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Original Research Article

COMPARATIVE CLINICAL AND ECONOMICAL OUTCOME EVALUATION OF LAPAROSCOPIC VERSUS OPEN CHOLECYSTECTOMY FOR ACUTE CHOLECYSTITIS IN ELDERLY PATIENTS: AN INSTITUTIONAL BASED STUDY

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ABSTRACT

Background: Acute cholecystitis in elderly patients is associated with higher perioperative risk due to comorbidities, reduced physiological reserve, and increased susceptibility to postoperative complications. While laparoscopic cholecystectomy is widely adopted, open cholecystectomy is still performed in complex cases, and comparative evidence on both clinical and economic outcomes in the elderly remains important for tertiary care decision-making.
Aim: To compare and evaluate clinical and economical outcome of laparoscopic versus open cholecystectomy for acute cholecystitis in elderly patients.
Materials and Methods: A hospital-based comparative observational study was conducted involving 94 elderly patients with acute cholecystitis who underwent cholecystectomy. Patients were grouped according to surgical approach: laparoscopic cholecystectomy (LC, n=52) and open cholecystectomy (OC, n=42). Baseline demographics, comorbidities, operative details, recovery parameters, postoperative complications, readmission, mortality, and economic outcomes were recorded. Statistical analysis was performed using SPSS version 27.0.
Results: Baseline characteristics were comparable between groups. LC showed significantly better intraoperative outcomes with shorter operative time (78.54±15.62 vs 92.36±18.41 minutes; p=0.001) and lower blood loss (72.31±28.45 vs 148.57±46.82 mL; p<0.001). Drain use (26.92% vs 66.67%; p<0.001) and transfusion requirement (3.85% vs 16.67%; p=0.041) were lower with LC; conversion rate was 11.54%. Postoperative recovery was faster after LC, including earlier oral intake (18.26±6.42 vs 34.71±8.53 hours; p<0.001), earlier ambulation (22.14±7.18 vs 40.52±10.36 hours; p<0.001), lower 24-hour pain scores (VAS 3.12±1.04 vs 5.46±1.32; p<0.001), and shorter hospital stay (4.18±1.26 vs 7.36±2.14 days; p<0.001). Surgical site infection, pulmonary complications, and ileus were significantly lower in LC. Total in-hospital cost was significantly lower with LC (61,060±8,940 vs 74,360±11,520; p<0.001) despite higher operative cost.
Conclusion: In elderly patients with acute cholecystitis, laparoscopic cholecystectomy is associated with faster recovery, fewer key postoperative complications, and lower overall in-hospital costs compared with open surgery, supporting LC as the preferred approach in suitable patients at tertiary care level.
Keywords: Acute Cholecystitis; Elderly; Laparoscopic Cholecystectomy; Open Cholecystectomy; Cost Analysis.

INTRODUCTION

Acute cholecystitis is one of the most frequent emergency presentations related to gallstone disease and remains a major cause of urgent surgical admission. In elderly patients, the clinical course is often more complex because inflammatory response may be blunted, symptoms can be atypical, and diagnosis may occur later in the disease trajectory. Alongside delayed presentation, age-related decline in physiological reserve and the high prevalence of comorbidities increase the risk of perioperative morbidity. Contemporary management therefore aims to achieve timely source control while minimizing operative stress, preventing complications such as sepsis and biliary injury, and reducing prolonged immobilization that can precipitate pulmonary events, delirium, thromboembolism, and functional decline. Modern guideline-based care emphasizes risk stratification, early recognition of disease severity, and individualized decision-making regarding operative timing and approach, particularly in frail or high-risk elderly populations.[1] Cholecystectomy remains the definitive treatment for acute calculous cholecystitis in most fit patients, and minimally invasive surgery has become the standard approach in many centers. However, the elderly represent a uniquely vulnerable cohort in whom the balance between surgical benefit and physiological stress must be carefully considered. Extremely elderly groups, including octogenarians and nonagenarians, are often under-treated surgically due to concerns regarding anesthesia risk, cardiopulmonary complications, and postoperative recovery. At the same time, non-operative strategies may expose patients to recurrent attacks, repeated hospitalizations, or complications associated with prolonged inflammation. Recent evidence focusing on very advanced age supports that cholecystectomy can still be feasible and effective when appropriately selected, while emphasizing the importance of perioperative optimization and careful postoperative monitoring.[2] The operative approach for acute cholecystitis has traditionally included open cholecystectomy, which offers direct exposure but is associated with greater incision-related trauma, higher postoperative pain, and slower return to baseline function. These disadvantages may be amplified in older adults, where postoperative pain and restricted ventilation can lead to atelectasis or pneumonia, and delayed mobilization may increase the risk of ileus, thromboembolic events, and deconditioning. In contrast, laparoscopic cholecystectomy typically reduces surgical access trauma and is frequently associated with faster functional recovery. Nonetheless, laparoscopy in acute inflammation can be technically demanding due to edema, friable tissues, adhesions, and distorted Calot's triangle anatomy, potentially increasing operative difficulty and the risk of bile duct injury if safe dissection principles are not followed. As a result, conversion to open surgery remains an important safety strategy rather than a failure, particularly in difficult anatomy or severe inflammation. The ongoing debate in elderly acute cholecystitis is therefore not merely whether laparoscopy can be performed, but whether it consistently delivers superior clinical outcomes and overall value compared with open surgery under real-world tertiary care conditions.[3] Beyond safety, postoperative recovery outcomes have special significance in elderly patients. Early oral intake, early ambulation, and shorter length of stay are not only markers of good surgical recovery, but also influence broader geriatric outcomes such as maintenance of independence and prevention of hospital-acquired complications. Longer hospital stays can disrupt sleep, nutrition, and mobility, increasing the risk of delirium and functional decline. From a systems perspective, prolonged admissions also increase bed occupancy and resource use in high-volume tertiary centers. In this context, comparative assessment of recovery parameters between laparoscopic and open cholecystectomy provides clinically actionable evidence for selecting an approach that supports faster rehabilitation while maintaining procedural safety.[4] Elderly patients also vary substantially in baseline risk due to differences in comorbidity burden, functional status, and urgency of presentation, making it essential to interpret outcomes within a framework that accounts for patient selection. Risk categorization, severity grading, and standardized definitions for complications help ensure that comparisons between surgical approaches reflect genuine differences in procedural impact rather than underlying patient frailty. Moreover, tertiary care hospitals frequently receive complex referrals, including patients with advanced inflammation, prior abdominal surgery, or significant medical comorbidities—factors that can affect conversion rates, complications, and costs. Recent cohort data in older populations highlight that adverse outcomes often relate as much to baseline physiological vulnerability and disease severity as to operative technique, reinforcing the need for analyses that include robust clinical parameters and meaningful endpoints.[5] Economic impact is increasingly recognized as a central component of surgical decision-making, especially in acute care surgery where costs are influenced by operative consumables, anesthesia duration, bed utilization, ICU need, management of complications, and readmissions. Laparoscopic surgery may increase direct operative expenditure due to specialized instruments and energy devices, yet it can potentially decrease total hospitalization costs by reducing postoperative complications and shortening length of stay. For elderly acute cholecystitis, this trade-off is particularly important because complications and prolonged hospitalization are common drivers of cost escalation. Therefore, analyzing both clinical and economic outcomes together provides a more complete assessment of "value," assisting surgeons and hospital administrators in planning resource allocation, investing in minimally invasive capability, and developing care pathways appropriate to the local setting.[6]

MATERIALS AND METHODS

A hospital-based comparative observational study was conducted to compare and evaluate clinical and economical outcome of laparoscopic versus open cholecystectomy for acute cholecystitis in elderly patients. The study population comprised 94 patients managed with either laparoscopic cholecystectomy (LC) or open cholecystectomy (OC), based on the treating surgical team's decision and patient suitability for anesthesia and operative approach. Elderly patients presenting with acute cholecystitis and planned for definitive surgical management were enrolled. Acute cholecystitis was established using a combination of clinical features (right upper quadrant pain/tenderness and/or fever), laboratory evidence of inflammation (elevated total leukocyte count and/or C-reactive protein where available), and imaging findings on ultrasonography consistent with acute cholecystitis (gallbladder wall thickening, distension, pericholecystic fluid, or sonographic Murphy's sign). Patients were categorized into two groups according to operative approach: LC group and OC group. Patients who required additional major procedures (e.g., bowel resection), had known gallbladder malignancy, or had incomplete clinical or billing records required for outcome assessment were excluded.

Methodology

All patients underwent standardized preoperative evaluation including detailed history, physical examination, and routine laboratory investigations (hemoglobin, total leukocyte count, platelet count, serum electrolytes, renal function tests, liver function tests, and coagulation profile). Baseline parameters recorded included age, sex, body mass index, presenting symptoms, vital signs, comorbidity profile (diabetes mellitus, hypertension, ischemic heart disease, chronic kidney disease, chronic obstructive pulmonary disease), American Society of Anesthesiologists (ASA) physical status classification, prior abdominal surgery, and ultrasonography findings (gallbladder wall thickness, pericholecystic collection, impacted stone, and common bile duct diameter). Disease severity was documented clinically and radiologically, and relevant perioperative risk indicators (e.g., deranged liver enzymes, raised inflammatory markers, or suspected choledocholithiasis) were captured where applicable.

Operative Technique and Perioperative Care

Patients in the LC group underwent standard four-port laparoscopic cholecystectomy under general anesthesia with pneumoperitoneum, identification of the cystic duct and artery, and achievement of the critical view of safety prior to clipping and division. Patients in the OC group underwent open cholecystectomy through a right subcostal incision (or midline incision when required), with conventional ligation and division of the cystic duct and artery followed by gallbladder dissection from the liver bed. Perioperative antibiotic prophylaxis and analgesia were administered according to institutional protocol, and postoperative care included early mobilization, pain control, monitoring for complications, and stepwise advancement of oral intake as tolerated. Intraoperative adverse events, need for drain placement, and requirement for blood transfusion were recorded. For the LC group, conversion to open surgery and the indication for conversion (dense adhesions, unclear anatomy, bleeding, suspected bile duct injury) were documented and analyzed.

Clinical Outcome Measures

Primary clinical outcomes included operative time (minutes), intraoperative blood loss (mL, estimated from suction canister and swab count where feasible), conversion rate (LC to open), postoperative pain assessment (using a validated pain scale such as Visual Analog Scale at defined postoperative time points), time to oral intake (hours), time to ambulation (hours), length of postoperative hospital stay (days), and postoperative complications. Complications were categorized and recorded as bile leak, surgical site infection, intra-abdominal collection, postoperative bleeding, pulmonary complications (atelectasis, pneumonia), cardiac events, ileus, and need for re-intervention (endoscopic, radiologic, or surgical). Readmission within 30 days and mortality (in-hospital or within 30 days, if available) were assessed. Where feasible, complications were graded using a standardized classification system (e.g., Clavien–Dindo), and severity was compared between groups.

Economic Outcome Measures

Economic outcomes were evaluated from the hospital/provider perspective using itemized billing and hospital resource utilization data. Direct medical costs included operative costs (operating room charges, anesthesia charges, consumables and devices including laparoscopic instruments and clips), medication costs (antibiotics, analgesics, antiemetics), laboratory and imaging costs, ward/ICU bed charges, and costs related to management of complications (additional investigations, interventions, prolonged hospitalization, or ICU care). Total in-hospital cost per patient was calculated by summing all relevant components, and cost drivers such as length of stay and complication-related expenses were analyzed. Cost outcomes were reported in local currency as mean/median total cost and major category-wise breakdown.

Statistical Analysis

Data were entered and analyzed using Statistical Package for the Social Sciences (SPSS) version 27.0. Continuous variables were tested for normality and presented as mean ± standard deviation for normally distributed data or median (interquartile range) for skewed data. Categorical variables were summarized as frequencies and percentages. Between-group comparisons were performed using independent samples t-test for normally distributed continuous variables and Mann–Whitney U test for non-normally distributed variables. Categorical variables were compared using Chi-square test or Fisher's exact test as appropriate. Multivariable analysis was performed to adjust for potential confounders relevant to elderly surgical outcomes (e.g., ASA class, key comorbidities, and disease severity indicators), using logistic regression for binary outcomes (complications, readmission) and linear regression (or generalized linear models where appropriate) for continuous outcomes such as cost and length of stay. A p-value <0.05 was considered statistically significant, and effect sizes were reported using adjusted odds ratios or mean differences with 95% confidence intervals where applicable.

RESULTS

Table 1 demonstrates that the baseline demographic and clinical characteristics of patients in the laparoscopic cholecystectomy (LC) and open cholecystectomy (OC) groups were comparable, indicating appropriate group balance. The mean age of patients was similar between the LC group (68.42 ± 5.36 years) and the OC group (69.11 ± 5.89 years), with no statistically significant difference (p = 0.524). Gender distribution was also nearly identical, with males constituting 53.85% of the LC group and 54.76% of the OC group (p = 0.926). Mean body mass index did not differ significantly between the two groups (p = 0.673). Comorbid conditions commonly seen in the elderly population were evenly distributed. Diabetes mellitus was present in 40.38% of LC patients and 45.24% of OC patients (p = 0.634), while hypertension was observed in 50.00% and 57.14% of patients in the LC and OC groups, respectively (p = 0.487). Although ischemic heart disease and higher anesthetic risk (ASA class III–IV) were more frequent in the OC group, these differences did not reach statistical significance.

Table 2 highlights significant differences in intraoperative outcomes between the two surgical approaches. The mean operative time was significantly shorter in the LC group (78.54 ± 15.62 minutes) compared with the OC group (92.36 ± 18.41 minutes), demonstrating improved operative efficiency with laparoscopy (p = 0.001). Intraoperative blood loss was markedly lower in the LC group, with a mean blood loss of 72.31 ± 28.45 mL compared to 148.57 ± 46.82 mL in the OC group, a difference that was highly statistically significant (p < 0.001). Drain placement was required in only 26.92% of LC patients, whereas two-thirds of OC patients (66.67%) required drainage (p < 0.001), reflecting greater surgical trauma associated with open procedures. Similarly, the need for blood transfusion was significantly lower in the LC group (3.85%) compared to the OC group (16.67%) (p = 0.041). Conversion from laparoscopic to open surgery occurred in 11.54% of LC cases, which is acceptable in elderly patients with acute inflammation and reflects intraoperative challenges rather than failure of technique.

Table 3 demonstrates significantly faster postoperative recovery in patients undergoing laparoscopic cholecystectomy. Time to oral intake was substantially shorter in the LC group (18.26 ± 6.42 hours) compared to the OC group (34.71 ± 8.53 hours), indicating quicker return of gastrointestinal function (p < 0.001). Similarly, early ambulation was achieved significantly sooner in LC patients (22.14 ± 7.18 hours) than in OC patients (40.52 ± 10.36 hours), highlighting the benefits of minimally invasive surgery in elderly individuals (p < 0.001). Postoperative pain severity, measured using the Visual Analog Scale at 24 hours, was significantly lower in the LC group (3.12 ± 1.04) compared with the OC group (5.46 ± 1.32), reflecting reduced surgical trauma and incision-related pain (p < 0.001). Length of hospital stay was also significantly shorter following LC, with a mean duration of 4.18 ± 1.26 days versus 7.36 ± 2.14 days in the OC group (p < 0.001).

Table 4 compares postoperative complications between the two groups and demonstrates a consistently lower complication rate in the LC group. Surgical site infections were significantly less frequent following laparoscopic surgery (5.77%) compared with open surgery (21.43%) (p = 0.026). Pulmonary complications, including atelectasis and pneumonia, were also significantly reduced in the LC group (7.69%) compared to the OC group (23.81%) (p = 0.031), likely due to earlier mobilization and reduced postoperative pain. Postoperative ileus occurred in only 1.92% of LC patients compared to 11.90% of OC patients, a statistically significant difference (p = 0.048). Although bile leak, cardiac events, re-intervention rates, and 30-day readmissions were numerically lower in the LC group, these differences did not reach statistical significance. Notably, there was no mortality in the LC group, while two deaths (4.76%) occurred in the OC group, though this difference was not statistically significant (p = 0.111). Table 5 presents the economic analysis, revealing important cost-related differences between the two surgical approaches. While the mean operative cost was higher in the LC group (38,420 ± 6,850) compared to the OC group (31,760 ± 5,940), this difference was statistically significant (p < 0.001) and reflects the expense of laparoscopic instruments and consumables. However, this initial cost disadvantage was offset by significantly lower postoperative care costs in the LC group (18,360 ± 4,210) compared to the OC group (32,840 ± 7,120) (p < 0.001). Additionally, complication-related costs were substantially lower in the LC group (4,280 ± 2,140) than in the OC group (9,760 ± 4,380), highlighting the financial impact of reduced morbidity (p < 0.001). As a result, the total in-hospital cost was significantly lower for laparoscopic cholecystectomy (61,060 ± 8,940) compared to open cholecystectomy (74,360 ± 11,520) (p < 0.001).

Table 1: Baseline Demographic and Clinical Characteristics of Study Population (n = 94)

Variable	LC Group (n = 52)	OC Group (n = 42)	p-value
Mean age (years)	68.42 ± 5.36	69.11 ± 5.89	0.524
Male gender	28 (53.85%)	23 (54.76%)	0.926
Female gender	24 (46.15%)	19 (45.24%)	
Mean BMI (kg/m²)	24.86 ± 3.21	25.14 ± 3.45	0.673
Diabetes mellitus	21 (40.38%)	19 (45.24%)	0.634
Hypertension	26 (50.00%)	24 (57.14%)	0.487
Ischemic heart disease	9 (17.31%)	11 (26.19%)	0.286
ASA class III–IV	18 (34.62%)	21 (50.00%)	0.131
Prior abdominal surgery	10 (19.23%)	12 (28.57%)	0.284

Table 2: Intraoperative Outcomes

Parameter	LC Group (n = 52)	OC Group (n = 42)	p-value
Mean operative time (minutes)	78.54 ± 15.62	92.36 ± 18.41	**0.001**
Mean blood loss (mL)	72.31 ± 28.45	148.57 ± 46.82	**<0.001**
Drain placement required	14 (26.92%)	28 (66.67%)	**<0.001**
Blood transfusion required	2 (3.85%)	7 (16.67%)	**0.041**
Conversion to open surgery	6 (11.54%)	—	—

Table 3: Postoperative Recovery Parameters

Parameter	LC Group (n = 52)	OC Group (n = 42)	p-value
Time to oral intake (hours)	18.26 ± 6.42	34.71 ± 8.53	**<0.001**
Time to ambulation (hours)	22.14 ± 7.18	40.52 ± 10.36	**<0.001**
Mean VAS pain score (24 hrs)	3.12 ± 1.04	5.46 ± 1.32	**<0.001**
Length of hospital stay (days)	4.18 ± 1.26	7.36 ± 2.14	**<0.001**

Table 4: Postoperative Complications and Outcomes

Complication	LC Group (n = 52)	OC Group (n = 42)	p-value
Surgical site infection	3 (5.77%)	9 (21.43%)	**0.026**
Bile leak	2 (3.85%)	3 (7.14%)	0.482
Pulmonary complications	4 (7.69%)	10 (23.81%)	**0.031**
Ileus	1 (1.92%)	5 (11.90%)	**0.048**
Cardiac events	2 (3.85%)	4 (9.52%)	0.256
Re-intervention required	1 (1.92%)	4 (9.52%)	0.097
30-day readmission	2 (3.85%)	5 (11.90%)	0.141
Mortality	0 (0.00%)	2 (4.76%)	0.111

Table 5: Adverse events and complications

Cost Parameter	LC Group (n = 52)	OC Group (n = 42)	p-value
Mean operative cost	38,420 ± 6,850	31,760 ± 5,940	**<0.001**
Mean postoperative care cost	18,360 ± 4,210	32,840 ± 7,120	**<0.001**
Complication-related cost	4,280 ± 2,140	9,760 ± 4,380	**<0.001**
Total in-hospital cost	**61,060 ± 8,940**	**74,360 ± 11,520**	**<0.001**

DISCUSSION

The baseline comparability in our cohort strengthens the interpretation that outcome differences were mainly procedure-related. In this study, the LC and OC groups had similar mean age (68.42 ± 5.36 vs 69.11 ± 5.89 years; $p = 0.524$), sex distribution (male: 53.85% vs 54.76%; $p = 0.926$), BMI (24.86 ± 3.21 vs 25.14 ± 3.45 kg/m²; $p = 0.673$), and major comorbidities such as diabetes (40.38% vs 45.24%; $p = 0.634$) and hypertension (50.00% vs 57.14%; $p = 0.487$).

Similar "no significant baseline difference" patterns were also reported in an elderly acute cholecystitis series by Chau et al (2002), where demographic data and comorbidities were comparable between laparoscopic and open groups, supporting that fair baseline matching is achievable even in high-risk elderly emergency admissions.[7] Our intraoperative findings showed clear technical and physiological advantages for laparoscopy in elderly acute cholecystitis. The LC group had significantly shorter operative time (78.54 ± 15.62 vs 92.36 ± 18.41 minutes; $p = 0.001$) and markedly reduced blood loss (72.31 ± 28.45 vs 148.57 ± 46.82 mL; $p < 0.001$). These differences align with Pessaux et al (2001), who reported substantially longer operating time for open surgery compared with laparoscopy in elderly patients (103.3 vs 149.7 minutes) and emphasized that minimally invasive dissection can reduce operative stress and expedite surgical completion even in older age groups with acute inflammation.[8]

Conversion remains an important quality and safety indicator in acute cholecystitis, especially in elderly patients with severe inflammation. In our study, conversion from LC to open occurred in 11.54% (6/52), which is within an acceptable range for acute inflammatory pathology and likely reflects difficult Calot's triangle anatomy. Kiviluoto et al (1998) reported a conversion rate of 16% in acute and gangrenous cholecystitis, with conversion commonly required when severe inflammation distorted anatomy, reinforcing that conversion should be viewed as a safety-driven decision rather than a complication, particularly in advanced inflammation or uncertain biliary anatomy.[9]

Postoperative functional recovery in our cohort was consistently faster after laparoscopy, with earlier oral intake (18.26 ± 6.42 vs 34.71 ± 8.53 hours; p < 0.001), earlier ambulation (22.14 ± 7.18 vs 40.52 ± 10.36 hours; p < 0.001), and less pain at 24 hours (VAS 3.12 ± 1.04 vs 5.46 ± 1.32; p < 0.001). This accelerated recovery pattern is consistent with randomized evidence in acute cholecystitis; Johansson et al (2005) reported significantly shorter postoperative hospital stay in the laparoscopic arm despite similar baseline characteristics, supporting that minimally invasive access improves early recovery metrics even when overall complication rates are comparable in controlled trials.[10] Length of stay is a major clinical and economic driver in elderly emergency surgery, and our results demonstrate a clinically meaningful reduction with laparoscopy. LC patients stayed 4.18 ± 1.26 days compared with 7.36 ± 2.14 days in OC (p < 0.001), a reduction of about 3.18 days, which also likely contributed to reduced downstream costs.

Coccolini et al (2015), in a systematic review and meta-analysis of acute cholecystitis trials, found postoperative hospital stay was significantly shorter with laparoscopy (mean difference −4.74 days), closely mirroring the direction and magnitude of benefit observed in our elderly cohort and reinforcing that reduced hospitalization is one of the most reproducible advantages of LC in acute cholecystitis.[11]

Our morbidity profile favored laparoscopy, particularly for complications linked to incision burden and impaired respiratory mechanics in older adults. Surgical site infection was significantly lower after LC (5.77%) than OC (21.43%; p = 0.026), pulmonary complications were reduced (7.69% vs 23.81%; p = 0.031), and ileus occurred less often (1.92% vs 11.90%; p = 0.048). These findings are directionally consistent with evidence synthesized for older populations; Antoniou et al (2014) reported lower overall morbidity with laparoscopy compared with open surgery (11.5% vs 21.3%) and fewer respiratory complications (2.8% vs 5.0%), supporting that the minimally invasive approach can meaningfully reduce postoperative physiological deterioration and complication burden in elderly surgical patients.[12]

Although mortality and readmission differences were not statistically significant in our sample, the trend still favored laparoscopy and is clinically relevant in elderly acute care. Mortality was 0.00% after LC and 4.76% after OC (p = 0.111), while 30-day readmission was 3.85% vs 11.90% (p = 0.141). Large population-level evidence supports this directional pattern; Hannan et al (1999) reported lower mortality with laparoscopic cholecystectomy than open (0.23% vs 1.90%; p < 0.0001) and noted that mortality remained significantly lower after adjusting for patient characteristics, suggesting that our observed mortality trend likely reflects a true benefit that a larger elderly acute-cholecystitis sample could detect with greater statistical power.[13]

The cost results in our study show the classic pattern of higher intraoperative expenditure but lower postoperative resource utilization for LC. Operative cost was higher with LC (38,420 ± 6,850 vs 31,760 ± 5,940; p < 0.001), yet postoperative care costs (18,360 ± 4,210 vs 32,840 ± 7,120; p < 0.001) and complication-related costs (4,280 ± 2,140 vs 9,760 ± 4,380; p < 0.001) were significantly lower, producing a lower total in-hospital cost for LC (61,060 ± 8,940 vs 74,360 ± 11,520; p < 0.001).

This distribution is consistent with Vanek et al (1995), who found that overall hospital costs may be similar while the *cost categories* differ substantially—laparoscopy tends to shift spending toward operating room/professional components but reduces recovery-related and indirect costs such as earlier return to work, highlighting why total cost advantages often emerge when postoperative utilization is included.[14]

Finally, when cost is interpreted alongside patient benefit (health outcomes), laparoscopy often remains favorable despite higher equipment and consumable costs, especially when recovery and complications improve. In our cohort, LC achieved lower total in-hospital cost and better recovery/complication outcomes, supporting overall value. In a formal cost-effectiveness framework, Silverstein et al (2017) reported laparoscopic cholecystectomy produced greater QALYs (0.87 vs 0.75) at higher cost ($2664.47 vs $2058.72), yielding an incremental cost-effectiveness ratio of $4946.18 per QALY—illustrating that even when laparoscopy is more expensive upfront, the health gains and reduced downstream burden can justify adoption, particularly as caseload rises and fixed equipment costs are distributed over more procedures.[15]

CONCLUSION

Laparoscopic cholecystectomy in elderly patients with acute cholecystitis demonstrated superior clinical outcomes compared with open cholecystectomy, with significantly lower blood loss, reduced need for drains and transfusions, faster recovery, and shorter hospital stay. Postoperative morbidity—particularly surgical site infection, pulmonary complications, and ileus—was significantly lower in the laparoscopic group, while mortality and readmission were not significantly different. Although operative cost was higher for laparoscopy, overall in-hospital cost was significantly lower due to reduced postoperative care needs and fewer complication-related expenses. These findings support laparoscopic cholecystectomy as a safe and more cost-effective approach for elderly patients when performed with appropriate patient selection and readiness for conversion when necessary.

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