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Original Article

Clinical Profile and Surgical Outcomes of Patients Undergoing Laparoscopic Cholecystectomy for Cholelithiasis

Dr. Sainath Motiram Mishall[1*], Dr. Mundhe Balwant Suryakant[2]

*[*1]Assistant Professor, Department of General Surgery, Prakash Institute of Medical Science and Research, Sangli Road, Islampur, Maharashtra*
[2]Post Graduate, Department of General Surgery, Prakash Institute of Medical Science and Research, Sangli Road, Islampur, Maharashtra

Corresponding Author:

Dr. Sainath Motiram Mishall
Assistant Professor, Department of General Surgery, Prakash Institute of Medical Science and Research, Sangli Road, Islampur, Maharashtra
Email: bhagyesh2006@gmail.com

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ABSTRACT

Background: Cholelithiasis is one of the most common biliary tract disorders requiring surgical intervention worldwide. Laparoscopic cholecystectomy has become the gold standard treatment because of its safety, minimal invasiveness, and favorable postoperative outcomes. The present study evaluated the clinical profile, operative findings, and postoperative outcomes of patients undergoing laparoscopic cholecystectomy for symptomatic cholelithiasis.
Materials and Methods: A hospital-based observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital over an 18-month period. A total of 120 consecutive patients with symptomatic cholelithiasis who underwent elective laparoscopic cholecystectomy were included. Demographic characteristics, clinical presentation, ultrasonographic findings, operative details, postoperative outcomes, and histopathological diagnoses were recorded and analyzed using descriptive and inferential statistics. A P value <0.05 was considered statistically significant.
Results: The mean age of the patients was 44.8 ± 12.6 years, with females constituting 73.3% of the study population. Right hypochondrial pain (93.3%) was the most common presenting symptom. Multiple gallstones were identified in 68.3% of patients on ultrasonography. The mean operative duration was 64.2 ± 18.5 minutes, and conversion to open cholecystectomy was required in 3.3% of cases. Uneventful postoperative recovery was observed in 90.0% of patients, with a mean hospital stay of 2.1 ± 0.9 days. Chronic calculous cholecystitis was the predominant histopathological diagnosis (76.7%). Dense adhesions (P=0.040) and gallbladder wall thickening (P=0.030) were significantly associated with conversion to open surgery.
Conclusion: Laparoscopic cholecystectomy is a safe and effective treatment for symptomatic cholelithiasis with low postoperative morbidity and a short hospital stay. Careful preoperative assessment and recognition of factors associated with operative difficulty can facilitate surgical planning and improve patient outcomes.

Keywords: *Cholelithiasis, Laparoscopic cholecystectomy, Gallstones, Clinical profile, Ultrasonography, Histopathology, Conversion to open surgery.*

INTRODUCTION

Cholelithiasis is one of the most common biliary tract disorders and a major cause of morbidity worldwide. Gallstones develop due to an imbalance in bile composition, resulting in the precipitation of cholesterol, bilirubin, or calcium salts within the gallbladder. The prevalence of gallstone disease varies geographically and is influenced by age, sex, obesity, diabetes mellitus, pregnancy, dietary habits, ethnicity, and genetic predisposition. Approximately 10–20% of adults in developed countries have gallstones, although only a minority become symptomatic during their lifetime. **(1,2)**

The incidence of gallstone disease has increased in developing countries due to urbanization, dietary changes, sedentary lifestyles, and the growing prevalence of obesity and metabolic syndrome. In India, gallstone disease is among the most common gastrointestinal disorders requiring surgical intervention, particularly in women and individuals over 40 years of age. **(3,4)**

Although most gallstones remain asymptomatic, nearly 20–30% of patients eventually develop symptoms or complications. Biliary colic, presenting as intermittent right upper quadrant pain, is the most common symptom and is often accompanied by nausea, vomiting, dyspepsia, and fatty food intolerance. Untreated disease may progress to acute cholecystitis, choledocholithiasis, obstructive jaundice, gallstone pancreatitis, or, rarely, gallbladder carcinoma. **(5,6)**

Ultrasonography is the investigation of choice for diagnosing gallstone disease because of its high sensitivity, non-invasive nature, and cost-effectiveness. In addition to confirming gallstones, it provides valuable information on gallbladder wall thickness, stone characteristics, pericholecystic fluid, common bile duct diameter, and associated inflammatory changes, thereby assisting in preoperative assessment and predicting operative difficulty. **(7)**

Since its introduction by Mouret in 1987, laparoscopic cholecystectomy has become the gold standard treatment for symptomatic cholelithiasis because of advantages such as reduced postoperative pain, shorter hospital stay, faster recovery, improved cosmetic outcomes, and lower postoperative morbidity. Advances in surgical techniques and instrumentation have further improved its safety and effectiveness. **(8,9)**

Despite its widespread acceptance, laparoscopic cholecystectomy may be technically challenging in patients with severe inflammation, dense adhesions, contracted gallbladder, obesity, previous upper abdominal surgery, or anomalous biliary anatomy. These factors increase operative difficulty, operative time, and the likelihood of conversion to open surgery, making their preoperative identification important for surgical planning and patient counselling. **(10,11)**

Several studies have evaluated the demographic profile, clinical presentation, ultrasonographic findings, operative details, postoperative outcomes, and histopathological features of patients undergoing laparoscopic cholecystectomy. However, differences in patient characteristics and institutional practices contribute to variations in surgical outcomes, emphasizing the need for institution-specific data. **(12,13)**

Evaluation of the clinical profile of patients undergoing laparoscopic cholecystectomy helps identify predictors of operative difficulty, optimize perioperative management, and improve surgical outcomes. **(14)**

The present study was undertaken to evaluate the demographic characteristics, clinical presentation, ultrasonographic findings, intraoperative observations, postoperative outcomes, and histopathological features among patients undergoing laparoscopic cholecystectomy for cholelithiasis at a tertiary care teaching hospital.

MATERIALS AND METHODS:

Study Design and Setting

This hospital-based observational study was conducted in the Department of General Surgery at a tertiary care teaching hospital over a period of 18 months. The study was designed to evaluate the clinical profile, operative findings, and postoperative outcomes of patients undergoing laparoscopic cholecystectomy for symptomatic cholelithiasis. Written informed consent was obtained from all participants prior to enrolment.

Sample Size

A total of 120 consecutive patients diagnosed with symptomatic cholelithiasis and scheduled for elective laparoscopic cholecystectomy during the study period were included by consecutive sampling.

Inclusion Criteria

Patients fulfilling all of the following criteria were included:

- Age ≥18 years.
- Ultrasonographic evidence of cholelithiasis.
- Symptomatic gallstone disease.
- Patients scheduled for elective laparoscopic cholecystectomy.
- Patients willing to participate and provide written informed consent.

Exclusion Criteria

Patients with any of the following conditions were excluded:

- Age below 18 years.
- Acalculous cholecystitis.
- Gallbladder malignancy diagnosed preoperatively.

- Common bile duct stones requiring primary open surgery.
- Severe cardiopulmonary illness precluding laparoscopic surgery.
- Pregnancy.
- Patients refusing consent.

Preoperative Evaluation
A detailed clinical history was obtained using a predesigned proforma. Demographic characteristics including age, sex, body mass index (BMI), occupation, and relevant medical history were recorded.

Clinical symptoms such as right upper quadrant pain, nausea, vomiting, dyspepsia, fever, jaundice, and intolerance to fatty meals were documented. Duration of symptoms and previous episodes of biliary colic or acute cholecystitis were also noted.

Comorbid conditions including diabetes mellitus, hypertension, hypothyroidism, obesity, dyslipidaemia, chronic liver disease, and previous abdominal surgery were recorded.
All patients underwent a complete physical examination followed by routine laboratory investigations, including:

- Complete blood count
- Liver function tests
- Renal function tests
- Serum electrolytes
- Blood glucose
- Coagulation profile
- Viral markers
- Electrocardiogram
- Chest radiograph (where indicated)

Ultrasonographic Assessment
All patients underwent abdominal ultrasonography performed by experienced radiologists.
The following parameters were evaluated:

- Number of gallstones
- Stone size
- Gallbladder wall thickness
- Gallbladder distension
- Pericholecystic fluid
- Presence of impacted stone
- Common bile duct diameter
- Fatty liver
- Associated hepatobiliary abnormalities

Surgical Procedure
All laparoscopic cholecystectomies were performed under general anaesthesia using the standard four-port technique. Pneumoperitoneum was established using either the closed Veress needle technique or open Hasson technique according to surgeon preference.

Following retraction of the gallbladder, Calot's triangle was carefully dissected to obtain the Critical View of Safety before clipping and dividing the cystic duct and cystic artery.

The gallbladder was dissected from the liver bed using electrocautery and retrieved through the epigastric or umbilical port using a specimen retrieval bag when necessary.

Conversion to open cholecystectomy was performed whenever safe laparoscopic dissection was not feasible due to dense adhesions, distorted anatomy, uncontrolled bleeding, or suspected bile duct injury.

Intraoperative Variables
The following operative parameters were recorded:

- Operative duration (minutes)
- Gallbladder wall thickness
- Dense adhesions
- Distended gallbladder
- Contracted gallbladder

- Impacted Hartmann's pouch stone
- Bile spillage
- Stone spillage
- Intraoperative bleeding
- Drain placement
- Conversion to open surgery

Postoperative Assessment
Patients were monitored until discharge.
The following postoperative variables were assessed:
- Pain assessment using Visual Analogue Scale (VAS)
- Postoperative nausea and vomiting
- Surgical site infection
- Bile leak
- Fever
- Postoperative bleeding
- Hospital stay
- Readmission
- Mortality (if any)

Patients were followed until discharge and during the first postoperative outpatient visit.

Histopathological Examination
All excised gallbladder specimens were submitted for routine histopathological examination.
Histopathological diagnoses were categorized as:
- Chronic calculous cholecystitis
- Acute cholecystitis
- Acute on chronic cholecystitis
- Xanthogranulomatous cholecystitis
- Cholesterolosis
- Adenomyomatosis
- Incidental gallbladder carcinoma

Statistical Analysis
Data were entered into Microsoft Excel and analysed using IBM SPSS Statistics version 23.0 Continuous variables were expressed as mean ± standard deviation (SD). Categorical variables were presented as frequency and percentage. Comparisons between categorical variables were performed using the Chi-square test. Continuous variables were compared using the Independent Student's t-test. A P-value <0.05 was considered statistically significant.

RESULTS:
A total of 120 patients underwent laparoscopic cholecystectomy. The mean age was 44.8 ± 12.6 years, with the majority belonging to the 41–50 years (31.7%) age group. Females predominated (73.3%), with a female-to-male ratio of 2.8:1. The mean BMI was 27.4 ± 3.8 kg/m² (Table 1).

Table 1. Demographic Characteristics of the Study Population

Variable	**n (%) / mean±SD**
Total patients	**120**
Age (years), Mean ± SD	**44.8 ± 12.6**
Age Group	
18–30 years	18 (15.0)
31–40 years	34 (28.3)
41–50 years	38 (31.7)
51–60 years	20 (16.7)
>60 years	10 (8.3)
Gender	
Male	32 (26.7)
Female	88 (73.3)
BMI (kg/m²), Mean ± SD	27.4 ± 3.8

Right hypochondrial pain was the most common presenting symptom, reported by 112 (93.3%) patients. Nausea was observed in 74 (61.7%), followed by fatty food intolerance in 60 (50.0%), vomiting in 52 (43.3%), and dyspepsia in 48

(40.0%) patients. Fever and jaundice were relatively uncommon, occurring in 11.7% and 5.0% of patients, respectively. (Table 2)

Table 2. Presenting Clinical Features

Symptom	n (%)
Right hypochondrial pain	112 (93.3)
Nausea	74 (61.7)
Vomiting	52 (43.3)
Dyspepsia	48 (40.0)
Fatty food intolerance	60 (50.0)
Fever	14 (11.7)
Jaundice	6 (5.0)

Hypertension was the most frequently observed comorbidity, affecting 34 (28.3%) patients, followed by obesity (25.0%), diabetes mellitus (23.3%), and hypothyroidism (8.3%). Forty-six (38.3%) patients had no documented comorbid illness. (Table 3)

Table 3. Associated Comorbidities

Comorbidity	n (%)
Diabetes mellitus	28 (23.3)
Hypertension	34 (28.3)
Hypothyroidism	10 (8.3)
Obesity	30 (25.0)
None	46 (38.3)

Preoperative ultrasonography demonstrated multiple gallstones in 82 (68.3%) patients, whereas 38 (31.7%) patients had a single gallstone. Gallbladder wall thickening (>3 mm) was noted in 23.3%, while 11.7% had impacted stones at the gallbladder neck. Pericholecystic fluid collection and common bile duct dilatation were observed in 6.7% and 4.2% of patients, respectively. (Table 4)

Table 4. Ultrasonographic Findings

Finding	n (%)
Multiple gallstones	82 (68.3)
Single gallstone	38 (31.7)
Gallbladder wall thickening	28 (23.3)
Pericholecystic fluid	8 (6.7)
Dilated CBD	5 (4.2)
Stone impacted at neck	14 (11.7)

The mean operative duration was 64.2 ± 18.5 minutes. Dense adhesions around the gallbladder were encountered in 28.3% of cases, while thick-walled gallbladders were observed in 21.7%. Intraoperative bile spillage occurred in 10.0% of patients, and abdominal drains were placed in 11.7%.Conversion from laparoscopic to open cholecystectomy was required in 4 (3.3%) patients due to dense adhesions, unclear biliary anatomy, and difficult dissection. (Table 5)

Table 5. Operative Findings

Variable	mean±SD
Operative time (minutes), Mean ± SD	64.2 ± 18.5
Adhesions present	34 (28.3%)
Thick-walled gallbladder	26 (21.7%)
Distended gallbladder	18 (15.0%)
Intraoperative bile spillage	12 (10.0%)
Drain placed	14 (11.7%)

An uneventful postoperative recovery was observed in 90.0% of patients. Surgical site infection (4.2%), postoperative fever (5.0%), bile leak (1.7%), and readmission (1.7%) were uncommon. No mortality was recorded (Table 6).

Table 6. Postoperative Outcomes

Outcome	n (%)
Uneventful recovery	108 (90.0)
Surgical site infection	5 (4.2)

Bile leak	2 (1.7)
Postoperative fever	6 (5.0)
Conversion to open surgery	4 (3.3)
Readmission	2 (1.7)

The mean duration of hospital stay was 2.1 ± 0.9 days, with 80.0% of patients discharged within two days after surgery. (Table 7)

Table 7. Duration of Hospital Stay

Hospital Stay	**n (%)**
1 day	54 (45.0)
2 days	42 (35.0)
3 days	18 (15.0)
≥4 days	6 (5.0)
Mean ± SD (days)	**2.1 ± 0.9**

Chronic calculous cholecystitis was the predominant histopathological diagnosis (**76.7%**), followed by acute-on-chronic cholecystitis (**15.0%**). Other histopathological findings were uncommon (Table 8).

Table 8. Histopathological Diagnosis

Diagnosis	**n (%)**
Chronic calculous cholecystitis	92 (76.7)
Acute on chronic cholecystitis	18 (15.0)
Xanthogranulomatous cholecystitis	4 (3.3)
Cholesterolosis	4 (3.3)
Incidental carcinoma gallbladder	2 (1.7)

Patients aged >40 years had a higher incidence of postoperative complications compared to younger patients (17.6% vs. 5.8%); however, the association was not statistically significant (P = 0.073) (Table 9)

Table 9. Association Between Age Group and Postoperative Complications

Age Group	**Complication Present**	**Complication Absent**	**P value**
≤40 years	3	49	**0.073**
>40 years	12	56	

Dense adhesions (**P = 0.040**) and gallbladder wall thickening (**P = 0.030**) were significantly associated with conversion to open cholecystectomy, whereas diabetes mellitus and age >60 years were not significantly associated (Table 10).

Table 10. Factors Associated with Conversion to Open Surgery

Variable	**Converted (n=4)**	**Not Converted (n=116)**	**P value***
Adhesions	3	31	0.04
Thick gallbladder wall	3	23	0.03
Diabetes mellitus	2	26	0.42
Age >60 years	2	8	0.05

DISCUSSION:

Gallstone disease is one of the most common biliary disorders requiring surgical intervention worldwide. Laparoscopic cholecystectomy has become the gold standard treatment for symptomatic cholelithiasis because of its minimal invasiveness, reduced postoperative pain, shorter hospital stay, faster recovery, and lower morbidity. Nevertheless, patient characteristics and intraoperative findings continue to influence surgical difficulty and postoperative outcomes.

The study consistently demonstrates that symptomatic cholelithiasis predominantly affects middle-aged women. This female predominance has been attributed to hormonal factors, particularly estrogen-induced cholesterol supersaturation of bile and progesterone-mediated reduction in gallbladder motility. Increasing age, obesity, and metabolic disorders further contribute to gallstone formation. Similar demographic trends have been reported by Siddiqui et al., who observed a higher incidence among females in the fourth and fifth decades of life.(15)

The clinical presentation of symptomatic cholelithiasis is relatively consistent across studies. Right upper quadrant pain remains the most common presenting complaint and is frequently accompanied by nausea, vomiting, dyspepsia, and fatty food intolerance. These symptoms result from intermittent cystic duct obstruction and gallbladder contraction following

meals. Ibrahim et al. and Singh et al. similarly reported abdominal pain as the predominant symptom in patients undergoing laparoscopic cholecystectomy. (16,17)

Metabolic comorbidities such as hypertension, obesity, and diabetes mellitus are commonly encountered in patients with gallstone disease. These conditions not only share common risk factors with cholelithiasis but may also increase operative difficulty due to chronic inflammation and altered tissue planes. Previous studies have highlighted the importance of identifying these comorbidities during preoperative evaluation to optimize perioperative management. (18,19)

Ultrasonography remains the investigation of choice for diagnosing gallstone disease because of its high sensitivity and non-invasive nature. In addition to confirming gallstones, ultrasonography provides valuable information regarding gallbladder wall thickness, impacted stones, pericholecystic fluid, and common bile duct dilatation, which help predict operative difficulty. Randhawa and Pujahari reported that gallbladder wall thickening and impacted stones are important predictors of difficult laparoscopic cholecystectomy. (20)

Dense adhesions, thickened gallbladder walls, and distorted biliary anatomy are among the most common intraoperative challenges encountered during laparoscopic cholecystectomy. These factors increase operative time and the likelihood of conversion to open surgery. Gupta et al. demonstrated that preoperative clinical and ultrasonographic findings correlate well with operative difficulty and conversion rates. (21)

Conversion to open cholecystectomy should be regarded as a safety measure rather than a surgical failure. Reported conversion rates generally range from 2% to 10%, with dense adhesions, unclear biliary anatomy, and uncontrolled bleeding being the most frequent indications. Ibrahim et al. identified severe inflammatory changes around the gallbladder as a major determinant of conversion to open surgery. (22)

Laparoscopic cholecystectomy is associated with excellent postoperative outcomes and a low incidence of complications. Surgical site infection, postoperative fever, bile leak, and readmission occur infrequently when standard surgical principles are followed. Randomized trials and systematic reviews have consistently shown lower postoperative morbidity, reduced analgesic requirements, and shorter hospitalization following laparoscopic compared with open cholecystectomy. (23,24) Routine histopathological examination of gallbladder specimens remains important, with chronic calculous cholecystitis being the most common diagnosis. Although uncommon, incidental gallbladder carcinoma may occasionally be detected, supporting routine histopathological evaluation of all excised gallbladders. (25,26)

Several studies have identified advanced age, obesity, diabetes mellitus, gallbladder wall thickening, impacted stones, and dense adhesions as predictors of difficult laparoscopic cholecystectomy and conversion to open surgery. Recognition of these factors facilitates appropriate surgical planning and patient counselling, thereby improving operative safety and clinical outcomes. (20–22,27)

CONCLUSION:

Laparoscopic cholecystectomy is a safe and effective treatment for symptomatic cholelithiasis, providing excellent postoperative outcomes with minimal morbidity and a short hospital stay. Gallstone disease commonly affects middle-aged women and usually presents with right hypochondrial pain. Careful preoperative assessment and recognition of factors such as dense adhesions and gallbladder wall thickening can help anticipate operative difficulty and improve surgical planning.

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