THE PLANET

Original Article

Postoperative Complications in Laparoscopic vs. Open Cholecystectomy: A Cross-Sectional Study

Mohammad Niamul Islam[1*], Proshanto Roy[2], Gobinda Biswas[3], Tahmid Ur Rahman[4], Shafiul Azam[5]

ARTICLE INFO

Received: 20 June 2026
Accepted: 25 June 2026
Published Online: 30 June 2026

DOI: 10.5281/zenodo.21078589

Volume: 9, Number: 4, Page: 238-241

e-ISSN: 2789-5912
ISSN: 2617-0817

*Corresponding author

ABSTRACT

Introduction: Gallstone disease is one of the most common surgical conditions requiring cholecystectomy. Laparoscopic and open cholecystectomy are widely used treatment approaches, each associated with different postoperative outcomes. This study aimed to compare postoperative complications and recovery outcomes between laparoscopic and open cholecystectomy. **Methods & Materials:** This cross-sectional comparative study was conducted in the Department of Surgery, Sir Salimullah Medical College & Mitford Hospital, Dhaka, Bangladesh from January 2025 to December 2025. A total of 104 patients diagnosed with symptomatic gallstone disease and scheduled for cholecystectomy were included in the study. Patients were selected using purposive sampling and were divided into two groups according to the surgical procedure performed: laparoscopic cholecystectomy (LC) (n=62) and open cholecystectomy (OC) (n=42). Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. **Result:** The laparoscopic group demonstrated significantly better postoperative outcomes, including shorter operative time (68.5±14.2 vs. 82.7±16.4 minutes), lower blood loss (58.3±21.6 vs. 122.8±45.3 mL), shorter hospital stay (2.3±0.9 vs. 5.1±1.7 days), and earlier return to normal activities (11.2±3.4 vs. 21.8±5.7 days) ($p<0.001$ for all). Postoperative pain was less severe in the laparoscopic group, and rates of surgical site infection (3.2% vs. 16.7%), fever (4.8% vs. 19.0%), and wound seroma (1.6% vs. 11.9%) were significantly lower. Overall postoperative complications occurred in 14.5% of laparoscopic cases compared with 38.1% of open cases (p=0.006). Additionally, recovery without morbidity was achieved in 93.5% of patients undergoing laparoscopic cholecystectomy versus 81.0% of those undergoing open cholecystectomy. **Conclusion:** This study shows that laparoscopic cholecystectomy provides better postoperative outcomes than open cholecystectomy, with less pain, fewer complications, reduced blood loss, shorter hospital stay, and faster recovery. Overall, it is associated with improved patient recovery and lower morbidity.

Keywords: *Postoperative Complications, Laparoscopic Cholecystectomy, Open Cholecystectomy*

1. *Associate Professor, Department of Surgery, Sir Salimullah Medical College & Mitford Hospital, Dhaka, Bangladesh (ORCID: 0009-0002-4406-7197)*
2. *Professor (CC), Department of Surgery, Ad-Din Sakina Women's Medical College & Hospital, Jashore, Bangladesh*
3. *Associate Professor, Department of Burn and Plastic Surgery, Sylhet M A G Osmani Medical College, Sylhet, Bangladesh*
4. *Assistant Professor, Department of Surgery, Jashore Medical College, Jashore Bangladesh*
5. *Assistant Professor, Department of Surgery, Insitu Upazila Health Complex, Godagari, Rajshahi, Bangladesh*

INTRODUCTION

Gallstone disease is one of the most common gastrointestinal disorders worldwide and represents a major cause of morbidity requiring surgical intervention. It affects approximately 10–20% of the adult population, with prevalence increasing with age and being more common among females, obese individuals, and patients with metabolic disorders [1]. Symptomatic gallstone disease may lead to complications such as biliary colic, acute cholecystitis, choledocholithiasis, and gallstone pancreatitis, making cholecystectomy the definitive treatment for affected patients. Open cholecystectomy (OC) was the standard surgical procedure for gallstone disease for over a century. However, the introduction of laparoscopic cholecystectomy (LC) in the late 1980s revolutionized biliary surgery and rapidly became the preferred treatment modality worldwide [3]. The minimally invasive nature of LC offers several advantages over the conventional open approach, including reduced postoperative pain, shorter hospital stays, faster recovery, earlier return to normal activities, and improved cosmetic outcomes. Consequently, LC is currently regarded as the gold standard treatment for uncomplicated symptomatic gallstone disease [4]. Despite significant advances in surgical techniques and perioperative care, postoperative complications remain an important concern following cholecystectomy. Common postoperative complications include surgical site infection, hemorrhage, bile leakage, bile duct injury, intra-abdominal abscess, respiratory complications, and prolonged postoperative pain [5]. These complications may adversely affect patient recovery, increase healthcare costs, prolong hospitalization, and negatively impact quality of life [6]. Therefore, continuous evaluation of postoperative outcomes remains essential to ensure patient safety and optimize surgical management. Several studies have compared the postoperative outcomes of laparoscopic and open cholecystectomy. Evidence suggests that laparoscopic cholecystectomy is associated with significantly lower rates of wound infection, postoperative pain, pulmonary complications, and hospital stay compared with open surgery [7]. The smaller incisions and reduced tissue trauma associated with laparoscopy contribute substantially to these favourable outcomes [8]. However, some concerns remain regarding the technical complexity of LC and the potential risk of bile duct injury, particularly in cases involving severe inflammation, dense adhesions, or distorted biliary anatomy [9]. Open cholecystectomy continues to play an important role in selected clinical situations, including complicated gallstone disease, severe acute cholecystitis, gallbladder malignancy, and cases requiring conversion from laparoscopic surgery [5]. In developing countries such as Bangladesh, gallstone disease constitutes a substantial surgical burden. Although laparoscopic facilities have become increasingly available, open cholecystectomy is still commonly performed in many healthcare settings because of resource limitations, surgeon preference, patient-related factors, and disease complexity.[3] Consequently, comparative assessment of postoperative complications between laparoscopic and

open cholecystectomy in local populations is necessary to provide evidence-based guidance for surgical decision-making and healthcare planning. Therefore, this study aimed to compare the postoperative complications associated with laparoscopic and open cholecystectomy and to evaluate the relative safety and effectiveness of these two surgical approaches.

METHODS & MATERIALS

This cross-sectional comparative study was conducted in the Department of Surgery, Sir Salimullah Medical College & Mitford Hospital, Dhaka, Bangladesh from January 2025 to December 2025. A total of 104 patients diagnosed with symptomatic gallstone disease and scheduled for cholecystectomy were included in the study. Patients were selected using purposive sampling and were divided into two groups according to the surgical procedure performed: laparoscopic cholecystectomy (LC) (n=62) and open cholecystectomy (OC) (n=42). Adult patients of either sex who underwent elective or emergency cholecystectomy for gallstone disease were included, while patients with gallbladder malignancy, severe systemic illness, incomplete clinical records, or those unwilling to participate were excluded. Demographic characteristics, comorbidities, operative details, postoperative pain severity, duration of hospital stay, time to return to normal activities, and postoperative complications, including surgical site infection, fever, wound seroma, respiratory complications, bile leak, and hemorrhage, were recorded using a structured data collection sheet. Patients were followed until discharge, and postoperative outcomes were assessed and compared between the two groups. Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 26.0. Continuous variables were expressed as mean ± standard deviation and compared using the independent samples t-test, while categorical variables were presented as frequencies and percentages and analyzed using the Chi-square test. A p-value of <0.05 was considered statistically significant. Ethical approval was obtained from the Institutional Ethics Committee, and informed written consent was obtained from all participants before enrollment.

RESULTS

The mean age was 42.8±11.3 years in the LC group and 45.7±12.6 years in the OC group (p=0.216). Females predominated in both groups, accounting for 71.0% of LC patients and 64.3% of OC patients. The prevalence of diabetes mellitus was 21.0% and 26.2% in the LC and OC groups, respectively, while hypertension was present in 27.4% and 31.0% of patients. No significant differences were observed in baseline characteristics between the groups (*Table I*).

Table I
Demographic Characteristics of the Study Population (*n*=104).

Variable	Laparoscopic Cholecystectomy (n=62)	Open Cholecystectomy (n=42)	p-value
Age (years), Mean ± SD	42.8 ± 11.3	45.7 ± 12.6	0.216
Male, n (%)	18 (29.0)	15 (35.7)	0.466
Female, n (%)	44 (71.0)	27 (64.3)	
BMI (kg/m²), Mean ± SD	26.2 ± 3.8	25.8 ± 4.1	0.614
Diabetes Mellitus, n (%)	13 (21.0)	11 (26.2)	0.538
Hypertension, n (%)	17 (27.4)	13 (31.0)	0.690

Patients undergoing laparoscopic cholecystectomy had significantly shorter operative time (68.5±14.2 vs. 82.7±16.4 minutes; p<0.001), lower intraoperative blood loss (58.3±21.6 vs. 122.8±45.3 mL; p<0.001), shorter hospital stay (2.3±0.9 vs. 5.1±1.7 days; p<0.001), and earlier return to normal activity (11.2±3.4 vs. 21.8±5.7 days; p<0.001) compared to the open surgery group (*Table II*).

Table II
Operative and Hospitalization Characteristics (*n*=104).

Variable	Laparoscopic Cholecystectomy (n=62)	Open Cholecystectomy (n=42)	p-value
Operative Time (minutes), Mean ± SD	68.5 ± 14.2	82.7 ± 16.4	<0.001
Blood Loss (mL), Mean ± SD	58.3 ± 21.6	122.8 ± 45.3	<0.001
Duration of Hospital Stay (days), Mean ± SD	2.3 ± 0.9	5.1 ± 1.7	<0.001
Return to Normal Activity (days), Mean ± SD	11.2 ± 3.4	21.8 ± 5.7	<0.001

Postoperative pain was significantly lower among patients undergoing laparoscopic cholecystectomy (p<0.001). Mild pain was reported by 54.8% of LC patients compared to 19.0% of OC patients. Severe pain occurred in only 6.5% of the LC group, whereas 31.0% of the OC group experienced severe postoperative pain (*Table III*).

Table III
Postoperative Pain Assessment (N=104).

Pain Severity (24 hours postoperatively)	Laparoscopic Cholecystectomy (n=62), n (%)	Open Cholecystectomy (n=42), n (%)	p-value
Mild	34 (54.8)	8 (19.0)	<0.001
Moderate	24 (38.7)	21 (50.0)	
Severe	4 (6.5)	13 (31.0)	

Early postoperative complications were generally less frequent in the laparoscopic group. Surgical site infection occurred in 3.2% of LC patients compared with 16.7% of OC patients (p=0.019). Fever was observed in 4.8% versus 19.0% (p=0.021), and wound seroma developed in 1.6% versus 11.9% of patients (p=0.026). Respiratory complications were more common after open surgery (9.5% vs. 1.6%), although the difference was not statistically significant (*Table IV*).

Table IV
Early Postoperative Complications (*n*=104).

Complication	Laparoscopic Cholecystectomy (n=62), n (%)	Open Cholecystectomy (n=42), n (%)	p-value
Surgical Site Infection	2 (3.2)	7 (16.7)	0.019
Fever	3 (4.8)	8 (19.0)	0.021
Wound Seroma	1 (1.6)	5 (11.9)	0.026
Respiratory Complication	1 (1.6)	4 (9.5)	0.066
Bile Leak	1 (1.6)	2 (4.8)	0.558
Hemorrhage	1 (1.6)	2 (4.8)	0.558

Overall postoperative complications were significantly less frequent among patients undergoing laparoscopic cholecystectomy. A total of 14.5% of LC patients experienced at least one postoperative complication compared with 38.1% of patients undergoing open cholecystectomy (p=0.006). The majority of patients in the LC group (85.5%) had an uncomplicated postoperative course (*Table V*).

Table V
Overall Postoperative Complication Rate (*n*=104).

Outcome	Laparoscopic Cholecystectomy (n=62), n (%)	Open Cholecystectomy (n=42), n (%)	p-value
No Complication	53 (85.5)	26 (61.9)	
At Least One Complication	9 (14.5)	16 (38.1)	0.006

At discharge, 93.5% of patients in the laparoscopic group recovered without morbidity compared to 81.0% in the open cholecystectomy group. Minor morbidity was documented in 6.5% and 16.7% of patients, respectively. One patient (2.3%) in the open surgery group experienced major morbidity. Although outcomes favored laparoscopic cholecystectomy, the difference did not reach statistical significance (p=0.087) (*Table VI*).

Table VI
Patient Outcome at Discharge (*n*=104).

Outcome	Laparoscopic Cholecystectomy (n=62), n (%)	Open Cholecystectomy (n=42), n (%)	p-value
Recovered Without Morbidity	58 (93.5)	34 (81.0)	
Recovered With Minor Morbidity	4 (6.5)	7 (16.7)	
Recovered With Major Morbidity	0 (0.0)	1 (2.3)	0.087

DISCUSSION

Regarding demographic characteristics, the mean age was 42.8±11.3 years in the LC group and 45.7±12.6 years in the OC group, while females constituted 71.0% and 64.3% of the groups, respectively. Similar findings were reported by Khalid et al., who observed mean ages of 40.0±8.1 years and 42.5±8.8 years in the LC and OC groups, respectively, with female predominance of 90% and 80% [5]. Islam et al. also reported that 55% of their 950 patients were female, confirming the greater burden of gallstone disease among women [3]. Concerning operative and hospitalization characteristics, the present study demonstrated significantly shorter operative time (68.5±14.2 vs. 82.7±16.4 minutes), lower blood loss (58.3±21.6 vs. 122.8±45.3 mL), shorter hospital stay (2.3±0.9 vs. 5.1±1.7 days), and earlier return to normal activities (11.2±3.4 vs. 21.8±5.7 days) among LC patients. Khalid et al. reported an average hospital stay of 7.2 days for LC compared with 9.55 days for OC and noted that shorter operative durations were more frequent in laparoscopic procedures, with 25% of LC operations completed within one hour compared with only 2.5% of OC procedures [5]. Islam et al. similarly found postoperative hospitalization of only 2–3 days following LC compared with 5–7 days after OC [3]. Postoperative pain was significantly lower in the LC group in the present study, where mild pain was reported by 54.8% of patients and severe pain by only 6.5%, compared with 19.0% and 31.0%, respectively, in the OC group. Keus et al. concluded that laparoscopic cholecystectomy resulted in significantly lower postoperative pain and reduced analgesic requirements compared with open surgery [8]. Similarly, Coccolini et al. demonstrated that LC was associated with less postoperative discomfort and earlier mobilization than OC.[2] The reduced tissue trauma and smaller incisions of laparoscopy are likely responsible for these favourable outcomes. Concerning early postoperative complications, surgical site infection occurred in 3.2% of LC patients compared with 16.7% of OC patients, while fever occurred in 4.8% and 19.0%, respectively. Wound seroma was observed in 1.6% of LC patients and 11.9% of OC patients. Khalid et al. found that low-grade postoperative complications occurred in 35% of LC patients compared with 40% of OC patients, and respiratory complications were the most common complication in both groups.[5] Islam et al. reported an overall postoperative complication rate of 2.8% following LC and 3.4% following OC, with lower morbidity and shorter recovery among laparoscopic patients [3]. The overall complication rate in the present study was 14.5% in the LC group compared with 38.1% in the OC group. Khalid et al. similarly demonstrated fewer complications following laparoscopic surgery, reporting low-grade complications in 35% of LC patients compared with 40% in OC patients and high-grade complications in 2.5% of OC patients, whereas no high-grade complications occurred after LC [5]. A systematic review by Marzoug also concluded that laparoscopic cholecystectomy was associated with lower postoperative morbidity and shorter hospitalization than open cholecystectomy [10]. Furthermore, a large network meta-analysis involving 11,083 patients confirmed that laparoscopic approaches consistently achieved superior postoperative outcomes compared with open surgery.[11] Regarding discharge outcomes, 93.5% of LC patients recovered without morbidity compared with 81.0% of OC patients. Only one patient (2.3%) in the OC group experienced major morbidity, whereas none occurred in the LC group. Khalid et al. similarly reported no severe (Grade IV–V) complications in either group and observed high-grade complications only among OC patients (2.5%) [5]. A recent literature review by Mannam et al. concluded that LC provides superior postoperative recovery, lower morbidity, and shorter hospital stay than OC, making it the preferred surgical approach whenever feasible [12].

LIMITATIONS

The study was conducted in a single hospital with a small sample size. So, the results may not represent the whole community.

CONCLUSION

This study demonstrated that laparoscopic cholecystectomy is associated with significantly better postoperative outcomes than open cholecystectomy. Patients undergoing laparoscopic surgery experienced less postoperative pain, lower rates of surgical site infection and other complications, shorter hospital stay, reduced blood loss, and earlier return to normal activities. Furthermore, a higher proportion of patients in the laparoscopic group recovered without morbidity.

RECOMMENDATION

Based on the findings of this study, laparoscopic cholecystectomy should be preferred over open cholecystectomy whenever technically feasible, as it is associated with fewer postoperative complications, less pain, shorter hospital stay, and faster recovery. Adequate training of surgeons in laparoscopic techniques and improved access to laparoscopic facilities are recommended to enhance patient outcomes. Further multicenter studies with larger sample sizes and longer follow-up periods are also suggested to validate these findings and assess long-term outcomes.

FUNDING

No funding sources

CONFLICT OF INTEREST

None declared

REFERENCES

1. Siddiqui T, MacDonald A, Chong PS, Jenkins JT. Early versus delayed laparoscopic cholecystectomy for acute cholecystitis: a meta-analysis of randomized clinical trials. The American Journal of Surgery. 2008 Jan 1;195(1):40-7.
2. Coccolini F, Catena F, Pisano M, Gheza F, Fagiuoli S, Di Saverio S, Leandro G, Montori G, Ceresoli M, Corbella D, Sartelli M. Open versus laparoscopic cholecystectomy in acute cholecystitis. Systematic review and meta-analysis. International journal of surgery. 2015 Jun 1;18:196-204.
3. Islam MR, Ali MS, Azam SG, Islam MR. Comparative study between laparoscopic and open cholecystectomy: complications and management. Medicine Today. 2021 Feb 25;33(1):19-21.
4. Magnano San Lio R, Barchitta M, Maugeri A, Quartarone S, Basile G, Agodi A. Preoperative risk factors for conversion from laparoscopic to open cholecystectomy: a systematic review and meta-analysis. International Journal of Environmental Research and Public Health. 2022 Dec 27;20(1):408.
5. Khalid A, Khalil K, Qadri HM, Ahmad CZ, Fatima W, Raza A, Asif MA, Luqman MS, Nizami MF. Comparison of postoperative complications of open versus laparoscopic cholecystectomy according to the modified Clavien-Dindo Classification system. Cureus. 2023 Aug 17;15(8).
6. Ahmad Z, Zafar A, Riaz D, Jawad A, Sahar DE. A Comparative Study of Postoperative Outcomes: Open Cholecystectomy versus Laparoscopic Cholecystectomy: Evaluating Postoperative Outcomes in Gallbladder Surgery. DEVELOPMENTAL MEDICO-LIFE-SCIENCES. 2024 Jul 31;1(5):25-9.
7. Mascagni P, Rodríguez-Luna MR, Urade T, Felli E, Pessaux P, Mutter D, Marescaux J, Costamagna G, Dallemagne B, Padoy N. Intraoperative time-out to promote the implementation of the critical view of safety in laparoscopic cholecystectomy: a video-based assessment of 343 procedures. Journal of the American College of Surgeons. 2021 Oct 1;233(4):497-505.
8. Keus F, de Vries J, Gooszen HG, van Laarhoven CJ. Laparoscopic versus small-incision cholecystectomy: health status in a blind randomised trial. Surgical endoscopy. 2008 Jul;22(7):1649-59.
9. Elshaer M, Gravante G, Thomas K, Sorge R, Al-Hamali S, Ebdewi H. Subtotal cholecystectomy for "difficult gallbladders": systematic review and meta-analysis. JAMA Surgery. 2015 Feb;150(2):159-68.
10. Roy DK, Sheikh R. A systematic review and meta-analysis of the outcomes of laparoscopic cholecystectomy compared to the open procedure in patients with gallbladder disease. Avicenna Journal of Medicine. 2024 Jan;14(01):003-21.
11. Zhao JJ, Syn NL, Chong C, Tan HL, Ng JY, Yap A, Kabir T, Goh BK. Comparative outcomes of needlescopic, single-incision laparoscopic, standard laparoscopic, mini-laparotomy, and open cholecystectomy: A systematic review and network meta-analysis of 96 randomized controlled trials with 11,083 patients. Surgery. 2021 Oct 1;170(4):994-1003.
12. Mannam R, Narayanan RS, Bansal A, Yanamaladoddi VR, Sarvepalli SS, Vemula SL, Aramadaka S. Laparoscopic cholecystectomy versus open cholecystectomy in acute cholecystitis: a literature review. Cureus. 2023 Sep 21;15(9).