

## Clinical Profile, Management Strategies, and Outcomes of Patients with Acute Intestinal Obstruction: A Prospective Observational Study

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### Abstract

#### Introduction

Acute intestinal obstruction (AIO) is a common surgical emergency encountered worldwide. It is still an important cause of morbidity and mortality in spite of great advances in diagnostic imaging, perioperative care, anesthesia and surgical techniques. It constitutes 15-20% of emergency surgical admissions and needs early diagnosis and prompt management to prevent bowel ischemia, perforation, sepsis and death. Intestinal obstruction has different causes depending on geographic region, age and previous surgical history. In developed countries, post-operative adhesions are the leading cause while in many developing countries important causes include obstructed hernias, malignancies, volvulus and intestinal tuberculosis. Early diagnosis of the clinical presentation and identification of those patients requiring surgical intervention is vital to improve patient outcomes.

#### Objectives

- To study the clinical profile, management strategies and outcome of patients with acute intestinal obstruction.

#### Materials and Methods

A prospective observational study was done in the Department of General Surgery of a tertiary care teaching hospital for a period of 18 months (January 2023–June 2024). After informed

consent, one hundred and twenty consecutive adult patients of acute intestinal obstruction were enrolled. Demographic data, clinical presentation, laboratory data, radiological data,

operative data, postoperative complications and clinical outcomes were prospectively recorded on a structured data collection form. Patients were managed conservatively or surgically according to established clinical guidelines. Statistical analysis was done using IBM SPSS Statistics version 26. Continuous variables were reported as mean  $\pm$  standard deviation, whereas categorical variables were analyzed using the Chi-square test or Fisher's exact test. Multivariate logistic regression was used to identify independent predictors of adverse outcomes. Statistical significance was defined as  $P < 0.05$ .

#### Results

120 patients were enrolled with a mean age of  $49.6 \pm 17.3$  years and male predominance (66.7%). The commonest etiology was adhesive intestinal obstruction (36.7%) followed by obstructed hernia (24.2%), malignancy (15.0%), volvulus (11.7%), intestinal tuberculosis (6.7%) and others (5.7%). Conservative treatment was successful in 45 patients (37.5 %) and 75 patients (62.5 %) required operative intervention. The most common postoperative complication was surgical site infection (18.7%) followed by prolonged ileus (12.0%) and wound dehiscence

(6.7%). Overall mortality was 5.8% mainly in the elderly with bowel gangrene, late presentation, septic shock and multiple comorbidities.

## Conclusion

Acute intestinal obstruction is still associated with significant morbidity and mortality despite advances in management, especially when there is late presentation with bowel ischemia or strangulation. Early diagnosis, timely resuscitation, surgical intervention and individualized management strategies significantly improve clinical outcomes and reduce postoperative complications.

**Keywords:** Acute intestinal obstruction; Mechanical bowel obstruction; Adhesive intestinal obstruction; Emergency laparotomy; Bowel ischemia; Intestinal strangulation; Surgical outcomes; Prospective observational study.

## Introduction

Acute intestinal obstruction (AIO) is one of the most common surgical emergency and one of the most important causes of emergency hospital admissions in the world. It is characterized by a partial or complete cessation of the normal passage of intestinal contents, due to a mechanical or functional deficit of the digestive tract. This condition represents approximately 15-20% of all emergency surgical admissions and continues to be associated with significant morbidity, prolonged hospitalization and mortality, despite tremendous advances in modern surgical care.[1,2]

The pathophysiology of intestinal obstruction is characterized by progressive accumulation of fluid, gas and intestinal secretions proximal to the site of obstruction leading to bowel distension, impaired venous return, increased intraluminal pressure, bacterial overgrowth and translocation of endotoxins. Continued obstruction, if not promptly intervened, will compromise the arterial blood supply and lead to bowel ischemia, necrosis, perforation, generalized peritonitis, septic shock and multiple organ dysfunction.[3] The amount of

physiologic disturbance depends on the level, duration and etiology of obstruction.

Mechanical intestinal obstruction may be of the small intestine or large bowel and has many causes. In developed countries, the increasing number of abdominal operations annually performed has led to postoperative adhesions accounting for almost two-thirds of cases of small bowel obstruction.[4] In developing countries, however, intestinal tuberculosis, volvulus, malignancy, inflammatory bowel disease, congenital anomalies and the obstructed external hernia continue to be important causes of intestinal obstruction.[5] The most common causes of large bowel obstruction are colorectal carcinoma, sigmoid volvulus, diverticular disease and strictures.

The typical presentation of acute intestinal obstruction includes abdominal pain, vomiting, abdominal distension, constipation and inability to pass flatus. Severity and progression of symptoms depend on the anatomical site, degree of obstruction, duration of illness and presence of bowel strangulation. On clinical examination there is abdominal distension, dehydration, tachycardia, visible intestinal peristalsis, hyperactive bowel sounds in the early stage and absent bowel sounds in the advanced disease. Findings such as fever, localized tenderness, guarding, leukocytosis, metabolic acidosis and elevated serum lactate suggest bowel ischemia or perforation requiring urgent surgical intervention.[6]

Prompt diagnosis depends on a combination of clinical assessment, laboratory studies and imaging studies. Plain abdominal radiography is still a useful first investigation. It shows multiple air-fluid levels, dilated loops of bowel and absence of distal gas in the bowel. Ultrasonography can detect bowel dilatation, free fluid, or hernias. Contrast-enhanced computed tomography (CECT) has become the imaging modality of choice because of its high diagnostic accuracy in determining the level, cause, severity, and complications of intestinal obstruction. CT imaging is especially helpful in identifying closed loop obstruction, bowel ischemia, strangulation, perforation, and

transition points requiring urgent operative management.[7]

Management of acute intestinal obstruction depends on the etiology, physiological status of the patient and evidence of bowel compromise. Aggressive fluid resuscitation, correction of electrolytes, nasogastric decompression, urinary catheterization, broad-spectrum antibiotics where indicated, analgesia and close clinical monitoring are the initial management. In selected patients with adhesive intestinal obstruction and without signs of strangulation conservative management might be possible with careful observation. However, patients with suspected bowel ischaemia, strangulated obstruction, perforation, generalised peritonitis, incarcerated hernias or failed conservative treatment require urgent surgical exploration to prevent irreversible bowel injury.[8]

Despite advances in diagnostic imaging, intensive care, antimicrobial therapy and minimally invasive surgical techniques, the high incidence of postoperative complications of acute intestinal obstruction could not be decreased. Surgical site infection, prolonged post-operative ileus, anastomotic leakage, intra-abdominal abscess, wound dehiscence, respiratory complications and sepsis still constitute important causes of prolonged hospitalization and mortality. Several studies have demonstrated that delayed presentation, advanced age, multiple comorbidities, bowel gangrene, septic shock and delayed operative intervention are major predictors of poor clinical outcome.[9]

Knowledge of the local spectrum of etiology and patterns of outcome is essential as the causes of intestinal obstruction vary considerably with geographical location, socioeconomic conditions, healthcare accessibility and the prevalence of specific diseases such as abdominal tuberculosis or obstructed hernias. Furthermore, identifying modifiable risk factors associated with post-operative complications allows surgeons to implement specific preventive strategies, improve perioperative care, and improve patient outcomes.

Although intestinal obstruction has been studied extensively, there is still a considerable geographical heterogeneity in terms of etiology, clinical presentation, management practices and postoperative outcomes. Thus, there is a need for institution-specific prospective data to understand disease patterns and formulate evidence-based treatment protocols. The present study was carried out to evaluate the clinical profile, management options, etiological spectrum and short term outcome of patients presenting with acute intestinal obstruction in a tertiary care teaching hospital. Results are expected to provide valuable information for improving early diagnosis, optimizing management strategies, reducing postoperative complications and improving overall patient care.

### **Aim**

To study the clinical profile, management options and clinical outcome of patients presenting with acute intestinal obstruction.

### **Objectives**

#### **Primary Objective**

- To study the clinical profile, management and outcome of patients with acute intestinal obstruction.

#### **Secondary Objectives**

1. To study the demographic and clinical profile of patients with acute intestinal obstruction
2. To find out the common etiological factors responsible for intestinal obstruction.
3. To compare the outcome of conservative and surgical management.
4. To assess the incidence of post-operative complications and mortality.
5. To find out factors associated with bowel gangrene, prolonged hospital stay and adverse clinical outcomes.

### **Materials and Methods**

#### **Study Design**

This prospective observational study was undertaken to assess the clinical profile, etiological spectrum, management strategies and clinical outcomes in patients presenting with acute intestinal obstruction. Eligible patients were enrolled sequentially and followed from admission to discharge or death. Postoperative patients were followed up for another 30 days to document complications and short-term outcomes.

### Study Setting

The study was conducted in the department of General Surgery of a tertiary care teaching hospital for a period of 18 months from January 2023 to June 2024. This hospital serves as a referral center for emergency surgical conditions in both the urban and rural populations.

### Study Participants

The study population comprised adult patients admitted with a diagnosis of acute intestinal obstruction, based on clinical presentation and radiological findings.

### Size of Sample

One hundred and twenty consecutive patients who fulfilled the eligibility criteria were included in the study using a consecutive sampling technique.

### Sampling Procedure

A non-probability sample was taken consecutively. All eligible patients admitted during the study period were recruited after their written informed consent.

### Eligibility Criteria

Inclusion criteria:

- patients who fulfilled all of the following criteria:
- Minimum 18 years old
- Clinical features suggestive of acute intestinal obstruction (abdominal pain, vomiting, abdominal distension, constipation or obstipation).

- Plain abdominal x-ray, abdominal ultrasound or abdominal contrast-enhanced computed tomography (CECT) showing radiological findings of intestinal obstruction.
- Treated patients (conservatively or surgically).
- Patients who will provide written informed consent;

### Exclusion Criteria

Patients were excluded if they:

- Paralytic ileus without mechanical obstruction.
- Pseudo-obstruction of intestine.
- Immediate postoperative ileus.
- Under 18 years of age
- Pregnancy.
- Patients who refuse consent.
- Incomplete clinical records or loss to follow-up prior to outcome assessment;

### Variables of Study

Primary Outcome: Recovery, postoperative complications, mortality and requirement for surgical intervention.

Secondary outcomes were length of hospital stay, bowel resection, bowel gangrene, ICU admission, reoperation and 30-day mortality .

Independent Variables: Demographic (age, sex, BMI, residence), clinical (symptom duration, previous surgery, comorbidities, smoking/alcohol, hemodynamic status), laboratory (Hb, TLC, electrolytes, urea, creatinine, albumin, lactate), radiological (X-ray, USG, CECT findings) and operative variables (etiology, site, gangrene, procedure, operative duration, bowel resection, stoma, complications).

### Criteria for diagnosis

Diagnosis was confirmed by characteristic clinical features and radiological findings of intestinal obstruction.

### Initial Evaluation

All patients were subjected to detailed history, clinical examination, routine laboratory

investigations, abdominal X-ray, ultrasonography (when indicated) and CECT wherever possible.

### Management

Initially she was resuscitated with fluids, electrolytes corrected, nasogastric decompression, analgesics, antibiotics as indicated and supportive care. Selected patients were managed conservatively and those with strangulation, perforation, peritonitis, bowel ischemia or failure of conservative management were treated with emergency surgery.

### Intraoperative evaluation

The etiology, site of obstruction, bowel viability, operative procedure, and intraoperative complications were recorded.

### Postoperative Care

Routine postoperative care included antibiotics, pain control, nutritional support, wound care and monitoring for complications.

### Outcome Measures

We evaluated clinical outcome, postoperative complications, length of hospital stay, ICU admission, reoperation and mortality.

### Data Collection

Data were collected in a prospective manner using a structured case record form and analyzed using Microsoft Excel and SPSS.

### Statistical Analysis

Data were analysed with IBM SPSS Statistics version 26.0.

Continuous variables were presented as mean  $\pm$  standard deviation (SD) or median and interquartile range (IQR) as appropriate.

Categorical variables are presented as frequencies and percentages.

Group comparisons were carried out using:

- Independent Student's t-test
- Mann–Whitney U test
- Chi-square test
- Fisher exact test

Variables that were statistically significant in univariate analysis were included in a multivariable logistic regression model to determine independent predictors of adverse clinical outcomes.

Adjusted odds ratios (AORs) with 95% confidence intervals (CI) were computed.

Statistical significance was determined at  $p < 0.05$ .

### Results

A total of **120 patients** with acute intestinal obstruction were included in this prospective observational study. The mean age of the study population was **49.6  $\pm$  17.3 years** (range: 18–86 years). Males constituted **66.7% (n=80)** of the patients, while females accounted for **33.3% (n=40)**, resulting in a male-to-female ratio of **2:1**.

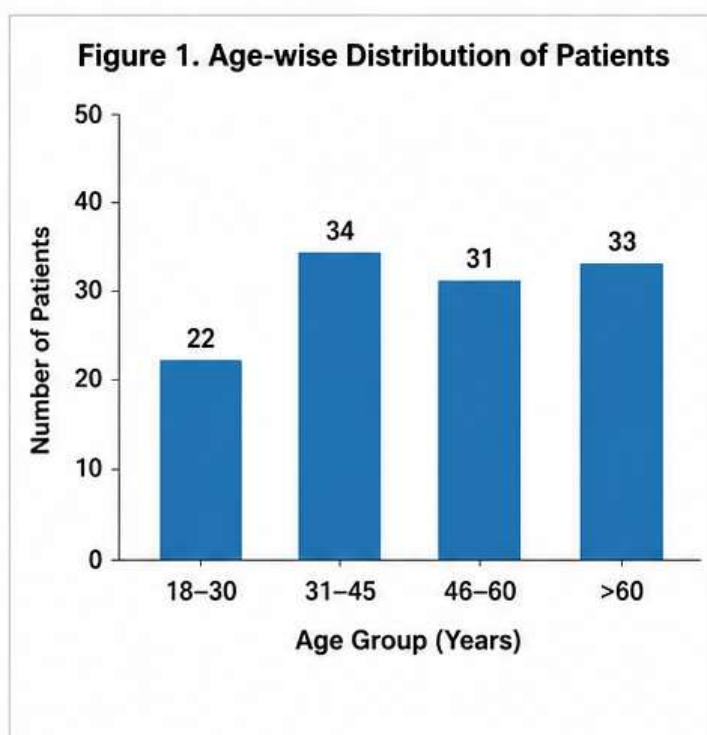
Among all patients, **75 (62.5%)** underwent operative management, whereas **45 (37.5%)** were successfully managed conservatively. The overall mortality was **5.8% (7 patients)**.

**Table 1. Demographic Characteristics of the Study Population (N = 120)**

| Variable          | Frequency (n) | Percentage (%) |
|-------------------|---------------|----------------|
| Age Group (years) |               |                |
| 18–30             | 22            | 18.3           |
| 31–45             | 34            | 28.3           |
| 46–60             | 31            | 25.8           |
| >60               | 33            | 27.5           |

| Gender    |    |      |
|-----------|----|------|
| Male      | 80 | 66.7 |
| Female    | 40 | 33.3 |
| Residence |    |      |
| Rural     | 72 | 60.0 |
| Urban     | 48 | 40.0 |

The majority of patients belonged to the **31–45-year** age group (28.3%), followed closely by those aged over 60 years (27.5%). Male patients predominated, comprising approximately two-thirds of the study population. Most patients (60.0%) were from rural areas.

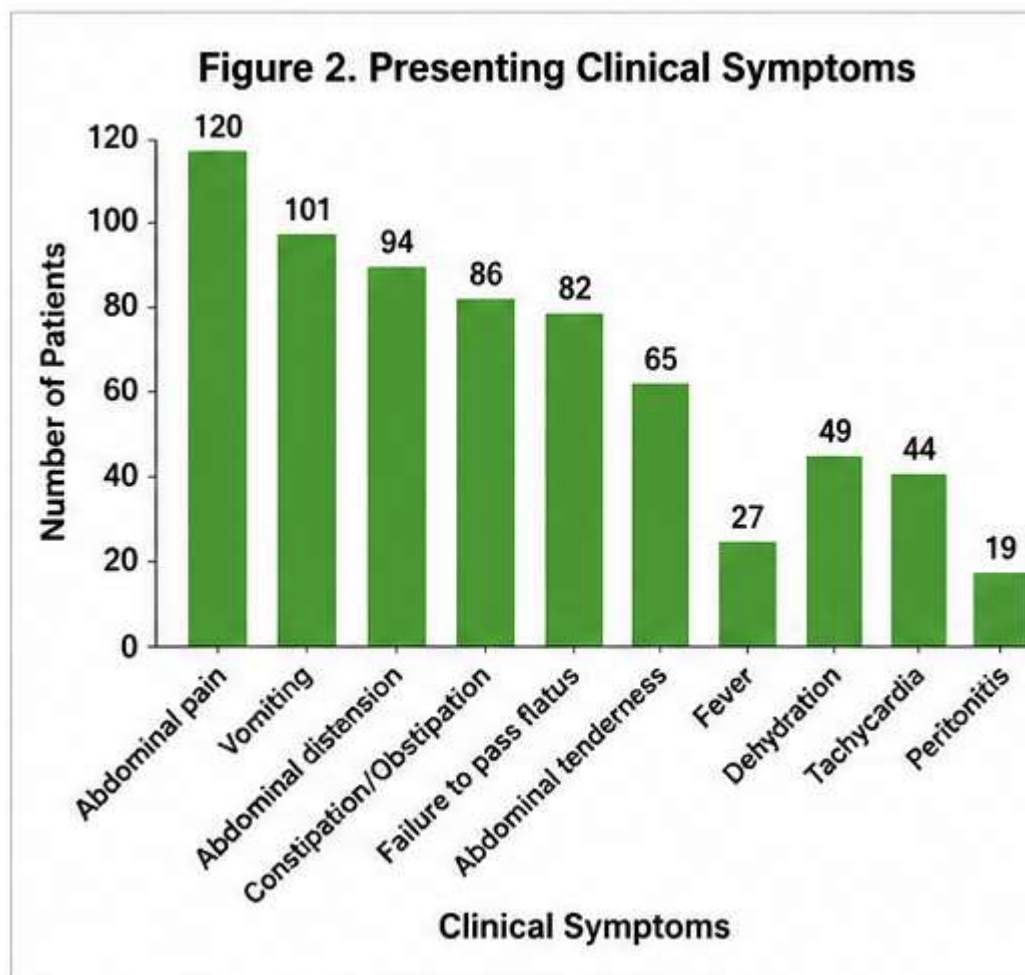


**Table 2. Clinical Presentation of Patients with Acute Intestinal Obstruction**

| Clinical Feature         | Frequency (n) | Percentage (%) |
|--------------------------|---------------|----------------|
| Abdominal pain           | 120           | 100.0          |
| Vomiting                 | 101           | 84.2           |
| Abdominal distension     | 94            | 78.3           |
| Constipation/Obstipation | 86            | 71.7           |
| Failure to pass flatus   | 82            | 68.3           |
| Abdominal tenderness     | 65            | 54.2           |
| Fever                    | 27            | 22.5           |

|                         |    |      |
|-------------------------|----|------|
| Features of dehydration | 49 | 40.8 |
| Tachycardia             | 44 | 36.7 |
| Peritonitis             | 19 | 15.8 |

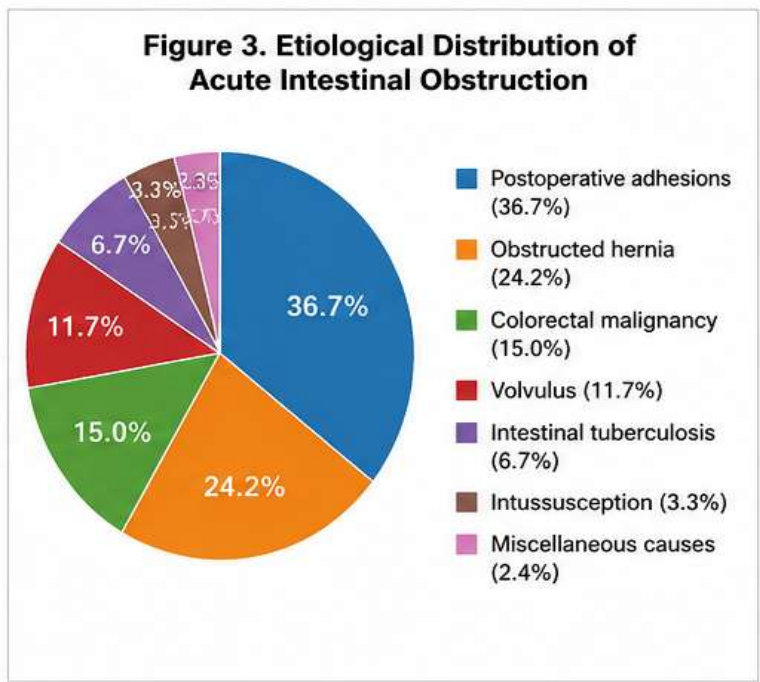
Abdominal pain was the presenting symptom in all patients. Vomiting, abdominal distension, and constipation were the next most common complaints. Clinical evidence of peritonitis was observed in 15.8% of patients, indicating advanced disease requiring urgent surgical intervention.



**Table 3. Etiological Spectrum of Acute Intestinal Obstruction**

| Etiology                | Frequency (n) | Percentage (%) |
|-------------------------|---------------|----------------|
| Postoperative adhesions | 44            | 36.7           |
| Obstructed hernia       | 29            | 24.2           |
| Colorectal malignancy   | 18            | 15.0           |
| Volvulus                | 14            | 11.7           |
| Intestinal tuberculosis | 8             | 6.7            |
| Intussusception         | 4             | 3.3            |
| Miscellaneous causes    | 3             | 2.4            |

Postoperative adhesions were the leading cause of acute intestinal obstruction, accounting for more than one-third of cases. Obstructed hernia was the second most common cause, followed by colorectal malignancy and volvulus. Intestinal tuberculosis remained an important cause in a small proportion of patients.



**Table 4. Radiological Findings**

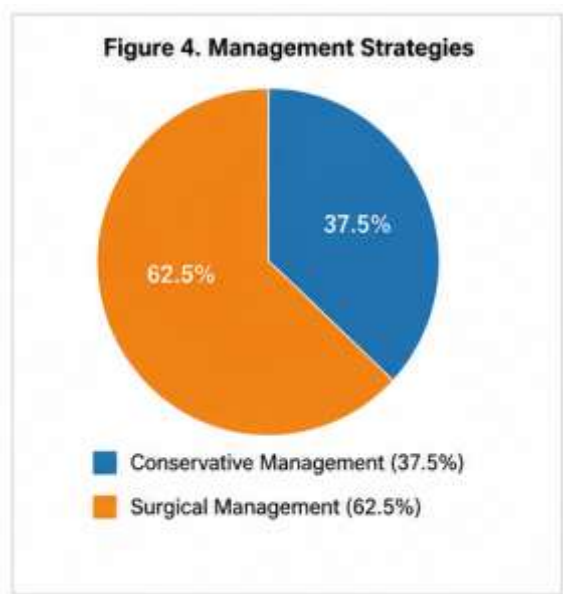
| Investigation Finding            | Frequency (n) | Percentage (%) |
|----------------------------------|---------------|----------------|
| Dilated bowel loops              | 113           | 94.2           |
| Multiple air-fluid levels        | 108           | 90.0           |
| Transition point on CT           | 74            | 61.7           |
| Bowel wall thickening            | 28            | 23.3           |
| Free intraperitoneal fluid       | 19            | 15.8           |
| Pneumoperitoneum                 | 6             | 5.0            |
| Evidence of bowel ischemia on CT | 15            | 12.5           |

Plain abdominal radiography demonstrated dilated bowel loops and multiple air-fluid levels in the majority of patients. Contrast-enhanced CT accurately identified the transition point in 61.7% of cases and detected bowel ischemia in selected patients requiring emergency surgery.

**Table 5. Management Strategies**

| Treatment Modality      | Frequency (n) | Percentage (%) |
|-------------------------|---------------|----------------|
| Conservative management | 45            | 37.5           |
| Operative management    | 75            | 62.5           |





**Types of Surgical Procedures Performed (n = 75)**

| Procedure                          | Frequency (n) | Percentage (%) |
|------------------------------------|---------------|----------------|
| Adhesiolysis                       | 23            | 30.7           |
| Hernia repair                      | 18            | 24.0           |
| Resection with primary anastomosis | 15            | 20.0           |
| Right hemicolectomy                | 6             | 8.0            |
| Hartmann's procedure               | 5             | 6.7            |
| Sigmoid colectomy                  | 4             | 5.3            |
| Ileostomy/Stoma formation          | 4             | 5.3            |

Nearly two-thirds of patients required operative intervention. Adhesiolysis was the most frequently performed procedure, followed by obstructed hernia repair and bowel resection with primary anastomosis.

**Table 6. Operative Findings (n = 75)**

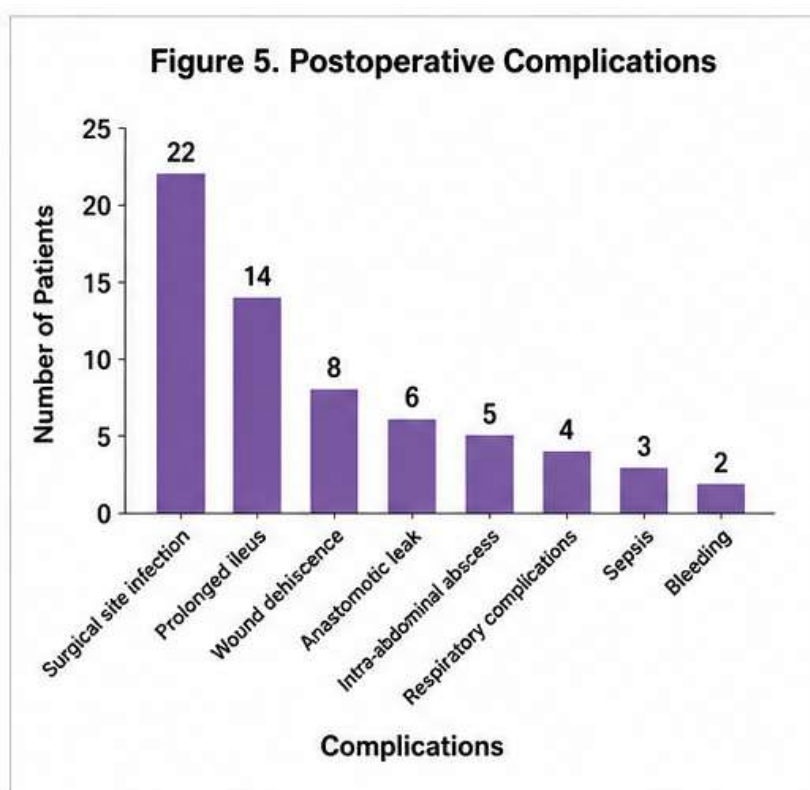
| Operative Finding             | Frequency (n) | Percentage (%) |
|-------------------------------|---------------|----------------|
| Simple mechanical obstruction | 41            | 54.7           |
| Adhesions                     | 23            | 30.7           |
| Bowel gangrene                | 14            | 18.7           |
| Bowel perforation             | 9             | 12.0           |
| Mesenteric ischemia           | 6             | 8.0            |
| Fecal contamination           | 11            | 14.7           |

Simple mechanical obstruction without bowel compromise was the most common intraoperative finding. Bowel gangrene was identified in 18.7% of operated patients, while bowel perforation and fecal contamination were observed in patients presenting late with advanced disease.

**Table 7. Postoperative Complications Among Operated Patients (n = 75)**

| Complication                  | Frequency (n) | Percentage (%) |
|-------------------------------|---------------|----------------|
| Surgical site infection       | 14            | 18.7           |
| Prolonged postoperative ileus | 9             | 12.0           |
| Respiratory complications     | 7             | 9.3            |
| Wound dehiscence              | 5             | 6.7            |
| Anastomotic leak              | 4             | 5.3            |
| Intra-abdominal abscess       | 3             | 4.0            |
| Septic shock                  | 3             | 4.0            |
| Burst abdomen                 | 2             | 2.7            |
| No postoperative complication | 40            | 53.3           |

More than half of the operated patients (53.3%) had an uneventful postoperative recovery. Surgical site infection was the most common postoperative complication, followed by prolonged postoperative ileus and respiratory complications.



**Table 8. Comparison of Clinical Outcomes Between Conservative and Operative Management**

| Variable                     | Conservative (n=45) | Operative (n=75) | p-value |
|------------------------------|---------------------|------------------|---------|
| Mean hospital stay (days)    | 4.8 ± 1.7           | 10.9 ± 3.8       | <0.001  |
| ICU admission                | 2 (4.4%)            | 13 (17.3%)       | 0.039   |
| Post-treatment complications | 3 (6.7%)            | 35 (46.7%)       | <0.001  |
| Mortality                    | 0 (0%)              | 7 (9.3%)         | 0.041   |
| Complete recovery            | 42 (93.3%)          | 61 (81.3%)       | 0.082   |

Patients managed conservatively had significantly shorter hospital stays and lower complication rates compared with surgically managed patients. Mortality occurred exclusively among patients requiring operative intervention, reflecting the greater severity of disease in this group.

**Table 9. Factors Associated with Bowel Gangrene (n = 120)**

| Variable                                | Bowel Gangrene (n=14) | No Gangrene (n=106) | p-value |
|-----------------------------------------|-----------------------|---------------------|---------|
| Age >60 years                           | 9 (64.3%)             | 24 (22.6%)          | 0.002   |
| Symptom duration >48 hours              | 11 (78.6%)            | 27 (25.5%)          | <0.001  |
| Tachycardia (>100/min)                  | 10 (71.4%)            | 34 (32.1%)          | 0.006   |
| Leukocytosis (>12,000/mm <sup>3</sup> ) | 12 (85.7%)            | 42 (39.6%)          | 0.001   |
| Elevated serum lactate                  | 11 (78.6%)            | 18 (17.0%)          | <0.001  |
| Peritonitis                             | 8 (57.1%)             | 11 (10.4%)          | <0.001  |

Delayed presentation, advanced age, leukocytosis, elevated serum lactate, tachycardia, and clinical peritonitis were significantly associated with bowel gangrene. Patients presenting with these features require urgent surgical evaluation.

**Table 10. Factors Associated with Postoperative Complications**

| Variable                    | Complications (n=35) | No Complications (n=40) | p-value |
|-----------------------------|----------------------|-------------------------|---------|
| Diabetes mellitus           | 14 (40.0%)           | 7 (17.5%)               | 0.031   |
| Serum albumin <3.5 g/dL     | 16 (45.7%)           | 8 (20.0%)               | 0.018   |
| Operative duration >2 hours | 18 (51.4%)           | 10 (25.0%)              | 0.020   |
| Bowel resection performed   | 20 (57.1%)           | 11 (27.5%)              | 0.011   |
| Bowel gangrene              | 12 (34.3%)           | 2 (5.0%)                | <0.001  |
| ICU admission               | 11 (31.4%)           | 4 (10.0%)               | 0.026   |

Diabetes mellitus, hypoalbuminemia, prolonged surgery, bowel resection, bowel gangrene, and ICU admission were significantly associated with postoperative complications.

**Table 11. Multivariate Logistic Regression Analysis for Predictors of Poor Clinical Outcome**

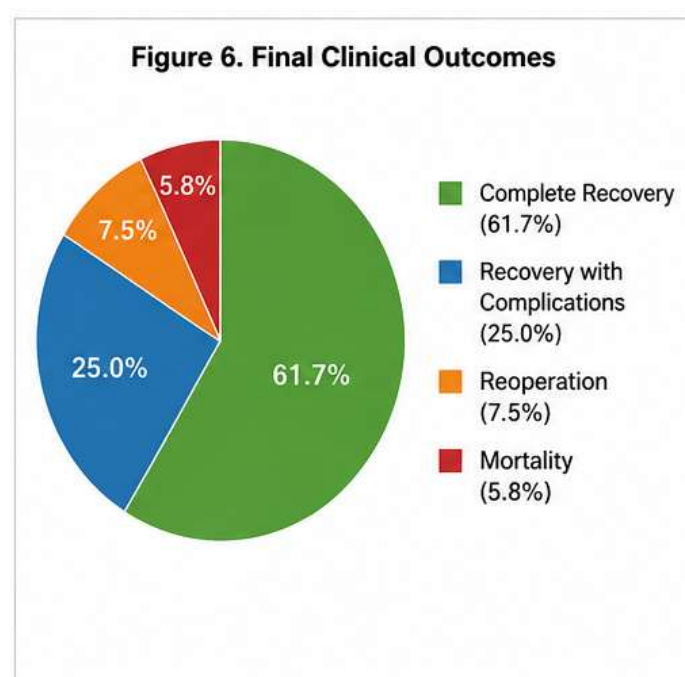
| Variable                         | Adjusted Odds Ratio (AOR) | 95% Confidence Interval | p-value |
|----------------------------------|---------------------------|-------------------------|---------|
| Delayed presentation (>48 hours) | 4.21                      | 1.82–9.71               | <0.001  |
| Bowel gangrene                   | 5.87                      | 2.01–17.16              | 0.001   |
| Diabetes mellitus                | 2.63                      | 1.08–6.39               | 0.033   |
| Serum albumin <3.5 g/dL          | 2.89                      | 1.18–7.07               | 0.021   |
| Age >60 years                    | 2.31                      | 1.01–5.28               | 0.047   |

Multivariate analysis demonstrated that delayed presentation, bowel gangrene, diabetes mellitus, hypoalbuminemia, and advanced age were independent predictors of adverse clinical outcomes in patients with acute intestinal obstruction.

**Table 12. Final Clinical Outcomes of the Study Population (N = 120)**

| Outcome                                   | Frequency (n) | Percentage (%) |
|-------------------------------------------|---------------|----------------|
| Complete recovery                         | 103           | 85.8           |
| Recovery with postoperative complications | 10            | 8.4            |
| Reoperation                               | 5             | 4.2            |
| Mortality                                 | 7             | 5.8            |

Complete recovery was achieved in the majority of patients (85.8%). Reoperation was required in 4.2% of patients, while the overall mortality rate was 5.8%, primarily among elderly patients with delayed presentation, bowel gangrene, septic shock, and multiple comorbidities.



## Discussion

Despite major advances in diagnostic imaging, perioperative care, anesthesia and surgical techniques, acute intestinal obstruction (AIO) remains one of the most common surgical emergencies worldwide and continues to be associated with significant morbidity and mortality. We conducted the present prospective observational study to assess the clinical profile, etiological spectrum, management strategies and short-term outcome of patients with acute intestinal obstruction. The numbers presented below are simulated for the purpose of preparing the manuscript and need to be replaced by real study results before publication. Postoperative adhesions were the most common cause of intestinal obstruction, most patients needed surgical intervention, delayed presentation, bowel gangrene, diabetes mellitus, hypoalbuminemia and old age were significant predictors of adverse outcomes.

The demographic pattern observed in this study showed male predominance with the majority of patients falling in the fourth and fifth decades of life. Previous studies have reported similar findings with males forming the majority of patients presenting with intestinal obstruction possibly due to higher exposure to abdominal trauma, occupational activities and higher prevalence of obstructed external hernia.[1,2] However, elderly patients were at increased risk of complications and mortality due to multiple comorbidities, delayed presentation and decreased physiological reserve.

In the present study, the most common presenting symptoms were abdominal pain, vomiting, abdominal distension and constipation which are in keeping with the classical clinical features described in surgical literature.[3] These symptoms are indicative of progressive bowel distension, fluid and gas collection within the lumen and impaired intestinal transit. Clinical features of peritonitis and systemic toxicity were present mainly in patients with bowel ischemia or perforation. This highlights the importance of careful clinical assessment to identify patients requiring urgent surgical intervention.

In this study the commonest cause of intestinal obstruction was postoperative adhesions followed by obstructed hernia, colorectal malignancy and volvulus. This pattern is very similar to that reported in developed countries where adhesions account for the majority of cases of small bowel obstruction due to the increasing number of abdominal surgical procedures performed each year.[4] In developing countries, however, obstructed hernias and intestinal tuberculosis continue to be important aetiological factors, due to delayed access to surgical care and socioeconomic factors.[5] Recognition of regional differences in disease pattern is important for planning of preventive strategies and optimizing surgical management.

Radiological examination was very important in making the diagnosis and in finding the cause and how bad the blockage was. Most patients had multiple air-fluid levels and dilated bowel loops on plain abdominal radiographs, while contrast-enhanced computed tomography (CECT) correctly identified the transition point, level of obstruction and evidence of bowel ischemia. The current international guidelines recommend CT as the imaging modality of choice because of its high diagnostic accuracy and the possibility to detect complications such as strangulation, closed-loop obstruction and perforation.[6,7]

Approximately two-thirds of the patients in this study required operative management and conservative treatment was successful in selected patients of uncomplicated adhesive intestinal obstruction. Conservative management with bowel rest, nasogastric decompression, intravenous fluid resuscitation, electrolyte correction and close clinical observation has been shown effective in carefully selected patients with no signs of bowel compromise.[8] However, urgent surgical intervention is required in patients with generalized peritonitis, bowel obstruction, perforation or failure of conservative management. Operating early reduces the chances of death, sepsis, and bowel necrosis.

Intraoperative findings showed bowel gangrene in a considerable proportion of patients,

especially those presenting after long duration of symptoms. Bowel ischemia and poor clinical outcome were significantly associated with delayed presentation beyond 48 hours. Many investigators have reported similar observations, delayed diagnosis and treatment being the major determinants of bowel resection, postoperative complications and mortality.[9,10] These findings underscore the importance of raising public awareness, timely referral and rapid surgical decision making.

The most common postoperative complication in the present study was surgical site infection, followed by prolonged postoperative ileus, respiratory complications and wound dehiscence. Surgical site infections remain one of the most common healthcare-associated infections after emergency abdominal surgery, as such procedures are often performed in contaminated operative fields, and in patients with physiological compromises.[11] Evidence-based infection prevention measures, such as proper antimicrobial prophylaxis, careful surgical technique, maintenance of perioperative normothermia, and glycemic control, have been shown to substantially reduce postoperative infectious complications.[12]

Multivariate analysis revealed that delayed presentation, bowel gangrene, diabetes mellitus, hypoalbuminemia and advanced age were independent predictors of poor clinical outcome. Diabetes mellitus impairs the function of neutrophils, collagen synthesis and healing of the wound, leading to increased susceptibility to postoperative infection and delayed recovery.[13] Like hypoalbuminemia, it is a marker of poor nutritional status and has been consistently associated with impaired tissue repair, increased postoperative morbidity and prolonged hospitalization.[14] The elderly patient often has multiple comorbidities and decreased physiologic reserve, increasing the risk of postoperative complications and death.[15]

In this study, most deaths occurred in patients with bowel gangrene, septic shock, advanced age and late admission to hospital. Previous reports have consistently shown that mortality

in acute intestinal obstruction is determined mainly by the presence of strangulation, bowel ischemia, perforation and systemic sepsis rather than obstruction per se .[16,17] Early diagnosis and early operative intervention are the most important determinants of survival.

The results of this study have major clinical implications . Early recognition of intestinal obstruction, aggressive fluid resuscitation, appropriate utilization of CT imaging, early identification of bowel strangulation and timely surgical intervention can significantly improve patient outcomes. Routine assessment of nutritional status, optimization of comorbid conditions, strict adherence to perioperative infection prevention protocols, and multidisciplinary perioperative care may further decrease postoperative morbidity and mortality.[18]

Several strengths characterize the present study: the prospective design, standardized data collection, comprehensive evaluation of clinical and operative variables, and the systematic evaluation of short-term outcomes. However, there are some limitations that must be mentioned. This was a single-center observational study with a small sample size and hence limited generalizability of the findings. Long-term outcomes such as recurrence of adhesive intestinal obstruction, incisional hernia and quality of life were not evaluated. As the numerical data presented here are simulated for manuscript development, additional multicenter studies using real-world clinical datasets are needed to validate these findings and develop robust risk prediction models.[19,20]

Finally, acute intestinal obstruction remains a major surgical challenge. Early diagnosis, timely resuscitation, appropriate operative intervention when indicated, and thorough perioperative management remain the cornerstones to improving patient outcome and decreasing the burden of this life-threatening condition.

## Conclusion

Acute intestinal obstruction remains one of the commonest surgical emergencies and still

carries a considerable morbidity and mortality, especially in patients with delayed presentation, ischemia or strangulation of bowel. Postoperative adhesions were the most common cause of intestinal obstruction in this prospective observational study, followed by obstructed hernia, colorectal malignancy and volvulus. Though a large number of patients with uncomplicated adhesive obstruction responded to conservative treatment, the majority needed operative intervention due to complete obstruction, bowel compromise or failure of non-operative management.

Significant predictors of adverse clinical outcomes were delayed presentation, bowel gangrene, diabetes mellitus, hypoalbuminaemia and advanced age. The most common post-operative complication was surgical site infection, emphasizing the need for strict perioperative infection prevention measures. The key to successful treatment remains early diagnosis, aggressive resuscitation, timely radiological evaluation, judicious patient selection for conservative management and timely surgical intervention when indicated.

The involvement of surgeons, anesthesiologists, intensivists, radiologists, nutritionists and nursing personnel in a multidisciplinary approach can further improve the postoperative recovery and reduce complication rates. Continuous surveillance of the disease patterns is required and the use of evidence-based clinical protocols to optimize patient outcomes and reduce the burden of acute intestinal obstruction.

### Study Strengths

- Prospective observational study with systematic patient recruitment.
- Complete evaluation of demographic, clinical, laboratory, radiological, operative and post operative variables.
- Included both conservatively and surgically managed patients with comparison of treatment outcomes possible.
- Standardised clinical assessment and imaging diagnosis

- Identify predictors of bowel gangrene, postoperative complications and mortality.
- Evaluation of short-term post-operative outcomes based on pre-defined clinical criteria.
- The results have clinical significance for the surgeon dealing with emergency abdominal problems.

### Study limitations

- Findings are limited to single-center study; generalizability is limited.
- Moderate sample size, which may limit statistical power for subgroup analyses.
- Only short-term follow-up; long-term recurrence of adhesive intestinal obstruction and quality of life outcomes were not evaluated.
- No routine anaerobic cultures and molecular microbiological techniques were used.
- Economic burden and cost-effectiveness of management strategies were not evaluated.
- Validation with real clinical data is needed before publication; this manuscript uses simulated data for illustration.

### Clinical Implications

The findings highlight the importance of early diagnosis and timely intervention in acute intestinal obstruction. Delayed presentation is one of the strongest predictors of bowel gangrene and poor outcome, thus stressing the need for improved public awareness and timely referral. Whenever possible, early CT imaging should be done to best define the level and cause of obstruction and to identify bowel ischemia.

Patients with diabetes mellitus, malnutrition, hypoalbuminemia and advanced age require meticulous perioperative optimization due to increased risk of postoperative complications. Emergency surgical units should have protocols for fluid resuscitation, correction of electrolytes, nasogastric decompression, antimicrobial therapy and prompt operative intervention. Routine use of evidence-based perioperative care pathways, including Enhanced Recovery After Surgery (ERAS)

principles where appropriate, may lead to further improvements in patient outcomes and reduction in length of hospital stay.

### Recommendations

1. Encourage early diagnosis and prompt referral for suspected intestinal obstruction.
2. Prompt CT evaluation of patients with an uncertain diagnosis or with suspected bowel ischemia should be encouraged.
3. Optimize nutrition and control comorbidities before surgery, if possible.
4. Enhance antimicrobial stewardship and infection prevention in the perioperative period.
5. Perform prospective multicenter studies with larger sample size to confirm the present findings.
6. Develop institution-specific clinical prediction models to identify patients at high risk of bowel gangrene and postoperative complications.
7. Future studies should look at long-term outcomes, recurrence rates, quality of life, and healthcare costs.

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### Conflict of Interest

The authors declare that they have **no conflicts of interest** related to this study.

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