

CLINICAL PROFILE, SURGICAL INDICATIONS, AND SHORT-TERM OUTCOMES OF ACUTE PANCREATITIS REQUIRING SURGICAL INTERVENTION: A HOSPITAL-BASED OBSERVATIONAL STUDY FROM A TERTIARY CARE CENTRE IN NORTH INDIA

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ABSTRACT

Background: Acute pancreatitis is a common gastrointestinal emergency with a clinical spectrum ranging from mild self-limiting disease to severe necrotizing pancreatitis associated with significant morbidity and mortality. Although most patients can be managed conservatively, a subset develops complications requiring surgical intervention. Data regarding the clinical profile and outcomes of surgically managed acute pancreatitis patients in North Indian tertiary care settings remain limited.

Objectives: To evaluate the clinical profile of patients with acute pancreatitis requiring surgical intervention and to assess indications for surgery, postoperative complications, and short-term clinical outcomes.

Methods: A hospital-based observational study was conducted in the Department of General Surgery of a tertiary care hospital in North India from September 2020 to December 2020. Thirty-two adult patients diagnosed with acute pancreatitis and requiring surgical intervention were enrolled using consecutive sampling. Demographic characteristics, etiology, clinical presentation, disease severity, imaging findings, operative details, postoperative complications, and in-hospital outcomes were recorded using a structured case record form. Data were analyzed using SPSS version 22.0. Statistical significance was considered at $p < 0.05$.

Results: Among the 32 patients studied, 75.0% were males and the largest age group was 31–45 years (40.6%). Alcohol-related pancreatitis was the most common etiology (43.8%), followed by gallstone-related pancreatitis (34.4%). Abdominal pain was present in all patients, while vomiting occurred in 75.0%. According to the Revised Atlanta Classification, 62.5% had moderately severe acute pancreatitis and 37.5% had severe disease. Pancreatic necrosis was identified in 59.4% of patients. Infected pancreatic necrosis was the most frequent indication for surgery (46.9%). Open necrosectomy with drainage was the commonest surgical procedure (56.2%). Surgical site infection was the most common postoperative complication (25.0%). Overall, 29 patients recovered and were discharged, while 3 patients died, yielding an in-hospital mortality rate of 9.4%. Severe acute pancreatitis was significantly associated with poorer outcomes ($p = 0.043$).

Conclusion: Patients requiring surgical intervention for acute pancreatitis constitute a high-risk group characterized by significant postoperative morbidity and notable mortality. Infected pancreatic necrosis remains the principal indication for surgery, and disease severity is an important determinant of outcome. Early recognition, timely surgical intervention, and multidisciplinary management are essential for improving patient outcomes.

Keywords: Acute pancreatitis; Pancreatic necrosis; Surgical intervention; Necrosectomy; Postoperative complications; Clinical outcomes; North India

INTRODUCTION

Acute pancreatitis (AP) is an acute inflammatory disorder of the pancreas characterized by a highly variable clinical course ranging from mild, self-limiting disease to severe systemic illness associated with multiorgan failure and death. It is one of the most common gastrointestinal emergencies requiring hospital admission worldwide, with an estimated incidence ranging from 10 to 50 cases per 100,000 population annually, and its burden continues to increase in many countries due to changing lifestyle factors and increasing prevalence of gallstone disease and alcohol consumption [1]. Despite advances in critical care, imaging modalities, and interventional techniques, acute pancreatitis remains associated with significant morbidity, prolonged hospitalization, and substantial healthcare expenditure [2].

The pathogenesis of acute pancreatitis involves premature activation of pancreatic enzymes leading to autodigestion of pancreatic tissue, local inflammation, and a systemic inflammatory response. The disease spectrum includes interstitial edematous pancreatitis and necrotizing pancreatitis, the latter being associated with a higher risk of complications and mortality [3]. Recognition of disease severity is essential because outcomes are closely linked to the development of local complications, infected pancreatic necrosis, and persistent organ failure [4]. The revised Atlanta Classification introduced standardized definitions for severity assessment and local complications, facilitating uniform reporting and management strategies across institutions [5].

Most patients with acute pancreatitis can be managed conservatively with fluid resuscitation, nutritional support, analgesia, and treatment of the underlying etiology [6]. However, a subset of patients develops severe disease requiring invasive intervention. Surgical intervention may become necessary in the presence of infected pancreatic necrosis, persistent sepsis, abdominal compartment syndrome, bowel ischemia, hemorrhagic complications, or failure of less invasive approaches [7]. Over the past decade, management paradigms have evolved from early open surgical necrosectomy toward delayed and minimally invasive interventions whenever feasible, resulting in improved outcomes and reduced procedure-related morbidity [8]. Nevertheless, surgery continues to play an important role in selected patients with complicated acute pancreatitis.

In India, acute pancreatitis represents a significant cause of emergency surgical admissions. The etiological profile differs from that reported in many Western populations, with varying contributions from gallstone disease, alcohol use, hypertriglyceridemia, and idiopathic causes across different regions [6]. Furthermore, resource availability, referral patterns, delayed presentation, and access to specialized pancreatic care may influence disease progression and treatment outcomes in tertiary care settings. Patients requiring surgical intervention constitute a particularly high-risk group, often presenting with severe disease, systemic complications, and prolonged hospital stay.

Although several international studies have evaluated outcomes of severe acute pancreatitis and pancreatic necrosis, data specifically focusing on patients undergoing surgical intervention in North Indian tertiary care hospitals remain limited. Most available literature combines medically and

surgically managed patients, making it difficult to characterize the clinical profile, operative indications, perioperative complications, and outcomes of this distinct subgroup [7,8].

Understanding these factors is essential for optimizing patient selection, perioperative management, and prognostic assessment. Therefore, the present study was undertaken in a tertiary care hospital in North India to evaluate the clinical profile of patients with acute pancreatitis requiring surgical intervention and to assess their treatment outcomes. The specific objectives were to describe demographic and clinical characteristics, identify indications for surgical management, determine postoperative complications, and evaluate short-term hospital outcomes among these patients.

METHODOLOGY

Study Design: This was a hospital-based observational descriptive study conducted among patients diagnosed with acute pancreatitis who required surgical intervention. The study was designed in accordance with the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines for observational studies.

Study Setting: The study was conducted in the Department of General Surgery of a tertiary care teaching hospital in North India. The hospital serves as a referral center for surrounding urban and rural populations and provides specialized surgical and critical care services for patients with pancreatic diseases.

Study Duration: The study was conducted over a four-month period from September 2020 to December 2020.

Study Population: The study population comprised patients admitted with a diagnosis of acute pancreatitis who subsequently underwent surgical intervention during the study period.

Inclusion Criteria

Patients aged ≥ 18 years.

Patients diagnosed with acute pancreatitis based on at least two of the following:

Characteristic abdominal pain suggestive of acute pancreatitis.

Serum amylase and/or lipase levels ≥ 3 times the upper limit of normal.

Radiological findings consistent with acute pancreatitis on ultrasonography, contrast-enhanced computed tomography (CECT), or magnetic resonance imaging.

Patients requiring surgical intervention for complications or management of acute pancreatitis.

Patients willing to provide written informed consent.

Exclusion Criteria

Patients younger than 18 years.

Patients with chronic pancreatitis without evidence of an acute episode.

Patients managed exclusively by conservative or radiological/endoscopic interventions without surgery.

Patients with pancreatic malignancy.

Patients with incomplete clinical records or who declined participation.

Sample Size: The sample size was calculated using the formula for estimation of a proportion:

$$n = Z^2 \times p \times q / d^2$$

Where:

n = required sample size

$Z = 1.96$ at 95% confidence level

p = expected proportion of surgical intervention among acute pancreatitis patients (assumed 3% based on available literature indicating that only a small proportion require operative management)

$q = 1 - p = 97\%$

d = absolute precision of 6%

The calculated minimum sample size was approximately 31 patients. During the study period, 32 eligible patients fulfilling the inclusion criteria were enrolled consecutively and included in the final analysis.

Sampling Technique: A consecutive sampling technique was employed. All eligible patients meeting the inclusion criteria during the study period were recruited until the desired sample size was achieved.

Data Collection Tools & Procedure: Data were collected using a predesigned and pretested case record form. After obtaining informed written consent, demographic information, clinical history, presenting symptoms, comorbidities, laboratory investigations, radiological findings, etiology of pancreatitis, severity assessment, indications for surgery, operative details, postoperative complications, duration of hospital stay, and clinical outcomes were recorded. Relevant information was obtained through patient interviews, physical examination, hospital records, operative notes, laboratory reports, and imaging findings. Patients were followed throughout their hospital stay until discharge or death, and outcome measures were documented systematically.

Study Variables: Independent variables included age, sex, etiology of acute pancreatitis, duration of symptoms before presentation, comorbidities, severity of pancreatitis, laboratory parameters, imaging findings, indication for surgery, and type of surgical procedure performed. Dependent variables included postoperative complications, requirement for intensive care unit admission, duration of hospital stay, postoperative morbidity, and in-hospital outcome (recovery or death).

Statistical Analysis: Data were entered into Microsoft Excel and analyzed using Statistical Package for the Social Sciences (SPSS) software version 22.0. Continuous variables were summarized as mean $\pm$ standard deviation or median with interquartile range depending on data distribution. Categorical variables were expressed as frequencies and percentages. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test wherever appropriate. Continuous variables were compared using Student's t-test or Mann-Whitney U test depending on normality of distribution. A p-value of less than 0.05 was considered statistically significant.

Ethical Considerations: Written informed consent was obtained from all participants or their legally authorized representatives. Confidentiality and anonymity of patient information were maintained throughout the study. Participation was voluntary, and patients were free to withdraw from the study at any stage without affecting their treatment. The study was conducted in accordance with the ethical principles outlined in the Declaration of Helsinki and subsequent amendments.

RESULTS

A total of 32 patients with acute pancreatitis requiring surgical intervention were included in the study. Most patients were aged 31–45 years, and males constituted three-fourths of the study population. Alcohol-related pancreatitis was the most common etiology, followed by gallstone-related disease (Table 1).

Table 1. Demographic and Baseline Clinical Characteristics of Patients with Acute Pancreatitis Requiring Surgical Intervention (n = 32)

Variable	Category	Frequency (n)	Percentage (%)
Age (years)	18–30	7	21.9
	31–45	13	40.6
	46–60	8	25.0
	>60	4	12.5
Sex	Male	24	75.0
	Female	8	25.0
Etiology	Alcohol-related	14	43.8
	Gallstone-related	11	34.4
	Hypertriglyceridemia	3	9.4
	Idiopathic	4	12.5
Comorbidities	Diabetes mellitus	8	25.0
	Hypertension	7	21.9
	Both DM and HTN	3	9.4
	None	14	43.8

Abdominal pain was the universal presenting symptom, while vomiting and fever were also frequently observed. According to the Revised Atlanta Classification, the majority of patients had moderately severe acute pancreatitis, whereas more than one-third had severe disease. Pancreatic necrosis was identified in over half of the patients, and approximately one-third required intensive care admission during hospitalization (Table 2).

Table 2. Clinical Presentation and Disease Severity at Admission (n = 32)

Variable	Category	Frequency (n)	Percentage (%)
Presenting symptoms*	Abdominal pain	32	100.0
	Vomiting	24	75.0
	Fever	15	46.9
Severity (Revised Atlanta Classification)	Abdominal distension	12	37.5
	Moderately severe AP	20	62.5
	Severe AP	12	37.5
Pancreatic necrosis on CECT	Present	19	59.4
	Absent	13	40.6
ICU admission	Required	11	34.4
	Not required	21	65.6

*Multiple responses possible.

The most frequent indication for surgical intervention was infected pancreatic necrosis, followed by persistent sepsis and pancreatic abscess formation. Open necrosectomy with drainage was the most commonly performed surgical procedure (Table 3).

Table 3. Indications for Surgery and Surgical Procedures Performed (n = 32)

Variable	Category	Frequency (n)	Percentage (%)
Indication for surgery	Infected pancreatic necrosis	15	46.9
	Persistent sepsis	7	21.9
	Pancreatic abscess	5	15.6
	Hemorrhagic complications	3	9.4
	Bowel-related complications	2	6.2
	Open necrosectomy with drainage	18	56.2
Surgical procedure	Debridement with lavage	7	21.9
	Abscess drainage	5	15.6
	Other procedures	2	6.2

Postoperative complications were observed in a substantial proportion of patients. Surgical site infection was the most common complication, followed by respiratory complications and sepsis. Nevertheless, over one-third of patients experienced no postoperative complications during their hospital stay (Table 4).

Table 4. Postoperative Complications Following Surgical Intervention (n = 32)

Complication	Frequency (n)	Percentage (%)
Surgical site infection	8	25.0
Respiratory complications	6	18.8
Pancreatic fistula	4	12.5
Sepsis	5	15.6
Acute kidney injury	3	9.4
No postoperative complication	12	37.5

*Some patients experienced more than one complication.

Overall, 29 patients recovered and were discharged, while 3 patients died, resulting in an in-hospital mortality rate of 9.4%. Severe acute pancreatitis was significantly associated with poorer clinical outcomes compared with moderately severe disease ($p = 0.043$) (Table 5).

Table 5. Association Between Disease Severity and Clinical Outcome (n = 32)

Severity Category	Recovered n (%)	Died n (%)	Total	p-value
Moderately severe AP (n=20)	20 (100.0)	0 (0.0)	20	0.043*
Severe AP (n=12)	9 (75.0)	3 (25.0)	12	
Total	29 (90.6)	3 (9.4)	32	

*Fisher's Exact Test; $p < 0.05$ considered statistically significant.

DISCUSSION

The present study evaluated the clinical profile and outcomes of patients with acute pancreatitis requiring surgical intervention in a tertiary care hospital in North India. Among the 32 patients included, the majority were middle-aged males, with alcohol-related pancreatitis representing the

most common etiology. Infected pancreatic necrosis was the leading indication for surgery, and open necrosectomy with drainage was the most frequently performed procedure. The overall in-hospital mortality rate was 9.4%, and severe acute pancreatitis was significantly associated with adverse outcomes.

The predominance of male patients observed in this study is consistent with reports from both Indian and international literature, where acute pancreatitis requiring intervention is more frequently encountered among men due to the higher prevalence of alcohol-related disease [6,8]. Similarly, the highest proportion of patients belonged to the economically productive age group of 31–45 years, a finding that has been reported in several observational studies evaluating severe acute pancreatitis and pancreatic necrosis [9,10]. This demographic pattern has important socioeconomic implications because prolonged hospitalization and postoperative recovery can substantially affect workforce productivity and healthcare costs.

Alcohol-related pancreatitis was identified as the most common etiology, followed by gallstone disease. This observation is comparable to findings from many tertiary care centers in India where alcohol consumption contributes significantly to the burden of acute pancreatitis, particularly among male patients [11]. In contrast, studies from several Western countries have reported gallstones as the predominant cause of acute pancreatitis [12]. Such differences may reflect regional variations in lifestyle factors, dietary habits, alcohol consumption patterns, and referral characteristics of tertiary hospitals.

Most patients in the present study had moderately severe or severe acute pancreatitis according to the Revised Atlanta Classification, with pancreatic necrosis documented in more than half of the cases. These findings are expected because the study specifically included patients requiring surgical intervention, a subgroup known to represent the severe end of the disease spectrum [1,5]. Previous studies have demonstrated that pancreatic necrosis is strongly associated with local complications, secondary infection, prolonged hospitalization, and increased mortality [13]. The high proportion of necrotizing disease in our cohort therefore reflects the clinical complexity of surgically managed patients.

Infected pancreatic necrosis was the most common indication for surgery, accounting for nearly half of all interventions. This finding aligns with contemporary management guidelines, which identify infected necrosis as the principal indication for operative or invasive intervention when conservative management fails [6,7]. During the period of the present study, open necrosectomy remained an important treatment option in many resource-constrained settings despite increasing adoption of minimally invasive approaches worldwide. The predominance of open necrosectomy in our study may be attributable to disease severity, delayed referrals, local expertise, and institutional resource availability.

Postoperative morbidity remained considerable, with surgical site infection, respiratory complications, and sepsis being the most frequently observed adverse events. Similar patterns of postoperative complications have been reported in previous studies evaluating surgical management of necrotizing pancreatitis [14,15]. The inflammatory burden associated with severe pancreatitis, prolonged critical illness, and the complexity of surgical procedures likely contribute to these outcomes. Nevertheless, more than one-third of patients experienced no postoperative complications, suggesting that timely surgical intervention and perioperative care may contribute to favorable recovery in selected patients.

The overall mortality rate of 9.4% observed in the present study falls within the range reported in contemporary literature for surgically managed acute pancreatitis and infected pancreatic necrosis

[13–15]. Importantly, severe acute pancreatitis was significantly associated with mortality and poorer outcomes. This observation supports previous evidence demonstrating that persistent organ failure and severe disease are among the strongest predictors of adverse prognosis in acute pancreatitis [3,4]. Early identification of high-risk patients, intensive monitoring, and multidisciplinary management remain essential to improve outcomes.

From a clinical perspective, the findings highlight the importance of prompt severity assessment, early recognition of infected necrosis, and appropriate surgical decision-making in patients with complicated acute pancreatitis. In tertiary care centers, coordinated management involving surgeons, gastroenterologists, radiologists, intensivists, and nutrition specialists may reduce morbidity and improve survival. The study also underscores the continued relevance of surgical intervention in carefully selected patients despite advances in minimally invasive techniques.

The strengths of the present study include the exclusive evaluation of surgically managed acute pancreatitis patients and the use of standardized diagnostic and severity criteria. Furthermore, the study provides data from a North Indian tertiary care center, contributing region-specific evidence to a relatively limited body of literature.

However, certain limitations should be acknowledged. The study was conducted at a single center with a relatively small sample size, limiting the generalizability of the findings. The observational design precludes causal inference, and the short study duration restricted assessment to in-hospital outcomes. Long-term follow-up data regarding pancreatic function, quality of life, and recurrence could not be evaluated. Additionally, comparison with non-surgically managed patients was beyond the scope of the study.

Overall, the present study demonstrates that patients requiring surgical intervention for acute pancreatitis represent a high-risk population characterized by significant morbidity and measurable mortality. Disease severity remains a key determinant of outcome, emphasizing the need for early risk stratification and specialized multidisciplinary care.

CONCLUSION

Acute pancreatitis requiring surgical intervention represents a severe subset of the disease associated with substantial morbidity and a measurable risk of mortality. In the present study, affected patients were predominantly middle-aged males, with alcohol-related pancreatitis emerging as the most common etiology. Infected pancreatic necrosis was the leading indication for surgery, and open necrosectomy with drainage was the most frequently performed procedure.

Postoperative complications, particularly surgical site infections, respiratory complications, and sepsis, were common; however, the majority of patients achieved successful recovery and were discharged. The overall in-hospital mortality rate was 9.4%, with severe acute pancreatitis showing a significant association with adverse outcomes. These findings emphasize the importance of early disease severity assessment, prompt identification of complications requiring surgical management, and multidisciplinary care in tertiary healthcare settings. Strengthening referral pathways, optimizing perioperative management, and ensuring timely intervention may further improve outcomes. Larger multicentric studies with long-term follow-up are recommended to better define prognostic factors and evaluate functional outcomes among surgically managed patients with acute pancreatitis.

DECLARATIONS

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Conflict of Interest: The authors declare no conflict of interest.

Informed Consent: Written informed consent was obtained from all participants or their legally authorized representatives before enrollment in the study.

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