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Original Research Article

Intraoperative Findings of Elective Laparoscopic Cholecystectomy in Diabetics Versus Nondiabetics: A Comparative Study

Kalpana Kumari[1], Saroj Kumar[2], Abhay Kumar[3], Pramod Kumar Sah[4]

[1]Senior Resident, Upgrated Department of General Surgery, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar, India

[2]Senior Resident, Upgrated Department of General Surgery, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar, India

[3]Senior Resident, Upgrated Department of General Surgery, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar, India

[4]Associate Professor, Upgrated Department of General Surgery, Darbhanga Medical College & Hospital, Laheriasarai, Darbhanga, Bihar, India

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Corresponding Author: Dr. Pramod Kumar Sah

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Abstract:

Background: Diabetes mellitus is known to impact various physiological processes, often leading to more complex surgical outcomes. This study aimed to compare intraoperative findings between diabetic and nondiabetic patients undergoing elective laparoscopic cholecystectomy at a tertiary care center in North Bihar.

Methods: A total of 107 patients scheduled for elective laparoscopic cholecystectomy were enrolled over a period of 11 months at Darbhanga Medical College & Hospital. Patients were divided into two groups: diabetics (Group A, n=42) and nondiabetics (Group B, n=65). Intraoperative findings such as adhesions, gallbladder wall thickness, presence of empyema or mucocele, operative time, and rate of conversion to open surgery were meticulously recorded and analyzed.

Results: Adhesions were significantly more common in the diabetic group (76.2%) compared to nondiabetics (38.4%) ($p < 0.01$). Thickened gallbladder wall was observed in 71.4% of diabetics and 30.7% of nondiabetics ($p < 0.01$). The mean operative time in diabetics was 73.4 ± 12.6 minutes, significantly higher than 59.1 ± 10.4 minutes in nondiabetics ($p < 0.01$). Conversion to open cholecystectomy was required in 4 diabetic patients (9.5%) and 1 nondiabetic patient (1.5%).

Conclusion: Diabetic patients undergoing elective laparoscopic cholecystectomy demonstrated more complex intraoperative scenarios, including higher adhesion rates, increased gallbladder wall thickness, and longer operative durations. These findings suggest the need for heightened surgical preparedness and optimized perioperative management in diabetic patients.

Introduction

Gallstone disease, or cholelithiasis, is a common gastrointestinal condition characterized by the formation of stones within the gallbladder [1]. It represents a significant healthcare burden globally and is frequently encountered in general surgical practice. Laparoscopic cholecystectomy has emerged as the gold standard for the treatment of symptomatic gallstone disease due to its advantages in terms of reduced postoperative pain, shorter hospital stays, faster recovery, and better cosmetic outcomes [2]. Despite its widespread use, various patient-related factors can influence the complexity and outcomes of this surgical procedure, with diabetes mellitus being a key contributor.

Diabetes mellitus (DM) is a chronic metabolic disorder marked by hyperglycemia resulting from defects in insulin secretion, insulin action, or both [3]. The prevalence of diabetes is rising globally, with developing countries like India witnessing a sharp increase in both urban and rural populations [4]. Diabetes is known to induce a spectrum of physiological alterations including microvascular and macrovascular complications, impaired immunity, delayed wound healing, and increased susceptibility to infections [5]. These pathophysiological changes are believed to influence surgical outcomes, particularly in abdominal surgeries.

In the context of gallstone disease, several studies have suggested a higher prevalence and severity of gallbladder pathology among diabetic individuals [6]. Diabetic patients tend to present with more

complicated forms of gallbladder disease, such as chronic cholecystitis, empyema, and gangrenous gallbladder, often with minimal or atypical symptoms. This can result in delayed diagnosis and intervention, further complicating the surgical procedure [7]. Intraoperatively, these patients frequently demonstrate features such as dense pericholecystic adhesions, contracted or fibrosed gallbladder, and thickened gallbladder walls, which may increase the technical difficulty of laparoscopic cholecystectomy and prolong operative time. In some cases, the procedure may even require conversion to open cholecystectomy.

Although numerous studies have assessed postoperative complications and outcomes in diabetic patients undergoing various surgical procedures, there is relatively limited data focusing specifically on intraoperative findings during laparoscopic cholecystectomy. Most available literature is either retrospective in nature or lacks comparative analysis between diabetics and nondiabetics in the same clinical setting. Moreover, the majority of existing studies are conducted in urban tertiary centers, and there is a dearth of research from peripheral and semi-urban institutions where resource constraints may further influence surgical outcomes.

Given this background, the present study was undertaken at Darbhanga Medical College & Hospital, a tertiary care institution in North Bihar, with the objective of evaluating and comparing the intraoperative findings of elective laparoscopic cholecystectomy in diabetic and nondiabetic patients. By systematically analyzing parameters such as the presence and severity of adhesions, gallbladder wall thickness, intraoperative complications, operative time, and conversion rates, this study aims to contribute to the growing body of evidence regarding surgical risk stratification and operative planning in diabetic patients. The insights gained may assist surgeons in anticipating potential difficulties, improving perioperative management, and optimizing surgical outcomes in this high-risk patient population.

Materials and Methods

A prospective, observational study was conducted over 11 months (September 2024 to July 2025) in the Department of General Surgery at Darbhanga Medical College & Hospital, Laheriasarai. A total of 107 consecutive patients scheduled for elective laparoscopic cholecystectomy and meeting the inclusion criteria were enrolled. All patients underwent preoperative evaluation, intraoperative assessment, and postoperative follow-up during their hospital stay.

Inclusion Criteria

- Adults aged ≥18 years
- Diagnosed with symptomatic gallstone disease
- Scheduled for elective laparoscopic cholecystectomy
- Provided informed consent

Exclusion Criteria

- Emergency cholecystectomy (e.g., for acute cholecystitis or perforation)
- Known or suspected gallbladder malignancy
- Previous upper abdominal surgery
- Incomplete intraoperative documentation

Intraoperative findings were recorded using a standardized format, with all surgeries performed under general anesthesia via a four-port laparoscopic technique. Parameters assessed included pericholecystic adhesions (graded as mild, moderate, or dense), gallbladder wall thickness (visually and histologically), presence of empyema, mucocele, or perforation, operative duration, need for conversion to open surgery, and intraoperative complications such as bleeding or bile duct injury. Patients were divided into Group A (diabetics, n = 42) and Group B (nondiabetics, n = 65). Primary outcomes were the frequency of adhesions, gallbladder wall thickening, and operative time; secondary outcomes included conversion rates and intraoperative complications. Data were analyzed using SPSS version 26, with t-tests for continuous variables and Chi-square or Fisher's exact tests for categorical data. A p-value < 0.05 was considered statistically significant.

Results

A total of 107 patients underwent elective laparoscopic cholecystectomy during the study period, comprising 42 diabetic patients (Group A) and 65 nondiabetic patients (Group B). The mean age of patients was comparable between the two groups, with a slight female predominance in both.

Intraoperative Findings: Pericholecystic adhesions were significantly more common in diabetic patients, observed in 32 out of 42 cases (76.2%), compared to 25 out of 65 cases (38.4%) in the nondiabetic group ($p < 0.01$). Gallbladder wall thickening was present in 30 diabetic patients (71.4%) versus 20 nondiabetic patients (30.7%).

Empyema or mucocele was encountered in 10 diabetic patients (23.8%) and 5 nondiabetics (7.7%). The mean operative time was significantly longer in diabetics (73.4 ± 12.6 minutes) than in nondiabetics (59.1 ± 10.4 minutes).

Conversion and Complications: Conversion to open surgery was required in 4 diabetic patients (9.5%) due to dense adhesions and unclear anatomy, compared to 1 case (1.5%) in the nondiabetic group ($p = 0.05$). Minor intraoperative bleeding was reported in 3 diabetics (7.1%) and 1

nondiabetic (1.5%), though this difference was not statistically significant. No bile duct injuries were reported in either group **(Table 1)**.

Table 1: Comparison of Intraoperative Findings Between Diabetic and Nondiabetic Patients Undergoing Elective Laparoscopic Cholecystectomy

Parameter	Diabetics (n = 42)	Nondiabetics (n = 65)	p-value
Pericholecystic adhesions	32 (76.2%)	25 (38.4%)	< 0.01
GB wall thickening	30 (71.4%)	20 (30.7%)	< 0.01
Empyema/Mucocele	10 (23.8%)	5 (7.7%)	0.02
Mean operative time (minutes)	73.4 ± 12.6	59.1 ± 10.4	<0.01
Conversion to open surgery	4 (9.5%)	1 (1.5%)	0.05
Intraoperative bleeding	3 (7.1%)	1 (1.5%)	0.15
Bile duct injury	0	0	--

Discussion

This study at Darbhanga Medical College & Hospital compared intraoperative findings of elective laparoscopic cholecystectomy in diabetic and nondiabetic patients. The results revealed significantly higher surgical complexity in diabetic patients, evidenced by increased rates of pericholecystic adhesions (76.2% vs. 38.4%, $p < 0.01$), thicker gallbladder walls (71.4% vs. 30.7%, $p < 0.01$), higher frequency of empyema or mucocele (23.8% vs. 7.7%, $p = 0.02$), longer operative times (73.4 ± 12.6 vs. 59.1 ± 10.4 minutes, $p < 0.01$), and a higher conversion rate to open surgery (9.5% vs. 1.5%, $p = 0.05$). These findings underscore the additional surgical challenges that diabetes poses in the context of laparoscopic gallbladder surgery.

Our findings closely align with the results of Luthra et al., who reported a significantly higher incidence of adverse intraoperative findings—such as thick-walled gallbladders, pericholecystic collections, and dense adhesions—in diabetic patients compared to nondiabetics [8]. This pattern of increased surgical difficulty is attributed to the chronic low-grade inflammatory milieu, microangiopathy, and fibrosis associated with diabetes, which contribute to gallbladder wall thickening and pericholecystic adhesions.

Similarly, Ziaee et al. found that diabetes significantly increased the risk of intraoperative complications such as adhesions (OR = 5.9), gangrene (OR = 7.6), and pancreatitis (OR = 4.5) [9]. These findings echo the heightened operative challenges documented in our study, including prolonged operative time and an increased need for conversion to open surgery.

While some studies, such as the one by Al-Mulhim, have claimed that laparoscopic cholecystectomy outcomes in diabetics can be made equivalent to nondiabetics through meticulous preoperative planning and surgical technique [10], our experience suggests that even under elective conditions, diabetes continues to impart considerable intraoperative complexity. This reinforces the importance of optimized preoperative glycemic control and careful surgical planning, even for elective cases.

Postoperative outcomes also merit attention. Singh et al. observed higher rates of bleeding, conversion to open surgery, postoperative pain, prolonged hospital stay, and wound infections in diabetics, although not all reached statistical significance [11]. Analogously, our study revealed a higher, but not statistically significant, trend toward intraoperative hemorrhage and longer operative durations. These adverse trends may reflect the impaired wound healing and immune dysfunction commonly seen in diabetic patients.

Contrastingly, Arora et al. observed that immediate postoperative complications such as wound infections, chest infections, and septicemia were comparable between diabetics and nondiabetics [12]. This suggests that with skilled surgical execution and postoperative care, early complications may be mitigated, though intraoperative challenges remain pronounced.

Beyond mechanical and procedural challenges, the diabetic state may influence physiological responses during surgery. Karimul et al. note that diabetics are at higher risk for postoperative wound infections, bile leaks, and pancreatitis, and benefit significantly from enhanced recovery protocols and strict glycemic control [13]. These protocols—including optimized fluid management, pain control, early mobilization, and tight perioperative glucose monitoring—not only reduce complication rates but may also improve the overall operative experience and outcomes.

Conversely, in a retrospective Turkish study, hypertensive patients with diabetes experienced less postoperative pain and lower analgesic requirements, potentially due to diabetic neuropathy and altered pain perception [14]. Though intriguing, these findings may not directly pertain to intraoperative findings, but they highlight this subgroup's variable pain response, which may influence postoperative management.

Our study highlights key clinical implications. Preoperative optimization through effective glycemic control may reduce intraoperative complications in diabetic patients by minimizing inflammation and fibrosis. Surgical planning should account for anticipated challenges such as dense adhesions and thickened gallbladder walls, requiring meticulous dissection and preparedness for conversion to open surgery. Risk stratification and counseling are essential to inform patients about potential complications and longer operative times. Postoperatively, enhanced recovery protocols—including strict glucose control, early mobilization, and infection monitoring—are particularly beneficial in diabetics.

However, the study has limitations. The sample size, while adequate, may be underpowered to detect rare complications. Being a single-center study, generalizability is limited. Not all gallbladder wall assessments were confirmed histologically, introducing possible bias. Additionally, the lack of long-term follow-up restricts conclusions about postoperative recovery and quality of life. Future research should include multicenter studies to enhance generalizability, intervention trials targeting preoperative optimization, and investigations of long-term outcomes to provide a more complete understanding of surgical success in diabetic patients.

Conclusion

The elective laparoscopic cholecystectomy in diabetic patients poses significantly increased intraoperative complexity, with higher rates of adhesions, gallbladder wall thickening, empyema, longer operative times, and higher conversion rates. These findings align with other studies and underscore the need for thorough preoperative preparation, anticipation of surgical challenges, and robust postoperative care. While careful technique and planning may help level outcomes between diabetics and nondiabetics, diabetes remains an important risk factor that merits attentive surgical management.

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