

A CLINICAL STUDY ON COMPLICATIONS OF OPEN CHOLECYSTECTOMY IN PATIENTS OPERATED IN THE SURGERY DEPARTMENT OF A TERTIARY CARE HOSPITAL

Dr. Arvind Kumar Sah¹, Dr. Nabajyoti Das², Dr. Mituban Gogoi³, Dr. Sorbeswar Bhuyan⁴;

¹Resident, Department of General Surgery, Assam Medical College and Hospital, Assam

²Assistant Professor, Department of General Surgery, Assam Medical College and Hospital, Assam

³Associate Professor, Department of General Surgery, Tinsukia Medical College and Hospital, Assam

⁴Professor, Department of General Surgery, Assam Medical College and Hospital, Assam

ABSTRACT

Introduction: Gallbladder diseases, particularly cholelithiasis and cholecystitis, are common indications for surgery. Although laparoscopic cholecystectomy is the standard treatment, open cholecystectomy remains important in complicated cases, difficult anatomy, and resource-limited settings. This study evaluated the spectrum and frequency of complications following open cholecystectomy in a tertiary care hospital in Northeast India.

Methods: This hospital-based observational study was conducted in the Department of General Surgery at Assam Medical College & Hospital over one year. A total of 210 patients aged above 18 years with acute or chronic cholecystitis undergoing open cholecystectomy were included. Patients with gallbladder carcinoma and choledocholithiasis were excluded. Demographic details, clinical presentation, intraoperative findings, and postoperative outcomes were recorded using a structured proforma and analyzed statistically.

Results: Female patients predominated, with most cases occurring in the 31–50-year age group. Right hypochondrial pain was the most common presenting symptom. Dense adhesions and thickened gallbladder wall were frequent intraoperative findings. Liver injury was the most common intraoperative complication, while common bile duct injury was uncommon. Postoperatively, fever was the most frequent complication, followed by wound infection and intra-abdominal collection. Most complications were detected early and managed successfully.

Conclusion: Open cholecystectomy remains associated with measurable intraoperative and postoperative complications. Careful surgical technique, early recognition, and prompt management are essential for reducing morbidity and improving patient outcomes.

Keywords: *Open cholecystectomy, gallstones, cholecystitis, complications, wound infection.*

INTRODUCTION

Gallstone disease (cholelithiasis) is one of the most common disorders affecting the hepatobiliary system and remains a significant global health burden. Gallstones are concretions formed within the gallbladder due to precipitation of bile constituents, mainly cholesterol,

bilirubin, and calcium salts. The clinical spectrum ranges from asymptomatic disease to severe complications such as acute cholecystitis, choledocholithiasis, and gallstone pancreatitis.¹

The prevalence of gallstone disease varies widely depending on geographical location, ethnicity, age, sex, dietary habits, and genetic predisposition. In Western countries, the prevalence is estimated at 10–15%, whereas in India it ranges from 6–10% of the general population.^{2,3} The disease is more common in females, particularly during the reproductive years, largely because estrogen and progesterone influence bile composition and gallbladder motility, thereby increasing the risk of stone formation.⁴

Although most gallstones remain clinically silent and are incidentally detected during imaging, approximately 10–25% of affected individuals develop symptoms or complications requiring surgical intervention. Biliary colic is the most common presenting symptom and usually results from intermittent cystic duct obstruction. Delayed diagnosis or untreated disease may lead to serious complications including acute cholecystitis, empyema, mucocele, and gallbladder perforation.^{5,6} Ultrasonography remains the first-line diagnostic modality due to its high sensitivity, non-invasive nature, and widespread availability.⁷

Cholecystectomy is the definitive treatment for symptomatic gallstone disease. Since its introduction in the late 1980s, laparoscopic cholecystectomy has become the gold standard owing to reduced postoperative pain, shorter hospital stay, faster recovery, and superior cosmetic outcomes.^{8,9} However, open cholecystectomy continues to play an important role in modern surgical practice.

Open cholecystectomy is particularly indicated in complicated gallbladder disease, including severe inflammation, dense adhesions, distorted biliary anatomy, gangrenous cholecystitis, suspected malignancy, or following conversion from laparoscopic surgery.^{10–14} Intraoperative challenges such as bleeding, unclear Calot's triangle anatomy, and bile duct injury may necessitate conversion to open surgery for patient safety.¹⁵

In many developing countries and resource-limited healthcare settings, limited access to laparoscopic equipment and trained personnel further increases the dependence on open cholecystectomy. Additionally, patients often present late with advanced disease, making open surgery a safer and more practical option.¹⁶ Open cholecystectomy also remains essential in surgical training, as it provides a strong foundation in biliary anatomy and operative decision-making.¹⁷

Despite declining frequency, open cholecystectomy remains clinically relevant. However, institution-specific data regarding its complications and associated risk factors remain limited. Therefore, this study was undertaken to evaluate the intraoperative and postoperative complications of open cholecystectomy and identify factors influencing surgical outcomes.

AIM OF THE STUDY

Evaluating intraoperative and postoperative complications of open cholecystectomy in patients from the Department of Surgery at a tertiary care hospital in Northeast India, Assam.

OBJECTIVES OF THE STUDY

Primary Objective

- ⑨ Assessing open cholecystectomy's intraoperative and postoperative complications in patients who had surgery in the Department of Surgery at a tertiary care hospital in Northeast India, Assam.

Secondary Objectives

- ⑨ To analyze the presenting symptoms and clinical features of patients who develop complications following open cholecystectomy.
- ⑨ To observe the short-term clinical outcomes in patients who experience complications after undergoing open cholecystectomy.

MATERIALS AND METHODS

STUDY DESIGN

The present study was designed as a **hospital-based observational study**, conducted with the objective of assessing the intraoperative and postoperative complications associated with open cholecystectomy in patients diagnosed with acute or chronic cholecystitis.

PLACE OF STUDY

This study was conducted in the **Department of General Surgery, Assam Medical College and Hospital (AMCH), Dibrugarh**, a tertiary care centre in Northeast India.

DURATION OF STUDY

The study was carried out over a period of **one year; 28th September 2024 to 27th September 2025**

STUDY POPULATION

The study population consisted of all patients admitted to the Department of General Surgery during the study period who were clinically and radiologically diagnosed with **acute or chronic cholecystitis**, and who underwent **open cholecystectomy**.

SAMPLE SIZE DETERMINATION

The sample size was calculated based on the **anticipated prevalence of complications** following open cholecystectomy, which was taken from relevant literature as approximately **16%** (References 1, 11, 14).

Using the formula for calculating the sample size for estimating a proportion:

$$n = Z^2 \times p \times (1-p) / d^2$$

Where:

- n = required sample size
- Z = Z-score for 95% confidence level = 1.96
- p = expected proportion (prevalence of complications) = 0.16
- d = absolute precision or allowable margin of error = 0.05

Thus, the minimum sample size required was calculated as **207**, which was rounded off to **210** patients to ensure adequate representation and account for any potential dropouts or data incompleteness.

INCLUSION CRITERIA

Patients were included in the study if they met all the following criteria:

- ☒ Patients aged **18 years and above**.
- ☒ Patients of **any gender**.
- ☒ Diagnosed with **acute cholecystitis with symptoms <7 days or chronic cholecystitis** on the basis of clinical presentation and radiological investigations.
- ☒ Undergoing **open cholecystectomy** during the study period.
- ☒ Provided **written informed consent** to participate in the study.

EXCLUSION CRITERIA

The following patients were excluded from the study:

- ☒ Patients diagnosed with **gallbladder carcinoma** either preoperatively or intraoperatively.
- ☒ Patients with **acute cholecystitis with symptoms >7 days**
- ☒ Patients with **choledocholithiasis** confirmed by ultrasonography, MRCP, or intraoperative findings.
- ☒ Patients who did not provide **informed consent**.

ETHICAL CONSIDERATIONS

Before the start of the study, the Institutional Ethics Committee (Human) at Assam Medical College and Hospital, Dibrugarh, granted ethical approval.

Participants of the study were given detailed explanations concerning the goals of the study, how it would be carried out, associated risks, and potential benefits. A written informed consent, using the IEC-approved template, was obtained from all participants (Annexure II).

DATA COLLECTION PROCEDURE

A **structured proforma** (Annexure I) was used to collect the data. The methodology included the following steps:

History and Clinical Examination

- A comprehensive clinical history was documented and included the length and type of abdominal pain and associated symptoms such as nausea and vomiting, fever and jaundice, bowel and bladder habits, and previously similar episodes.
- The documented history of past medical or surgical illnesses (e.g., diabetes mellitus, hypertension, peptic ulcer disease, previous abdominal surgeries) was noted.
- The findings of the thorough general physical, local abdominal, and digital rectal examinations, and the findings were recorded.

Investigations

The following investigations were performed preoperatively:

- **Hematological tests:** Complete Blood Count (CBC), Random Blood Sugar (RBS), Liver Function Tests (LFT), Renal Function Tests (RFT), and Serum Electrolytes.
- **Radiological imaging:**
 - **Ultrasound abdomen** to assess gallbladder wall thickening, presence of gallstones, pericholecystic fluid, or signs of empyema.
 - **Plain X-ray abdomen** in erect and supine positions to detect air-fluid levels, bowel obstruction, or pneumoperitoneum.
 - **CT abdomen** was done in selected cases where complications or unclear diagnosis was suspected.

Operative Management

- The following statements have been rewritten while keeping the original meaning intact.
- Under general anesthesia and in an open cholecystectomy procedure, the operation was performed by either supervising senior residents or by consultants.

- The duration of the surgery, intraoperative findings (adhesions, gallbladder condition, difficulty in dissection), and any intraoperative complications (e.g. bleeding, injuries to the bile duct) were recorded in detail.

Postoperative Management and Follow-Up

- Patients were monitored postoperatively for signs of complications such as fever, wound infection, bile leak, paralytic ileus, intra-abdominal abscess, or respiratory tract infections.
- Standard postoperative care was given including **analgesia, antibiotics, fluid management, and early ambulation.**
- Patients were followed up at **2, 4, 8, and 12 weeks** postoperatively in the outpatient department, and any delayed or late complications were recorded during follow-up visits.

Outcome Measures

The primary outcome measures were:

- **Intraoperative complications:** bleeding, bile duct injury, bowel injury, gallbladder rupture, etc.
- **Early postoperative complications** (within 30 days): surgical site infection, bile leak, respiratory complications, etc.
- **Late postoperative complications** (after 30 days): incisional hernia, chronic pain, adhesive bowel obstruction.

Statistical Analysis

- All collected data were entered and coded in **Microsoft Excel** and analyzed using **IBM SPSS Statistics (Version 28)**.
- **Descriptive statistics** were applied to summarize data. Categorical variables were presented as **frequencies and percentages**, while continuous variables were expressed as **mean $\pm$ standard deviation**.
- **Chi-square test** was used to determine associations between categorical variables.
- **Student's t-test** was applied to compare continuous variables between groups.
- A **p-value < 0.05** was considered statistically significant.

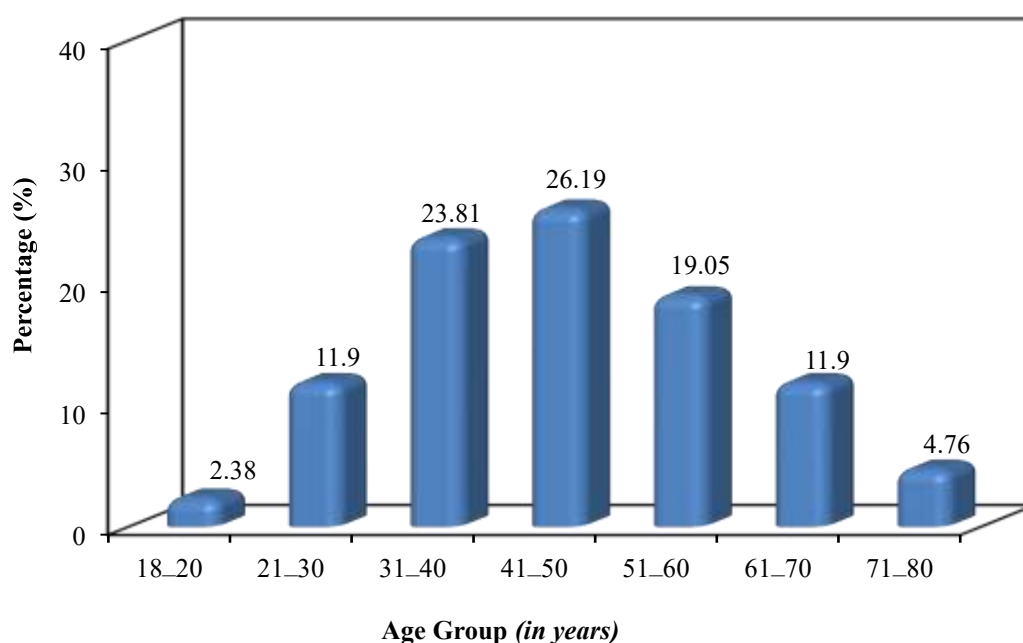
RESULTS AND ANALYSIS

Table-1: Age Distribution of Patients Undergoing Open Cholecystectomy

Age Group (<i>Years</i>)	No. of Patients (<i>n=210</i>)	Percentage (%)
----------------------------	-------------------------------------	-------------------

18–20	5	2.38%
21–30	25	11.90%
31–40	50	23.81%
41–50	55	26.19%
51–60	40	19.05%
61–70	25	11.90%
71–80	10	4.76%

Figure-1: Age Distribution of Patients Undergoing Open Cholecystectomy (n = 210)



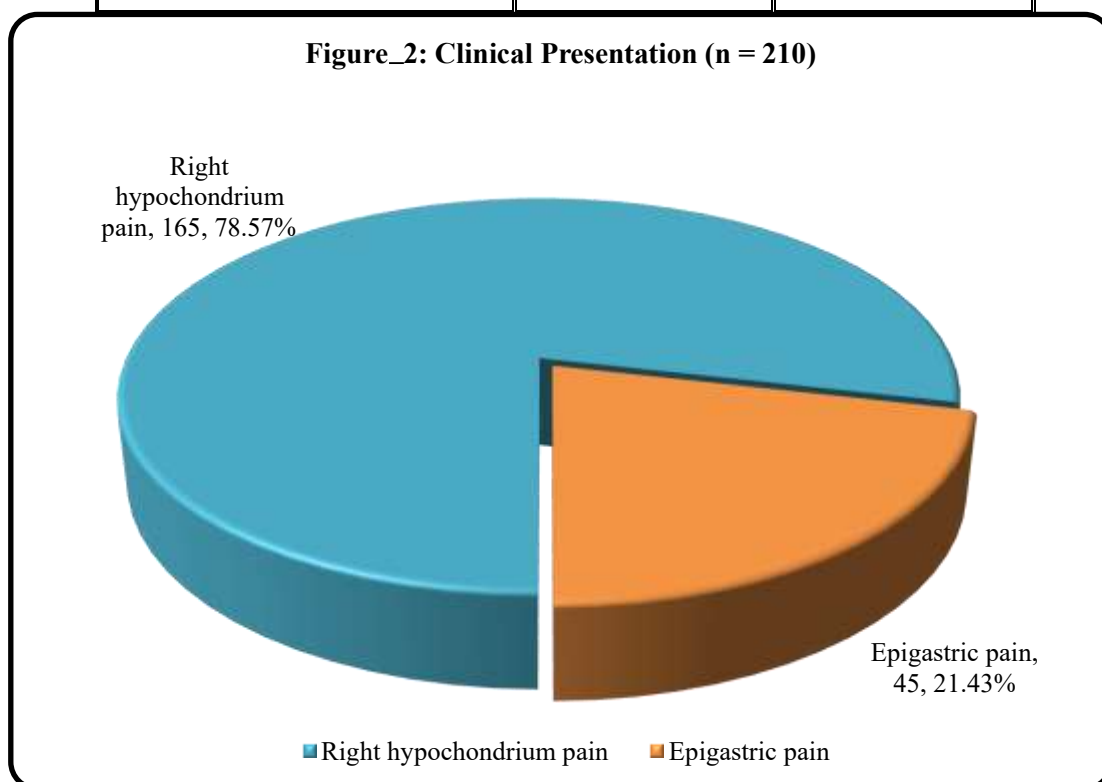
Most patients who have undergone an open cholecystectomy were aged between 41 and 50 years (26.19%) and were followed closely by those aged 31–40 years (23.81%). The age range indicates that gallstone disease predominantly affects the middle-aged. The younger age group (18–20 years) was the least represented (2.38%).

Table-2: Clinical Presentation

Presentation	No. of Patients (n=210)	Percentage (%)
Right hypochondrium pain	165	78.57%

Epigastric pain	45	21.43%
-----------------	----	--------

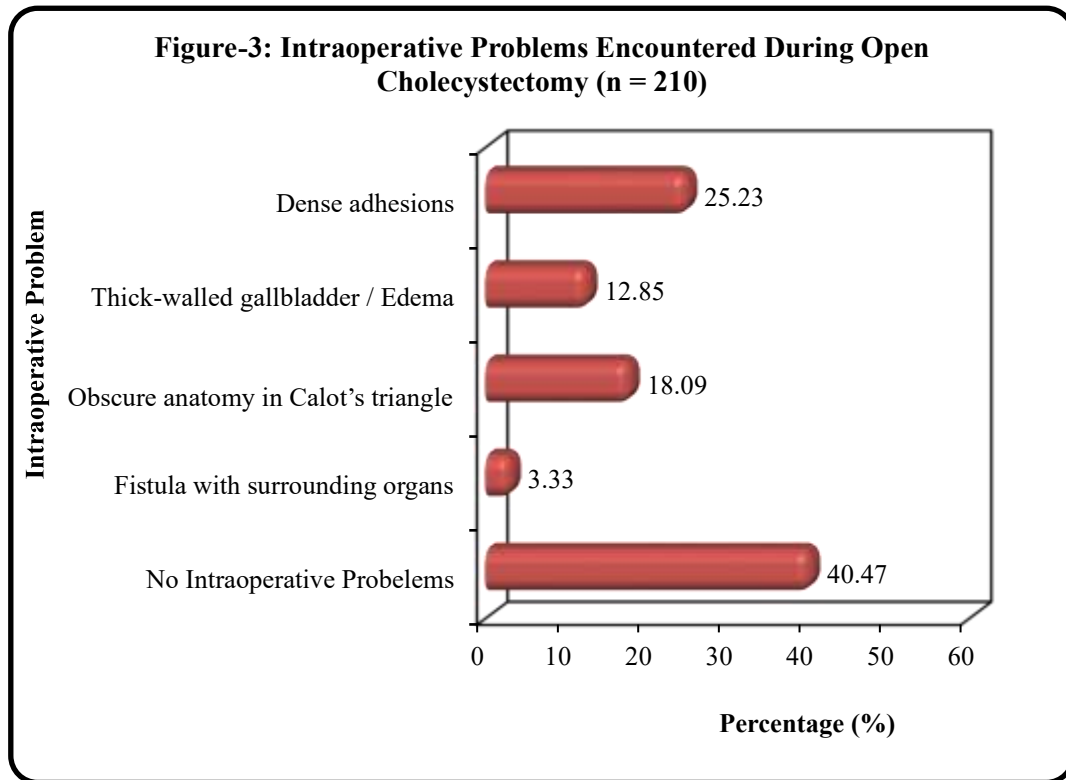
Figure_2: Clinical Presentation (n = 210)



Right hypochondrial pain was the most common presenting complaint (78.57%), while epigastric pain was reported in 21.43% of patients. These findings are consistent with the typical clinical presentation of gallstone disease and cholecystitis.

Table-3: Intraoperative Problems Encountered During Open Cholecystectomy

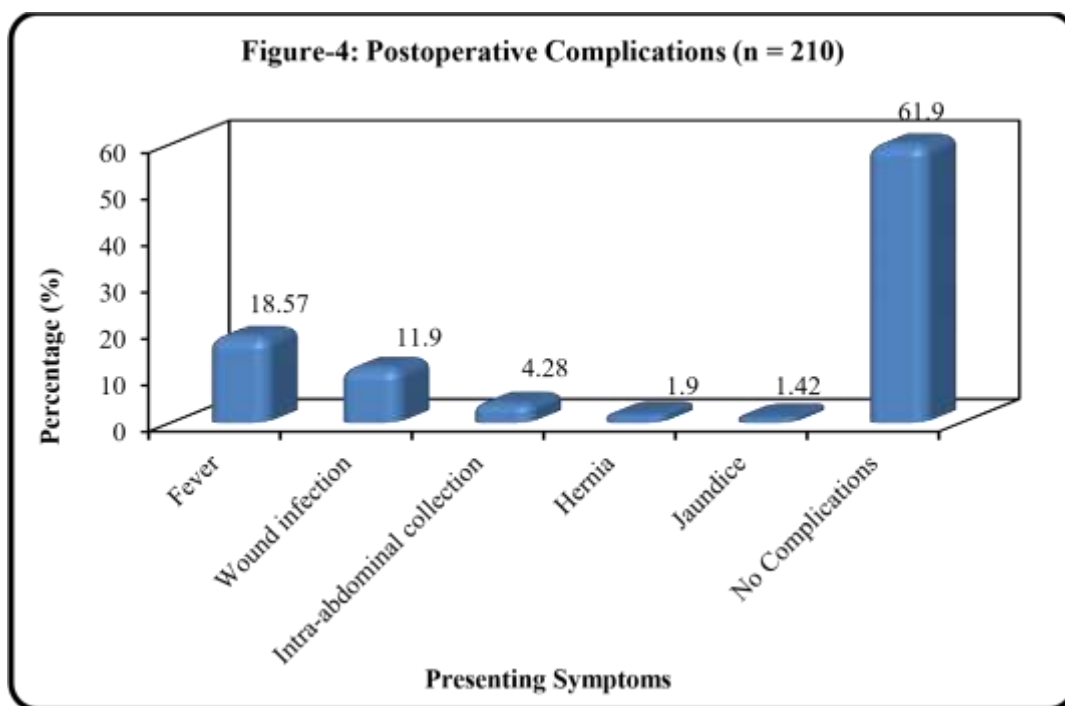
Intraoperative Problem	No. of Patients (n=210)	Percentage (%)
Dense adhesions	53	25.23%
Thick-walled gallbladder / Edema	27	12.85%
Obscure anatomy in Calot's triangle	38	18.09%
Fistula with surrounding organs	7	3.33%
No Intraoperative Probelems	85	40.47%



Dense adhesions (25.23%) were the most common intraoperative difficulty, followed by obscure Calot's triangle anatomy (18.09%) and thick-walled gallbladder (12.85%). Despite these challenges, 40.47% of surgeries were completed without intraoperative difficulty.

Table-4: Postoperative Complications

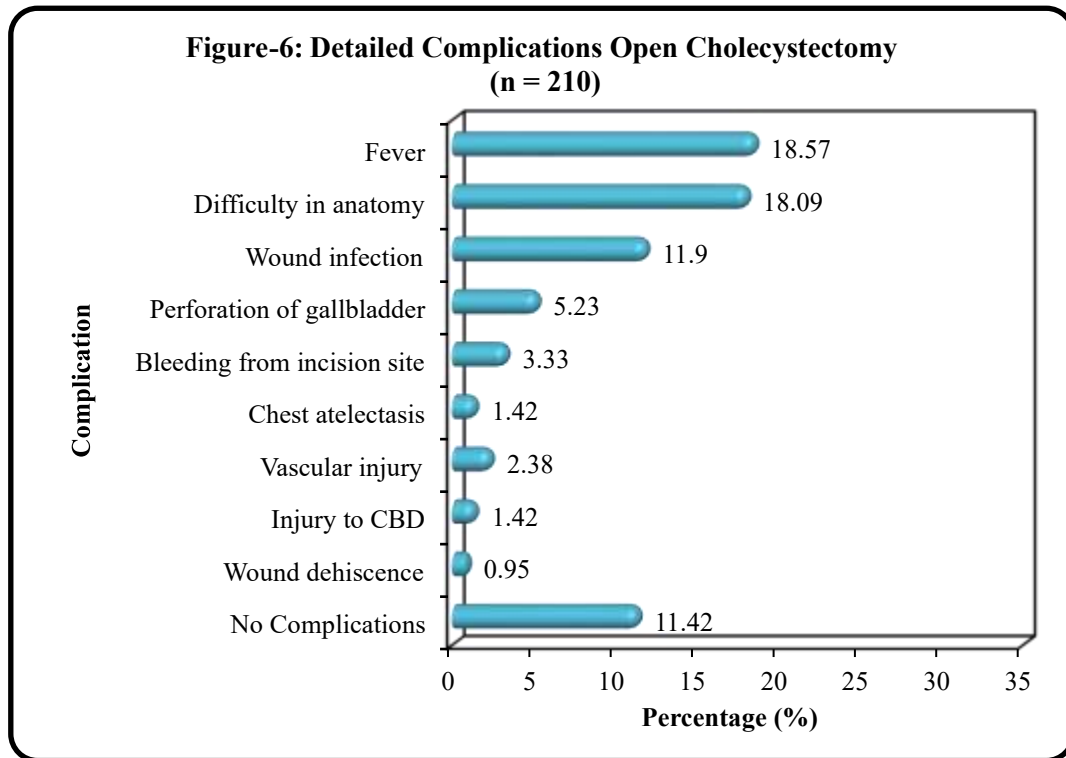
Postoperative Complication	No. of Patients (n=210)	Percentage (%)
Fever	39	18.57%
Wound infection	25	11.90%
Intra-abdominal collection	9	4.28%
Hernia	4	1.90%
Jaundice	3	1.42%
No Complication	130	61.90



Most patients (61.90%) had an uncomplicated postoperative recovery. Among complications, fever (18.57%) and wound infection (11.90%) were the most common, while intra-abdominal collection, hernia, and jaundice were relatively infrequent.

Table-5: Detailed Complications Open Cholecystectomy

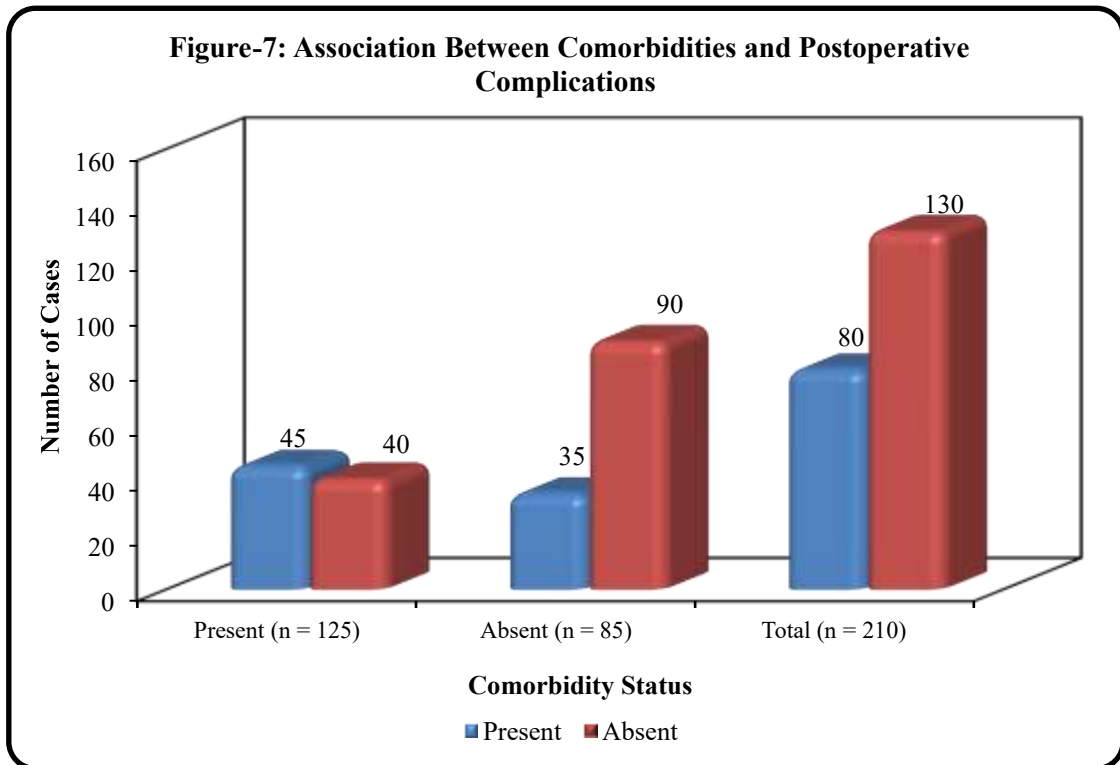
Complication	No. of Patients (n=210)	Percentage (%)
Fever	39	18.57
Difficulty in anatomy	38	18.09
Wound infection	25	11.90
Perforation of gallbladder	11	5.23
Bleeding from incision site	7	3.33
Chest atelectasis	3	1.42
Vascular injury	5	2.38
Injury to CBD	3	1.42
Wound dehiscence	2	0.95
No Complications	24	11.42



Open cholecystectomy was associated with several intraoperative and postoperative complications, with fever (18.57%), difficult anatomy (18.09%), and wound infection (11.90%) being the most common. However, most complications were manageable, and overall surgical outcomes remained satisfactory.

Table-7: Association between Comorbidities and Postoperative Complications

Comorbidity Status	Complication		Total (n)	% With Complications	<i>p-value</i>
	Present	Absent			
Present (n = 85)	45	40	85	52.94	<0.001
Absent (n = 125)	35	90	125	28%	
Total (n = 210)	80	130	210		



Demonstrates a statistically significant association between presence of comorbidities and postoperative complications ($p < 0.001$), indicating that comorbid patients had a higher complication rate (52.94%) than those without.





INTRA-OPERATIVE IMAGES OF OPEN CHOLECYSTECTOMY

DISCUSSION

The present prospective observational study evaluated the intraoperative and postoperative complications associated with open cholecystectomy in 210 patients. The mean age of patients was 45.2 years, with the highest incidence in the 41–50 years age group, consistent with previous studies by Kumar et al. and Singh et al., suggesting that symptomatic gallstone disease commonly manifests in middle age.

A clear female predominance (71.43%) was observed, supporting established evidence that hormonal factors, particularly estrogen, contribute to increased gallstone formation in women. Chronic cholecystitis was the most common pathological presentation, reflecting the progressive nature of long-standing gallstone disease.

Dense adhesions were the most frequent intraoperative difficulty and showed a significant association with prolonged operative time. Among intraoperative complications, liver injury was the most common, followed by gallbladder perforation and bleeding. These findings highlight the technical challenges of open cholecystectomy, especially in patients with distorted anatomy and severe inflammation.

Postoperative complications occurred in 38.09% of patients, with fever and wound infection being the most common. Patients with comorbidities demonstrated significantly higher complication rates, emphasizing the impact of systemic illnesses on postoperative recovery.

Most complications developed within the first five postoperative days, indicating the importance of close postoperative monitoring.

Overall, the complication profile observed in this study was comparable to previous literature. Although open cholecystectomy remains a safe and effective procedure, careful patient selection, meticulous surgical technique, and early postoperative surveillance are essential to minimize morbidity and improve outcomes.

Strengths of the Study

1. The prospective design with 210 patients ensured reliable, real-time data collection with minimal bias.
2. Comprehensive evaluation of clinical, intraoperative, and postoperative variables, including follow-up at 4, 8, and 12 weeks, enabled assessment of both early and late complications.
3. The single-center focus on open cholecystectomy provided consistent surgical protocols and improved relevance to resource-limited healthcare settings.

Limitations of the Study

1. Being a single-center study without a laparoscopic control group, the findings may have limited generalizability and comparative value.
2. Surgeon-related factors and detailed preoperative imaging parameters were not analyzed, which may have influenced operative difficulty and outcomes.
3. The relatively short follow-up period may have missed long-term complications such as incisional hernia and chronic postoperative pain.

CONCLUSION

Open cholecystectomy remains a safe and effective surgical procedure for the management of gallbladder disease, particularly in complicated cases and resource-limited settings. In this study, chronic cholecystitis was the most common indication, with female predominance and peak incidence in the fourth and fifth decades of life. Dense adhesions and thickened gallbladder wall were the major intraoperative challenges and were associated with prolonged operative time. Postoperative complications were mostly minor, with fever and surgical site infection being the most common. Comorbidities such as diabetes and hypertension significantly increased postoperative complications. Careful preoperative assessment, meticulous surgical technique, and vigilant postoperative care are essential to minimize complications and improve surgical outcomes.

REFERENCES

1. Shaffer EA. Gallstone disease: epidemiology of gallbladder stone disease. *Best Pract Res Clin Gastroenterol.* 2006;20(6):981–96.

2. Acalovschi M. Cholesterol gallstones: from epidemiology to prevention. *Postgrad Med J.* 2001;77(906):221–9.
3. Tandon RK, Thappa V, Irshad M. Prevalence of gallstone disease in India: a community-based study. *Indian J Gastroenterol.* 2001;20(Suppl 1):A63.
4. Ko CW, Lee SP. Epidemiology and natural history of gallstone disease. *Gastroenterol Clin North Am.* 2010;39(2):157–69.
5. Stinton LM, Shaffer EA. Epidemiology of gallbladder disease: cholelithiasis and cancer. *Gut Liver.* 2012;6(2):172–87.
6. Strasberg SM. Acute Calculous Cholecystitis. *N Engl J Med.* 2008 Jun 26;358(26):2804–11. doi:10.1056/NEJMcp0800929
7. Soper NJ, Stockmann PT, Dunnegan DL, Ashley SW. Laparoscopic cholecystectomy: the new “gold standard”? *Arch Surg.* 1992;127(8):917–23.
8. Kumar A, Sharma P, Mehta S. Current indications and relevance of open cholecystectomy in the laparoscopic era: a tertiary care experience. *Int Surg J.* 2017;4(5):1633–7.
9. Vecchio R, MacFadyen BV 2nd, Palazzo F. History of laparoscopic surgery. *Panminerva Med.* 2000;42(1):87–90.
10. Hugh TB. New strategies to prevent laparoscopic bile duct injury—surgeons can learn from pilots. *Surgery.* 2002;132(5):826–35.
11. Shrestha S, Adhikary S, Basnet RB. Open versus laparoscopic cholecystectomy in complicated cholelithiasis. *Nepal Med Coll J.* 2010;12(1):7–10.
12. Sanjay P, Fulke JL, Exon DJ. Complications of laparoscopic cholecystectomy: our experience and review of literature. *JSLs.* 2010;14(3):379–85.
13. Khalid M, Iqbal M, Shahzad N, Saeed A, Ahmad Z, Khan JS, et al. Changing trends in indications of open cholecystectomy in the era of laparoscopic surgery. *Cureus.* 2020;12(7):e9227.
14. Dhir M, Schiesser M, Oldhafer KJ. Indications for open cholecystectomy: a changing spectrum in the era of laparoscopic surgery. *Surg Today.* 2015;45(8):995–1001.
15. Livingston EH, Rege RV. A nationwide study of conversion from laparoscopic to open cholecystectomy. *Am J Surg.* 2004;188(3):205–11.