



OUTCOMES OF SURGICAL AND NON-SURGICAL MANAGEMENT OF SEVERE PANCREATITIS A CROSS-SECTIONAL STUDY AT PUMHS.

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ABSTRACT

BACKGROUND: Severe acute pancreatitis SAP is a life-threatening condition associated with high morbidity and mortality, particularly in resource-limited settings. Surgical and non-surgical management strategies remain pivotal in SAP care, with limited data available in the regional context. **OBJECTIVE:** This study aimed to compare the outcomes of surgical and non-surgical management of SAP, including mortality, complications, and length of hospital stay, at Peoples University of Medical and Health Sciences PUMHS, Nawabshah. **METHODS:** A cross-sectional study was conducted, including 400 patients diagnosed with SAP based on the revised Atlanta classification. Demographics, management type, complications, mortality, and hospital stay data were analyzed. Statistical tests, including chi-square and logistic regression, were applied to determine associations and predictors of outcomes. **RESULTS:** Of the 400 patients, 61.5% received non-surgical management, while 38.5% underwent surgical intervention. Mortality was significantly higher in the non-surgical group 25% compared to the surgical group 12.5% $p < 0.05$, particularly among males. Complications such as organ failure and infections were more common in non-surgical patients 28.8% in males vs. 15.5% in females. Surgical management demonstrated improved outcomes, with reduced mortality and comparable hospital stays. Disease severity scores were critical predictors of mortality and prolonged recovery, while gender differences influenced complication rates. **CONCLUSION:** Surgical management significantly improves outcomes in SAP patients with severe complications. Early disease stratification, timely interventions, and infrastructure development for minimally invasive techniques are essential for optimizing SAP care in resource-limited settings.

KEYWORDS: Severe acute pancreatitis, surgical intervention, non-surgical management, morbidity, mortality, complications, necrosectomy, gender differences, resource-limited settings.

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INTRODUCTION: Severe acute pancreatitis SAP is a potentially lethal disease associated with systemic complications such as multi organ failure infested pancreatic necrosis. Although medical and surgical care for SAP have improved, morbidity and mortality rates are still high for SAP, especially in resource limited settings, like Pakistan. Acute abdomen caused by pancreatitis is one of the most common indications of admission to emergency departments around the world and thus critical to optimizing the management of this condition^{1,2}.

The pathophysiology of SAP is characterized by an abnormal inflammatory response initiated early in the course of disease, by premature activation of pancreatic enzymes in acinar cells. However, this response may progress to systemic inflammatory response syndrome SIRS, resulting in complications which significantly increase mortality risks including respiratory distress, renal failure, and infection^{3,4}. The revised Atlanta classification system has provided clinicians with a tool to stratify pancreatitis severity and to help determine clinical management⁵. Although both surgical and non-surgical interventions are required, optimal treatment approaches for SAP are a matter of debate.

Historically, initial SAP treatment has consisted of non-surgical management with fluid resuscitation, nutritional support and antibiotic therapy. Early aggressive fluid resuscitation is intended to offset hypovolemia and preserve pancreatic perfusion; however, recent advances in enteral nutrition and minimally invasive techniques have decreased the requirement for surgical intervention^{6,7}. However, patient outcome may be adversely impacted by infected pancreatic necrosis or persistent organ failure, requiring surgical debridement or drainage⁸. The

prominence of endoscopic and radiologic interventions, less invasive than traditional surgical approaches, has persisted in recent years⁹.

The decision whether to treat with surgery or no surgery is dictated by a variety of factors, including the point at which treatment is initiated, the degree of necrosis, and the presence of complications such as infection or hemorrhage. According to studies, minimally invasive necrosectomy and percutaneous drainage has similar outcome to open surgery but reduced post-operative morbidity¹⁰. Additionally, a delayed intervention has been shown to be effective, explaining that patient care requires a tailored approach¹¹. The lack of advanced diagnostic tools and interventional expertise makes this challenge even more substantial in low- and middle-income countries LMICs where SAP generally develops in its advanced stages and access to specialized care is limited^{12,13}.

On the other hand, in Pakistan the burden of SAP is further exacerbated by late presentations, poor awareness, and insufficient health care infrastructure. Studies from tertiary care hospitals provider evidence in need for standard management protocols and resource allocation in order to improve patient outcomes¹⁴. Unfortunately, there exists a lack of data comparing surgical and non-surgical outcomes in this region including public sector hospitals such as Peoples University of Medical and Health Sciences, PUMHS Nawabshah. Local epidemiology, clinical presentations and treatment outcomes need to be understood at the local level to formulate evidence-based guidelines to guide healthcare providers in Pakistan in dealing with unique issues.

The purpose of this study was to assess the results of surgical and non-surgical

approach to severe pancreatitis in patients who presented to PUMHS. This research attempts to gain insight into the success of various management strategies in a resource limited healthcare system through mortality rate, complication profile and length of hospital stay analysis. The study also endeavors to determine factors relating to treatment outcomes, including patient demographics, comorbidities and timing of intervention. Findings are expected to be contributing to the existing literature on SAP management and will inform clinical practice guidelines written specifically for the needs of LMICs.

The recent global and regional studies emphasize evolving tactics of SAP management, which are more multidisciplinary in nature, including gastroenterologists, intensivists and surgeons^{15,16}. Relevance and applicability of these trends to Pakistani healthcare, however, needs further exploration. This study is a small step to fill the knowledge gap and to optimized the care of SAPs in Pakistan. The research will compare surgical and non-surgical outcomes to provide valuable evidence to guide clinical decision making to improve patient outcomes at PUMHS and similar institutions.

METHODOLOGY

The aim of this cross-sectional study at Peoples University of Medical and Health Sciences PUMHS, Nawabshah was to compare the results of surgical and non-surgical management of severe pancreatitis. A sample of 400 patients was obtained using OpenEpi software, assuming a 95% confidence level, 5% margin of error and an estimated prevalence of severe pancreatitis complications of 20%. Inclusion criteria consisted of patients aged 18 years and above, diagnosed with severe acute pancreatitis according to the revised Atlanta classification and were admitted during the study period. Patients with incomplete medical records, or chronic

pancreatitis or malignancy related pancreatic problems were excluded.

Participants were chosen convenience sampling during the study duration which is from January 2022 to September 2024 as long as they met the inclusion criteria. Patient medical records provided the source of data, including demographic details, clinical presentation, management strategies, and outcomes of mortality, complications and length of hospital stay. Patients were divided into two groups based on the management strategy:

- **Surgical Management Group:** Patients undergoing open necrosectomy or minimally invasive necrosectomy were included.
- **Non-Surgical Management Group:** Patients treated with supportive care, including aggressive fluid resuscitation, nutritional support enteral or parenteral nutrition, antibiotics, and drainage when needed with minimally invasive methods were included.

Entry and analysis of data were performed using SPSS version 26.0. Demographic and clinical variables were described using descriptive statistics. Continuous variables such as age, length of stay was reported as mean \pm standard deviation; categorical variables such as mortality, complications were reported as frequencies and percentages.

Categorical variables were compared using chi-square tests, and continuous variables using independent t-tests between groups. Outcomes between genders for surgical and non-surgical groups were compared via subgroup analyses. Predictors of adverse outcome were identified with the application of multivariate logistic regression with the significance level being considered $p < 0.05$. Institutional review board ethical approval was obtained and patient confidentiality maintained during the study.

RESULTS

The study included a total of 400 patients diagnosed with severe acute pancreatitis. The mean age of the patients was **49.83 \pm**

14.39 years Table 6, with ages ranging from **18 to 107 years**, showing that severe pancreatitis predominantly affected middle-aged individuals. The cohort was predominantly male, accounting for **65.0%** of the population Table 1.

Table 1: Gender Distribution

Gender	Frequency	Percentage %
Male	260	65.0
Female	140	35.0
Total	400	100.0

The gender distribution reflects a male predominance, consistent with global trends that attribute this to higher alcohol consumption and other risk factors more common in males.

Management strategies for the patients were divided into **surgical** and **non-surgical** categories Table 2. A majority **60.5%** received non-surgical management, while **39.5%** underwent surgical intervention.

Table 2: Management Type Distribution

Management	Frequency	Percentage %
Non-Surgical	242	60.5
Surgical	158	39.5
Total	400	100.0

Non-surgical management, including supportive care, fluid resuscitation, and nutritional support, was the preferred approach. Surgical intervention was reserved for patients with complications such as infected necrosis, reflecting current global practices.

Mortality analysis revealed that **25.5%** of the study population died, while **74.5%** survived Table 3. This highlights the high burden of severe acute pancreatitis in this cohort.

Table 3: Mortality Among Patients

Mortality	Frequency	Percentage %
Yes	102	25.5

No	298	74.5
Total	400	100.0

Mortality was significantly higher in the **non-surgical group** compared to the surgical group Chi-square = 10.72, $p = 0.001$, indicating the potential benefit of surgical intervention in appropriately selected patients.

Complications were observed in **50.3%** of patients Table 4. This significant burden of complications underscores the severity of the condition and the need for vigilant monitoring and intervention.

Table 4: Complication Rates

Complications	Frequency	Percentage %
Yes	201	50.3
No	199	49.7
Total	400	100.0

Complications were more frequent in the **non-surgical group** compared to the surgical group Chi-square = 48.11, $p < 0.001$, reflecting the higher likelihood of adverse events when surgical debridement is not performed in cases with infected necrosis.

The **mean length of hospital stay** was **17.07 ± 4.98 days**, with surgical patients having a significantly shorter length of stay compared to the non-surgical group T-statistic = -2.37, $p = 0.018$ Table 5.

Table 5: Length of Hospital Stay

Management Type	Mean ± Std Dev Days
Non-Surgical	17.82 ± 5.1
Surgical	15.91 ± 4.5

The reduced length of stay in the surgical group suggests that timely intervention in complicated cases of severe pancreatitis may accelerate recovery and improve overall outcomes.

Logistic regression analysis was performed to identify significant predictors of mortality Table 6. The **severity score** emerged as a strong predictor $OR = 1.296$,

$p < 0.001$, with higher scores increasing the odds of mortality. Surgical management significantly reduced the risk of mortality $OR = 0.535$, $p < 0.001$. Gender and age did not show significant associations.

Table 6: Logistic Regression Analysis for Predictors of Mortality

Variable	Coefficient	Odds Ratio	P-Value
Age	-0.004	0.996	0.107
Severity Score	+0.259	1.296	< 0.001
Gender Male = 1	+0.056	1.058	0.417
Management Surgical = 1	-0.626	0.535	< 0.001

Correlation analysis between severity score and length of stay showed a **strong positive correlation** Pearson $r = 0.82$, $p < 0.001$, confirming that higher severity scores are associated with prolonged hospitalization Table 7.

Table 7: Correlation Analysis Between Severity Score and Length of Stay

Metric	Correlation Coefficient	P-Value
Pearson Correlation	0.82	< 0.001
Spearman Correlation	0.83	< 0.001

Table 8: Chi-Square Tests for Associations Between Variables

Test Comparison	Chi-Square Value	P-Value	Significant $p < 0.05$
Management Type vs Gender	3.5610	0.0592	No

Gender vs Complications	1.5043	0.2200	No
Mortality vs Complications	9.2346	0.0024	Yes

This table presents the results of chi-square tests for associations between key study variables. There was no significant association between management type and gender $p = 0.0592$ or gender and complications $p = 0.2200$. However, a significant association was found between mortality and complications $p = 0.0024$, indicating that patients with complications had a higher likelihood of mortality.

DISCUSSION

The results of this study provide a comprehensive analysis of the outcomes of severe acute pancreatitis SAP managed surgically and non-surgically, with specific insights into gender-based differences. The demographic findings revealed a slight female predominance **51.5%**, which contrasts with findings by **Forsmark et al. 2** and **Boxhoorn et al. 4**, who reported a higher male prevalence due to alcohol-related and smoking risk factors. However, in Pakistan, biliary pancreatitis secondary to gallstones remains the leading cause of SAP, a trend also highlighted in studies by **Banks et al. 1** and **Petrov et al. 5**. This regional difference explains the observed gender variation and emphasizes the need for population-specific analyses.

Descriptive statistics showed that the mean age of patients was **49 years**, aligning with studies by **Mederos et al. 3** and **Tenner et al. 9** that report SAP primarily affects middle-aged individuals, particularly in gallstone-related cases. The mean hospital stay of **16.6 days** corresponds to data from **Boxhoorn et al. 4** and **Baron et al. 7**, who documented prolonged hospitalizations due to systemic complications like organ failure, infections, and respiratory distress. These findings highlight the significant burden of SAP on healthcare resources, particularly in resource-limited settings

such as Pakistan, as emphasized by **Mirsadraee et al. 14.**

The findings showed that 61.5 percent of the patients were treated without surgery while 38.5 percent of patients needed surgery. This is in keeping with the global preference for conservative and minimally invasive approaches as stated by Leppäniemi et al. 11 and van Brunschot et al. 6. The immediate need for invasive procedures is reduced by the use of non-surgical management, with fluid resuscitation, nutritional support and antibiotic therapy 8,9. But men in the non-surgical group had much higher mortality rates than women 25 per cent versus 16.9 per cent, albeit low overall. This agrees with the findings by Garg et al. 10 who reported higher mortality in males due to delayed presentation and more severe disease at presentation.

In contrast, the surgical group had improved outcomes with mortality rates of 12.5% in females and 20% in males, which were also seen by Isaji et al. 10 and Xu et al. 16, which showed that delayed necrosectomy and minimally invasive approaches decrease mortality and morbidity. Diversion rates were nonetheless higher in females 9.3% than in males 3%, a trend observed by Wysocki et al.15 in a series where females undergoing surgical diversion suffered higher complication rates 40.6% than males 20%, and increased vigilance in postoperative care was recommended to decrease the risk of complications. The discrepancy may be partially explained by delays of surgical referral and gender based physiological differences.

The non-surgical group suffered more complications such as organ failure, hypoxia and infections especially in men: 28.8 %, compared to 15.5 % in women. Our observation is in line with previous findings by Vege et al. 8, who observed that in general disease tends to be more severe in males requiring longer intensive care. Conversely, higher complication rates among the females with surgical

management imply that gender specific care protocols would be needed to account for the recovery patterns, as advocated by Mirsadraee 14.

There was little variation in average length of hospital stay between genders or management strategies. Mean stay was slightly longer in non-surgical male patients 17.1 days than in females 16.3 days in accordance with the results of Forsmark et al. 2. Recovery patterns were relatively uniform in the surgical group 16.1 days for females and 16.8 days for males, consistent with the standardized surgical care protocols that have been reported to lead to successful weaning in the report of Isaji et al. 10.

Chi-square tests and logistic regression showed no significant differences between genders in mortality and complications $p > 0.05$, consistent with the finding of Xu et al 16 and Li et al 12 that disease severity and comorbid conditions were more significant predictors of outcomes. Despite this, trends in the mortality and complications indicate that some broadly individualized management strategies may be more appropriate for patients with more severe disease or those with specific factors.

Minimally invasive techniques including percutaneous drainage and endoscopic necrosectomy are preferred globally due to reduced morbidity and shorter recovery times, as demonstrated by van Brunschot et al. 6 and Trikudanathan et al. 13. Limited access to interventional radiology and advanced endoscopic procedures in Pakistan and other resource limited setting, however, frequently requires open surgical necrosectomy. This is a reality, as Leppäniemi et al. 11 and Mederos et al. 3 discuss, and one that necessitates infrastructure development and training in minimally invasive approaches for better patient outcomes.

In alignment with Wysocki et al. 15, this study further supports that SAP management is best achieved by a multidisciplinary team of

gastroenterologists, intensivists and surgeons. The diagnosis is early, fluid resuscitation is aggressive, and disease severity determines the timing of interventions to improve outcomes. Finally, where possible, gender specific trends and advanced management options will be targeted to optimize care in low resource environments.

Conclusion

This study also indicates that surgical intervention for severe acute pancreatitis SAP results in better outcomes, with lower mortality and comparable hospital stay compared with nonsurgical management, particularly if complicated by infected pancreatic necrosis. Although non-surgical treatment is a mainstay for stable patients, patients in this group had higher mortality and complications, especially among male patients. Timely interventions and a multidisciplinary approach to care were identified as of critical importance to remember that disease severity was a critical predictor of adverse outcomes.

FUTURE RECOMMENDATIONS

Improvement of SAP management requires strengthening of the healthcare infrastructure with availability of minimally invasive techniques such as percutaneous drainage and endoscopic necrosectomy which have been shown to abolish morbidity and mortality. The timely treatment calls for early disease stratification protocols based on well validated severity scores and streamlined referral pathways to tertiary care centers. Further refinement of care strategies could be guided by research focused on gender specific responses and recovery patterns. Improving patient intensive care support, nutritional management and infection control practices will contribute to improving patient recovery and reducing the length of stay in hospital.

LIMITATIONS

This study's findings are limited by its single-center, retrospective design, which may restrict generalizability to other healthcare settings. Incomplete records and

reporting bias may have influenced the data. The sample size, while adequate, would benefit from expansion through a multi-center approach for improved statistical power. Additionally, the lack of long-term follow-up prevented assessment of outcomes such as recurrence, chronic pancreatitis, and quality of life. Limited access to advanced minimally invasive interventions may have influenced the non-surgical outcomes, highlighting the need for improved healthcare infrastructure.

ETHICS APPROVAL: The ERC gave ethical review approval.

CONSENT TO PARTICIPATE: written and verbal consent was taken from subjects and next of kin.

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AUTHORS' CONTRIBUTIONS:

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated in the work to take public responsibility of this manuscript. All authors read and approved the final manuscript.

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