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Original Research Article

A Study on Perforation Peritonitis – Clinical Profile and Outcomes in a Tertiary Care Teaching Hospital

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Abstract:

Background: Perforation peritonitis remains a life-threatening abdominal surgical emergency with diverse aetiology and variable outcomes depending on regional, socioeconomic, and healthcare-related factors. Timely operative intervention is the cornerstone of management, and understanding institutional disease patterns is essential for optimising outcomes.

Methods: A prospective observational study was conducted over 18 months in the Department of General Surgery at Oxford Medical College, Hospital and Research Centre, Bangalore. A total of 75 consecutive patients with clinical and radiological evidence of perforation peritonitis who underwent emergency laparotomy were enrolled. Demographic data, clinical presentation, comorbidities, site and cause of perforation, operative procedure, postoperative complications, length of hospital stay, and in-hospital mortality were systematically recorded and analysed.

Results: The mean age of the study population was 43.2 ± 11.8 years with a male predominance (70.7%). Comorbidities were present in 62.7% of patients, most commonly diabetes mellitus (17.3%) and hypertension (14.7%). Universal presentation with acute abdominal pain was noted; 74.7% had abdominal distension or constipation, 44.0% vomited, and 34.7% were febrile. The appendix was the most frequent site of perforation (28.0%), followed by the duodenum (22.7%), ileum (20.0%), and stomach (16.0%). Modified Graham's omentoplasty (34.7%) and primary closure (33.3%) were the most common operative procedures, followed by open appendectomy (28.0%). Postoperative ICU care was required by 46.7% of patients. Wound infection (20.0%) was the most common complication. In-hospital mortality was 5.3%, predominantly in patients with comorbidities, advanced age, and delayed presentation.

Conclusions: Appendicular and peptic ulcer perforations are the predominant causes of perforation peritonitis in this tertiary care teaching hospital cohort. Prompt surgical intervention coupled with aggressive perioperative care results in acceptable morbidity and mortality. Advanced age, comorbidities, and delayed presentation are key determinants of adverse outcomes and warrant early recognition and referral.

Keywords: Perforation Peritonitis, Hollow Viscus Perforation, Emergency Laparotomy, Surgical Outcomes, Morbidity, Mortality.

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Introduction

Perforation peritonitis, resulting from a breach in the continuity of the hollow viscus and consequent contamination of the peritoneal cavity, represents one of the most frequent and formidable abdominal surgical emergencies encountered in surgical practice worldwide [1]. The condition mandates urgent operative intervention and carries significant risks of systemic sepsis, multi-organ dysfunction, and death if not managed promptly and effectively [2]. The aetiological spectrum of perforation peritonitis is broad, encompassing peptic ulcer disease, acute appendicitis complicated by perforation, typhoid ileal perforation, traumatic perforations, and rarely, colonic and rectal pathology [3]. The distribution of these causes varies considerably between developed and developing nations, as well as across different regions within a country [4]. In the Indian subcontinent, appendicular and duodenal perforations tend to predominate, in contrast to

Western series where colonic and anastomotic perforations account for a larger proportion of cases [5,6]. These geographic differences are shaped by dietary habits, prevalence of infectious diseases, access to healthcare, and sociocultural factors that influence the timing of presentation.

Despite improvements in surgical technique, anaesthesia, critical care, and antimicrobial therapy, perforation peritonitis continues to carry substantial morbidity and mortality, particularly in resource-constrained environments [7]. Factors that adversely influence outcomes include delayed presentation, advanced age, underlying comorbidities, extent of peritoneal contamination, and the site of perforation [8]. Generating institution-specific data is therefore essential, as it permits a precise understanding of the local disease burden, guides evidence-based clinical decision making, and enables targeted quality improvement interventions.

Oxford Medical College, Hospital and Research Centre in Bangalore functions as a major tertiary care teaching institution serving a large urban and peri-urban population in southern Karnataka.

The Department of General Surgery encounters a substantial volume of emergency surgical cases annually, of which perforation peritonitis constitutes a significant proportion. However, institutional data specifically characterising the clinical profile and surgical outcomes of these patients remained limited prior to this study. In this context, the present prospective observational study was undertaken to describe the demographic and clinical characteristics, aetiological distribution, operative management strategies, and postoperative outcomes of patients presenting with perforation peritonitis at this institution.

The objectives of this study were: (1) to describe the demographic and clinical profile of patients presenting with perforation peritonitis; (2) to determine the aetiological spectrum and anatomical sites of gastrointestinal perforation; (3) to assess the surgical procedures employed and their postoperative outcomes in terms of morbidity and mortality; and (4) to identify clinical and perioperative factors associated with complications, prolonged hospitalisation, and in-hospital mortality.

Materials and Methods

This was a prospective observational study conducted in the Department of General Surgery at Oxford Medical College, Hospital and Research Centre, Bangalore, over an 18-month period from January 2024 to June 2025. Ethical clearance was obtained from the Institutional Ethics Committee, and written informed consent was obtained from all participants or their legally authorised representatives prior to enrolment.

All consecutive patients presenting to the emergency surgery unit with clinical and radiological features of peritonitis secondary to gastrointestinal perforation who underwent emergency exploratory laparotomy during the study period were included. Patients with peritonitis secondary to postoperative anastomotic leaks, gynaecological perforations, or those with incomplete medical records were excluded from analysis.

For each enrolled patient, detailed demographic information (age, sex, and comorbidities), presenting symptoms and signs, duration from onset of symptoms to hospital presentation, and preoperative clinical findings were recorded on a predesigned, standardised data collection proforma. Laboratory parameters including total leucocyte count and serum electrolytes were documented at admission. All patients underwent erect chest and abdominal radiography. Abdominal and pelvic ultrasonography was performed in all cases, and computed tomography (CT) of the abdomen and pelvis was employed selectively in cases of diagnostic uncertainty or suspected complications. Intraoperative findings including the site and aetiology of perforation were recorded at the time of surgery. Postoperative data collected included the need for intensive care unit (ICU) admission, nature and frequency of complications, duration of hospital stay, and in-hospital mortality.

All patients received standardised preoperative resuscitation comprising intravenous fluid therapy, empirical broad-spectrum antibiotics, nasogastric decompression, and urinary catheterisation. The choice of operative procedure was individualised based on intraoperative findings, site and cause of perforation, degree of peritoneal contamination, and patient comorbidities. Procedures performed included primary closure of the perforation, modified Graham's omentoplasty for peptic ulcer perforations, open appendectomy for appendicular perforations, small bowel or colonic resection with or without primary anastomosis, stoma formation (ileostomy, colostomy, or jejunostomy), and radical hemicolectomy in selected cases.

Data were entered and analysed using SPSS version 25.0 (IBM Corp., Armonk, NY, USA). Categorical variables were expressed as frequencies and percentages. Continuous variables were summarised as mean, standard deviation (SD), and median as appropriate. Group comparisons for categorical variables were performed using the chi-square test or Fisher's exact test, and for continuous variables using the independent samples Student's t-test. A p-value of less than 0.05 was considered statistically significant.

Results

A total of 75 patients with perforation peritonitis were enrolled during the study period. The age of patients ranged from 21 to 68 years, with a mean age of 43.2 ± 11.8 years and a median age of 44 years. The highest incidence was recorded in the 41–50 year age group (33.3%), followed by patients older than 50 years (28.0%), and those in the 31–40 year group (25.3%). A total of 10 patients (13.4%) were aged between 20 and 30 years, and no cases were recorded in individuals younger than 20 years.

There was a marked male predominance, with 53 males (70.7%) and 22 females (29.3%), yielding a male-to-female ratio of approximately 2.4:1. Comorbid conditions were documented in 47 patients (62.7%), while 28 patients (37.3%) had no comorbidity.

The most prevalent comorbidities were diabetes mellitus (17.3%) and hypertension (14.7%), followed by tobacco or alcohol use (13.3%), malignancy (6.7%), chronic obstructive pulmonary disease or asthma (5.3%), tuberculosis (4.0%), and HIV infection (1.3%). These demographic and comorbidity data are summarised in Table 1.

Table 1: Patient Demographics and Baseline Characteristics

Variable	n (%)	Mean ± SD / Median
Total patients	75	—
Age (years)	—	43.2 ± 11.8 / 44
Age group 31–40 years	19 (25.3)	—
Age group 41–50 years	25 (33.3)	—
Age group > 50 years	21 (28.0)	—
Age group 20–30 years	10 (13.4)	—
Male	53 (70.7)	—
Female	22 (29.3)	—
No comorbidity	28 (37.3)	—
Diabetes mellitus	13 (17.3)	—
Hypertension	11 (14.7)	—
Tobacco / alcohol use	10 (13.3)	—
Malignancy	5 (6.7)	—
COPD / Asthma	4 (5.3)	—
Tuberculosis	3 (4.0)	—
HIV	1 (1.3)	—

The study cohort was predominantly middle-aged and male, with nearly two-thirds harbouring at least one significant comorbidity.

Clinical Presentation, Aetiology, and Radiological Findings: Acute abdominal pain was the universal presenting symptom, reported by all 75 patients (100%). Abdominal distension or constipation was noted in 56 patients (74.7%), vomiting in 33 patients (44.0%), and fever in 26 patients (34.7%). Tachycardia was documented on admission in 17 patients (22.7%). A majority of patients (64.0%, n = 48) presented more than 24 hours after the onset of symptoms, reflecting the predominance of delayed presentation in this cohort.

The most common site of gastrointestinal perforation was the appendix, identified in 21 patients (28.0%), followed by the duodenum in 17 patients (22.7%), ileum in 15 patients (20.0%), and stomach in 12 patients (16.0%). Jejunal perforations accounted for 6 cases (8.0%), while colonic perforations were noted in 3 patients (4.0%). No cases of rectal perforation were identified. One patient (1.3%) had perforation attributed to mesenteric ischaemia.

Pneumoperitoneum was detected on erect abdominal radiography in 67 patients (89.3%). Abdominal and pelvic ultrasonography revealed free intra-abdominal fluid in the majority of cases. CT scanning was reserved for selected patients with diagnostic uncertainty or clinically suspected complications. Laboratory investigations most consistently demonstrated leucocytosis and electrolyte imbalances. The clinical, aetiological, and radiological data are consolidated in Table 2.

Appendicular and peptic ulcer-related (duodenal and gastric) perforations together accounted for the majority of cases, with small bowel perforations comprising a further significant proportion.

Operative Management: All 75 patients underwent emergency exploratory laparotomy following preoperative resuscitation and stabilisation.

The operative procedure was individualised according to the site and aetiology of the perforation and the intraoperative findings. Modified Graham's omentoplasty was the most frequently performed procedure, carried out in 26 patients (34.7%), and followed closely by primary surgical closure in 25 patients (33.3%). Open

appendectomy was performed in 21 patients (28.0%). Bowel resection and anastomosis was required in 5 patients (6.7%) with small bowel or colonic perforations associated with non-viable bowel. Radical hemicolectomy was performed in 1 patient (1.3%).

Table 2: Clinical Presentation, Site of Perforation, and Radiological Findings

Variable	Number of Patients (%)
Symptoms & Signs	
Abdominal pain	75 (100.0)
Abdominal distension / constipation	56 (74.7)
Vomiting	33 (44.0)
Fever	26 (34.7)
Tachycardia on admission	17 (22.7)
Delayed presentation (> 24 h)	48 (64.0)
Site of Perforation	
Appendix	21 (28.0)
Duodenum	17 (22.7)
Ileum	15 (20.0)
Stomach	12 (16.0)
Jejunum	6 (8.0)
Colon	3 (4.0)
Rectum	0 (0.0)
Mesenteric ischemia / stercoral ulcer	1 (1.3)
Radiological Findings	
Pneumoperitoneum on X-ray	67 (89.3)
Free fluid on ultrasonography	Majority
CT abdomen / pelvis performed	Selected cases

Stoma formation was necessary in patients with extensive peritoneal contamination, compromised bowel integrity, or haemodynamic instability at the time of surgery. Ileostomy was fashioned in 3 patients (4.0%), colostomy in 2 patients (2.7%), and jejunostomy in 1 patient (1.3%). The details of operative procedures are presented in Table 3.

Table 3: Operative Procedures Performed for Perforation Peritonitis

Surgical Procedure	Number of Patients (%)
Primary surgical closure	25 (33.3)
Modified Graham's omentoplasty	26 (34.7)
Open appendectomy	21 (28.0)
Resection and anastomosis	5 (6.7)
Radical hemicolectomy	1 (1.3)
Ileostomy	3 (4.0)
Colostomy	2 (2.7)
Jejunostomy	1 (1.3)

Primary closure and modified Graham's omentoplasty together addressed the majority of peptic and gastric perforations, with appendectomy managing all appendicular cases. Stoma formation and bowel resection were reserved for complex or contaminated scenarios.

Postoperative Outcomes and Factors Influencing Outcomes: Postoperative recovery was uneventful in the majority of patients; however, complications were observed in a significant proportion of the cohort. A total of 35 patients (46.7%) required postoperative ICU admission, most commonly for sepsis, respiratory compromise, or features of multi-organ dysfunction. Wound infection was the most frequent postoperative complication, occurring in 15 patients (20.0%). Respiratory complications including pneumonia and atelectasis were documented in 8 patients (10.7%), intra-abdominal collections in 5 patients (6.7%), and sepsis with multi-organ dysfunction in 4 patients (5.3%).

The in-hospital mortality rate was 5.3% (4 out of 75 patients). All four deaths occurred in patients who required ICU care postoperatively and who had significant underlying comorbidities. The duration of hospital stay ranged from 7 to 28 days. The majority of patients (58.7%) were hospitalised for 10–15 days, 18.7% for 16–20 days, and 10.7% for more than 21 days. Only 12.0% of patients were discharged within 10 days of surgery. Postoperative outcome data are detailed in Table 4.

Table 4: Postoperative Outcomes

Outcome	Number of Patients (%)
ICU admission postoperatively	35 (46.7)
Wound infection	15 (20.0)
Respiratory complications	8 (10.7)
Intra-abdominal collection	5 (6.7)
Sepsis / multi-organ dysfunction	4 (5.3)
In-hospital mortality	4 (5.3)
Hospital stay < 10 days	9 (12.0)
Hospital stay 10–15 days	44 (58.7)
Hospital stay 16–20 days	14 (18.7)
Hospital stay > 21 days	8 (10.7)

On analysis of clinical variables, advanced age (> 50 years), the presence of comorbidities (particularly diabetes, malignancy, and chronic respiratory disease), delayed presentation beyond 24 hours, and perforations involving the colon, jejunum, or ileum were each associated with higher rates of postoperative complications, ICU admission, prolonged hospitalisation, and in-hospital mortality. All four patients who died had two or more comorbid conditions and delayed presentation. Although formal multivariate regression was not conducted for all variables, these observed trends were consistent and clinically meaningful.

Discussion

Perforation peritonitis continues to represent one of the most challenging abdominal emergencies in surgical practice, particularly in developing countries where delays in diagnosis and presentation are commonplace [7]. The findings of this prospective study from Oxford Medical College, Bangalore, contribute institutional data to the existing evidence base and allow meaningful comparisons with published literature from India and other regions.

The mean age of presentation in our study was 43.2 years, which is closely aligned with data from Neeraj Kumar Jain et al. who reported a mean age of 42.8 years in their Central India cohort, and with the study by Faraz et al. from rural South India who reported a mean age of 44.6 years [9,10]. The preponderance of middle-aged patients likely reflects the peak incidence of peptic ulcer disease and acute appendicitis in this demographic. The male predominance observed in our series (70.7%) is consistent with previous Indian and international reports, and is generally attributed to higher rates of peptic ulcer disease, tobacco use, and NSAID consumption among men [9,11].

In terms of aetiology, appendicular perforation was the most frequent cause (28.0%) in our cohort, followed by duodenal (22.7%), ileal (20.0%), and gastric (16.0%) perforations. This distribution mirrors findings from other Indian series. Yadav and Garg, in their Delhi-based series of 77 cases, similarly reported appendicular perforation as the most common aetiology, with peptic ulcer perforations constituting the next largest group [4]. Bali et al., in their comprehensive review of perforation peritonitis in the developing world, also noted a predominance of appendicular and peptic ulcer-related perforations in South Asian populations, in contrast to Western series where colonic perforation assumes greater relative importance [6]. The relatively lower incidence of typhoid ileal perforation compared to older Indian series likely reflects improvements in water sanitation, vaccination coverage, and early antibiotic treatment over recent decades [3].

Diagnostic imaging was pivotal in confirming the clinical diagnosis. Erect abdominal radiography demonstrated pneumoperitoneum in 89.3% of our patients, consistent with the sensitivity of 85–90% reported by Bansal et al. in their large multicentre study of 1,723 patients with perforation peritonitis [12]. Abdominal ultrasonography, performed in all patients, identified free intra-abdominal fluid in the majority, corroborating the utility of this readily available modality for rapid bedside assessment as detailed by Coppolino et al. [13]. CT scanning was reserved for equivocal cases, consistent with established diagnostic algorithms.

Operative strategy in our series was governed by intraoperative findings and the underlying aetiology of perforation, in keeping with standard surgical principles. Modified Graham's omentoplasty (34.7%) and primary closure (33.3%) were the most frequent procedures, reflecting the predominance of peptic ulcer perforations, for which omental patch repair remains the gold standard as described by Yeo and others in standard surgical texts [14]. Open appendectomy was performed in all patients with appendicular perforation (28.0%). The need for bowel resection and anastomosis (6.7%) and stoma formation (8.0%) was relatively infrequent, reserved for cases with compromised or non-viable bowel or extensive faecal contamination. These operative rates are concordant with findings from comparable

Indian series [9,10]. Postoperatively, 46.7% of our patients required ICU care, a rate comparable to the 47% reported by Faraz et al. and consistent with the severity of illness inherent in this patient population [10]. Wound infection (20.0%) was the most prevalent complication, a finding echoed in multiple published series from both India and internationally [9,14]. The overall in-hospital mortality rate of 5.3% in our study is in keeping with the 5.2% reported by Faraz et al. and the 4.3% documented by Neeraj Kumar Jain et al., suggesting that outcomes at our institution are comparable to peer institutions in India [9,10]. Mortality was uniformly restricted to patients with significant comorbidities and delayed presentation, a finding that underscores the multifactorial determinants of adverse outcome in this condition as elaborated by Mabewa et al. and others [7].

The pathophysiology of peptic ulcer perforation and its historical evolution have been extensively described. The seminal observations of William Beaumont in the 19th century laid the foundation for understanding gastric acid physiology [15]. Subsequent identification of gastrin by Edkins and its clinical significance as elucidated by Modlin et al. transformed the management of peptic ulcer disease [16].

The introduction of vagotomy as a therapeutic surgical option, championed by Dragstedt and reviewed by Modlin and Darr, represented a landmark in reducing acid secretion-related complications [17]. The discovery of Helicobacter pylori by Marshall and Warren, and the demonstration by Rauws and Tytgat that eradication cures duodenal ulcer, have since dramatically reduced the incidence of peptic ulcer perforation in populations with access to effective medical therapy [18]. Nevertheless, as demonstrated by our series and those from comparable settings, peptic ulcer perforation remains a significant surgical problem in regions where H. pylori eradication therapy and proton pump inhibitor use are not universally accessible.

Sharma et al. observed in their retrospective clinical study that delayed presentation to a surgical unit was the single most consistently identified risk factor for postoperative complications in perforation peritonitis, an observation that aligns with our finding that 64.0% of patients presented beyond 24 hours from symptom onset [3]. Chakrabarti et al., analysing 100 cases of perforative peritonitis from Navi Mumbai, similarly identified delayed referral and comorbidity as key adverse prognostic determinants [5]. Educational initiatives targeting community awareness of the symptoms of acute abdomen, combined with improvements in pre-hospital transport and emergency triage, are therefore likely to translate into meaningful reductions in morbidity and mortality in tertiary care settings such as our own.

This study is subject to certain limitations. The single-centre design and moderate sample size may limit the generalisability of findings to other institutional and regional contexts. Although all patients underwent systematic clinical evaluation and standardised radiological workup, detailed quantitative laboratory data for the entire cohort were not uniformly available for analysis. Formal multivariate logistic regression analysis to identify independent predictors of mortality was not performed due to the limited sample size, though clear univariate trends were observed. Future multi-centre prospective studies with larger cohorts and standardised data collection protocols would strengthen the evidence base and allow more rigorous identification of independent prognostic factors.

Conclusion

Perforation peritonitis remains a significant surgical emergency at this tertiary care teaching hospital, with appendicular and peptic ulcer perforations constituting the leading aetiologies. The disease predominantly affects middle-aged males, with a substantial proportion presenting with comorbidities and after a delay of more than 24 hours from symptom onset. Prompt and appropriate surgical intervention, encompassing primary closure, omentoplasty, and appendectomy as the most frequently performed procedures, yields acceptable morbidity and mortality outcomes that are comparable with other Indian institutional series. Advanced age, comorbid illness, and delayed presentation are the principal adverse prognostic determinants. Ongoing efforts to enhance community awareness, facilitate early presentation, and improve perioperative care pathways are essential to further reducing the burden of this condition in our patient population.

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