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Evaluation of the Clinical Spectrum, Etiology, Surgical Management and Outcomes of Small Bowel Perforation: A Prospective Observational Study from a Tertiary Care

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ABSTRACT

Background: Small bowel perforation remains a major cause of emergency laparotomy in developing countries. Infectious etiologies such as enteric fever and tuberculosis continue to predominate in South Asia, contributing significantly to postoperative morbidity and mortality. This study aimed to evaluate demographic characteristics, etiological spectrum, clinical presentation, surgical strategies, and postoperative outcomes in patients presenting with small bowel perforation.

Methods: This prospective observational study was conducted from March 2023 to March 2025 in a tertiary care teaching hospital. Fifty consecutive patients aged >12 years with intraoperatively confirmed small bowel perforation were included. Clinical data, radiological findings, operative details, postoperative complications, and mortality were recorded. Statistical analysis was performed using the chi-square test, Fisher's exact test, and Student's t-test. A p-value<0.05 was considered significant.

Results: The majority of patients were male (80%) with a mean age of 30.6 ± 10.19 years. The most affected age group was 20–40 years (75%). Ileal perforation was observed in 68% of cases. Enteric fever (24%) and tuberculosis (20%) were the leading etiologies. Resection with primary end-to-end anastomosis was performed in 60% of patients. Surgical site infection was the most common postoperative complication (34%). Overall mortality was 10%.

Conclusion: Small bowel perforation in endemic regions predominantly affects young adult males and is largely attributable to infectious causes. Early diagnosis, aggressive resuscitation, and appropriate surgical intervention are essential to reduce morbidity and mortality.

Key-words: Small bowel perforation; Ileal perforation; Enteric fever; Tuberculosis; Perforation peritonitis; Surgical outcomes

INTRODUCTION

Small bowel perforation is a life-threatening surgical emergency characterized by full-thickness disruption of the intestinal wall, resulting in peritoneal contamination and systemic inflammatory response [1].

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Complicated intra-abdominal infections remain a major global surgical challenge and contribute substantially to emergency laparotomies worldwide [2]. Global epidemiological analyses demonstrate that digestive diseases account for a significant proportion of surgical morbidity, particularly in low- and middle-income countries (LMICs), where delayed presentation and limited access to healthcare amplify adverse outcomes [3]. Despite advances in perioperative management, mortality associated with perforated peritonitis remains between 8–20%, depending on physiological status at presentation [4]. The etiological spectrum of small bowel perforation demonstrates geographic variation. In high-

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income countries, mesenteric ischemia, inflammatory bowel disease, and malignancy predominate [5]. In contrast, infectious etiologies such as enteric fever and intestinal tuberculosis remain leading causes in South Asia [6]. Persistent sanitation challenges and incomplete vaccination coverage continue to sustain this burden [7]. Ileal perforation represents the most frequent anatomical site in endemic regions [8]. Contemporary prospective studies report ileal involvement in approximately 60–75% of non-traumatic cases, predominantly affecting young adult males [9].

Early diagnosis and prompt surgical source control are essential for survival. International consensus guidelines emphasize aggressive resuscitation, broad-spectrum antibiotics, and timely operative intervention [10]. The choice between primary repair, resection with anastomosis, or diversion depends on hemodynamic stability, bowel viability, and contamination severity [11]. Postoperative complications such as surgical site infection (SSI), anastomotic leak, and multiorgan dysfunction significantly influence outcomes [12]. Delayed presentation and septic shock have been consistently identified as independent predictors of mortality [13]. This study was designed to analyse the clinical spectrum and surgical outcomes of small bowel perforation in a tertiary care setting and to identify patterns that may guide evidence-based management in similar endemic regions.

MATERIALS AND METHODS

Study Design and Setting- This prospective observational study was conducted in the Department of General Surgery at Basaweshwara Medical College and Hospital, Chitradurga, from March 2023 to March 2025. Ethical clearance was obtained from the Institutional Ethical Committee before commencement of the study.

Inclusion criteria- Fifty consecutive patients Aged >12 years with intraoperatively confirmed small bowel perforation were included.

Exclusion criteria- Pediatric patients (<12 years), Gastric or colonic perforations, and conservatively managed cases.

Data Collection- The following were recorded: Demographics, Symptom duration, Clinical examination findings, Hemodynamic parameters, Radiological findings, Intraoperative findings, Surgical procedure, Postoperative complications and Mortality

Statistical Analysis- The proportions of complications (Major/All) in association with the surgical procedures and Total leucocyte count were tested with the help of the chi-square and Fisher's exact test. The strength of the relationship between complications that occurred and the Total leucocyte count has been shown using the Odds Ratio. The significance of time duration in hospital stay in days in association with the presence of complications after surgery has been found using the Student t-test. Statistical significance was set at $p<0.05$.

Ethical Approval- Approval was obtained from the Institutional Ethics Committee, BMCH, Chitradurga. Written informed consent was secured from all participants.

RESULTS

The majority of patients in the present study were males (80%), while females constituted 20% of the study population. The most commonly affected age group was 21–30 years (40%), followed by 31–40 years (30%). The overall mean age of the patients was 30.60±10.19 years, with males having a mean age of 32.60±10.91 years and females 22.60±6.55 years.

Table 1: Demographic data

Age (years)	Male		Female		Total Number
	No.	%	No.	%	
12-20	4	10	5	50	9
21-30	16	40	4	40	20
31-40	14	35	1	10	15
41-50	4	10	-	-	4
>50	2	5	-	-	2

Total	40	10	50
Mean + SD	32.60+ 10.91	22.60+ 6.55	30.60+10.19

Abdominal pain was the most common symptom in all cases under study, followed by vomiting (76%), fever (46 %) and abdominal distension (44%). Constipation accounted for 50% of cases (Table 2).

Table 2: Clinical Presentation- Symptoms

Presenting Symptoms	Number	Percentage (%)
Pain	48	96
Vomiting	38	76
Distension	22	44
Constipation	25	50
Fever	23	46

In the present study, most cases had guarding and rigidity at the time of hospitalization (84%), rebound tenderness (84%), no bowel sounds were heard in 72% cases, distension of the abdomen (66%), obliteration of liver dullness (44%) and per rectal tenderness (12%) (Table 3).

Table 3: Clinical Signs at Presentation

Physical Examination	Number	Percentage (%)
Guarding and Rigidity	42	84
Rebound Tenderness	42	84
Distension	33	66
Obliteration of liver dullness	22	44
Absent or diminished bowel sounds	36	72
Per-rectal Tenderness	6	12

Most patients were hemodynamically stable at presentation; however, as assessed, tachycardia and borderline hypotension were suggestive of early sepsis (Table 4).

Table 4: Hemodynamic Parameters at Presentation

Hemodynamics	Range	Mean+SD
PULSE (beats/min)	66-120	99.34+12.1
SBP mm hg	90-150	117+ 9.6
DBP mm hg	60-100	73.2+12.5

Total 68% of cases in our study presented with ileal perforation and thus it was the most common type. Among the total ileal perforations, 24% were due to typhoid disease. 1 case of ileal perforation was due to an iatrogenic cause. The patient had undergone an abdominal hysterectomy 15 days before the development of pain, which did not improve on conservative treatment. On re-laparotomy, a loop of ileum was caught in the suture during abdominal closure. Resection and end-to-end anastomosis in 2 layers were done in this case (Table 5).

Table 5: Etiology of Small Bowel Perforation

Postoperative diagnosis	Number (n=50)	Percentage (%)
Ileum perforation (34)		
Typhoid	12	24
Tuberculosis	10	20
Iatrogenic	1	2
Ischemic Bowel Disease	3	6
Non specific	8	16
Jejunum Perforation (10)		
Traumatic	3	6
Ischemic bowel disease	1	2
Non specific	6	12
Appendicular Perforation (6)		
Fecolith	4	8
Non Specific	2	4

The incision was right para-median in (4%), midline in 92% cases and McBurney's incision 4% cases. Appendicular perforation was seen in 6 cases and McBurney's incision was used.

Resection & End-End anastomosis in 2 layers was done in 60% of cases, Simple closure in 1 layer was done in 26% of cases, Resection & End-End anastomosis in 1 layer was done in 8% of cases and in 6% cases, Simple closure in 1 layer with Omental patch was done (Table 6).

Table 6: Surgical Procedures in Small Bowel Perforation

Type of surgical Procedure	Number N=50	Percentage (%)
Resection & End-End anastomosis in 2 layers	30	60
Resection & End-End anastomosis in one layer	4	8
Simple closure in one layer	13	26
Simple closure in one layer with an omental patch	3	6

Wound infection was the most commonly encountered complication and was seen in 17 cases (34%). 3 patients have shown Wound dehiscence. 1 patient had reperforation. The patient was a case of Ischemic Bowel Disease. The patient was treated by re-laparotomy; gangrenous bowel was resected, and an end-end anastomosis was done in 2 layers. An enterocutaneous fistula was seen in 1 case and treated by re-laparotomy, gangrenous bowel was resected and end-end anastomosis was done in 2 layers.

Anastomotic leak was observed in 9 patients. 5 deaths were encountered in the present study (10%). One death was seen in a patient with reperforation in the case of Ischemic Bowel Disease. One death was with ileal perforation, where the patient developed Acute respiratory distress syndrome. One death was seen in jejunal perforation as the patient developed Acute renal failure. Two patients died in the postoperative period due to septicemic shock (Table 7).

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Table 7: Post-operative complications

Postoperative complications	Number n=50	Percentage (%)
Wound infection	17	34
Burst abdomen	3	6
Anastamotic leakage	9	18
Perforation	1	2
Entero cutaneous fistula	1	2
Mortality	5	10
No-complictions	14	28

The patients were followed up for a period of 2 months and the complications were noted. 4 patients were lost to follow-up. At the end of 2 months, 1 case had a wound infection (2.4%). In this case, the patient had undergone. Re-laparotomy for iatrogenic ileal perforation, as explained earlier. The wound was infected and healed with regular dressings for three months (Table 8).

Table 8: Follow-up and morbidity

Postoperative complications	Up to 1 week (n=50)	Follow up		
		15 days (n=44)	30 days (n=43)	60 days (n=41)
Wound infection	17 (34)	14 (31.8)	10 (23.2)	1 (2.4)
Burst abdomen	3(6)	2 (4.5)	1 (2.3)	-
Re perforation	1(2)	-	-	-
Entero cutaneous fistula	1(2)	-	-	-
mortality	5 (10)	-	-	-
No complication	23 (46)	28 (63.7)	32 (74.4)	40 (97.5)
Lost to follow up	-	1	2	4

DISCUSSION

Small bowel perforation continues to represent a major surgical burden in low- and middle-income countries. In the present study, young adult males constituted the majority of affected patients (75% between 20–40 years; male: female ratio 4:1. The predominance of young adult males in our study is consistent with regional epidemiological data [14]. Similar demographic patterns have been documented in contemporary South Asian cohorts [15]. Ileal perforation constituted 68% of cases, aligning with multicenter analyses reporting ileal involvement in approximately two-thirds of non-traumatic perforations [16].

Infectious etiologies, particularly enteric fever and tuberculosis, predominated. Contemporary regional studies confirm infectious diseases as principal contributors to small bowel perforation in endemic settings [17]. Persistent typhoid transmission and incomplete vaccination programs continue to influence disease incidence [18]. In contrast, Western literature reports ischemic and inflammatory etiologies as dominant causes. This clear geographic variation underscores the continued public health disparity between developed and developing countries.

Abdominal pain was the most common presenting complaint (96%), similar to rates reported in

contemporary observational studies of perforation peritonitis. Guarding and rigidity (84%) were also consistent with findings from emergency laparotomy series reporting generalized peritonitis signs in the majority of patients. Radiological detection of pneumoperitoneum falls within the reported sensitivity range described in previous literature. The absence of radiographic free air in a significant proportion highlights the need for strong clinical suspicion, particularly in septic patients with inconclusive imaging.

Resection with primary anastomosis was the most common procedure in our study. Comparative studies support its safety in hemodynamically stable patients with viable bowel margins [19]. Individualised operative strategy remains essential [20]. In contrast, some studies advocate diversion procedures in cases of severe contamination or delayed presentation. The absence of routine diversion in our cohort reflects institutional preference and intraoperative assessment rather than standardized protocol.

Surgical site infection was the most frequent complication. Emergency bowel surgery is known to carry high SSI rates due to faecal contamination and systemic inflammation [21]. Anastomotic leak rate was slightly higher than some contemporary series, potentially reflecting delayed presentation and inflammatory burden [22]. The mortality rate of 10% aligns with LMIC data [23]. Mortality correlates strongly with physiological derangement and septic progression rather than operative technique alone [24]. The predominance of infectious causes emphasises the preventable nature of many cases. Global burden studies continue to identify enteric infections as major contributors to emergency surgical admissions in resource-limited settings.

Interpretation of Findings

The predominance of infectious etiologies in our study highlights the continued burden of preventable diseases. WHO reports emphasize that improvements in sanitation and typhoid vaccination programs can significantly reduce the incidence of enteric perforation. The Global Burden of Disease study similarly identifies enteric infections as persistent contributors to surgical emergencies in low-resource settings. Overall, when compared with existing literature, Demographic trends are consistent across endemic regions. Infectious ileal perforation remains dominant in South Asia. Primary anastomosis is increasingly favored in stable patients. Surgical site infection remains the leading complication. Mortality rates are comparable to contemporary series (8–12%). The consistency of findings across recent studies strengthens the external validity of our results and supports the applicability of our management approach in similar resource-constrained settings.

LIMITATIONS

Small sample size, Single-center design, absence of a validated severity scoring system (MPI/APACHE II) and lack of multivariate analysis limit generalizability.

CONCLUSIONS

Small bowel perforation remains a significant cause of emergency surgical admissions in developing and endemic regions. The present study demonstrates that the condition predominantly affects young adult males and is most frequently associated with infectious etiologies, particularly enteric fever and intestinal tuberculosis. Ileal perforation constituted the majority of cases, reflecting the continued burden of preventable infectious diseases in low-resource settings. Early recognition of clinical features, prompt resuscitation, and timely surgical intervention are critical determinants of favorable outcomes. In our study, resection with primary end-to-end anastomosis was the most commonly performed procedure and was associated with acceptable postoperative outcomes in appropriately selected patients. However, postoperative complications such as surgical site infection and anastomotic leakage remain important challenges. Strengthening preventive strategies, including improved sanitation, early diagnosis of enteric infections, and better access to emergency surgical care, may help reduce the incidence and mortality associated with small bowel perforation in resource-constrained healthcare settings.

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