

A Clinical Study on Surgical Management and Outcome of Non-Traumatic Small Intestinal Perforation**Dilip Punnam¹, Shanker Dharmaraj Basa²**¹Assistant Professor, Department of General Surgery, Prathima Institute of Medical Sciences, Nagunoor Karimnagar, Telangana State.²Associate Professor, Department of General Surgery, Prathima Institute of Medical Sciences, Nagunoor Karimnagar, Telangana State.

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Abstract:**Background:** Small intestinal perforation peritonitis is a surgical emergency that has been a challenge for surgeons for centuries. Regardless of its cause, all cases of small intestinal perforation present similar clinical features leading to peritonitis with severe secondary bacterial infection, making it necessary to study this condition as a single entity. The present study was undertaken to determine the outcome of surgical management of small intestinal perforation.**Methods:** Following the diagnosis of perforation peritonitis, patients were resuscitated and prepared for exploratory laparotomy. During surgery, pathological findings were observed and addressed accordingly. Data was recorded using a comprehensive working proforma, which included relevant demographic details, clinical findings, and radiological and pathological information. Patients were monitored postoperative to assess complications, morbidity, and mortality rates.**Results:** Non-traumatic small intestine perforations predominantly affected young to middle-aged adults, with males accounting for 65% of cases. Abdominal pain was the universal presenting symptom in 100% of cases. Other common symptoms included vomiting (75%), constipation (55%), fever (47.5%), and loose motions (12.5%). Significant abdominal signs were guarding and rigidity (97.5%), rebound tenderness (87.5%), distension (95%), obliteration of liver dullness (87.5%), and absent bowel sounds (90%). Typhoid and nonspecific inflammation were the most common causes, accounting for 37.5% and 35% of cases, respectively. Tuberculosis, jejunal diverticulosis, and Meckel's diverticulum were less frequent, representing 20%, 5%, and 2.5% of cases, respectively. Simple closure with drainage was the most common surgical procedure.**Conclusions:** Small intestinal perforation is a severe condition with high morbidity and mortality, predominantly affecting young and middle-aged males. Key symptoms include deep abdominal pain, vomiting, and fever, often caused by typhoid or nonspecific inflammation. Early diagnosis, surgical intervention, and strict aseptic care are crucial for improving outcomes.**Keywords:** Non-traumatic, Small Intestine, Perforation, Surgical Management.

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Introduction

Perforation of the small intestine is a severe and life-threatening pathology that is typically associated with the formation of peritonitis and inflammation of the peritoneum. Small intestinal perforation peritonitis is a complex and challenging surgical emergency that urgently requires the attention of the surgeon and proper treatment to prevent serious outcomes [1,2]. The causes of atraumatic small intestine perforation (ASP) are many and may be broadly divided into traumatic and non-traumatic aetiologies [3]. Traumatic causes include any injury that has resulted in the formation of a defect or perforation to any organ in the abdomen, whether blunt or penetrating in nature, while non-traumatic causes are a vast category. Non-traumatic small intestinal perforations can

occur due to a variety of factors, including infections and typhoid fever, it is one of the most common causes of small intestinal perforation especially in the developing world [4-6]. Tuberculosis: Another major contributing factor to small bowel perforation, particularly in areas where the condition is rampant [1,6]. Crohn's disease: This most frequently induces spontaneous small bowel perforation in the developed world owing to necrosis and ulceration [7-8]. Diverticular disease: The same source also indicated that apart from bleeding, perforation of the small bowel diverticula may cause peritonitis [9]. The malignant causes are Intestinal lymphoma: In general, small bowel perforation is extremely rare while patients with T-cell lymphoma have only been reported in a few

instances [10]. Perforations can also be noted in relation to small bowel tumors whether they are benign or malignant [11]. Iatrogenic causes included perforation during endoscopic procedures: As mentioned above, small bowel perforations may be observed in cases with complications of endoscopic procedures like capsule endoscopy or enteroscopy. The other cause is foreign body ingestion: Accomplishing this process, one can realize that sharpened objects, including fish bones, can result in penetration and, therefore, injury to the small intestine [12-14]. Pathophysiological conditions which include mesenteric ischemia, and other nontraumatic small bowel vascular lesions predispose the small bowel to necrosis and perforation [11]. Small intestinal perforation can may also occur as a primary event and its incidence, and specific causes are related to geographical regions and the population type. This highlights the need for proper classification of this condition based on the wide etiologic variations always present clinically. The clinical presentation of patients with small intestinal perforation peritonitis exhibits a cluster of symptoms that are related to the overall extent of peritonitis as well as the inflammation of the peritoneum. Common clinical features include [15]. Abdominal pain: The severe, sudden onset of abdominal pain is the most constant feature with localization to the place of perforation. Abdominal distension and guarding: Some of these effects are generalized abdominal distension and guarding or rigidity. Fever and tachycardia: The patient could feel fever and a rise in pulse rate and other kinetics of inflammation of the system. Nausea, vomiting, and obstipation: Nausea, vomiting, and obstipation are various other side effects often associated with gastrointestinal tracts. Shock and dehydration: In severe cases, they may experience hypovolemic shock-like features and be seriously dehydrated. Different methods of diagnosis have been employed in the past, some of these include straight X-ray abdomen, peritoneal tap, hematological investigations, culture sensitivity tests, weld test, and CT scan. However, laparotomy still retains its status as the gold standard in the diagnosis of the cause of peritonitis, to outcome of the cause through biopsy, the location of leakage accurately identified from this procedure, and consequently its treatment. With this background, the present study was carried out in the Department of General Surgery, Prathima Institute of Medical Sciences, Karimnagar to determine the surgical management and outcome of small intestinal perforation in the cases presenting to our hospital.

Material and Methods

This cross-sectional interventional study was conducted in the Department of General Surgery, Prathima Institute of Medical Science, Naganoor, Karimnagar. Institutional Ethical approval was obtained for the study. Written consent was obtained from all the participants or the parent/guardian if the patient was a minor included in the study.

Inclusion Criteria

1. Aged 12 and above
2. Males and Females
3. With suspected nontraumatic peritoneal perforation
4. Willing to participate in the study voluntarily

Exclusion Criteria

1. Not as per inclusion criteria
2. Traumatic small intestine perforations
3. Cases managed conservatively

Following the diagnosis of perforation peritonitis, patients were resuscitated and prepared for exploratory laparotomy. During surgery, pathological findings were observed and addressed accordingly. Data was recorded using a comprehensive working proforma, which included relevant demographic details, clinical findings, and radiological and pathological information. Patients were monitored postoperative to assess complications, morbidity, and mortality rates. The data was analyzed to evaluate the effectiveness of clinical features and investigations in diagnosis.

Statistical Analysis: All the available data was refined and uploaded to an MS Excel spreadsheet and analyzed by using SPSS 22 in Windows format. The continuous variables were represented as mean, standard deviation, and percentages, and the categorical variables were calculated using a chi-square test to determine differences between the two groups.

Results

The study included a total of 40 patients. The age group distribution is depicted in Table 1. There were 26 male patients (65%) and 14 female patients (35%). The most affected age group was 21-30 years, comprising 11 cases (27.5%). The youngest age group (12-20 years) had the lowest number of cases with only 5(12.5%). Both males and females were distributed relatively evenly across the age groups, with no significant gender disparities observed within specific age brackets. The results indicate that small intestinal non-traumatic perforations predominantly affect young to middle-aged adults, with the 21-30 age group being the most vulnerable.

Table 1: Age Distribution of Patients with Small Intestinal Non-Traumatic Perforations

Age group	Male	Female	Total
12 - 20	3	2	5
21 - 30	8	3	11
31 - 40	6	4	10
41 - 50	5	3	8
51 - 60	4	2	6
Total	26	14	40

Figure 1 presents the frequency and percentage of presenting symptoms and abdominal signs in patients with small intestinal perforations. Abdominal pain was the most common presenting symptom, observed in all cases (100%) Other Symptoms: Vomiting, constipation, fever, and loose motions were less frequent but still significant.

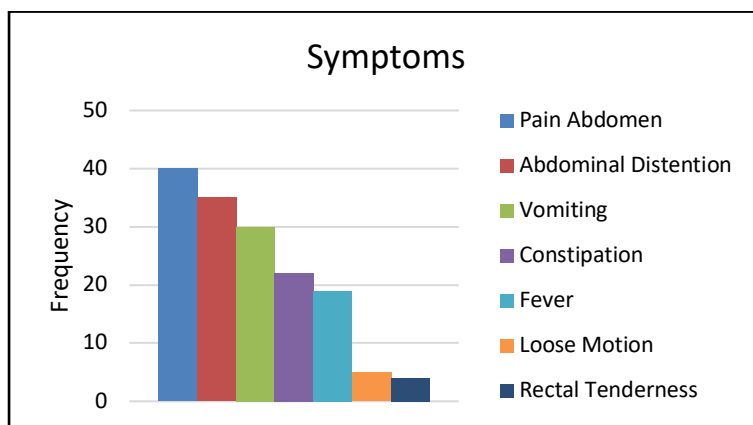


Figure 1: Presenting Symptoms in Small Intestinal Perforation

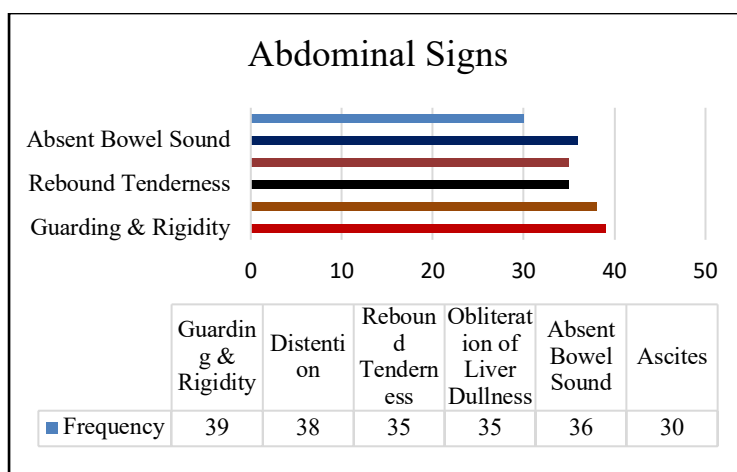


Figure 2: Presenting Abdominal Signs in Small Intestinal Perforation

Figure 2 depicts the frequency of Abdominal Signs: Guarding and rigidity, rebound tenderness, distension, and obliteration of liver dullness were present in a majority of patients (75-97.5%). Absent Bowel Sounds: A high percentage of patients (90%) exhibited absent bowel sounds. The results indicate that abdominal pain, guarding and rigidity, rebound tenderness, distension, and absent bowel sounds are the most reliable indicators of small intestinal perforation. These signs should be considered as red flags for this condition. While fever, vomiting, constipation, and loose motions can be associated with small intestinal perforation, their absence does not exclude the diagnosis.

The distribution of symptom duration in patients with intestinal perforation before seeking medical attention. The majority of patients (77.5%) presented within 24 hours of symptom onset. Delayed Presentation: A significant proportion (30%) of patients presented between 24 and 48 hours after symptom onset. Rare Delayed Presentation: Only a small percentage (12.5%) of patients presented more than 72 hours after symptom onset. The data suggests that most patients with intestinal perforation seek medical attention relatively promptly after symptom onset. However, a substantial number of patients experience a delay in presentation, which can

potentially impact the severity of the condition and treatment outcomes. Early diagnosis and

intervention are crucial for optimal management of intestinal perforation.

Table 2: Primary Surgical Procedure performed in cases of intestinal perforation

Surgical Procedure	Frequency	Percentage
Simple Closure with Drainage	25	62.5
Resection & Anastomosis with Bypass and Drainage	11	27.5
Resection & Anastomosis and Drainage without Bypass	3	7.5
Resection & End Ileostomy with Drainage	1	2.5

Table 2 presents the frequency and percentage of different surgical procedures performed in cases of intestinal perforation. Dominant Procedure: the common surgical procedure performed was simple closure with drainage was the most common surgical intervention, accounting for 62.5% of cases. Resection and Anastomosis: This procedure was performed in 30% of cases, with and without bypass. Resection with Ileostomy: This was the least common procedure, performed in only 2.5% of cases. The choice of surgical procedure for intestinal perforation was influenced by various

factors, including the location and extent of the perforation, the patient's overall condition, and the surgeon's preference. Simple closure with drainage is the preferred approach in a majority of cases, indicating that these perforations are often localized and without extensive bowel damage. However, in cases involving more severe or extensive perforations, resection and anastomosis with or without bypass become necessary. Ileostomy was reserved for complex cases where primary repair was not feasible.

Table 3: Histopathology of Perforation Margins and Lymph Nodes

Histopathology	Frequency	%
Typhoid	15	37.5
Tuberculosis	8	20.0
Jejunal Diverticulosis with Necrosis	2	5.0
Meckel's Diverticulum	1	2.5
Nonspecific Inflammation	14	35.0

Analysis of Table 3: Histopathology of Perforation Margins and Lymph Nodes Typhoid and nonspecific inflammation were the most common histopathological findings, each accounting for 35% of the cases. Tuberculosis: A significant proportion (20%) of perforations were associated with tuberculosis. Other Causes: Jejunal diverticulosis with necrosis and Meckel's diverticulum were less common, contributing to

5% and 2.5% of cases, respectively. The data indicates that infectious etiologies, particularly typhoid and tuberculosis, are the primary causes of intestinal perforation in this study population. Nonspecific inflammation suggests a broader spectrum of inflammatory conditions that might contribute to perforation. While diverticular disease and Meckel's diverticulum are less frequent causes.

Table 4: Post Operative Complications and secondary procedures performed

Complications	Secondary Procedure	Cases	%
Wound Infection	Dressing & Sec. Suturing	10	25.0
Burst Abdomen*	En-Mass Closure	1	2.5
Anastomotic Leak	Re-Exploration & Ileostomy	1	2.5
Enterocutaneous Fistula	Re-Exploration+ Resection & Anastomosis	1	2.5
ARDS	-	1	2.5
Mortality	-	2	5.0
No Complication	-	24	60.0

Table 4 presents the frequency and percentage of postoperative complications and the corresponding secondary procedures performed in a group of patients who underwent surgery for intestinal perforation. Wound infection was the most common complication, affecting 25% of patients. The table reveals a range of complications, from relatively minor (wound infection) to severe (burst

abdomen, anastomotic leak, enterocutaneous fistula). The mortality rate was 5%, indicating a significant risk associated with this condition. In 60% of cases, no complications were reported. The results show that post-operative complications are a significant concern in patients with intestinal perforation. Wound infection is a common issue, while more severe complications such as burst

abdomen, anastomotic leak, and enterocutaneous fistula require aggressive management. The mortality rate highlights the seriousness of this condition.

Discussion

This study was done to determine the outcome of non-traumatic small intestinal perforations reporting to our tertiary care teaching hospital. The important findings of the present study show that predominantly affected young to middle-aged adults, with males accounting for 65% of cases. Abdominal pain was the universal presenting symptom in 100% of cases. Other common symptoms included vomiting (75%), constipation (55%), fever (47.5%), and loose motions (12.5%). Significant abdominal signs were guarding and rigidity (97.5%), rebound tenderness (87.5%), distension (95%), obliteration of liver dullness (87.5%), and absent bowel sounds (90%). Typhoid and nonspecific inflammation were the most common causes, accounting for 37.5% and 35% of cases, respectively. Tuberculosis, jejunal diverticulosis, and Meckel's diverticulum were less frequent, representing 20%, 5%, and 2.5% of cases, respectively. Simple closure with drainage was the most common surgical procedure, performed in 62.5% of cases. Resection and anastomosis with or without bypass accounted for 30% of cases. Wound infection was the most frequent complication, occurring in 25% of cases. Severe complications such as burst abdomen, anastomotic leak, and enterocutaneous fistula had an incidence of 2.5% each, and the mortality rate was 5%.

Nair et al. [16] in a similar study observed that males are 3-4 times more likely to suffer from intestinal perforation as compared to females, with most patients being in their 2nd and 3rd decades of life. In our series, the most common presenting symptoms were abdominal pain (100%), abdominal distension, and vomiting. Additionally, 80% of patients exhibited tachycardia, and 70% were in shock at the time of presentation. Guarding, rigidity, and abdominal distension were present in all cases; rebound tenderness, obliterated liver dullness, and absent bowel sounds were observed in 90% of cases. Free peritoneal fluid was detected in 75% of cases, and per rectal tenderness was found in 10% of cases. The lower incidence of fever (45%) compared to Nair et al. [16] (100%) could be attributed to prior treatment and different etiologies. Dickson et al. [17] reported diarrhea in 42% of their series, whereas the low incidence of diarrhea (10%) in our series may be due to the absence of amoebiasis.

All patients underwent an abdominal X-ray in an upright position. Free gas under the diaphragm was observed in 90% of cases, while 50% showed distended intestinal loops with multiple fluid levels.

Serum creatinine levels were elevated in 34 cases, with 8 cases having values above 3 mg/dl. Hyponatremia was present in 92.5% of cases, and hypernatremia in 2.5%. Hypokalemia was detected in 60% of cases, and hyperkalemia in 5%. The Widal test was positive in 14 cases. All patients received preoperative resuscitation, including nasogastric aspiration, intravenous fluids, and antibiotics. Blood transfusion was necessary in 20% of cases, vasopressors in 22.5%, and oxygen in 10%. Ahmed et al. [18] recommended preoperative resuscitation followed by laparotomy. During laparotomy, purulent and feculent fluid was found in all 40 cases, with mesenteric lymphadenopathy in 25%. Karmakar et al. [19] reported 17 typhoid cases out of 30, while we observed 15 out of 40. The lower incidence may be due to early diagnosis and treatment with modern antibiotics. Tuberculosis was found in 8 cases, and perforated Meckel's diverticulum in 1 case, possibly due to the exclusion of children under 12 years from the study. In the remaining 14 cases, no specific cause was identified, leading them to be categorized as non-specific perforations. Nandkarni et al. [20] attributed the majority of small intestine perforations in tropical countries to typhoid, with roundworm being an associated finding. In this study, 5 cases, out of 40 required ICU care postoperatively. The indications for ICU care were lack of effort during anesthesia recovery, persistent severe shock, acute renal failure and ARDS not responding to non-invasive ventilation. Four cases required mechanical ventilation, and 5 cases required vasopressor support. During ICU care 2 patients succumbed to death. The cause of death was septic shock in one patient and acute or chronic kidney disease with progressive renal failure in one case.

In our study, we observed an overall mortality rate of 5%. Mortality was higher in patients over 50 years of age ($p < 0.001$), those with delayed presentation ($p = 0.001$), and patients requiring preoperative vasopressors ($p < 0.001$). Olurin et al. [21] reported a 31% mortality rate, Nadkarni et al. [20] noted 12.5%, and Khorwal et al. [22] reported 11% mortality in their series of non-traumatic small bowel perforations. The mortality rate in our study is considerably small because of the advent of modern techniques, early detection, and the availability of empirical antibiotics.

Conclusion

Small intestinal perforation is a severe condition with a great deal of morbidity and mortality rate. The study population was skewed towards the young and middle-aged male group of patients. Symptoms were mainly deep abdominal pain evidenced by other signs like vomiting, constipation, and a rise in body temperature. Typhoid fever and nonspecific inflammation

appear as the main causes. Surgical management mainly included simple closure and drainage, but resection and anastomosis had to be done in certain complicated cases. Wound infection was also a common postoperative event signifying the importance of aseptic surgery and postoperative nursing care. Delays in diagnosis and surgery should be avoided as much as possible to improve the overall prognosis of the disease. The circumstances that led to the formation of this condition require further research to find ways to prevent this lethal disease.

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