication (18.2%), followed by systemic complications such as pulmonary and renal dysfunction. Enterocutaneous fistula, wound dehiscence, and intra-abdominal abscesses were less common. Similar complication profiles have been reported in previous Indian studies. The high frequency of surgical site infection can be explained by emergency surgery, fecal contamination, and the septic nature of hollow viscus injuries.

The relationship between peritoneal contamination and postoperative complications was particularly noteworthy. Among patients with diffuse contamination, postoperative complications occurred in approximately two-thirds of cases, whereas complications were uncommon among patients with minimal contamination. This observation reinforces the role of contamination as a major predictor of postoperative outcome. Several studies have demonstrated that bacterial load, fecal soilage, and established peritonitis are

directly associated with increased rates of wound infection, anastomotic leak, prolonged hospitalization, and mortality.

Most patients (79.6%) were discharged within 12 days of surgery, with a mean hospital stay of approximately 9 days. Prolonged hospitalization was primarily observed in patients with diffuse contamination, stoma formation, and postoperative complications. Similar durations of hospital stay have been reported in trauma centers managing hollow viscus injuries.

Overall mortality in the present study was 8%. Mortality was exclusively observed among patients with diffuse peritoneal contamination, while no deaths occurred in patients with minimal contamination. This finding underscores the profound impact of delayed presentation and advanced peritoneal sepsis on patient survival.

The mortality rate observed in this study compares favorably with published literature, where mortality rates range from 10–20%. The relatively lower mortality may be attributed to early surgical intervention, aggressive resuscitation, and appropriate postoperative management. In summary, the present study demonstrates that hollow viscus injuries predominantly affect young males following blunt abdominal trauma. Small bowel injuries were the most common pattern of injury, and primary repair was the preferred surgical procedure. Early presentation was associated with lower contamination rates, fewer complications, shorter hospital stay, and improved survival. Diffuse peritoneal contamination emerged as the most important determinant of postoperative morbidity and mortality. Prompt recognition and timely surgical intervention remain essential for improving outcomes in patients with hollow viscus injuries following abdominal trauma.

Table 1: Demographic and Clinical Characteristics of Patients (n=88)

Variable	Number (%)
Age 21–30 years	49 (55.6)
Male sex	78 (88.6)
Blunt trauma	64 (72.7)
Penetrating trauma	24 (27.3)
Presented within 12 h	66 (75.0)
Pain abdomen	83 (94.3)
Vomiting	81 (92.0)
Abdominal distension	49 (55.7)

Table 2: Operative Findings and Surgical Procedures

Variable	Number (%)
Jejunal injury	41 (46.6)
Ileal injury	40 (45.5)
Gastric injury	4 (4.5)
Duodenal injury	1 (1.1)
Colonic injury	2 (2.3)
Primary repair	62 (70.5)
Resection with ileostomy	13 (14.8)
Resection and anastomosis	9 (10.2)
Other procedures	4 (4.5)

Table 3: Effect of Peritoneal Contamination on Outcome

Outcome	Diffuse Contamination (n=53)	Minimal Contamination (n=35)
Postoperative complications	35	2
No complications	18	33
Mortality	7	0
Discharged	46	35

Figure 1: Jejunal Perforation Following Blunt Trauma

Figure 2: Long Segment of Jejunal Injury Following Penetrating Trauma

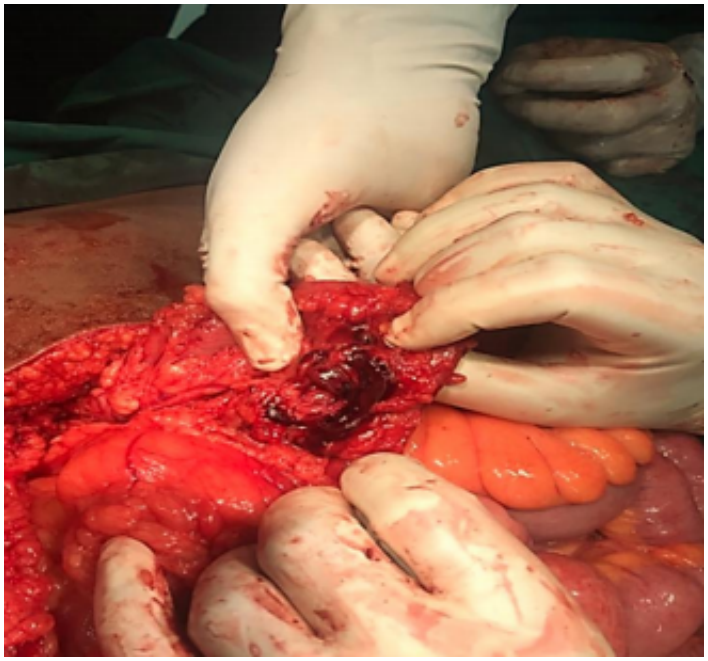

Figure 3: Image of Mesenteric Tear Due to Blunt Trauma

Conclusion

Hollow viscus injury following abdominal trauma remains an important surgical emergency associated with significant morbidity and mortality when diagnosis and treatment are delayed. The present study demonstrates that these injuries predominantly affect young adult males and are most commonly caused by blunt abdominal trauma, particularly road traffic accidents. Small bowel injuries, especially involving the jejunum and ileum, constituted the majority of hollow viscus injuries encountered in this series.

Clinical assessment remains the cornerstone of diagnosis. Abdominal pain and vomiting were the most frequent presenting symptoms, while free gas under the diaphragm on plain radiography was the most common radiological finding. However, no single clinical or radiological feature was sufficiently sensitive to exclude hollow viscus injury, emphasizing the importance of maintaining a high index of suspicion in all patients presenting with abdominal trauma.

A key finding of this study was the significant influence of the time interval between injury and surgical intervention on patient outcomes. Patients presenting within 12 hours of injury had lower rates of peritoneal contamination, fewer postoperative complications, shorter hospital stays, and better overall outcomes. In contrast, delayed presentation was strongly associated with diffuse peritoneal contamination, increased postoperative morbidity, prolonged hospitalization, and higher mortality. Diffuse peritoneal contamination emerged as the most important predictor of adverse outcomes, with all deaths occurring in this subgroup.

Primary repair was the most commonly performed surgical procedure and was associated with favorable outcomes in appropriately selected patients. Diversion procedures and bowel resection were reserved for patients with extensive bowel injury, ischemia, or severe contamination. These findings support an individualized surgical approach based on the extent of injury, physiological status of the patient, and degree of intra-abdominal contamination.

Overall, the mortality rate in the present study was 8%, with a successful discharge rate of 92%. Early diagnosis, prompt resuscitation, timely surgical intervention, and meticulous postoperative care were the major factors contributing to improved survival. The study highlights the need for enhanced trauma awareness, rapid referral systems, and early access to definitive surgical care. Adoption of these measures may significantly reduce the burden of complications and mortality associated with hollow viscus injuries following abdominal trauma.

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