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Clinical Spectrum and Postoperative Outcomes of Perforation Peritonitis: A Prospective Observational Study

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ABSTRACT

Background: Perforation peritonitis is a major abdominal emergency associated with substantial postoperative morbidity and mortality. Its clinical pattern and outcomes vary according to the anatomical site, underlying cause, physiological derangement, contamination, and delay before definitive source control.
Objectives: To describe the clinical spectrum, operative findings, postoperative complications, and factors associated with adverse in-hospital outcomes among patients undergoing emergency surgery for perforation peritonitis.
Methods: This single-centre prospective observational cohort study included 80 consecutive adults treated at Government Medical College, Sangareddy, Telangana, India, from June 2023 to May 2024. Demographic, clinical, laboratory, radiological, operative, and postoperative data were recorded prospectively. Categorical variables were compared using the chi-square test or Fisher's exact test, as appropriate.
Results: The mean age was 43.7 ± 16.2 years, and 59 (73.8%) patients were male. Delayed presentation beyond 48 hours occurred in 26 (32.5%) patients. Gastroduodenal perforation was most frequent (37.5%), followed by ileal perforation (27.5%). Peptic ulcer disease was the leading aetiology (36.3%). Generalised contamination was present in 55.0%, and omental patch closure was the commonest procedure (35.0%). Postoperative complications occurred in 31 (38.8%) patients; surgical-site infection was most frequent (20.0%). Eight patients died, giving an in-hospital mortality rate of 10.0%. Complications were associated with age above 60 years, delayed presentation, comorbidity, hypotension, generalised contamination, and elevated creatinine. Mortality was associated with advanced age, delayed presentation, hypotension, and elevated creatinine.
Conclusion: Perforation peritonitis produced considerable postoperative morbidity and mortality. Early presentation, prompt resuscitation, timely source control, and intensified perioperative surveillance of physiologically high-risk patients are central to improving outcomes.

Keywords: *perforation peritonitis; gastrointestinal perforation; emergency laparotomy; postoperative complications; mortality; source control.*

INTRODUCTION

Perforation of a hollow abdominal viscus permits gastrointestinal contents and microorganisms to enter the peritoneal cavity, producing chemical inflammation followed by bacterial contamination, systemic infection, and organ dysfunction. Perforation peritonitis therefore represents a time-sensitive surgical emergency in which delayed recognition or inadequate source control can rapidly progress to sepsis and death. Contemporary management rests on early physiological stabilisation, appropriate antimicrobial therapy, and definitive control of the perforation, together with postoperative organ support when required.[1,2] In gastroduodenal perforation, emergency operative repair remains the principal treatment for patients with diffuse peritonitis or clinical instability.[3]

The anatomical and aetiological spectrum of perforation peritonitis is not uniform across regions. Reports from South Asia have consistently described a predominance of upper gastrointestinal and small-bowel perforations, whereas distal colonic perforations are proportionally more frequent in many Western series. Indian data have shown peptic ulcer perforation, enteric ileal perforation, appendicitis, abdominal tuberculosis, and trauma as important causes.[4,5] This pattern reflects differences in infectious disease burden, healthcare access, medication exposure, socioeconomic conditions, and the interval between symptom onset and hospital presentation. More recent regional studies continue to report marked variation in the relative contribution of peptic ulcer disease, appendicular disease, and small-bowel pathology.[6]

Despite improvements in imaging, anaesthesia, critical care, antimicrobial treatment, and operative technique, adverse outcomes remain common. The extent of peritoneal contamination, preoperative shock, renal dysfunction, hypoalbuminaemia, advanced age, associated illness, and delayed surgery influence postoperative recovery. Surgical-site infection, respiratory complications, intra-abdominal collection, wound dehiscence, enterocutaneous fistula, acute kidney injury, and septic shock can prolong hospitalisation and increase the need for intensive care or reoperation. Mortality is especially concentrated among patients who reach the hospital with established physiological deterioration.

Local prospective data are valuable because the distribution of perforation sites, operative procedures, and postoperative events is shaped by referral pathways and available resources. A structured evaluation of presentation, intraoperative findings, and early outcomes can identify groups requiring expedited resuscitation, earlier source control, and closer postoperative monitoring. Such evidence also provides a benchmark for surgical audit and supports context-specific quality-improvement strategies. This is especially relevant in settings where delayed referral and limited critical-care capacity intensify the consequences of abdominal sepsis.

The present study was undertaken to characterise the demographic and clinical profile of patients with perforation peritonitis treated at a tertiary teaching institution in Telangana. The objectives were to determine the anatomical sites and aetiologies of perforation, describe the operative procedures performed, quantify postoperative complications and in-hospital mortality, and examine the clinical and laboratory factors associated with postoperative complications and death.

METHODOLOGY

Study design and setting: This hospital-based, single-centre prospective observational cohort study was conducted in the Department of General Surgery, Government Medical College, Sangareddy, Telangana, India, from June 2023 to May 2024. Reporting followed the Strengthening the Reporting of Observational Studies in Epidemiology recommendations.[7]

Study population and sampling: All consecutive patients aged 18 years or older who presented with clinical and radiological features of perforation peritonitis and underwent emergency surgery were assessed. Perforation was confirmed during laparotomy. Patients managed non-operatively, those with primary peritonitis without hollow-viscus perforation, isolated postoperative anastomotic leakage, or incomplete essential records were excluded. A time-bound census approach was used, and every eligible patient during the predefined period was enrolled. Eighty patients met the criteria, with no exclusions after enrolment.

Clinical assessment and perioperative management: At admission, a structured evaluation documented age, sex, comorbidities, symptom duration, presenting symptoms, abdominal guarding or rigidity, pulse rate, and blood pressure. Investigations included complete blood count, renal function, serum electrolytes, serum albumin, and erect chest or abdominal radiography. Ultrasonography or computed tomography was obtained when clinically required and patient stability permitted. Initial management comprised nil per oral status, nasogastric decompression, intravenous crystalloids, urinary catheterisation, broad-spectrum antibiotics, analgesia, correction of metabolic abnormalities, and organ support when indicated. Operative source control followed resuscitation and established principles for complicated intra-abdominal infection.[1-3] The procedure was selected according to the perforation site, aetiology, bowel viability, contamination, physiological status, and surgeon's judgement.

Data collection and outcomes: Data were recorded prospectively using a predefined case-record form. Intraoperative variables included anatomical site, aetiology, extent of contamination, operative procedure, and operative duration. Patients were followed from surgery until discharge or in-hospital death. Outcomes included intensive care admission, mechanical ventilation, surgical-site infection, respiratory complications, septic shock, acute kidney injury, wound dehiscence, intra-abdominal collection, enterocutaneous fistula, reoperation, hospital stay, and mortality. Delayed presentation was defined as arrival more than 48 hours after symptom onset. Elevated creatinine was defined as serum creatinine above 1.5 mg/dL, and hypoalbuminaemia as serum albumin below 3.5 g/dL.

Bias and missing data: Consecutive enrolment reduced selection bias. Variables were documented using uniform definitions, and postoperative outcomes were verified from inpatient records before database closure. Complete information was available for all participants; therefore, imputation was unnecessary.

Statistical analysis: Data were entered into a spreadsheet and analysed using [statistical software and version to be inserted]. Continuous variables were summarised as mean ± standard deviation, and categorical variables as frequencies and percentages. Associations with postoperative complications were assessed using the Pearson chi-square test. Fisher's exact test was used for mortality comparisons because of small expected cell counts. Tests were two-sided, with $p<0.05$ indicating statistical significance. Analyses were unadjusted; findings are therefore described as associations rather than independent predictors.

Ethical considerations: Necessary Permissions were obtained before starting the study. Written informed consent was obtained from each patient or a legally authorised representative. Coded identifiers were used to protect confidentiality.

RESULTS

A total of 80 patients with perforation peritonitis underwent emergency surgical treatment during the study period. Complete clinical, operative, and postoperative data were available for all participants, and all 80 patients were included in the final analysis.

The mean age of the study population was 43.7 ± 16.2 years, with an age range of 18-79 years. Most patients were aged between 31 and 60 years. There were 59 (73.8%) males and 21 (26.2%) females, giving a male-to-female ratio of 2.8:1. At least one pre-existing comorbidity was present in 33 (41.3%) patients. Twenty-six (32.5%) patients presented more than 48 hours after the onset of symptoms.

Abdominal pain was reported by all patients. Abdominal distension was present in 65 (81.3%), vomiting in 57 (71.3%), fever in 46 (57.5%), and obstipation in 42 (52.5%) patients. Generalised abdominal guarding or rigidity was observed in 74 (92.5%) patients. Tachycardia was documented in 61 (76.3%), while 14 (17.5%) patients presented with hypotension. Leukocytosis was identified in 58 (72.5%) patients, elevated serum creatinine in 19 (23.8%), and hypoalbuminaemia in 31 (38.8%). Pneumoperitoneum was detected radiologically in 69 (86.3%) patients (Table 1).

Table 1. Demographic, clinical, and laboratory characteristics of the study participants (N=80)

Characteristic	Category	Frequency	Percentage
Age, years	Mean ± SD	43.7 ± 16.2	-
Age range, years	Minimum-maximum	18-79	-
Age group	≤30 years	17	21.3
	31-45 years	24	30.0
	46-60 years	25	31.3
	>60 years	14	17.5
Sex	Male	59	73.8
	Female	21	26.2
Comorbidity	Present	33	41.3
	Absent	47	58.8
Symptom duration	≤48 hours	54	67.5
	>48 hours	26	32.5
Abdominal pain	Present	80	100.0
Abdominal distension	Present	65	81.3
Vomiting	Present	57	71.3
Fever	Present	46	57.5
Obstipation	Present	42	52.5
Guarding or rigidity	Present	74	92.5
Tachycardia	Present	61	76.3
Hypotension	Present	14	17.5
Leukocytosis	Present	58	72.5
Serum creatinine >1.5 mg/dL	Present	19	23.8
Serum albumin <3.5 g/dL	Present	31	38.8
Pneumoperitoneum	Present	69	86.3

Gastroduodenal perforation was the most common anatomical type, identified in 30 (37.5%) patients, followed by ileal perforation in 22 (27.5%) and appendicular perforation in 12 (15.0%). Peptic ulcer disease was the leading aetiology, accounting for 29 (36.3%) cases. Enteric perforation and acute appendicitis were observed in 14 (17.5%) and 12 (15.0%) patients, respectively.

Generalised peritoneal contamination was noted in 44 (55.0%) patients. Omental patch closure was the most frequently performed procedure, accounting for 28 (35.0%) operations. Resection with anastomosis was undertaken in 18 (22.5%) patients, while 8 (10.0%) required bowel resection with stoma formation. The mean operative duration was 112.6 ± 34.8 minutes (Table 2).

Table 2. Operative findings and surgical management (N=80)

Variable	Category	Frequency	Percentage
Anatomical site	Gastroduodenal	30	37.5
	Ileal	22	27.5
	Appendicular	12	15.0
	Colonic	8	10.0
	Jejunal	5	6.3
	Other sites	3	3.8
Aetiology	Peptic ulcer disease	29	36.3
	Enteric perforation	14	17.5
	Acute appendicitis	12	15.0
	Nonspecific small-bowel perforation	8	10.0
	Abdominal tuberculosis	5	6.3
	Abdominal trauma	4	5.0
	Malignancy	4	5.0
	Other causes	4	5.0
Peritoneal contamination	Generalised	44	55.0
	Localised	36	45.0
Surgical procedure	Omental patch closure	28	35.0
	Resection and anastomosis	18	22.5
	Appendicectomy	12	15.0
	Primary closure	10	12.5
	Resection with stoma	8	10.0
	Peritoneal lavage and drainage	4	5.0
Operative duration, minutes	Mean ± SD	112.6 ± 34.8	-

Postoperative intensive care unit admission was required in 19 (23.8%) patients, and 11 (13.8%) required mechanical ventilation. At least one postoperative complication occurred in 31 (38.8%) patients.

Surgical-site infection was the most frequent complication, affecting 16 (20.0%) patients. Respiratory complications occurred in 11 (13.8%), septic shock in 8 (10.0%), acute kidney injury in 7 (8.8%), and wound dehiscence in 6 (7.5%) patients. Seven (8.8%) patients required reoperation. The mean duration of hospital stay was 10.6 ± 5.4 days. Seventy-two (90.0%) patients were discharged alive, while 8 (10.0%) died during the postoperative hospital stay (Table 3).

Table 3. Postoperative complications and clinical outcomes (N=80)

Postoperative outcome	Frequency	Percentage
Intensive care unit admission	19	23.8
Mechanical ventilation	11	13.8
At least one postoperative complication	31	38.8
Surgical-site infection	16	20.0
Respiratory complication	11	13.8
Septic shock	8	10.0
Acute kidney injury	7	8.8
Wound dehiscence	6	7.5
Intra-abdominal collection	5	6.3
Enterocutaneous fistula	3	3.8
Reoperation	7	8.8
Hospital stay, days, mean ± SD	10.6 ± 5.4	-
Discharged alive	72	90.0
In-hospital mortality	8	10.0

Individual patients could have experienced more than one postoperative complication.

Postoperative complications were significantly more frequent among patients aged over 60 years, those presenting more than 48 hours after symptom onset, patients with comorbidities, those presenting with hypotension, and patients with generalised peritoneal contamination or elevated serum creatinine.

Mortality was significantly associated with age over 60 years, delayed presentation, hypotension, and elevated serum creatinine. The highest mortality rate was observed among patients presenting with hypotension, of whom 5 of 14 (35.7%) died (Table 4).

Table 4. Factors associated with postoperative complications and in-hospital mortality

Factor	Postoperative complications, n/N (%)	p-value	Mortality, n/N (%)	p-value
Age >60 years	9/14 (64.3)	0.031	4/14 (28.6)	0.028
Age ≤60 years	22/66 (33.3)		4/66 (6.1)	
Presentation >48 hours	17/26 (65.4)	<0.001	6/26 (23.1)	0.013
Presentation ≤48 hours	14/54 (25.9)		2/54 (3.7)	
Comorbidity present	18/33 (54.5)	0.015	5/33 (15.2)	0.264
Comorbidity absent	13/47 (27.7)		3/47 (6.4)	
Hypotension present	10/14 (71.4)	0.006	5/14 (35.7)	0.003
Hypotension absent	21/66 (31.8)		3/66 (4.5)	
Generalised contamination	23/44 (52.3)	0.006	6/44 (13.6)	0.284
Localised contamination	8/36 (22.2)		2/36 (5.6)	
Serum creatinine >1.5 mg/dL	12/19 (63.2)	0.012	5/19 (26.3)	0.016
Serum creatinine ≤1.5 mg/dL	19/61 (31.1)		3/61 (4.9)	

Pearson chi-square test was used for postoperative complication comparisons. Fisher's exact test was used for mortality comparisons. All p-values are two-sided.

DISCUSSION

This study shows that perforation peritonitis remains a predominantly male emergency among adults. The mean age was 43.7 years, and nearly three-quarters of participants were male. Comparable male predominance has been described in Indian series, including Jhobta et al. and Yadav and Garg.[4,5] This pattern could reflect differences in peptic ulcer risk, smoking and alcohol exposure, occupational healthcare-seeking behaviour, and delayed presentation among men. One-third of patients presented beyond 48 hours, underscoring persistent prehospital delay.

Gastroduodenal perforation was the commonest anatomical type, and peptic ulcer disease was the leading aetiology. This finding is consistent with earlier Indian data showing a greater burden of upper gastrointestinal perforation than that described in many Western populations.[4,5] Neupane et al. also identified peptic ulcer disease as the dominant cause in their prospective South Asian cohort, although its proportion was higher than in the present study.[6] Ileal perforation formed the second-largest group, reflecting the continuing contribution of enteric infection, nonspecific inflammation, tuberculosis, and other small-bowel disorders. The predominance of omental patch closure corresponds with the frequency of gastroduodenal disease, whereas resection, anastomosis, and stoma formation were reserved for diseased or nonviable bowel and heavier contamination.

At least one postoperative complication occurred in 38.8% of patients. Surgical-site infection was the most frequent event, followed by respiratory complications, septic shock, acute kidney injury, and wound dehiscence. Rai et al. similarly reported that haemodynamic compromise, renal dysfunction, hypoalbuminaemia, and delayed surgery were associated with poor postoperative outcomes.[8] Surgical wounds after perforation peritonitis are exposed to a high microbial burden; a New Delhi study documented clinically important organisms in peritoneal fluid and surgical wounds, reinforcing the importance of timely antibiotics, source control, and wound surveillance.[9] Higher complication rates reported in some cohorts likely reflect differences in disease severity, definitions, referral delay, and case mix.[6,10]

The in-hospital mortality rate was 10.0%, identical to the mortality reported in the 504-patient Indian series and lower than the 13% described in Delhi.[4,5] Mortality was significantly associated with age above 60 years, presentation after 48 hours, hypotension, and creatinine above 1.5 mg/dL. These findings align with evidence that advanced age, shock, renal impairment, comorbidity, and operative delay identify patients at increased risk after perforated peptic ulcer surgery.[11] Large cohort data have shown a progressive reduction in survival with each hour of surgical delay, supporting rapid resuscitation and expedited source control.[12]

Generalised contamination was associated with postoperative complications but not significantly with mortality in this sample, possibly because only eight deaths occurred and the study lacked power for smaller mortality differences. Fungal and bacterial contamination can further complicate diffuse peritonitis, although routine antifungal treatment requires

clinical and microbiological judgement.[13] Risk stratification systems such as the Mannheim Peritonitis Index remain useful for early triage and intensive monitoring across Indian populations.[14] The present findings support an integrated pathway centred on early recognition, physiological stabilisation, broad-spectrum antimicrobial treatment, definitive source control, and targeted critical-care support.[1-3]

Limitations

This study was conducted at a single tertiary institution with a modest sample of 80 patients, limiting external generalisability. Associations were examined using unadjusted analyses, and the small number of deaths prevented reliable multivariable modelling. Outcomes were restricted to the hospital stay without 30-day follow-up. Microbiological findings, validated severity scores, long-term stoma outcomes, and postoperative quality of life were not evaluated.

CONCLUSION

Perforation peritonitis remained a surgical emergency with a postoperative complication rate of 38.8% and an in-hospital mortality rate of 10.0%. Gastroduodenal and ileal perforations constituted the principal patterns, while peptic ulcer disease was the leading aetiology. Surgical-site infection was the most frequent postoperative complication. Advanced age, delayed presentation, hypotension, generalised contamination, comorbidity, and renal dysfunction were associated with adverse outcomes, although mortality associations were strongest for age, delay, hypotension, and elevated creatinine. Prompt referral, rapid resuscitation, early antimicrobial therapy, timely operative source control, and intensified postoperative surveillance of high-risk patients should remain central components of management in tertiary surgical practice. These measures reduce morbidity, organ failure, and death.

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