

ORIGINALARTICLE**Patterns of presentation, management, and outcomes of perforation peritonitis in a tertiary care center: an observational study**¹Praveen Pushkar, ²Arun Tungaria¹Assistant Professor, Department of General Surgery, Muzaffarnagar Medical College, Muzaffarnagar, Uttar Pradesh, India;²Assistant Professor, Department of General Surgery, Saraswathi Institute of Medical Sciences, Hapur, Uttar Pradesh, India**ABSTRACT:**

Background: Perforation peritonitis is a common and potentially fatal surgical emergency, particularly in developing countries, where delayed presentation and limited resources often complicate management. It results from a breach in the gastrointestinal tract leading to contamination of the peritoneal cavity, rapid progression to sepsis, and high postoperative morbidity and mortality. Despite advances in surgical techniques, antibiotics, and critical care, perforation peritonitis continues to pose significant challenges in tertiary care hospitals. Understanding local patterns of presentation, operative management, and outcomes is essential for optimizing treatment strategies and improving patient survival. **Aim:** The aim of this study was to evaluate the patterns of clinical presentation, management approaches, and outcomes of patients with perforation peritonitis treated at a tertiary care center. **Materials and Methods:** This observational study included 74 patients diagnosed with perforation peritonitis and admitted to a tertiary care teaching hospital. Patients of all age groups and both sexes with clinical, radiological, and/or intraoperative confirmation of gastrointestinal perforation were included, while primary peritonitis, traumatic perforations, and postoperative anastomotic leaks were excluded. Data were collected prospectively using a structured proforma and included demographic details, clinical presentation, comorbidities, laboratory and radiological findings, intraoperative details, surgical procedures performed, postoperative complications, and outcomes. Statistical analysis was performed using Statistical Package for the Social Sciences (SPSS) version 21.0, with categorical variables expressed as frequencies and percentages and a p-value <0.05 considered statistically significant. **Results:** The mean age of patients was 46.72 ± 15.38 years, with a male predominance (75.68%). Abdominal pain was the universal presenting symptom, followed by vomiting (66.22%) and abdominal distension (56.76%). Gastroduodenal perforation was the most common site (39.19%), and peptic ulcer disease was the leading etiology (36.49%). Primary closure (35.14%) and omental patch repair (29.73%) were the most frequently performed surgical procedures. Postoperative complications occurred in a significant proportion of patients, with surgical site infection being the most common (28.38%). ICU admission was required in 35.14% of cases, and overall mortality was 10.81%. Delayed presentation, presence of comorbidities, and septic shock were significantly associated with increased mortality. **Conclusion:** Perforation peritonitis continues to be associated with considerable morbidity and mortality in tertiary care settings. Early presentation, prompt resuscitation, timely surgical intervention, and meticulous postoperative care are crucial in improving outcomes.

Keywords: Perforation peritonitis; Emergency laparotomy; Gastrointestinal perforation; Postoperative complications; Mortality

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INTRODUCTION

Perforation peritonitis remains one of the most frequent and life-threatening surgical emergencies encountered in tertiary care centers. It represents the end result of a full-thickness breach in the gastrointestinal tract with subsequent spillage of gas, enteric contents, and bacteria into the peritoneal cavity, rapidly progressing from localized inflammation to generalized peritonitis, systemic inflammatory response, sepsis, and multi-organ dysfunction if untreated. Despite advances in diagnostic imaging, critical care, antibiotics, and operative technique, outcomes are still strongly influenced by the initial physiological insult and the speed with which definitive source control is achieved. Contemporary guidance on intra-abdominal infection management emphasizes early recognition,

prompt resuscitation, timely antimicrobial therapy, and definitive source control as the cornerstones of care, highlighting that delays at any step can translate into higher morbidity, prolonged hospitalization, and mortality.^{1,2} The clinical phenotype of perforation peritonitis is typically acute, but its severity varies widely depending on the site of perforation, the extent of contamination, the host response, and the presence of comorbid illness. Patients often present with sudden severe abdominal pain, evolving generalized tenderness and guarding, abdominal distension due to paralytic ileus, vomiting, and features of dehydration or shock in advanced cases. However, the classical presentation may be blunted in elderly individuals, immunocompromised patients, or those receiving steroids, resulting in delayed diagnosis and later presentation with established sepsis. Perforated peptic

ulcer, a key contributor to emergency peritonitis, has been described as a global emergency condition with substantial short-term morbidity and mortality, and meaningful geographic variation in demographics, risk factors, and outcomes.³In low- and middle-income settings, the burden of delayed presentation is particularly important because it directly increases bacterial load, inflammatory severity, metabolic derangements, and organ dysfunction at the time of surgery. Multiple clinical series have emphasized the prognostic impact of “time to operation” in perforation, with later intervention correlating with higher morbidity and mortality. In perforated peptic ulcer specifically, the perforation-operation interval has been demonstrated as a critical mortality indicator, supporting the concept that early operative source control is not simply desirable but prognostically decisive.⁴Management of perforation peritonitis is inherently multidisciplinary and time-sensitive. Initial care typically includes rapid hemodynamic stabilization with intravenous fluids, nasogastric decompression, urinary output monitoring, early broad-spectrum antibiotics guided by likely source, and correction of electrolyte and acid–base disturbances, followed by operative source control. Operative strategy is individualized according to anatomical site, tissue viability, contamination, and patient physiology, ranging from simple closure (including omental patch for peptic ulcer perforation) to segmental resection with anastomosis or diversion stoma in unstable patients or gross contamination. Large institutional experiences from high-volume centers illustrate that the need for stoma formation, intensive postoperative monitoring, and complication management is common in perforation peritonitis, particularly where infectious etiologies and severe contamination predominate.^{5,6}

MATERIALS AND METHODS

This observational study was conducted at a tertiary care teaching hospital with facilities for emergency surgical services, advanced imaging, intensive care, and postoperative monitoring. The study aimed to evaluate the patterns of presentation, management strategies, and outcomes of patients presenting with perforation peritonitis. A total of 74 patients diagnosed with perforation peritonitis were included in the study. All patients presenting to the emergency department and subsequently admitted under the department of general surgery with clinical, radiological, and/or intraoperative confirmation of gastrointestinal perforation were considered eligible. Patients of all age groups and both genders were included. Patients with primary peritonitis, postoperative anastomotic leaks, or traumatic perforations were excluded from the study.

Methodology

Data were collected prospectively using a structured proforma. Demographic variables such as age and sex

were recorded. Clinical parameters included presenting symptoms (abdominal pain, vomiting, abdominal distension, fever, constipation), duration of symptoms prior to presentation, vital signs at admission, and comorbid conditions such as diabetes mellitus, hypertension, chronic kidney disease, chronic liver disease, and chronic obstructive pulmonary disease. Laboratory investigations including hemoglobin levels, total leukocyte count, serum electrolytes, renal function tests, and serum albumin were documented. Radiological findings from erect abdominal and chest radiographs and ultrasonography or computed tomography, where available, were noted.

Intraoperative details were documented for all patients undergoing surgical intervention. The site of perforation (gastroduodenal, small bowel, appendicular, or colonic), number of perforations, size of perforation, degree of peritoneal contamination, and nature of peritoneal fluid were recorded. The probable etiology of perforation such as peptic ulcer disease, enteric perforation, appendicitis, tuberculosis, malignancy, or nonspecific causes was also analyzed. All patients received initial resuscitation with intravenous fluids, nasogastric decompression, broad-spectrum intravenous antibiotics, and correction of electrolyte imbalances. Surgical management was individualized based on the patient’s clinical condition, site of perforation, and intraoperative findings. Surgical procedures included primary repair, omental patch repair, resection with anastomosis, resection with stoma formation, or appendectomy, as indicated. Postoperative care included monitoring in the surgical ward or intensive care unit depending on patient status.

Outcome parameters assessed included postoperative complications such as surgical site infection, wound dehiscence, intra-abdominal collections, septic shock, respiratory complications, and need for re-exploration. Duration of hospital stay, requirement for intensive care support, and in-hospital mortality were also recorded. Patients were followed until discharge or death.

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) version 21.0. Continuous variables were expressed as mean and standard deviation or median and range as appropriate. Categorical variables were presented as frequencies and percentages. Associations between clinical variables and outcomes were assessed using appropriate statistical tests. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 summarizes the demographic characteristics of the 74 patients included in the study. The largest proportion of patients belonged to the 31–50 years age

group (28/74; 37.84%), followed closely by those aged 51–70 years (26/74; 35.14%). Younger patients aged ≤30 years constituted 12/74 (16.22%), while elderly patients above 70 years formed the smallest group (8/74; 10.81%). The mean age of presentation was 46.72 ± 15.38 years, indicating that perforation peritonitis predominantly affected middle-aged individuals. There was a marked male predominance, with 56 males (75.68%) compared to 18 females (24.32%), reflecting a higher burden of disease among males in this cohort.

Table 2 describes the clinical presentation and comorbidity profile. Abdominal pain was the universal presenting symptom, reported in 100.00% (74/74) of patients, consistent with the acute inflammatory nature of perforation peritonitis. Vomiting was the second most common symptom, present in 49/74 (66.22%), followed by abdominal distension in 42/74 (56.76%), suggesting frequent paralytic ileus and bowel dysfunction. Fever was observed in 31/74 (41.89%), indicating systemic inflammatory response in a significant proportion, while constipation was reported in 28/74 (37.84%), likely reflecting ileus or delayed bowel transit due to peritonitis. With respect to comorbidities, diabetes mellitus was the most frequent (18/74; 24.32%), followed by hypertension (15/74; 20.27%). Chronic kidney disease (6/74; 8.11%), chronic liver disease (5/74; 6.76%), and COPD (4/74; 5.41%) were less common but clinically relevant due to their impact on surgical risk and recovery. Importantly, patients with one or more comorbidities demonstrated a significantly higher rate of postoperative complications (p = 0.032), indicating that pre-existing systemic illness contributed to adverse postoperative outcomes.

Table 3 presents the anatomical site and etiology of perforation. Gastroduodenal perforations were the most frequent site, seen in 29/74 (39.19%), followed by small bowel perforations in 24/74 (32.43%). Appendicular perforation accounted for 13/74 (17.57%), while colonic perforation was least common (8/74; 10.81%). Regarding etiology, peptic ulcer disease was the leading cause (27/74; 36.49%), corresponding well with the predominance of gastroduodenal perforations. Enteric perforation constituted 21/74 (28.38%), representing a major burden of infectious small bowel perforation in this setting. Appendicitis was responsible for 13/74 (17.57%), aligning with appendicular perforation frequency. Tuberculosis-related perforation was noted in 7/74 (9.46%), while malignancy accounted for 6/74 (8.11%), reflecting less frequent but high-risk

etiologies. A statistically significant association between etiology and site of perforation was observed (p < 0.001), meaning that the underlying cause strongly influenced the anatomical location of perforation.

Table 4 outlines surgical procedures performed and postoperative complications encountered. The most common operative procedure was primary closure, performed in 26/74 (35.14%), reflecting cases where perforation size and local pathology allowed direct repair. Omental patch repair was done in 22/74 (29.73%), typically suggestive of gastroduodenal perforation management. Resection with anastomosis was required in 14/74 (18.92%), indicating non-viable bowel segments or multiple perforations, whereas resection with stoma formation was performed in 7/74 (9.46%), usually in cases of severe contamination, unstable physiology, or unhealthy bowel where diversion was safer. Appendectomy accounted for 5/74 (6.76%), consistent with the appendicular perforation subgroup. Postoperative complications were notable; surgical site infection was the most common complication (21/74; 28.38%), highlighting the contaminated nature of emergency peritonitis surgery. Wound dehiscence occurred in 11/74 (14.86%), while respiratory complications were seen in 10/74 (13.51%), possibly related to sepsis, anesthesia risk, and postoperative immobility. Intra-abdominal collections were found in 9/74 (12.16%), and septic shock was documented in 7/74 (9.46%), representing severe systemic sepsis. Postoperative complications were significantly higher among patients with gross peritoneal contamination (p = 0.018), emphasizing that the extent of contamination is a key determinant of morbidity.

Table 5 presents key outcome indicators and mortality. ICU admission was required in 26/74 (35.14%), indicating that over one-third of patients needed intensive monitoring or organ support. Prolonged hospitalization (>10 days) was observed in 31/74 (41.89%), suggesting substantial postoperative morbidity and recovery time in many patients. Re-exploration was required in 6/74 (8.11%), implying complications such as persistent sepsis, collections, leakage, or wound-related issues. Overall mortality was 8/74 (10.81%), reflecting the high-risk nature of perforation peritonitis even in a tertiary care setting. Mortality showed significant association with delayed presentation beyond 24 hours (p = 0.004), presence of comorbidities (p = 0.021), and septic shock (p < 0.001), indicating that late arrival, poor physiological reserve, and severe sepsis were the strongest predictors of death in this cohort.

Table 1: Demographic Profile of Study Population (n = 74)

Variable	Number (n)	Percentage (%)
Age group (years)		
≤30	12	16.22
31–50	28	37.84
51–70	26	35.14

>70	8	10.81
Sex		
Male	56	75.68
Female	18	24.32

Mean age of patients was **46.72 ± 15.38 years**. Male predominance was observed.

Table 2: Clinical Presentation and Comorbidities

Clinical Parameter	Number (n)	Percentage (%)
Abdominal pain	74	100.00
Vomiting	49	66.22
Abdominal distension	42	56.76
Fever	31	41.89
Constipation	28	37.84
Comorbidities		
Diabetes mellitus	18	24.32
Hypertension	15	20.27
Chronic kidney disease	6	8.11
Chronic liver disease	5	6.76
COPD	4	5.41

Patients with comorbidities showed a **significantly higher rate of postoperative complications** ($p = 0.032$).

Table 3: Site and Etiology of Perforation

Variable	Number (n)	Percentage (%)
Site of perforation		
Gastroduodenal	29	39.19
Small bowel	24	32.43
Appendicular	13	17.57
Colonic	8	10.81
Etiology		
Peptic ulcer disease	27	36.49
Enteric perforation	21	28.38
Appendicitis	13	17.57
Tuberculosis	7	9.46
Malignancy	6	8.11

Gastroduodenal perforation was the most common site. Etiology was **significantly associated with site of perforation** ($p < 0.001$).

Table 4: Surgical Management and Postoperative Complications

Variable	Number (n)	Percentage (%)
Surgical procedure		
Primary closure	26	35.14
Omental patch repair	22	29.73
Resection with anastomosis	14	18.92
Resection with stoma	7	9.46
Appendectomy	5	6.76
Postoperative complications		
Surgical site infection	21	28.38
Wound dehiscence	11	14.86
Intra-abdominal collection	9	12.16
Septic shock	7	9.46
Respiratory complications	10	13.51

Postoperative complications were significantly higher in patients with gross peritoneal contamination ($p = 0.018$).

Table 5: Outcomes and Mortality Analysis

Outcome Parameter	Number (n)	Percentage (%)
ICU admission	26	35.14
Hospital stay >10 days	31	41.89

Re-exploration required	6	8.11
Mortality	8	10.81

Mortality was significantly associated with delayed presentation (>24 hours), presence of comorbidities, and septic shock ($p = 0.004$, 0.021 , and <0.001 respectively).

DISCUSSION

Perforation peritonitis in the present cohort predominantly affected middle-aged adults, with a mean age of 46.72 ± 15.38 years and the highest proportion in the 31–50 years group (37.84%), along with a clear male predominance (75.68%). This pattern differs slightly from the relatively younger profile reported by Yadav et al (2012) from Delhi, where the mean age was 33.9 years and males constituted 64/77 (83.12%), suggesting that the age at presentation may shift upward depending on regional disease patterns and referral characteristics of tertiary centers.⁷

Abdominal pain was universal in this study (100.00%), followed by vomiting (66.22%) and abdominal distension (56.76%), indicating frequent ileus and systemic inflammatory response in a large subset (fever 41.89%). These findings are broadly comparable to the large Indian series of Jhobta et al (2006), who also reported abdominal pain in nearly all patients (98%), with vomiting (59%) and distension (44%) being common accompanying symptoms, while constipation in our cohort (37.84%) closely mirrors the constipation/altered bowel pattern often described in tropical perforation peritonitis presentations.⁸

Comorbid illness was frequent in the present study, particularly diabetes mellitus (24.32%) and hypertension (20.27%), and comorbidities significantly increased postoperative complications ($p = 0.032$). In comparison, Bali et al (2014) documented comorbid conditions in their 400-patient series, with respiratory disease 60/400 (15.00%), diabetes 41/400 (10.25%), renal disease 36/400 (9.00%), and hypertension 16/400 (4.00%), showing that the burden and type of comorbidity can vary substantially, but consistently acts as a key modifier of postoperative risk in perforation peritonitis.⁹

Regarding anatomical distribution, the present study showed gastroduodenal perforation (39.19%) as the commonest site, followed by small bowel (32.43%), then appendicular (17.57%) and colonic (10.81%) perforations, reinforcing the predominance of upper gastrointestinal sources in many Indian settings. This aligns with the long-term Indian experience described by Dorairajan et al (1995) in a decade-long analysis of 250 surgical peritonitis cases, where the authors emphasized that upper gastrointestinal tract perforations constitute the majority in contrast to Western series where distal perforations are more frequent, supporting the concept that geographic and etiologic factors strongly influence site distribution.¹⁰ Etiologically, peptic ulcer disease (36.49%) was the leading cause in this study, followed by enteric perforation (28.38%), appendicitis (17.57%),

tuberculosis (9.46%), and malignancy (8.11%), and etiology was significantly associated with site ($p < 0.001$). In the Eastern experience reported by Afridi et al (2008), acid peptic disease accounted for 45% (predominantly duodenal 43.6%), while tuberculosis (21%) and typhoid (17%) together formed a major share of small-bowel perforations; their overall malignancy-related perforation rate was lower (2.6%) than ours (8.11%), suggesting that a tertiary referral mix (including suspected/known cancers and late presenters) may increase the observed malignant perforation proportion.¹¹

Management in the present study most commonly involved primary closure (35.14%) and omental patch repair (29.73%), while resection with anastomosis (18.92%) and resection with stoma (9.46%) reflected more advanced disease, unhealthy bowel, or severe contamination. When compared with Chakma et al (2013), their large series reported Graham's omental patch repair in 56.72%, primary closure in 31.34%, and appendectomy in 11.65%, indicating that centers with a higher duodenal-ulcer perforation load tend to show a higher omental patch proportion, whereas the comparatively higher resection/anastomosis share in our cohort likely reflects a greater contribution from small-bowel enteric/tubercular pathology and complicated presentations.¹²

Postoperative morbidity in the present study was dominated by surgical site infection (28.38%), followed by wound dehiscence (14.86%), intra-abdominal collection (12.16%), respiratory complications (13.51%), and septic shock (9.46%), with complications being significantly higher in gross contamination ($p = 0.018$). In the decade-long surgical unit experience of Agarwal et al (2007) involving 260 patients, the incidence of major complications was 25%, including burst abdomen 11%, leak 5%, intra-abdominal abscess 5%, and multi-organ failure 6.5%; the higher infection/dehiscence burden in our cohort is consistent with heavily contaminated emergency laparotomies, while our septic shock rate underscores the contribution of advanced sepsis at presentation and early postoperative period.¹³

Outcome analysis in this study showed substantial resource utilization, with ICU admission in 35.14%, prolonged stay >10 days in 41.89%, re-exploration 8.11%, and overall mortality 10.81%. In comparison, the Central India tertiary-center study by Jain et al (2017) ($n = 110$) reported a higher mortality of 16.36% with overall morbidity of 63%, and their leading causes included peptic ulcer perforation (52/110) followed by typhoid and appendicular perforations, indicating that differences in delay,

physiologic derangement, and perioperative support can shift mortality even within tertiary settings; our comparatively lower mortality may reflect earlier operative control in some patients and/or case-mix differences despite notable ICU needs.¹⁴

Finally, mortality in the present study was significantly associated with delayed presentation >24 hours ($p = 0.004$), presence of comorbidities ($p = 0.021$), and especially septic shock ($p < 0.001$), emphasizing that physiologic reserve and sepsis severity are central determinants of survival. This is consistent with prognostic modeling work such as Sharma et al (2015) evaluating the Mannheim Peritonitis Index, where mortality rose significantly with higher risk strata and individual factors like organ failure and generalized peritonitis were strongly associated with death (with high statistical significance), reinforcing that early recognition, aggressive resuscitation, prompt source control, and intensive postoperative monitoring remain the most impactful levers to reduce perforation-peritonitis mortality.¹⁵

CONCLUSION

This study demonstrates that perforation peritonitis remains a serious surgical emergency with significant morbidity and mortality despite management in a tertiary care setting. Middle-aged males were most commonly affected, with gastroduodenal and small bowel perforations being the predominant sites. Delayed presentation, presence of comorbidities, gross peritoneal contamination, and septic shock were major determinants of adverse outcomes. Early diagnosis, prompt resuscitation, timely surgical intervention, and intensive postoperative care are essential to improve survival and reduce complications in patients with perforation peritonitis.

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