

## Perioperative Challenges in Laparoscopic Cholecystectomy: A Comprehensive Review

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### Abstract:

**Introduction:** Laparoscopic cholecystectomy, renowned for its minimally invasive approach, stands as the primary treatment for symptomatic gallstone disease globally. Despite its advantages over open cholecystectomy, concerns persist regarding perioperative complications. As evidence mounts on the short-term benefits of laparoscopic surgery, understanding its complications becomes paramount. Gallstone disease, a prevalent condition, burdens healthcare systems, making the refinement of laparoscopic techniques crucial. We aim to investigate the incidence and nature of perioperative complications in laparoscopic cholecystectomy.

**Material and Methods:** This retrospective observational study enrolled 120 patients from M P Shah Medical College & GG Government hospital, Jamnagar conducted between June 2021 to May 2022. Approval was obtained from the Institutional Ethics Committee, with all patients providing informed consent. Inclusion criteria encompassed patients aged 18 years or older diagnosed with benign gallbladder disease. Patients underwent laparoscopic cholecystectomy performed by a single consultant surgeon, with thorough preoperative evaluation and meticulous recording of clinical details and complications. Descriptive analysis summarized the study population characteristics and complication incidences, with comparative analysis conducted using appropriate statistical methods.

**Results:** In this study of 120 laparoscopic cholecystectomy patients, most were females (64.16%), with a mean age of 41.6±14.5 years. Comorbidities were present in 35.83% of cases. Common presenting symptoms included abdominal pain, dyspepsia, vomiting, and nausea. Postoperatively, patients stayed for an average of 2.13 days. The most common complication was trocar site bleeding (6.66%), with a 5.83% conversion rate to open cholecystectomy.

**Conclusion:** Our study emphasizes the need to address risk factors to reduce peri-operative complications in laparoscopic cholecystectomy. The observed conversion rate to open cholecystectomy underscores the importance of meticulous patient selection and surgical planning for better outcomes.

**Keywords:** Laparoscopic Cholecystectomy, Perioperative Complications, Gallbladder.

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### Introduction

Laparoscopic cholecystectomy, a minimally invasive surgical procedure, has become the gold standard for the treatment of symptomatic gallstone disease worldwide. [1] Despite its widespread adoption and perceived advantages over open cholecystectomy, such as shorter hospital stays, reduced postoperative pain, and faster recovery, perioperative complications remain a significant concern. [2] There has been an increasing evidence base showing the short-term benefits of laparoscopic surgery over open surgery, such as reduced postoperative pain, shorter hospital stays, and earlier return to normal activities, while maintaining equivalence in long-term outcomes. [3]

Gallstone disease, characterized by the presence of calculi within the gallbladder or biliary tract,

affects millions of individuals globally and represents a substantial burden on healthcare systems. [4] Laparoscopic cholecystectomy, introduced in the late 1980s, revolutionized the management of gallstone-related pathology, offering patients a minimally invasive alternative to traditional open surgery. [5] However, despite its advantages, laparoscopic cholecystectomy is not devoid of risks, with perioperative complications ranging from minor issues such as wound infections and urinary retention to more severe complications like bile duct injury, haemorrhage, and bile leak. [6] Understanding the frequency and nature of these complications is imperative for optimizing patient outcomes and refining surgical techniques.

This study adopts a cross-sectional observational design to provide a snapshot of perioperative complications encountered during laparoscopic cholecystectomy procedures within a defined population or healthcare setting. By systematically analyzing a diverse array of complications, including intraoperative, immediate postoperative, and delayed events, this research endeavors to identify patterns, trends, and potential predictors of adverse outcomes. Moreover, by elucidating the management strategies employed to address these complications, the study aims to inform clinical practice guidelines and enhance the quality of perioperative care delivered to patients undergoing laparoscopic cholecystectomy.

### Material and Methods:

A total of 120 patients admitted to our tertiary care center in Jamnagar were included in this retrospective observational study. The study was conducted in the Department of General Surgery over a period from June 2021 to May 2022. Approval for the study was obtained from the Institutional Ethics Committee (IEC) and all patients provided informed consent before participating in the study.

Inclusion criteria for this study were as follows: patients aged 18 years or above diagnosed with benign gallbladder disease. Exclusion criteria comprised patients with common bile duct (CBD) stones, features of obstructive jaundice, or gallbladder malignancy. Patients meeting the inclusion/exclusion criteria constituted the study population.

Upon admission, patients were thoroughly evaluated through physical examination and relevant laboratory and radiological investigations to confirm the diagnosis of benign gallbladder disease and rule out exclusion criteria. All included

patients underwent laparoscopic cholecystectomy (LC) in the General Surgery Department our center.

LC procedures were performed by a single consultant surgeon experienced in laparoscopic surgery techniques. Pertinent clinical details of all patients, as well as perioperative complications, were meticulously recorded and analyzed. Descriptive analysis was performed using proportions, numbers, and percentages to summarize the characteristics of the study population and the incidence of complications.

For comparative analysis, non-parametric data were analyzed using the chi-square test, while parametric data were analyzed using Student's t-test and ANOVA where applicable. The collected data were then subjected to descriptive statistics using SPSS software. The results were interpreted with the aid of statistical methods, tables, and graphs to facilitate a comprehensive understanding of the perioperative complications associated with laparoscopic cholecystectomy at M P Shah Medical Collage & GG Government hospital, Jamnagar.

### Results

Out of the total 120 patients who underwent laparoscopic cholecystectomy at our center, the demographic distribution reveals a varied age and gender representation. The mean of the patients was  $41.6 \pm 14.5$  years. Among these patients, the majority were females, constituting 77 cases (64.16%), while males accounted for 43 cases (35.83%). In terms of age groups, the highest proportion of cases, total of 55 patients (45.83%), belonged to the 41-50 age range. (fig.1) Among the patient cohort, 43 individuals (35.83%) presented with comorbidities, encompassing conditions such as hypertension, cardiovascular disease, diabetes mellitus, and neurogenic and mental disorders.

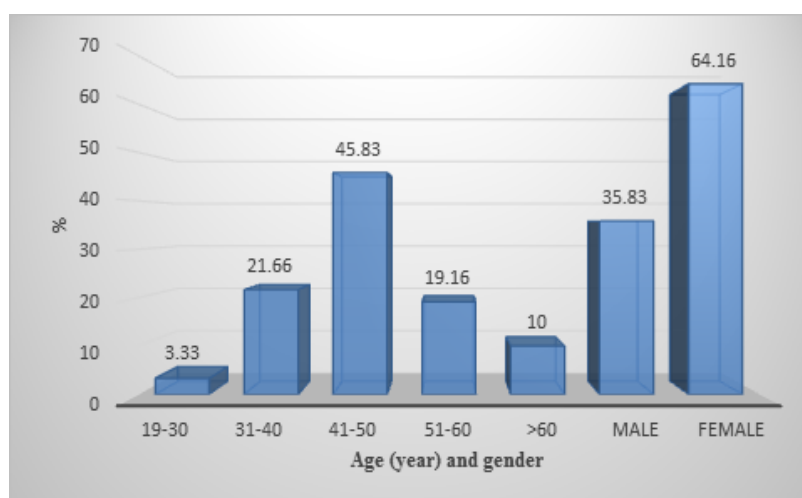


Figure 1: Age and sex distribution of patients

Patients undergoing laparoscopic cholecystectomy commonly presented with abdominal pain as the primary complaint, accompanied by symptoms like dyspepsia, vomiting, and nausea, indicative of gallbladder pathology. The duration of presenting complaints varied, ranging from as recent as 6 days to nearly a year. Following surgery, patients experienced a brief mean post-operative stay of 2.13 days, reflecting the minimally invasive nature of the procedure. The mean total hospital stay duration was 4.50 days, encompassing both pre- and post-operative care.

Histopathological evaluation of the study subjects revealed diverse findings, with chronic calculous cholecystitis being the most prevalent condition, accounting for 63.33% of cases. Other common pathologies included chronic calculous cholecystitis with mucocele (11.66%), acute on chronic calculus cholecystitis (7.5%), and acute cholecystitis (5.83%). Empyema gallbladder was also observed in 5.83% of cases. (Table 1)

**Table 1: Histopathological evaluation of study subjects**

Histopathological evaluation	Frequency (n)	Percentage (%)
Chronic calculous cholecystitis	76	63.33%
Chronic calculous cholecystitis with mucocele	14	11.66%
Acute on chronic calculus cholecystitis	9	7.5%
Acute cholecystitis	7	5.83%
Empyema gallbladder	7	5.83%
Chronic acalculus cholecystitis	4	3.33%
Chronic cholecystitis with cystitis glandularis proliferans	1	0.83%
Polyp	2	1.66%
Total	120	100%

Our study analyzed peri-operative complications in patients undergoing laparoscopic cholecystectomy, revealed incidence of complication in 34 patients (25.8%). The conversion rate to open cholecystectomy in our study was 5.83%. Intraoperative complications included trocar site bleeding (9.16%), liver bed injury (5.83%), bile leakage from the gallbladder (5%), bleeding from

Calot's triangle (2.50%), spilled gallstones (1.66%), and rare occurrences of injury to the common bile duct (0.83%), bowel injury (0.83%), and major vascular injury (0%). Postoperatively, only minor complications were noted, including port site infection (0.83%), haemorrhage (0.83%), and biliary leak (0.83%), with no recorded mortality.

Peri-operative Complications	Total (n)	Percentage (%)
<b>Intraoperative</b>		
Trocar site bleeding	8	6.66%
Liver bed injury	7	5.83%
Bile leakage from GB	6	5%
Bleeding from Calot's	3	2.50%
Spilled gallstones	2	1.66%
Injury to common bile duct	1	0.83%
Bowel injury	1	0.83%
Major vascular injury	0	0
<b>Postoperative</b>		0
Port site infection	1	0.83%
Haemorrhage	1	0.83%
Biliary leak	1	0.83%
Mortality	0	0
Total	34	25.80%

## Discussion

Understanding the peri-operative complications of laparoscopic cholecystectomy is crucial not only for optimizing patient outcomes but also for refining surgical techniques and informing clinical practice. As the gold standard treatment for benign gallbladder diseases, laparoscopic cholecystectomy

has revolutionized surgical management, offering numerous advantages including reduced postoperative pain and shorter hospital stays. However, the occurrence of peri-operative complications remains a concern, necessitating a comprehensive evaluation of their incidence, nature, and management strategies.

Our study findings, which reveal a mean patient age of 41.6 years and a majority female population, align with the demographics observed in the studies by Sato et al. [7] and Mamakeev et al. [8] Both studies also reported a higher prevalence of female patients and a comparable mean age range. Additionally, our study's age distribution, with the highest proportion of patients falling within the 41-50 age group, is consistent with Mamakeev et al.'s observation of the main study population being individuals over 40 years old. [8]

Another study by Kamarajah et al. [9], who highlighted the association between increasing age and higher rates of complications, conversion to open cholecystectomy, bile leaks, postoperative mortality, and prolonged hospital stay, it's important to consider the age distribution and gender disparity observed in our study. The predominance of females and the higher representation of patients in the 41-50 age group in our study may suggest a potential correlation with increased rates of complications, as noted by Kamarajah et al. [9] Additionally, the observed trends in patient characteristics highlight the importance of considering age and gender factors in risk assessment and perioperative management strategies for gallbladder surgery.

Our study findings regarding comorbidities among laparoscopic cholecystectomy (LC) patients align with existing literature that emphasizes the significance of assessing patients' overall health status in predicting postoperative complications. Gigar et al. [10] identified several predictive factors, including ASA score > 2, conversion to open surgery, emergency surgery, acute cholecystitis, old age, and intervention time, as high-risk factors for inducing postoperative systemic complications. Similarly, Murphy et al. [11] found that advanced age, male gender, high CCI, comorbidities, and emergent LC were associated with postoperative complications. Moreover, various studies have highlighted age, gender, comorbidity, BMI, presence of fever, and conversion to open cholecystectomy as independent risk factors for postoperative complications in LC. [12–15]

Our study revealed peri-operative complications in laparoscopic cholecystectomy patients, with a 25.8% incidence rate, and a 5.83% conversion rate to open cholecystectomy. Intraoperative complications included trocar site bleeding (9.16%), liver bed injury (5.83%), and bile leakage from the gallbladder (5%). Postoperatively, minor complications such as port site infection (0.83%), hemorrhage (0.83%), and biliary leak (0.83%) were noted, with no recorded mortality. Satu et al. [7] highlighted POSSUM morbidity and moderate or severe cholecystitis as potential risk factors for postoperative complications, emphasizing pre-

operative management strategies. Serban et al. [16] reported favorable postoperative outcomes in most cases, with conservative management of surgical-related complications. Martino et al. [17] included 282 (15.1%) patients with postoperative complications, identifying predictors such as previous percutaneous cholecystostomy, previous abdominal surgery, and diabetes, with a focus on the development of the Chole-Risk Score, which showed a progressive increase in complications with higher score.

Our study examined peri-operative complications in laparoscopic cholecystectomy patients, revealing complications in 34 cases (25.8%). Intraoperative complications included trocar site bleeding (9.16%), liver bed injury (5.83%), bile leakage from the gallbladder with no recorded mortality. Agarwal et al. [18] reported a mean post-operative stay of  $2.34 \pm 1.82$  days for all patients, with an increase to  $2.62 \pm 1.83$  days among those experiencing complications, and a significant rise to  $4.83 \pm 2.79$  days ( $p$ -value <0.05) in patients undergoing conversion to open cholecystectomy. Abdulmohsen A. et al. [19] observed a comparable postoperative stay of  $3.2 \pm 3.1$  days in their study. The conversion rate to open cholecystectomy was 5.83% in our study. Comparatively, other studies have reported varying conversion rates, with Zarin et al. [20] at 3.6%, Ghnam et al. [21] at 5.30%, Daniel et al. [22] at 7%, Shankar et al. [23] at 7.80%. Mamakeev et al.'s [8] study categorized patients into three groups based on the timeframe of their surgeries. The highest complication rates (4.8% vs 1.5% and 0.4%, respectively,  $p < 0.001$ ) and conversion to surgical cholecystectomy (11.2% vs 1.5% and 0.1%, respectively,  $p = 0.001$ ) were observed in the first group, highlighting the association between surgical experience and outcomes.

One limitation of our study is its retrospective design, which may introduce biases and limitations in data collection and analysis. Additionally, the study was conducted at a single center, potentially limiting the generalizability of our findings to broader populations. Furthermore, the sample size of our study may have been relatively small, which could impact the statistical power and precision of our results. Finally, the lack of long-term follow-up data may restrict our ability to assess the persistence of complications or the effectiveness of interventions beyond the immediate peri-operative period.

## Conclusion

In conclusion, our study sheds light on the peri-operative complications associated with laparoscopic cholecystectomy, revealing a notable incidence rate of 25.8% and a 5.83% conversion rate to open cholecystectomy. These findings

underscore the significance of identifying and addressing risk factors preoperatively to mitigate the occurrence of major complications. Notably, factors such as comorbidities, advanced age, and the presence of acute cholecystitis may contribute to increased rates of conversion and major complications, emphasizing the importance of thorough patient evaluation and surgical planning. Despite the advancements in laparoscopic techniques, our study underscores the need for vigilance and careful management to optimize patient outcomes and minimize adverse events during laparoscopic cholecystectomy procedures.

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