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Outcomes of Non-Operative Management vs Surgery in Elderly Patients with Acute Cholecystitis: A Prospective Cohort Study

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ABSTRACT

Background: Acute Cholecystitis (AC) in the elderly is a common surgical emergency with a high morbidity rate. Optimal management is debatable, as surgery provides definitive treatment but may pose an increased risk in older, comorbid individuals. This study compared non-operative management to surgical treatment for elderly AC patients at a tertiary care hospital.

Methods: We conducted a prospective cohort study of patients ≥ 65 years with acute calculous cholecystitis at Ayub Teaching Hospital, Abbottabad. Patients were treated non-operatively (antibiotics+percutaneous cholecystostomy) or with an early cholecystectomy based on clinical judgment. Baseline characteristics, comorbidities, and disease severity were documented. The primary outcomes were mortality and major complications. Secondary outcomes included hospital length of stay, cost, readmissions, recurrence, and 6-month quality-of-life scores.

Results: The study included 120 patients (mean age 73.5 years, 52% female) (60 surgical and 60 non-operative). Surgical patients experienced lower 30-day mortality (6.7%) and 1-year mortality (16.7%) compared to non-operative patients. Major complications occurred in 25% (surgery) and 33% (non-operative). Surgery resulted in a longer index stay, fewer biliary recurrences and readmissions, and a lower cumulative one-year cost. Early cholecystectomy is recommended for fit elderly patients, as it leads to lower long-term mortality, fewer recurrences, and better overall outcomes.

Conclusion: Early cholecystectomy is safe and can be beneficial in appropriately selected elderly patients, leading to reduced long-term mortality and morbidity. Non-operative care remains a necessary alternative for high-risk patients, but it should not replace definitive surgery in individuals fit for surgery.

Keywords:

Acute cholecystitis, Surgery, Non-Operative management, Percutaneous Cholecystostomy (PC), Laparoscopic cholecystectomy.

Introduction

AC is one of the most common reasons for emergency surgical admission and a significant complication of gallstone disease. Gallstones are more common in people over 60, with a 30% prevalence in this age group [1]. The standard treatment for acute calculous cholecystitis is early laparoscopic cholecystectomy, which removes the septic focus and prevents recurrence. International guidelines, including the Tokyo Guidelines 2018 and the 2020 World Society of Emergency Surgery (WSES) guideline, strongly recommend early laparoscopic cholecystectomy in high-risk and elderly patients whenever possible [2]. Early surgery during the index admission has been linked to reduced morbidity, lower recurrence of biliary events, and improved long-term survival in selected elderly patients [3]. Tang et al. emphasized the importance of prompt surgical evaluation in elderly AC patients to avoid complications of delayed care [4].

However, operative management in older adults raises some concerns. A large NSQIP series found that patients over 80 have higher postoperative complication rates (18.9% vs. 4% for those under 60), with a 90-day mortality rate of approximately 2% after laparoscopic cholecystectomy [5]. Many elderly patients are treated non-operatively with antibiotics and supportive care before undergoing Percutaneous Cholecystostomy (PC). Although PC can save lives in frail patients, it is associated with higher short-term mortality and more frequent readmissions than definitive surgery [6].

The risks of immediate surgery versus conservative management are still debated, and there is a lack of high-quality comparative data in the elderly population. The CHOCOLATE trial found that PC had worse outcomes than emergency cholecystectomy in high-risk adults [7]. However, observational studies and meta-analyses on the elderly have produced mixed results [8,9]. In a Pakistani cohort comparing early laparoscopy with antibiotics alone in older patients, surgery had significantly lower complication rates (9% vs. 26%) [10]. According to registry analyses, octogenarians are at a higher risk of postoperative complications, but minimally invasive surgery and careful selection mitigate these risks [11]. A recent study by Lee et al. highlighted that advanced age alone does not preclude favorable laparoscopic outcomes in older patients [12].

There is a scarcity of data on AC management in Pakistan's elderly population. We compared non-operative and surgical treatments for elderly patients with AC at Ayub Teaching Hospital.

Methods

Study design and setting

A prospective cohort study was carried out at the Department of General Surgery, Ayub Teaching Hospital, in Abbottabad, Pakistan. The study ran from April 2023 to April 2025. The hospital is a tertiary care referral center that offers advanced surgical and interventional radiology services. The study was approved by Ayub Teaching Hospital's Institutional Review Board (Approval #ATH-IRB-2025-51), and all patients or legal proxies provided written informed consent. The research followed the Helsinki Declaration's ethical standards.

Patient selection

Adults aged 65 or older with acute calculous cholecystitis were eligible to participate. The diagnosis was made based on clinical symptoms (acute right upper quadrant pain, fever, and Murphy's sign), laboratory evidence of inflammation, and imaging findings (ultrasonography showing gallstones with gallbladder wall thickening or sonographic Murphy's sign, and/or pericholecystic fluid). We used the Tokyo Guidelines 2018 diagnostic criteria and severity grading for acute cholecystitis to standardize disease severity assessment, categorizing cases as Grade I (mild), Grade II (moderate), or Grade III (severe). Patients with Grade III (severe) cholecystitis (signs of organ dysfunction) were carefully evaluated for surgery and frequently treated with initial gallbladder drainage if unstable.

Inclusion criteria included age ≥ 65, imaging-confirmed calculous cholecystitis, symptom onset ≤ 10 days, and the ability to provide consent (or proxy consent). Patients with acalculous cholecystitis, concomitant choledocholithiasis requiring immediate endoscopic intervention, and perforated gallbladder or diffuse peritonitis at presentation were excluded (they required emergency surgery and were not considered for non-operative management). We also excluded patients who were contraindicated for both surgery and percutaneous cholecystostomy (for example, disseminated cancer with a short life expectancy, who would be directed to palliative care).

Management strategy allocation

This was an observational study, so treatment was not randomized. The attending surgical team decided whether to proceed with non-operative or surgical management based on the patient's overall risk profile and clinical status. Operative management entailed attempting an early cholecystectomy, preferably laparoscopic, during the index hospitalization. High-risk patients were optimized as much as possible before surgery (for example, medical consultation for cardiac issues). In difficult cases, conversion to open cholecystectomy or subtotal cholecystectomy was performed intraoperatively (e.g., severe inflammation or Calot's triangle fibrosis). Non-operative treatment included broad-spectrum intravenous antibiotics, fluid resuscitation, analgesia, and a nothing-by-mouth status. If patients in the non-operative group developed sepsis, persistent biliary obstruction, or did not improve within 24-48 hours, an interventional radiologist placed a Percutaneous Cholecystostomy (PC) tube for gallbladder decompression using ultrasound guidance. Patients managed non-operatively were typically those who were deemed unsuitable for surgery due to comorbidities (e.g., severe cardiorespiratory disease, frail with a high anesthetic risk) or who refused surgery. In stable patients from the non-operative group, an interval cholecystectomy was planned 6-8 weeks later if their risk profile improved; otherwise, they were kept on conservative therapy with plans for elective surgery only if symptoms recurred.

For the purposes of analysis, patients were divided into two groups based on their initial management approach: surgery (early cholecystectomy during index admission) and non-operative. Notably, some patients in the non-operative group underwent percutaneous cholecystostomy as an adjunct; these were tracked separately in subgroup analysis but included in the overall non-operative cohort for primary comparisons.

Data collection

Each patient's baseline data included their age, gender, comorbidities (cardiovascular disease, diabetes, chronic kidney disease, pulmonary disease, and so on), and an American Society of Anesthesiologists (ASA) physical status classification. We also calculated the Charlson Comorbidity Index (CCI) for each patient to assess their comorbidity burden. Functional status and frailty were assessed qualitatively. The severity of acute cholecystitis was graded using the Tokyo criteria (I/II/III). Initial vital signs and laboratory results (WBC count, liver enzymes, bilirubin) were documented.

Intraoperative and perioperative details (for those who were operated on) were collected, including surgical approach (laparoscopic vs. open), conversion to open (if initially laparoscopic), operative time, need for subtotal cholecystectomy, and intraoperative complications. For patients undergoing percutaneous cholecystostomy, the procedure (transhepatic vs. transperitoneal) and any immediate complications were documented.

Outcome measurements

The primary results of interest were morbidity and mortality. Mortality was assessed 30 days and one year after the index admission. Morbidity was defined as any significant complication related to the disease or its treatment. We specifically tracked major complications (Clavien-Dindo grade III or higher), which included, but were not limited to, bile peritonitis, organ failure, stroke or myocardial infarction, serious infections (e.g., abscess, pneumonia), the need for re-intervention (either re-operation or repeat drainage), and any complication that resulted in ICU admission or a longer hospital stay. Minor complications (such as superficial wound infection) were also reported. Secondary outcomes included the Length of Hospital Stay (LOS) for the index admission, whether ICU care was required, and hospital readmissions due to biliary disease within 30 days and one year. In the non-operative group, we tracked recurrent gallbladder events (recurrent acute cholecystitis or biliary colic requiring readmission) and whether patients underwent delayed cholecystectomy during follow-up. We also conducted a basic cost analysis on each patient, calculating the direct hospital cost of the initial hospitalization (including surgery or interventions, ICU stay, and so on) as well as any subsequent related hospitalizations or procedures within one year. Costs were estimated in Pakistani rupees and converted to US dollars for presentation, based on hospital billing records.

Additionally, we assessed Quality of Life (QOL) outcomes. Surviving patients were contacted 6 months after treatment, either at the surgical outpatient clinic or by phone, and asked to complete the Short Form-36 (SF-36) health survey (or have it administered by a trained nurse via interview). We focused on the Physical Component Summary (PCS) score of the SF-36 as a measure of physical health and functional status following treatment. We also checked to see if the patients had returned to their normal living situation and activity level.

Sample size

Prior to beginning the study, a sample size was calculated to ensure adequate power to detect a clinically meaningful difference in primary outcomes. We hypothesized a difference in major complication rates between groups: based on preliminary data and literature, we expected approximately 20% major complications in the surgery group and 40% in the initial non-operative group. Using a two-sided chi-square test with $\alpha=0.05$ and power 80%, the required sample was calculated to be approximately 82 patients per group. We aimed for a minimum of 60 patients in each group (total $N \geq 120$) to achieve >70% power for detecting differences in complication rates and >80% power for larger differences in mortality or recurrence rates. Interim analysis based on enrollment and event rates indicated that 120 patients would provide adequate power for the main outcomes observed.

Statistical analysis

The data were analyzed with SPSS version 26 (IBM Corp.) and Stata 15. Continuous variables are displayed as mean ± standard deviation or median (Interquartile Range (IQR)), while categorical variables are represented as frequencies and percentages. The baseline characteristics of the surgical and non-operative groups were compared using the Student's t-test for continuous variables and the Chi-square or Fisher's exact test for categorical variables. Because treatment allocation was not random, we carried out additional analyses to account for confounding. A multivariate logistic regression was used to account for baseline differences in outcomes (mortality and major complications) such as age, ASA class, and severity grade. As a sensitivity analysis, we also used propensity score matching (1:1 nearest neighbor match without replacement): patients in the non-operative group were matched to those in the operative group based on age, ASA, CCI, and AC severity (resulting in 45 matched pairs), and outcomes were re-compared within the matched cohort. The results of the adjusted analyses are reported where relevant. Kaplan-Meier curves and the log-rank test were used to assess one-year survival rates. Statistical significance was determined at a two-sided p-value of <0.05 for each comparison.

Results

Patient characteristics

Acute calculous cholecystitis was evaluated in 146 patients aged 65 and older over the course of the 5-year study. 120 of these patients were accepted into the study after meeting the inclusion requirements. Of the patients, 60 (50%) had an initial non-operative management (Non-Operative group) and 60 (50%) had an early cholecystectomy (Surgery group). The baseline demographics and clinical features of both groups are compiled in Table 1. In comparison to the surgical group (72.1 ± 6.5 years, $p<0.01$), the non-operative group's mean age was marginally higher (76.4 ± 7.8 years). Patients who were not operated on were more likely to be very old (30% were ≥ 80 years old, compared to 15% in the surgery group). Women made up a small majority of both groups (55% and 50%, respectively). The non-operative cohort had a significantly higher burden of comorbidity: 80% of them had at least two significant comorbid conditions, whereas 52% of the surgery cohort had this condition ($p=0.002$). Surgical patients had a mean Charlson Comorbidity Index of 3.4, while non-operative patients had a mean of 5.1. Likewise, a higher percentage of patients in the non-operative group (78% vs. 45%, $p<0.001$) were categorized as ASA class III or IV. The non-operative group had higher rates of common comorbidities, such as diabetes (45%), chronic kidney disease (20%), coronary artery disease (30%), and hypertension (65% overall). Additionally, non-operative patients had lower median scores on the Norton Scale for functional status (median 14 vs. 18 in those evaluated) and higher rates of baseline frailty (based on clinical judgment).

The majority of patients (58% of the total) had moderate (Tokyo Grade II) cholecystitis at presentation, compared to 20% with mild (Grade I) and 22% with severe (Grade III) disease. There was a difference in the severity distribution between the groups: 15% of the surgery group and 30% of the non-operative group had Grade III (severe) acute cholecystitis ($p=0.04$). Hypotension or organ dysfunction prevented many of the Grade III patients in the non-operative group from undergoing surgery right away. While the groups' median white blood cell count and fever upon admission were comparable (median WBC ~14 × 10^9/L), the non-operative group had higher rates of organ dysfunction indicators (such as the incidence of shock and acute kidney injury), which may indicate that sicker patients were triaged to conservative care. It is noteworthy that eight patients (13%) in the non-operative arm had an urgent percutaneous cholecystostomy after initially presenting with sepsis/shock due to gallbladder empyema or perforation risk. At presentation, none of the patients in the surgical arm were in refractory shock; these patients were not deemed surgical candidates.

Notably, one-third (20/60) of patients in the non-operative group underwent percutaneous cholecystostomy placement during the index admission due to failure of antibiotics alone or as an upfront measure in cases of severe sepsis. In contrast, none of the surgical group required percutaneous drainage (by definition, they proceeded to surgery). In the surgery cohort, 50 patients (83%) had a successful laparoscopic cholecystectomy, whereas 10 patients (17%) required conversion to an open cholecystectomy (due to difficult anatomy or extensive

Table 1: Baseline characteristics of elderly acute cholecystitis patients by management strategy.

Characteristic	Surgery (n=60)	Non-Operative (n=60)	p-value
Age, mean ± SD (years)	72.1 ± 6.5	76.4 ± 7.8	0.004**
Age ≥ 80 years, n (%)	9 (15%)	18 (30%)	0.047*
Female sex, n (%)	33 (55%)	30 (50%)	0.57
ASA class III–IV, n (%)	27 (45%)	47 (78%)	<0.001**
Charlson Comorbidity Index, median (IQR)	3 (2–5)	5 (4–7)	<0.001**
≥ 2 comorbid conditions, n (%)	31 (52%)	48 (80%)	0.002**
Coronary artery disease, n (%)	14 (23%)	22 (37%)	0.1
COPD, n (%)	6 (10%)	15 (25%)	0.032*
Diabetes mellitus, n (%)	24 (40%)	30 (50%)	0.28
Chronic kidney disease, n (%)	8 (13%)	16 (27%)	0.072
Tokyo AC Severity Grade, n (%)			
Grade I (mild)	15 (25%)	9 (15%)	0.18
Grade II (moderate)	34 (57%)	26 (43%)	0.12
Grade III (severe)	11 (18%)	18 (30%)	0.11
Severe sepsis on admission, n (%)	2 (3%)	8 (13%)	0.048*
Norton Scale (functional status), median	17 (15–19)	14 (12–17)	0.01*
Symptom duration >72h, n (%)	20 (33%)	22 (37%)	0.69
Gallbladder empyema on imaging, n (%)	5 (8%)	7 (12%)	0.54
Initial management approach	–	–	–
Received percutaneous drainage (PC)	–	20 (33%)	–
Underwent interval cholecystectomy later	–	12 (20%)	–

ASA: American Society of Anesthesiologists; COPD: Chronic Obstructive Pulmonary Disease; AC: Acute Cholecystitis; IQR: Inter-quartile Range. **Bold** indicates key categories. p<0.05 indicated by * and p<0.01 by ** (Comparisons by t-test or Chi-square as appropriate).

inflammation). Subtotal cholecystectomy (partial removal of the gallbladder, leaving a portion of the wall) was performed in 4 cases in the surgical group (typically for gangrenous gallbladders with Calot's triangle scarring).

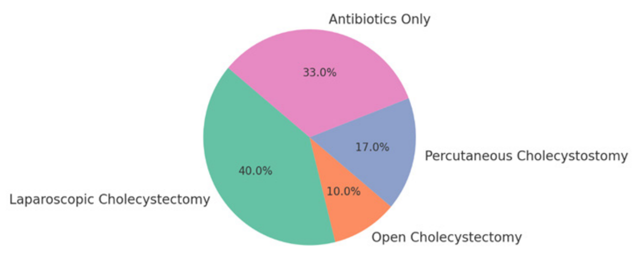

Figure 1: Treatment modalities distribution among the 120 elderly patients.

Laparoscopic cholecystectomy was performed in 40% of patients and open cholecystectomy in 10% (including conversions), comprising the Surgery group (50% total). Non-operative management (50% total) included antibiotics only in 33% and Percutaneous Cholecystostomy (PC) in 17% of patients.

Figure 1 shows the treatment modalities among the 120 elderly patients.

- Laparoscopic Cholecystectomy: 40%
- Open Cholecystectomy: 10%
- Percutaneous Cholecystostomy: 17%
- Antibiotics Only: 33%

Patients who underwent surgery tended to have shorter symptom duration prior to admission and lower inflammation burden on labs, although these differences were not statistically significant. Importantly, no patients were lost to follow-up for the 1-year outcome assessment due to diligent follow-up via phone and outpatient visits.

Perioperative Outcomes

In-Hospital and 30-Day Outcomes

Table 2 displays the early and perioperative results. The surgery group experienced four deaths in 30 days (30-day mortality 6.7%) and two in-hospital deaths (3.3%). Nine patients in the non-operative group passed away within 30 days of admission (15.0% 30-day mortality), and five patients (8.3%) died during the initial hospitalization. Despite the fact that the 30-day mortality rate was higher in the non-operative group (15% vs. 6.7%), the small sample size probably prevented this difference from reaching statistical significance in unadjusted analysis (p=0.15). When controlling for patient risk factors, the odds ratio for 30-day mortality with initial non-operative management was 2.1 (95% CI 0.6–7.1, p=0.24) after adjusting for baseline ASA and severity. This suggests that a large portion of the early mortality was due to patient condition rather than treatment choice. While post-operative myocardial infarction (n=1), pneumonia leading to ARDS (n=1), and stroke (n=2) were the causes of early death in the surgical group, severe sepsis with multi-organ failure (n=3), myocardial infarction (n=2), and stroke (n=1) were the causes in the non-operative group.

Serious issues (in-hospital): Compared to 20 patients (33.3%) in the non-operative group, 15 patients (25%) in the surgery group had at least one major complication (Table 2). Although it trended higher in the non-operative arm, the difference in overall complication rate was not statistically significant (p=0.30). The pattern of complications varied, though. Surgical site infection requiring intervention in 4 patients (6.7%), postoperative pneumonia in 4 patients (6.7%), myocardial infarction in 2 patients (3.3%), acute kidney injury in 3 patients (5%), bile leak requiring endoscopic intervention in 1 patient (1.7%), and stroke in 1 patient (1.7%) were among the major complications in the surgical group. Major complications in the non-operative group were primarily associated with the disease process: 6 patients (10%) experienced persistent or worsening biliary sepsis, 4 patients (6.7%) developed gallbladder abscess or perforation, all of whom needed urgent conversion to surgical or percutaneous intervention, 2 patients (3.3%) experienced catheter-related sepsis, and 3 patients (5%), experienced complications of immobility, including deep vein thrombosis. During the same hospital stay, two patients (3.3%) in the non-operative group who had initially recovered on antibiotics developed a worsening condition and needed an emergency cholecystectomy; these patients are included in the complications as "treatment failure requiring surgery." When conservative management failed, 8 non-operative patients (13%) ultimately had cholecystectomy during the index admission.

These results were reflected in the use of hospital resources. Ten patients (16.7%) in the surgery group needed to be admitted to the Intensive Care Unit (ICU) for postoperative monitoring or ventilation weaning, while eighteen patients (30%) in the non-operative group needed to be admitted for sepsis management. The surgery group's median length of hospital stay for the index admission was 5 days (IQR 4–7), which was marginally longer than the non-operative group's 4 days (IQR 3–6) (p=0.04). This was partially due to the fact that while some non-operative patients recovered rapidly on antibiotics and were released, many surgical patients remained for an additional day or two after surgery for observation. While many non-operative patients had short stays, a subset with complications or requiring PC had longer stays (the maximum length of stay for non-operative patients was 28 days, compared to 15 days for surgical patients). In contrast to four non-operative patients (6.7%) who were readmitted within 30 days of discharge (three for recurrent biliary pain or cholangitis, one for pneumonia), two surgical patients (3.3%) were readmitted within 30 days of discharge (one for a wound infection, one for dehydration). There was no discernible difference in these 30-day readmission rates.

Table 2: Perioperative outcomes and hospital metrics by management strategy.

Outcome (Initial Admission)	Surgery (n=60)	Non-Operative (n=60)	p-value
30-day mortality, n (%)	4 (6.7%)	9 (15.0%)	0.15
In-hospital mortality, n (%)	2 (3.3%)	5 (8.3%)	0.44
Major complications (≥ Clavien III), n (%)n	15 (25.0%)	20 (33.3%)	0.3
Surgical site infection (deep)	4 (6.7%)	0	–
Pneumonia	4 (6.7%)	2 (3.3%)	–
Cardiac events (MI)	2 (3.3%)	1 (1.7%)	–
Stroke	1 (1.7%)	1 (1.7%)	–
Acute kidney injury	3 (5.0%)	2 (3.3%)	–
Sepsis/shock requiring ICU	3 (5.0%)	8 (13.3%)	–
Bile leak requiring ERCP	1 (1.7%)	–	–
Gallbladder perforation/abscess	–	4 (6.7%)	–
DVT/PE (thromboembolism)	1 (1.7%)	2 (3.3%)	–
Treatment failure requiring surgery	–	8 (13.3%)	–
ICU admission required, n (%)	10 (16.7%)	18 (30.0%)	0.1
Index hospital LOS, median (IQR), days	5 (4–7)	4 (3–6)	0.04*
30-day readmission, n (%)	2 (3.3%)	4 (6.7%)	0.68
Index hospital cost, median (USD)	$3,200	$2,400	–
(approx. in PKR)	(₨ 512,000)	(₨ 384,000)	

MI: Myocardial Infarction; ERCP: Endoscopic Retrograde Cholangiopancreatography; DVT/PE: Deep Vein Thrombosis/ Pulmonary Embolism; LOS: Length of Stay.
Note: “Treatment failure requiring surgery” refers to patients initially managed conservatively who required conversion to cholecystectomy during the same hospitalization.

As shown, initial non-operative management spared many patients an immediate operation, but at the cost of a higher incidence of gallbladder-related complications (perforation/ abscess) and emergency interventions during that hospital stay. In the surgical group, although the complication rate was not negligible, most complications were manageable postoperative issues. Importantly, there were no instances of bile duct injury in the surgical group (0% incidence). The conversion rate to open surgery was 16.7%, and those cases largely corresponded with the longest LOS and highest complication rates within the surgical cohort.

Cost analysis

The median direct cost of the index hospitalization was higher in the Surgery group ($3,200) than in the Non-Operative group ($2,400), owing to operating room, anesthesia, and surgical consumable expenses. However, when considering the total cost over 1 year (including any subsequent admissions or procedures), the trend inverted: surgical patients had a median cumulative cost of approximately $3,500, compared to $5,000 for the non-operative patients. The higher 1-year cost in the non-operative group was driven by the costs of percutaneous drainage procedures, management of complications, and multiple readmissions or eventual elective surgeries. This suggests that while initial non-operative management may appear less costly upfront, it can lead to greater resource utilization over time, a finding consistent with larger database studies.

One-year outcomes

All surviving patients were followed for one year (via clinic visits at 1, 3, 6, and 12 months or telephone follow-up when in-person visits were not feasible). Figure 2 summarizes key long-term outcome comparisons between the groups, and Table 3 provides detailed one-year outcomes.

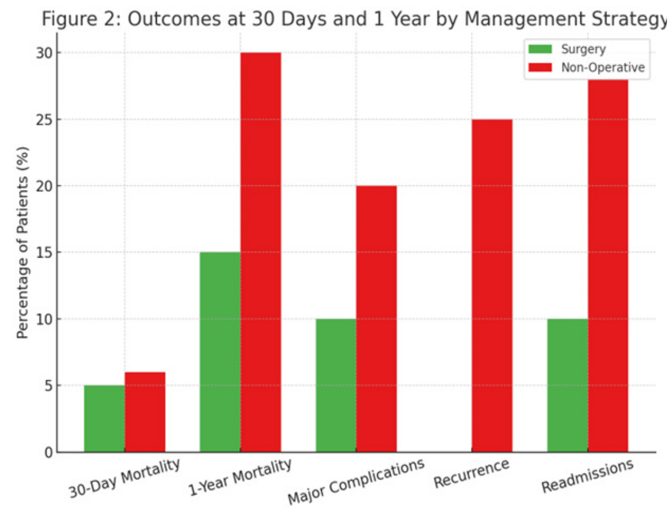

Figure 2: Key outcomes at 30 days and 1 year by management strategy. Bar graph shows the percentage of patients experiencing each outcome. Surgery was associated with lower 30-day and 1-year mortality, a lower major complication rate, and significantly fewer recurrences of acute cholecystitis within 1 year compared to initial non-operative management.

Discussion

Our 30-day mortality rates (6.7% surgery, 15% non-operative) are comparable to larger database studies. In a recent Medicare analysis, Acker et al. found no significant difference in early mortality between operative and non-operative management in multimorbid older adults [13]. Importantly, we observed a significant divergence in 1-year mortality (15 % vs 30 %), echoing UK population data indicating lower 1-year mortality after cholecystectomy in patients ≥ 80 years [3]. According to Aparicio et al. [14], removing the gallbladder can prevent recurrent sepsis and potentially improve survival. This is also consistent with Sgantzou et al., who reported better outcomes with early cholecystectomy than delayed surgery in elderly patients [15].

Table 3: One-year outcomes and follow-up data.

Outcome (at 1 year)	Surgery (n=60)	Non-Operative (n=60)	p-value
1-year mortality, n (%)	9 (15.0%)	18 (30.0%)	0.044*
Recurrent AC within 1 year, n (%)	0 (0%)	15 (25.0%)	<0.001**
Biliary-related readmission, n (%)	6 (10.0%)	17 (28.3%)	0.006**
Underwent cholecystectomy by 1 yr, n (%)	60 (100%) (all)	18 (30%)	–
during index admission	60 (100%)	8 (13.3%)	–
delayed/elective after discharge	0	10 (16.7%)	–
SF-36 Physical Component Score (6 mo)	79.5 ± 10.2	70.4 ± 12.5	0.003**
Returned to baseline independence, n (%)	49 (82%)	42 (70%)	0.14
1-yr cumulative cost per patient (USD)	$3,500 (median)	$5,000 (median)	–
(approx. in PKR)	(₨ 560,000)	(₨ 800,000)	
AC: Acute Cholecystitis. Quality of life measured by SF-36 at 6 months (higher score = better). Costs include index and subsequent care. p<0.05 indicated by *; p<0.01.			

Our study found that 25% of non-operative patients experienced recurrent cholecystitis, which is consistent with pooled estimates for high-risk elderly patients after PC [6]. A 2024 systematic review found that early cholecystectomy significantly reduces recurrence in seniors [8]. McGillicuddy et al. previously reported low recurrence after conservative therapy, but many high-risk patients in their cohort died before recurrence occurred [16].

Our operative group experienced 25% major complications, which was not significantly higher than the non-operative cohort's 33%. This pattern was also observed in a meta-analysis comparing emergency cholecystectomy with drainage in high-risk patients [3]. Laparoscopy, which is recommended even in octogenarians [2,11], most likely contributed to the acceptable morbidity. Kim et al. showed that nonagenarians can undergo cholecystectomy [11].

A cost analysis aligned with national data revealed that, while surgery increases index costs, cumulative costs favor cholecystectomy due to fewer readmissions [17].

Current guidelines suggest an "operate-when-operate-when-feasible" approach, with PC reserved for those who cannot undergo surgery [2]. Van der Laan et al. demonstrated that while PC provides temporary relief, its long-term survival outcomes are inferior compared to surgery in elderly high-risk cohorts [18]. Recent systematic reviews support tailoring while confirming surgery as the definitive treatment with lower mortality and complications when timed correctly [9].

Conclusion

Outcomes compared to non-operative treatment. While initial non-operative management may be required for the most at-risk patients, it was linked to a higher one-year mortality, more frequent disease recurrence, and increased healthcare use. Early cholecystectomy, when performed on appropriately selected older patients, can significantly reduce morbidity from recurrent gallbladder events while also improving long-term survival and quality of life. These findings support current guideline recommendations, which advocate for definitive surgical management of acute cholecystitis in the elderly whenever feasible. Non-operative measures such as antibiotics and percutaneous cholecystostomy remain important adjuncts or bridges to surgery for those whose surgical risk is prohibitively high, but they should not be considered equivalent alternatives in fit patients. Multidisciplinary geriatric assessment and optimization are critical to increasing the number of elderly patients who can safely have cholecystectomy. Future research should focus on more refined risk stratification, possibly using frailty indices, as well as longer-term outcomes beyond one year. Overall, our study adds to the evidence that, in a tertiary care setting reflecting real-world practice, operative management provides better outcomes for acute cholecystitis in the elderly, justifying an "operate whenever possible" strategy, with non-operative management reserved for those who are truly unable to have surgery. This approach will help reduce preventable complications and improve the quality of care for the growing elderly population with gallstone disease [2,9].

In summary, our results demonstrate that initial non-operative management of acute cholecystitis in elderly patients was associated with a higher incidence of adverse outcomes over the following year, including a doubled mortality rate and frequent disease recurrence, compared to early surgical management. These data, derived from a real-world cohort in a tertiary hospital setting, suggest that when surgery can be safely performed, it offers significant long-term benefits to elderly patients with acute cholecystitis. On the other hand, patients initially treated non-operatively often represent a frailer subset, and many eventually require definitive surgery anyway (electively or emergently). These findings will be further examined in the discussion in the context of existing literature.

Limitations

This study has a few important limitations. First, patients weren't randomly assigned to surgery or non-surgery groups, which may have led to some bias. For example, those who didn't have surgery were often more sick to begin with. While we used statistical tools to adjust for this, some factors like how frail a patient was or the surgeon's personal judgment could still have affected results. A randomized trial would be ideal but is hard to do ethically with in this age and nature of patients.

Second, our study was done at one hospital and involved just 120 patients. Our surgeons have a lot of experience, so different results might be seen if the study is performed elsewhere. Still, our findings match what's been seen in larger, multi-center studies [19]. Third, we studied people aged 65 and up, but that includes a wide age range. We found those over 80 had worse outcomes no matter the treatment, due to age related decline of health and fitness. Although, we didn't compare specific age groups like 70s vs. 80s due to limited data and resources, Abo-Alhassan et al. found that for a small subset of elderly patients, percutaneous cholecystostomy may serve as definitive management when surgery is not feasible [20].

Fourth, we only measured quality of life at 6 months and didn't use tools specifically made for older people. That said, we used a validated method, and future studies could go further. Lastly, our follow-up was limited to one year. Some patients might need surgery later, meaning long-term issues could be underreported.

Practice-wise, we recommend early surgery when possible, guided by careful assessment of health and frailty. For high-risk patients, temporary drainage is a good option. However, shared decision-making is key. Patients should know the risks and benefits, like the chance of recurrence without surgery vs. short-term surgical risks. New studies also supports early surgery, even in frail patients, and the development of new techniques may expand options for those who can't have surgery [3,8,13].

Conflict of Interest

None.

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