Original Research Article

Journal of College of Medical Sciences-Nepal, Vol-21, No.4, Oct-Dec 2025

ISSN: 2091-0657 (Print); 2091-0673 (Online) Open Access
DOI: 10.3126/jcmsn.v21i4.82209

# Outcomes of Elective Laparoscopic Cholecystectomy in Elderly Patients

**Sandesh Shrestha**[1], **Sushim Bhujel**[1], **Saroj Babu Pradhan**[1], **Binay Timilsina**[1], **Rohit Gupta**[1], **Hari Prasad Upadhyay**[2]

[1]Department of General & Gastrointestinal Surgery, College of Medical Sciences-Teaching Hospital, Bharatpur, Chitwan, Nepal, [2]Department of Statistics, Birendra Multiple Campus, Bharatpur, Chitwan, Nepal.

## ABSTRACT

### Background

Laparoscopic cholecystectomy (LC) is the gold standard of treatment for benign gallbladder disease. However, many surgeons remain reluctant to perform LC in elderly due to perceived concerns about safety. The study aimed to evaluate the outcomes of elective LC in the elderly.

### Methods

We conducted a descriptive retrospective cross-sectional study in the Department of General & Gastrointestinal Surgery at College of Medical Sciences, Teaching Hospital. The study duration was from July 2024 to January 2025. Data were entered analyzed in SPSS and descriptive findings are presented.

### Results

A total of 330 elective LC were performed during the study duration. All 59 elderly patients who underwent elective LC were included in the study. Post-operative complications were seen in 7/59 (11.9%, with 95% CI; 5.9%-22.6%); however, all of them were minor complications (Clavien-Dindo grade I and II). Mean operative time was 75±31 minutes (with 95% CI; 67.3-82.7), mean postoperative length of stay (LOS) was 3.4±1.1 days (with 95% CI; 3.1-3.7) and conversion to open cholecystectomy was necessary in 3/59 (4.8%, with 95% CI; 0.0-10.7%).

### Conclusions

This study reinforced that LC is a relatively safe procedure, with no evidence of increased postoperative complications, increased risk for conversion to an open cholecystectomy, or prolonged hospitalization in adequately optimized elderly patients. Further multicenter studies should be conducted to confirm these findings across diverse settings and include patients with ASA III–IV to guide surgical decision-making in higher-risk elderly populations.

**Keywords:** complications; elderly; laparoscopic cholecystectomy; open cholecystectomy; safety.

**Correspondence:** Dr. Sandesh Shrestha, Department of General & Gastrointestinal Surgery, College of Medical Sciences-Teaching Hospital, Bharatpur, Chitwan, Nepal. Email: drssbu@gmail.com, Phone: +977-9851240989. **Article received**: 2025-04-07. **Article accepted**: 2025-10-12. **Article published**: 2025-12-28.

## INTRODUCTION

Laparoscopic cholecystectomy (LC) is the gold standard for the management of benign biliary disease, including symptomatic cholelithiasis.[1,2] Gallstone disease is one of the most common surgical indications for abdominal surgery worldwide.[3] With increasing life expectancy, the number of elderly patients with gallstone disease is expected to rise. Thus, optimum management of these patients is of public health significance. Many recent studies have suggested that LC in elderly patients is safe.[4,5] Unfortunately, it is a common practice to defer surgical treatment to elderly patients with benign gallbladder disease, which is not supported by recent evidences.[6] In addition, when elective surgery is decided, open cholecystectomy (OC) is still commonly performed by surgeons, despite its higher morbidity and mortality compared to LC.[7] This study aimed to evaluate the outcome of elective LC in elderly populations. The study will provide local evidence and promote timely LC options to the elderly with symptomatic gallbladder disease.

## METHODS

This was a descriptive retrospective cross-sectional study conducted in the General & GI Surgery Department at College of Medical Sciences (COMS), Bharatpur, Nepal, a referral tertiary center, from July 2024 to January 2025, following approval from the Institutional Review Committee (Reference No.: COMSTH-IRC/2024-016). Informed consent was waived due to the retrospective nature of the study. All patients aged ≥60 years that underwent elective LC during the study duration were included. The required sample size calculated using Cochran's formula for estimating a binomial proportion in a large population was 58. Sample size (n) $=\{Z^2\times p\times(1-p)\}/E^2$, where Z=1.96 (95% confidence), p-value=0.039 (expected postoperative complication rate from Polychronidis et al.[8] and E=0.05 (5% margin of error). However, we used a census sampling of all eligible patients during the study period. Exclusion criteria included emergency LC cases, LC performed along with surgery for other pathology and incomplete records. Data was extracted from hospital records and variables including age, gender, comorbidities, American Society of Anesthesiologists (ASA) grading, intraoperative difficulty grading, intraoperative complications, conversion to OC, postoperative complications, postoperative hospital length of stay (LOS) and 30-day mortality were studied. The primary outcome of this study was to calculate postoperative complication rate and secondary outcomes included operative time, postoperative length of stay (LOS) and conversion rate.

Elective LCs was performed using the standard 4-port technique under general anesthesia with CO2 pneumoperitoneum (10-12 mm Hg). Five experienced surgeons (each with >500 prior LCs) conducted the procedures, assigned based on availability. Intraoperative difficulty grading was assessed using Nassar difficulty grading scale[9] by the operating surgeon and validated by another surgeon based on intraoperative images. A sub-hepatic drain was placed selectively in cases of difficult cholecystectomy, particularly when hemostasis was suboptimal or a possibility of a bile leak was suspected. As per the institutional protocol, postoperative antibiotics (ceftriaxone + metronidazole IV for 2 days, followed by oral cefixime + metronidazole for 5 days) and analgesia were provided. Discharge criteria included stability of vital signs, toleration of solid food, mobility, and adequate pain control. Postoperative complications were graded according to Clavien Dindo Classification.[10] All data were analyzed using SPSS version 16. Descriptive statistics, including mean, standard deviation, and proportions, were calculated to summarize demographic and clinical characteristics. Categorical variables, such as complication rates, and conversion rate, are presented as proportions with 95% confidence intervals. For these proportions, 95% confidence intervals were computed using the Wilson score method. For continuous outcomes, such as operative time and postoperative stay, 95% CIs for means are calculated using the t-distribution. No missing data were identified for any variables of interest; therefore, full case analysis was performed, and no observations

were excluded due to incomplete records.

## RESULTS

During the study period, 330 elective interval cholecystectomies were performed. Among them, 81 patients (25%) were aged ≥60 years and considered elderly. After excluding those who underwent primary OC (n=19) and conversions (n=3), 59 elderly patients completed LC and were included (Figure 1).

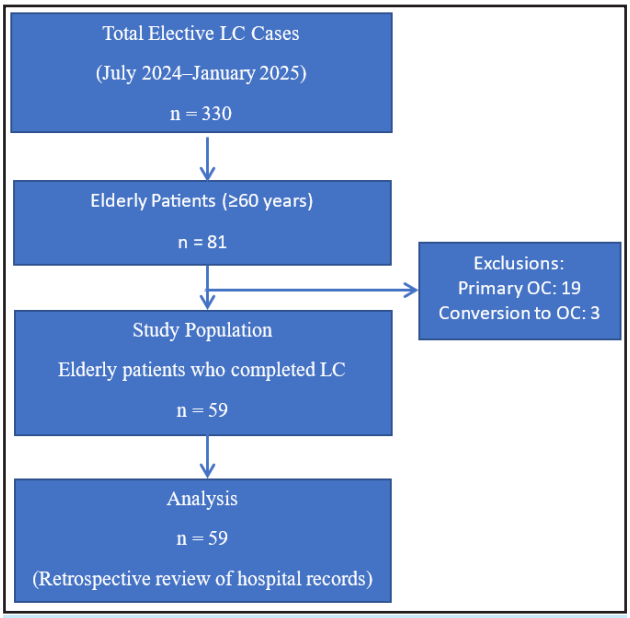


**Figure 1. Participant selection flow diagram.**

| Table 1. Demographic data of the patients. (n=59) | |
|---|---|
| **Characteristics** | **Frequency (%)** |
| **Age range (years): 60-78** | |
| Mean ± SD (Years): 65.92 ± 4.96 | |
| 60-64 | 27(45.8%) |
| 65-69 | 19(32.2%) |
| 70-74 | 8(13.6%) |
| ≥75 | 5(8.5%) |
| **Sex** | |
| Male | 17(28.8%) |
| Female | 42(71.2%) |
| **ASA Grading** | |
| ASA I | 21(35.6%) |
| ASA II | 38(64.4%) |
| **Comorbidities** | |
| Presence of ≥1comorbidity | 38(64.4%) |
| Hypertension | 30(50.8%) |
| Diabetes Mellitus | 11(18.6%) |
| COPD | 5(8.5%) |
| Chronic Renal Insufficiency | 1(1.7%) |

The demographic characteristics of the study cohort are reported in Table 1. The majority of patients were female 42(71.2%) and the mean age was 65.92±4.96 years, with a range from 60 to 78 years. 38(65%) of the patients had at least one comorbidity. The most common comorbidity was hypertension 30(50.8%), followed by diabetes mellitus 11(18.6%), COPD 5(8.5%), and chronic renal insufficiency 1(1.7%). All patients had either an ASA score of I or II, with the majority having an ASA score of II 38(64.4%) (Table 1).

Regarding intraoperative difficulty, Nassar difficulty grade II–IV was observed in 45(76%) patients; 13(22%) were grade III, and 10(17%) were grade IV (Table 2).

| Table 2. Intraoperative findings based on Nassar difficulty grading scale. (n=59) | | |
|---|---|---|
| **Intraoperative Grading** | **Description** | **Frequency (%)** |
| **Grade 1** | Floppy nonadherent GB with clear cystic pedicle and simple adhesion up to neck (n=14) | 14(24%) |
| **Grade 2** | Simple adhesion up to body (n=12) | 22(37%) |
| | Fat laden cystic Pedicle (n=8) | |
| | Mucocele (n=2) | |
| **Grade 3** | Contracted GB with obscured cystic pedicle (n=6) | 13(22%) |
| | Dense adhesion up to fundus (n=5) | |
| | Short dilated cystic duct (n=1) | |
| | Deep Fossa (n=1) | |
| **Grade 4** | Empyema (n=6) | 10(17%) |
| | Frozen Calots without empyema (n=4) | |

Intraoperative bleeding, which occurred in 18 (31%) and bile spillage occurred in 15(25%) of the patients. There was a need for conversion to OC in 3 (5%) of the cases. All three of these patients were ≥65 years of age, and two of them were male. All three conversions were due to frozen calot's triangle and were electively converted without any significant intraoperative complications as dissection could not be satisfactorily advanced. No other complications such as surgical site

infection (SSI), bile leak, postoperative hemorrhage, or deep vein thrombosis/pulmonary embolism (DVT/PE) were observed in this study (Table 3).

| Table 3. Intraoperative complication. (n=59) | |
|---|---|
| **Complications** | **Frequency (%)** |
| Hemorrhage | 18(31.0) |
| Bile Spillage | 15(25.0) |
| Conversion to OC | 3(5.0) |
| Bile leak | - |
| Bile duct injury | - |
| Bowel injury | - |

A total of seven patients (11.9%, 95% CI; 5.9%-22.6%) experienced postoperative complications, and all complications were medical complications. Two patients each suffered from chest infection, acute exacerbation of COPD, and dry cough, while one patient suffered from both dry cough and dysuria. All complications were classified as Clavien-Dindo grades I-II, and no surgical complications or mortality occurred (Table 4).

| Table 4. Postoperative complications with Clavien-Dindo classification. (n=59) | | | |
|---|---|---|---|
| **Complications** | **n(%)** | **95% CI** | **Clavien Dindo classification** |
| Total Complications | 7(11.9) | (5.9-22.6)% | |
| Related to surgery | - | - | |
| Not related to surgery | 7(11.9) | (5.9-22.6)% | |
| Chest Infection | 2(3.4) | (1.2-8.2)% | Grade II |
| Acute Exacerbation of COPD | 2(3.4) | (1.2-8.2)% | Grade II |
| Dry cough | 2(3.4) | (1.2-8.2)% | Grade I |
| Dry cough with dysuria | 1(1.7) | (0.3-6.5)% | Grade I |

Regarding LC outcomes, the mean operative time was 75±31 minutes (95% CI; 67.3–82.7), the mean postoperative length of stay (LOS) was 3.4±1.1 days (95% CI; 3.1–3.7), and a total of three patients (4.8%, 95% CI; 0.0–10.7%) required conversion to open surgery (Table 5).

| Table 5. LC outcomes. (n=59) | | |
|---|---|---|
| **Outcomes** | **Frequency(%)** | **95% CI** |
| Conversion rate | 3(4.8) | (0.0-10.7)% |
| Postoperative Complication rate | 7(11.9) | (3.0-20.7)% |
| Operative time (min) | 75(30-165) | 67.3-82.7 |
| Postoperative length of stay (LOS) (days) | 3.4(2-7) | 3.1-3.7 |

*Postoperative complication rate, operative time and postoperative stay refer to successful LC only.*

## DISCUSSION

This study found that intraoperative surgical difficulty was frequently higher in the elderly patients undergoing LC; however, the postoperative complications were usually mild. Advanced age was not associated with higher complication rates in our study. Although Bhandari et al. reported a higher rate of complications of 21.2%,[5] Caglia et al. reported similar postoperative complications of 10%.[11] Notably, none of the patients had major complications (Clavein-Dindo grade III and IV) and none of the patients developed feared complications like postoperative haemorrhage and bile leak. This outcome could have been possible due to extensive experience of all the operating surgeons, each having performed over 500 LCs. In addition, all patients had been optimized preoperatively (ASA I and II), which should have contributed to the low morbidity in this study.

Among the postoperative morbidity, pulmonary complications including chest infection, acute exacerbation of COPD, and dry cough, were common. Chong et al. suggest that lack of compliance with smoking cessation significantly increases the risk of postoperative pulmonary complication in patients undergoing elective LC.[12] This highlights the importance of preoperative optimization of respiratory function by encouraging breathing exercises and cessation of smoking, and proactive postoperative management, such as adequate pain management and early mobilization, particularly in patients with COPD and obesity. Further studies should be conducted to study the cause of postoperative pulmonary complications and identify ways to reduce them.

Intraoperative surgical difficulty was found to be higher in the elderly in this study than in those reported in the general population.[13,14] Furthermore, the rate of intraoperative complications like bleeding and bile spillage was higher than that reported by previous studies in the general population at our institute.[15] However, there were no dreaded complications like

bile leak, bile duct injury, and bowel injury. As a referral hospital with over 500 cholecystectomies performed annually, the high volume of LC allows our surgeons to build and maintain meticulous surgical techniques, thus reducing intraoperative complications.

The elderly population did not appear to be at increased risk of OC conversion in the conducted research. The conversion rates in studies performed in the general population vary across studies, ranging from 3.16% to 9.62%.[16–18] However, consistent with the 6% rate of conversion in the elderly reported by Caglia et al.,[11] the rate of conversion in this study was 5%. Nonetheless, despite a low percentage of patients undergoing conversion to open, surgeons should be prepared for OC and adequately counsel the patient accordingly. Caglia et al. identified several factors associated with conversion from LC to OC, including the operating surgeon's limited experience, challenges in delineating the patient's anatomy due to adhesions or prior abdominal surgeries, and the discovery of concurrent intra-abdominal diseases.[11] In our case, the primary reason for conversion was difficulty in resolving the anatomy due to the presence of dense adhesions.

The average operating time was 75 min, which was higher than reported in other studies on younger patients.[19] This increase is because of the greater complexity of intraoperative challenges commonly encountered in elderly individuals. Thus, longer OT time slots should therefore be provided during planning for older patients. Although postoperative LOS of 3.4 days in our study was similar to those reported in other similar studies in elderly patients;[6,11] the reported LOS varies significantly across research. This variability largely reflects the care protocol of a specific hospital, and the fact that LC is increasingly being performed as an outpatient procedure. In our hospital, even patients without any postoperative complications are scheduled for discharge only after the second POD; therefore, a LOS of 3.4 days in our study is reasonable. This study reinforces that LC can be safely performed in elderly patients despite the presence of existing comorbidities, reduced reserve, and difficult surgical anatomy; especially in carefully optimized patient preoperatively, along with meticulous surgical techniques.

### Limitations

This study has several limitations. First, it was a retrospective study and therefore there is a possibility of recall bias. However, comprehensive review of medical records was performed to mitigate this bias. Second, it was a single-center study with a relatively small sample size, which may limit the generalizability of our findings. To overcome this limitation, future research involving multicenter and including a larger sample size, particularly in settings with constrained resources or limited surgical capacity should be conducted. Third, all patients in this study had ASA scores I and II, which limits its applicability to individuals with more severe systemic disease; therefore, further studies in patients with higher ASA should be conducted. Fourth, because LC is already standard of care in younger patients, a direct comparison of outcomes between elderly and younger cohorts would provide more compelling evidence to support LC adoption in older populations. Nonetheless, such a comparative study would require a large sample size, which was beyond the scope of the present analysis. Finally, long-term follow-up data were not available in this study, and future studies should be performed to evaluate long-term outcomes and quality-of-life outcomes.

## CONCLUSIONS

We concluded that LC is a relatively safe procedure with no evidence of any increased risk for conversion to OC, increased postoperative complications, or prolonged hospitalization in adequately optimized elderly patients. It can be performed with acceptable morbidity, even in resource-limited setups. Further research should be conducted on long-term outcomes and on ASA III and IV patients as well, to ensure optimal surgical care across elderly populations.

## ACKNOWLEDGEMENTS

We thank the Department of General & GI Surgery at

the College of Medical Sciences, Bharatpur, Nepal, for their support in conducting this study.

**Conflict of interest:** None

**Funding**: None

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**Citation:** Shrestha S, Bhujel S, Pradhan SB, Timilsina B, Gupta R, Upadhyay HP. Outcomes of Elective Laparoscopic Cholecystectomy in Elderly Patients. JCMS Nepal. 2025; 21(4): 396-402.