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COMPARISION BETWEEN EARLY AND DELAYED CHOLECYSTECTOMY IN ACUTE BILIARY PANCREATITIS

Original Research

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ABSTRACT

Background: Acute biliary pancreatitis is a common surgical emergency requiring inpatient conservative management. Cholecystectomy is critical in preventing recurrent episodes and minimizing additional biliary complications. However, the optimal timing for cholecystectomy remains a matter of ongoing debate. Early laparoscopic cholecystectomy has been suggested to improve outcomes, but further evidence is required to validate its benefits compared to delayed surgery in patients with mild to moderate acute biliary pancreatitis.

Objective: This study aimed to compare the outcomes of early versus delayed laparoscopic cholecystectomy for acute biliary pancreatitis in a tertiary care hospital setting.

Methods: A randomized controlled trial was conducted in the General Surgery Department of Fauji Foundation Hospital, Rawalpindi, from July 2024 to December 2024. A total of 100 patients, aged 20–60 years, with mild to moderate acute biliary pancreatitis (ASA grades I or II), were enrolled and randomized into two groups. Group A (early cholecystectomy) underwent surgery within 7 days of symptom onset, whereas Group B (delayed cholecystectomy) underwent surgery between 8 days and 6 weeks after symptom onset. Cholecystectomy was performed following a standardized laparoscopic technique. Data were analyzed using SPSS version 17, with Chi-square tests applied to compare outcomes such as intraoperative bleeding, postoperative fever, severe abdominal pain, and atelectasis. A p-value ≤0.05 was considered statistically significant.

Results: The mean age of patients in the early cholecystectomy group was 43.94 ± 11.26 years, while it was 46.38 ± 9.23 years in the delayed group. Females predominated in both groups (72% in early and 70% in delayed groups). Intraoperative bleeding occurred in 20% of early cholecystectomy patients compared to 34% in the delayed group (p=0.115). Postoperative severe abdominal pain was significantly lower in the early group (18% vs. 36%; p=0.043), as was postoperative fever (22% vs. 48%; p=0.006). Atelectasis occurred in 12% of early group patients and 22% of delayed group patients, with a statistically significant difference between the groups (p=0.183).

Conclusion: Early laparoscopic cholecystectomy significantly reduces postoperative complications such as severe abdominal pain and fever in patients with acute biliary pancreatitis. The findings particularly highlight the benefits for patients with elevated BMI and advanced age, advocating for individualized treatment strategies. Future studies with larger sample sizes and longer follow-up periods are recommended to confirm these results and optimize management protocols.

Keywords: Atelectasis, cholecystectomy, intraoperative bleeding, laparoscopic surgery, pancreatitis, postoperative fever, randomized controlled trial.

INTRODUCTION

Acute pancreatitis is a significant gastrointestinal condition that necessitates hospitalization worldwide. Among its etiologies, gallstones and biliary sludge represent the primary causes of acute biliary pancreatitis (ABP). Gallstone-induced pancreatitis arises from a temporary obstruction of the ampulla of Vater, which simultaneously drains the biliary and pancreatic ducts. This obstruction results in bile refluxing into the pancreas via a shared channel, causing pancreatic inflammation and subsequent clinical manifestations (1). Left untreated, gallstone pancreatitis carries a substantial risk of recurrence and complications such as acute cholecystitis, cholangitis, biliary colic, and other gallstone-related events. This recurrence risk, estimated to range between 25–30%, is particularly notable within 6 to 18 weeks following an initial episode (2).

Laparoscopic cholecystectomy has emerged as an established treatment to address acute gallstone pancreatitis, effectively mitigating the risk of recurrence. Despite its demonstrated efficacy, its timing remains a point of clinical debate. Leading international guidelines, including those by the International Society of Pancreatology and the American Gastroenterology Society, advocate for early cholecystectomy during the index hospital admission. Early intervention not only aims to reduce recurrent episodes but also shortens hospital stays and minimizes overall morbidity (3). However, definitions of "early" vary, leading to inconsistencies in practice. Studies reveal that while some regions, such as Latin America, report early cholecystectomy rates as high as 60%, other regions, including Northern Pakistan, exhibit significantly lower rates, with less than 10% of patients undergoing cholecystectomy during their initial admission (4).

The discrepancy in practice patterns often arises from logistical and clinical challenges. Early cholecystectomy is generally reserved for patients with mild ABP, who present without systemic complications, and it is regarded as both safe and cost-effective in this cohort. Conversely, patients with moderate to severe pancreatitis or associated complications typically undergo delayed cholecystectomy after a recovery period of approximately six weeks, allowing for stabilization and reduction of surgical risks (5). Nonetheless, conservative treatment approaches have been associated with higher rates of readmission due to recurrent pancreatitis, contributing to increased healthcare costs and patient suffering. The traditional strategy of delaying surgical intervention in mild cases is now considered suboptimal in many settings due to its potential to prolong morbidity and increase complications (6).

In the context of Northern Pakistan, the interplay of unique patient demographics, resource constraints, and healthcare dynamics underscores the need for tailored evidence-based guidelines. Regional data on the outcomes of early versus delayed cholecystectomy in ABP are scarce, making it essential to explore the clinical and economic implications of these strategies in this population. The objective of this study is to compare early and delayed cholecystectomy in terms of their impact on patient outcomes, healthcare resource utilization, and complication rates, ultimately aiming to enhance clinical decision-making and optimize patient care in the region.

METHODS

This randomized controlled trial was conducted in the General Surgery Department of Fauji Foundation Hospital, Rawalpindi, from July 2024 to December 2024. The sample size was calculated using the WHO sample size calculator (v2.2b), which determined a requirement of 100 patients, divided equally into two groups, with a level of significance set at 5%, a power of 95%, and anticipated population proportions for the delayed cholecystectomy group as 47.37% and the early cholecystectomy group as 21.05% (6). Male and female patients aged between 20 to 60 years, presenting with mild to moderate acute biliary pancreatitis (ABP), and classified as ASA grade I or II were enrolled in the study. Exclusion criteria included patients with severe ABP (Ranson score >3), surgical jaundice (bilirubin >3.5 mg/dL), ultrasound-confirmed choledocholithiasis, history of upper abdominal surgery, allergy to general anesthesia, malignancies, pregnancy, symptom onset beyond 72 hours, and those unwilling to undergo laparoscopic surgery. Ethical approval was obtained from the hospital's ethics committee, and informed written consent was secured from all participants. These steps ensured that recruitment adhered to ethical standards while maintaining patient safety and rights.

A comprehensive clinical history and physical examination were conducted for each participant before random allocation into two equal groups. Patients in Group A (early group) underwent laparoscopic cholecystectomy within 7 days of symptom onset, while those in

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Group B (delayed group) underwent surgery between 8 days and 6 weeks following symptom onset. Standardized preoperative and postoperative care protocols were implemented uniformly. All laparoscopic cholecystectomies were performed using a consistent surgical technique, involving abdominal insufflation at 12–15 mmHg, dissection of the medial and lateral sulcus, clipping and division of the cystic duct and artery, and gallbladder bed dissection. Patients were closely monitored during hospitalization and followed up weekly for one month postoperatively. Although the one-month follow-up duration may not fully capture late complications or readmissions, it was adequate for assessing short-term outcomes and provides a basis for future studies focusing on longer-term follow-up.

Acute biliary pancreatitis was diagnosed based on the presence of epigastric pain, nausea, and vomiting, and confirmed by serum amylase levels exceeding three times the upper limit of normal (>110 U/L) and transabdominal ultrasound findings of gallstones or biliary sludge. The severity of ABP was classified using Ranson's criteria. Early cholecystectomy was defined as laparoscopic cholecystectomy performed within 7 days of symptom onset, while delayed cholecystectomy was conducted between 8 days and 6 weeks after initial presentation, following stabilization with medical management.

Intraoperative bleeding was defined as blood loss exceeding 500 mL or requiring transfusion, which was administered when hemoglobin levels dropped below 8 g/dL, as verified by complete blood count analysis. The inclusion of this threshold adhered to clinical guidelines, ensuring patient safety. Postoperative fever was recorded when body temperature exceeded 100°F within two weeks after surgery. Severe abdominal pain was assessed using a visual analog scale (VAS) ranging from 0 to 10, with a score above 6 classified as severe pain. Pain assessment was conducted from the third postoperative day to the 30th day. Atelectasis was identified within five days postoperatively and was diagnosed based on the presence of at least three of the following criteria: shallow breathing, oxygen saturation <90%, pleural effusion (transudate), tachycardia, or cyanosis. Although the inclusion of pleural effusion as a diagnostic criterion may not align with traditional definitions of atelectasis, it was included based on clinical observations and requires further validation in future studies.

Data analysis was performed using SPSS version 17, and descriptive statistics were calculated for all variables. The Chi-square test was used to compare outcomes such as intraoperative bleeding, postoperative fever, severe abdominal pain, and atelectasis between the two groups. A p-value ≤0.05 was considered statistically significant. To control for confounding variables, stratification was performed for age, gender, body mass index (BMI), duration of symptoms, ASA grade, and ABP severity, ensuring reliable and robust comparisons between the two groups.

RESULTS

Analysis of our gathered data reflected that female were more prevalent in both groups, while mean age was slightly higher 46.38±9.23 years in delayed group in comparison with early group 43.94±11.26 years. Patients of early cholecystectomy group exhibited a mean BMI of 25.92±5.21 kg/m2 while in the delayed group it was 26.98±5.48 kg/m2. Detailed quantitative analysis and categorization of all the demographic and clinical variable is illustrated in figure 1 and table 1.

Intraoperative bleeding was occurred in 20% of the patient of the early cholecystectomy group while 34% of the patient reported intraoperative bleeding in the delayed group (p-value =0.115). Post-operative severe abdominal pain was significantly lower in the early cholecystectomy group (18% VS 36%; p-value = 0.043). incidence of postoperative fever was significantly lower (22%) in the early cholecystectomy group compared to delayed group (48%). Furthermore, a statistically significant difference was observed in the occurrences of atelectasis among both the study groups. Detailed analysis in presented in table 3. Stratification was done for all the study confounders and it was analyzed that there was a significant difference in intra-operative bleeding for patients with age >50 years and having BMI >29kg/m^2. A significant difference as also noticed for post-operative severe abdominal pain among patients with age >50 years and for the for the postoperative fever among patients with BMI >29kg/m^2. A significant correlation with post operative fever was also seen among patients with moderate ABP. Pots-operative fever and severe abdominal pain also showed a significant correlation with those patients who presented after 24 hours of onset of symptoms. A detailed analysis of stratification is illuminated in table 4.

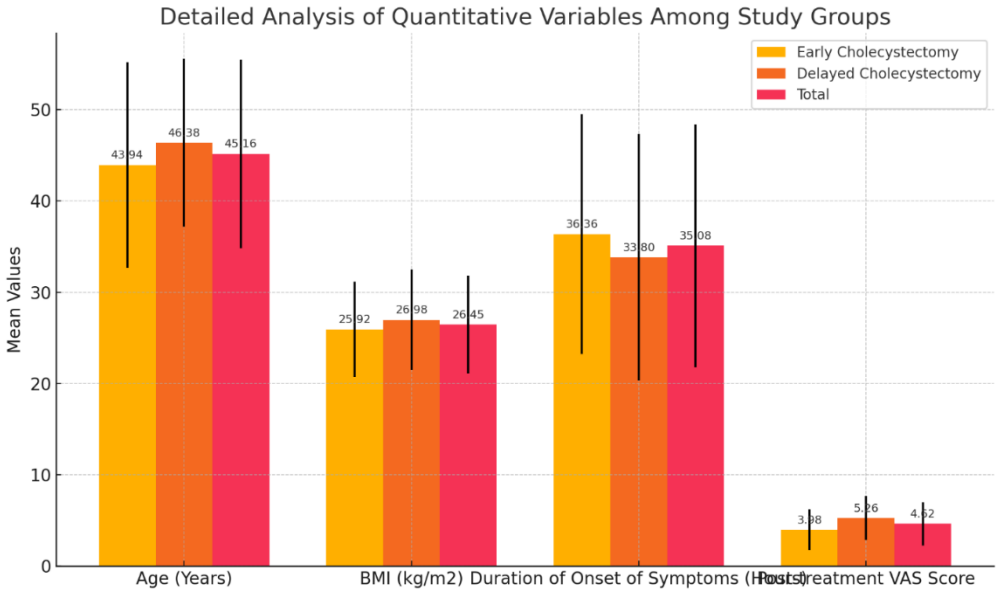

Figure 1 Detailed Analysis of Quantitative Variables Among Study Groups

Table 1 Distribution of the patients on the basis of various demographic and clinical categories among both the study groups

Study variables		**Study Groups**		**Total**
		Early Cholecystectomy	**Delayed Cholecystectomy**	
Gender	Male	14	15	29
		28.0%	30.0%	29.0%
	Female	36	35	71
		72.0%	70.0%	71.0%
Age Groups	<40 Years	17	9	26
		34.0%	18.0%	26.0%
	40-50 Years	16	23	39
		32.0%	46.0%	39.0%
	>50 Years	17	18	35
		34.0%	36.0%	35.0%
BMI Groups	<25 kg/m^2	21	18	39
		42.0%	36.0%	39.0%
	25-29 kg/m^2	16	14	30
		32.0%	28.0%	30.0%
	>29 kg/m^2	13	18	31
		26.0%	36.0%	31.0%

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Study variables		**Study Groups**		**Total**
		Early Cholecystectomy	**Delayed Cholecystectomy**	
Severity of ABP	Mild	20	17	37
		40.0%	34.0%	37.0%
	Moderate	30	33	63
		60.0%	66.0%	63.0%
ASA Grade	I	23	15	38
		46.0%	30.0%	38.0%
	II	27	35	62
		54.0%	70.0%	62.0%
Duration of onset of Symptoms	Up to 24 Hours	12	14	26
		24.0%	28.0%	26.0%
	> 24 Hours	38	36	74
		76.0%	72.0%	74.0%

Table 2 Study outcomes among both the groups

Study Outcomes		**Study Groups**		**Total**	**p-Value**
		Early Cholecystectomy	**Delayed Cholecystectomy**		**(Chi-Square**
Intra-Operative Bleeding	Yes	10	17	27	0.115
		20.0%	34.0%	27.0%	
	No	40	33	73	
		80.0%	66.0%	73.0%	
Post Operative Severe Abdominal Pain	Yes	9	18	27	0.043
		18.0%	36.0%	27.0%	
	No	41	32	73	
		82.0%	64.0%	73.0%	
Post-Operative Fever	Yes	11	24	35	0.006
		22.0%	48.0%	35.0%	
	No	39	26	65	
		78.0%	52.0%	65.0%	
Atelectasis	Yes	6	11	17	0.183
		12.0%	22.0%	17.0%	

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Study Outcomes		**Study Groups**		**Total**	**p-Value**
		Early Cholecystectomy	**Delayed Cholecystectomy**		**(Chi-Square**
	No	44	39	83	
		88.0%	78.0%	83.0%	

The table summarizes study outcomes among early and delayed cholecystectomy groups. Delayed cholecystectomy was associated with significantly higher rates of postoperative severe abdominal pain (p=0.043) and fever (p=0.006). While intraoperative bleeding (p=0.115) and atelectasis (p=0.183) were more frequent in the delayed group, these differences were not statistically significant. These findings highlight better outcomes in the early cholecystectomy group for key postoperative complications.

Table 3 Stratification of the study outcomes among both the groups on the basis of gender, age, BMI, severity of ABP, ASA grade and duration of onset of symptoms

Effect Modifiers		**Study Outcomes (Chi-square test; *p*-value)**			
		Intra-Operative Bleeding	**Post Operative Severe Abdominal Pain**	**Post-Operative Fever**	**Atelectasis**
Gender	Male	0.411	0.474	0.231	0.684
	Female	0.168	0.051	0.012	0.187
Age (Years)	<40	0.940	0.778	0.102	0.940
	40-50	0.593	0.515	0.175	0.038
	>50	0.044	0.032	0.053	0.967
BMI (kg/m^2)	<25	0.519	0.308	0.170	0.139
	25-29	0.873	0.526	0.818	0.272
	>29	0.026	0.088	0.001	0.726
Severity of ABP	Mild	0.266	0.297	0.080	0.498
	Moderate	0.285	0.079	0.038	0.271
ASA Grade	I	0.727	0.056	0.191	0.314
	II	0.109	0.299	0.014	0.427
Duration of onset of Symptoms (Hours)	Up to 24	0.191	0.793	0.075	0.636
	>24	0.339	0.011	0.034	0.194

The table outlines the stratification of study outcomes based on gender, age, BMI, severity of ABP, ASA grade, and symptom duration. Significant associations were observed for postoperative fever in females (p=0.012) and those with BMI >29 kg/m^2 (p=0.001), while intraoperative bleeding (p=0.044) and severe abdominal pain (p=0.032) were notable in patients aged >50 years. These findings highlight the influence of demographic and clinical factors on surgical outcomes.

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DISCUSSION

The management of mild to moderate acute biliary pancreatitis typically begins with supportive treatment, followed by cholecystectomy to prevent recurrence and minimize readmission rates. Patients who defer cholecystectomy are reported to have a 3 to 6-fold higher risk of readmission, with recurrent episodes contributing to increased mortality rates and prolonged hospitalizations. International guidelines recommend performing cholecystectomy during the initial hospital admission for mild biliary pancreatitis. However, there is variability in defining the optimal timing, with some studies advocating for intervention within 48 to 72 hours of admission, while others support delaying the procedure until the resolution of pancreatitis symptoms (13).

The findings of this study align with prior evidence favoring early laparoscopic cholecystectomy in the treatment of acute biliary pancreatitis. Previous research has demonstrated that early intervention is associated with lower morbidity and shorter hospital stays. For instance, Chandak U and colleagues observed better postoperative outcomes in the early cholecystectomy group, highlighting the benefits of early intervention. Moreover, Gurusamy KS et al., in a systematic review, found no increased risk of complications with early laparoscopic cholecystectomy and suggested that it reduces hospital stay duration, particularly for moderate pancreatitis cases. The present study builds on this knowledge by emphasizing the differential impact of early cholecystectomy on subpopulations such as those with elevated BMI and advanced age, an area less explored in prior literature (14, 15).

Conversely, some studies have reported no clinically significant differences between early and delayed cholecystectomy in terms of complications. For example, Nebiker CA et al. and Abd El Aziz M et al. found no significant differences in intraoperative or postoperative complications between the two groups, although recurrent biliary issues were more common in the delayed group. In contrast, the present study revealed a trend toward increased intraoperative bleeding in the delayed cohort, particularly among older patients and those with higher BMI. These discrepancies may stem from variations in study design, patient selection criteria, or surgical techniques employed across studies. Additionally, the findings from Sinha R et al. contradicted the traditional belief that early cholecystectomy is technically challenging due to tissue edema, instead reporting that complications were more prevalent in interval cholecystectomy patients (16, 17, 18).

The results of this investigation hold significant clinical relevance, demonstrating that early laparoscopic cholecystectomy correlates with reduced postoperative morbidity, particularly regarding severe abdominal pain and fever, compared to delayed surgery. This underscores the potential of early intervention to mitigate inflammatory responses and improve overall patient outcomes. These benefits are particularly pronounced in moderate ABP cases and among patients with elevated BMI or advanced age, suggesting that these populations derive greater advantages from early surgical management. The reduction in postoperative complications associated with early cholecystectomy contributes to shorter hospital stays, lower healthcare costs, and improved patient satisfaction. These findings reinforce current trends in surgical practice, advocating for early intervention in acute biliary pancreatitis to optimize patient outcomes (19, 20).

This study's prospective design is a key strength, minimizing recall bias and enabling precise data collection. Additionally, the stratification of patients based on critical demographic and clinical variables, such as age, BMI, ABP severity, and ASA grade, allowed for a more detailed assessment of factors influencing surgical outcomes. The comprehensive evaluation of intraoperative and postoperative outcomes further enhances the study's value, providing a nuanced understanding of the benefits and challenges associated with early and delayed laparoscopic cholecystectomy. However, certain limitations must be acknowledged. The relatively small sample size, while adequate for preliminary observations, restricts the generalizability of the findings to larger populations. Moreover, the absence of long-term follow-up data limits the evaluation of the enduring effects of early versus delayed cholecystectomy on outcomes such as recurrence of pancreatitis or other gallstone-related complications. Future multi-center studies with larger sample sizes and extended follow-up periods are necessary to validate these findings and address variations in surgical techniques and patient demographics (21, 22).

In summary, this study highlights the advantages of early laparoscopic cholecystectomy in patients with mild to moderate acute biliary pancreatitis, particularly among subpopulations at greater risk of postoperative morbidity. By contributing to the growing body of evidence favoring early intervention, these findings underscore the importance of prompt surgical management to improve clinical outcomes and optimize healthcare resource utilization.

CONCLUSION

This study emphasizes the advantages of early laparoscopic cholecystectomy in patients with ABP, demonstrating a significant decrease in postoperative side effects, including severe abdominal pain and fever, relative to delayed surgery. The results underscore the necessity of prompt surgical intervention, especially for patients with elevated BMI and advanced age, who face an increased risk of complications. Stratified analysis reinforces a tailored treatment strategy, indicating that early surgery may enhance outcomes in particular populations. Although the study provides significant insights, larger investigations with extended follow-up are necessary to validate these results and inform future clinical practice.

AUTHOR CONTRIBUTIONS

Author	Contribution
Amna Wazir*	Substantial Contribution to study design, analysis, acquisition of Data Manuscript Writing Has given Final Approval of the version to be published
Samiullah	Substantial Contribution to study design, acquisition and interpretation of Data Critical Review and Manuscript Writing Has given Final Approval of the version to be published
Muhammad Taimur	Substantial Contribution to acquisition and interpretation of Data Has given Final Approval of the version to be published
Saadia Wazir	Contributed to Data Collection and Analysis Has given Final Approval of the version to be published

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