



ORIGINAL ARTICLE

Frequency of biliary complications after laparoscopic cholecystectomy.

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ABSTRACT... Objective: To determine the frequency of biliary complications, specifically bile leak and post-cholecystectomy syndrome, following laparoscopic cholecystectomy, and to assess their associations with demographic variables. **Study Design:** Prospective Observational Study. **Setting:** Department of General Surgery, Hayatabad Medical Complex, Peshawar. **Period:** March 2021 to February 2022. **Methods:** A total of 171 patients aged 20–60 years undergoing elective laparoscopic cholecystectomy were enrolled through convenience sampling. Patients were followed for six months to assess for bile leak and post-cholecystectomy syndrome. Data were analyzed using SPSS version 24, and associations with demographic variables were assessed using the Chi-square test. **Results:** Bile leak occurred in 19 patients (11.1%) and post-cholecystectomy syndrome in 32 cases (18.7%). Out of 171 patients, bile leakage occurred in 19 cases (11.1%) and post-cholecystectomy syndrome in 32 cases (18.7%). Bile leakage was observed in 11 males (14.1%) and 8 females (8.6%), while post-cholecystectomy syndrome was noted in 14 males (17.9%) and 19 females (19.4%). Across BMI categories, bile leak was reported in 6 patients (15.4%) with BMI 20–23, 11 (9.9%) with BMI 24–27, and 2 (9.5%) with BMI 28–30. Post-cholecystectomy syndrome was most common in the 28–30 BMI group (6 patients, 28.6%). None of the associations with age, gender, or BMI were statistically significant ($p > 0.05$). **Conclusion:** Biliary complications following laparoscopic cholecystectomy were relatively infrequent and showed no significant association with demographic variables.

Key words: Bile Leak, Complications, Laparoscopic Cholecystectomy, Post-cholecystectomy Syndrome.

INTRODUCTION

Since its introduction thirty years ago, laparoscopy has been the gold standard for cholecystectomy and is still one of the most frequently performed general surgical procedures.¹ Laparoscopic cholecystectomy is the preferred treatment for symptomatic cholelithiasis as compared to the open method because it has been shown to have advantages such decreased postoperative discomfort, a shorter hospital stay, better cosmesis, and increased patient satisfaction.²

With the increasing use of endoscopic retrograde cholangiopancreatography (ERCP) and LC as the gold standard for treating symptomatic gallstone disease, open common duct exploration experience has decreased. Biliary damage, bile leak, biliary strictures, retained common bile duct (CBD) stones, postcholecystectomy syndrome, postcholecystectomy diarrhea, vascular injury/

hemorrhage, abscess formation, and bowel injury are some of the most frequent problems associated with LC.⁴

The failure to avoid the biliary tract and its blood supply during dissection results in biliary injuries associated to cholecystectomy. A number of variables have been linked to a higher incidence of biliary problems following cholecystectomy. These include the existence of choledocholithiasis, operating on acute cholecystitis, anatomical variances in the biliary tree's structure, the inability to definitively identify the cystic duct prior to clipping or dividing, and urgent surgery.⁶ According to certain research, a surgeon's experience may be associated with a higher incidence of biliary problems.⁷ Biliary damage (0.08%–0.5%), bile leak (0.42%–1.1%), retained common bile duct stones (0.8%–5.7%), postcholecystectomy syndrome (10%–15%),

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and postcholecystectomy diarrhea (5%–12%) are among the most frequent side effects after laparoscopic cholecystectomy, according to one narrative study.⁸ Gallstone loss was 1.2% and gall bladder perforation was 2.4% in another investigation.⁹ The reported prevalence of GB perforation during laparoscopic cholecystectomy is 15%¹⁰, 28.3%¹¹ and 16.7%.¹²

OBJECTIVE

To determine the frequency of biliary complications such as bile leak and post cholecystectomy syndrome after laparoscopic cholecystectomy and associations with demographic variables.

METHODS

From March 2021 to February 2022, this prospective observational study was carried out at the Department of General Surgery, Hayatabad Medical Complex's, Peshawar, Pakistan after approval ethical committee (Ref No: CPSP/REU/SGR-2020-021-11814). A WHO sample size estimation algorithm was used to determine the sample size, which was based on a 2.4% prevalence of gallbladder perforation after laparoscopic cholecystectomy (LC), a 95% confidence level, and an absolute precision of 2.3%. The study included 171 patients in total. Using a non-probability convenience sampling method, participants were chosen. Participants were defined as ASA Class I and II patients with a BMI of less than 30 kg/m², aged 20–60 years, of either gender, and undergoing laparoscopic cholecystectomy for chronic cholecystitis. The study excluded patients with comorbidities determined by medical records and history, such as obesity (BMI > 30 kg/m²).

Patients who met the eligibility requirements were scheduled for laparoscopic cholecystectomy and prospectively enrolled through the outpatient department (OPD). All participants gave their informed written consent after being told of the study's goals and advantages prior to surgery. One skilled laparoscopic surgeon with more than ten years of experience carried out every treatment. Patients who complained of continuous abdominal pain that was greater than five on the visual analogue scale and whose

ERCP showed an anatomical leak as determined by naked eye examination up until the fifth postoperative day were monitored for bile leaks during the intraoperative period and after surgery. Radiological investigations were performed to check for any unusual symptoms, such as fever, jaundice, or abdominal distension. Six months of follow-up were done in order to detect and record post-cholecystectomy syndrome, which is characterized by symptoms that continue even after cholecystectomy despite extensive testing using magnetic resonance pancreatography (MRCP) or ultrasound. Using a structured proforma, demographic and clinical information such as age, gender, BMI, and the presence of problems including bile leak and post-cholecystectomy syndrome were methodically documented.

SPSS version 24 was used to analyze the data. While categorical factors like gender and particular biliary problems were reported as frequencies and percentages, continuous variables like age, height, weight, and BMI were expressed as mean $\pm$ standard deviation (SD). The Chi-square test was used to evaluate any relationships between biliary problems and demographic variables (age, gender, and BMI); a p-value of 0.05 or less was deemed statistically significant.

RESULTS

The largest age group among the 171 patients who had laparoscopic cholecystectomy was 41 to 50 years old, with 74 patients (43.3%). Next in line were patients aged 31 to 40 years (31.6%) with 54 and those aged 22 to 30 years (19.9%) with 34. Nine patients (5.3%), or the least represented group, were between the ages of 51 and 60. There were 78 patients (45.6%) who were male and 93 patients (54.4%) who were female. The majority of patients, 111 (64.9%), had a body mass index (BMI) in the range of 24 to 27. Twenty-one patients (12.3%) had a BMI between 28 and 30, and 39 patients (22.8%) had a BMI between 20 and 23 and between 28 and 30.

According to Figure-1, bile leakage was observed in 19 cases (11.1 Post-cholecystectomy syndrome occurred in 32 patients (18.7%).

Variable	Category	Frequency (n)	Percent (%)
Age (years)	22–30	34	19.9
	31–40	54	31.6
	41–50	74	43.3
	51–60	9	5.3
Gender	Male	78	45.6
	Female	93	54.4
BMI (kg/m ²)	20–23	39	22.8
	24–27	111	64.9
	28–30	21	12.3

Table-I. Demographic characteristics of the study sample (n = 171)

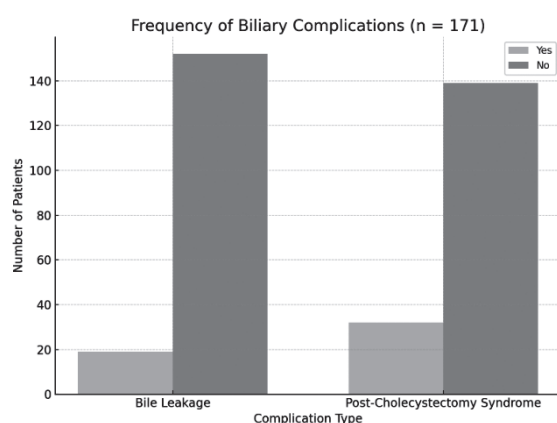


Figure-1. Frequency of biliary complications (n = 171)

Three patients (8.8%) aged 22 to 30 years, seven patients (11.0%) aged 31 to 40 years, eight patients (10.8%) aged 41 to 50 years, and one patient (11.1%) aged 51 to 60 years experienced bile leakage, according to an age-group analysis of biliary problems in Table-II. ($p = 0.945$) The differences were not statistically significant. Similarly, 7 patients (20.6%) between the ages of 22 and 30 years, 11 patients (20.4%) between the ages of 31 and 40, 12 patients (16.2%) between the ages of 41 and 50, and 2 patients (22.2%) between the ages of 51 and 60 were reported to have post-cholecystectomy syndrome. Once more, $p = 0.907$ indicates that there was no significant difference between the groups. Bile leakage was observed in 11 male patients (14.1%) and 8 female patients (8.6%), with no statistically significant difference between the two groups ($p = 0.254$). Post-cholecystectomy syndrome was

slightly more common in females—19 patients (19.4%)—compared to 14 males (17.9%), but this difference was also not significant ($p = 0.814$). Among patients with a BMI of 20 to 23, bile leakage was seen in 6 cases (15.4%). For those with a BMI of 24 to 27, it occurred in 11 patients (9.9%), and in the 28 to 30 BMI group, 2 patients (9.5%) were affected. The variation across BMI categories was not statistically significant ($p = 0.626$). Regarding post-cholecystectomy syndrome, 8 patients (20.5%) in the 20 to 23 BMI group experienced the complication, compared to 18 patients (16.2%) in the 24 to 27 group and 6 patients (28.6%) in the 28 to 30 group. Again, the difference was not significant ($p = 0.391$).

Stratification Category	Bile Leakage	Post-cholecystectomy Syndrome
Age 22–30 years	3 (8.8%)	7 (20.6%)
Age >30–40 years	7 (13.0%)	11 (20.4%)
Age >40–50 years	8 (10.8%)	12 (16.2%)
Age >50–60 years	1 (11.1%)	2 (22.2%)
P-value (Age)	0.945	0.907
Male	11 (14.1%)	14 (17.9%)
Female	8 (8.6%)	19 (19.4%)
P-value (Gender)	0.254	0.814
BMI 20–23	6 (15.4%)	8 (20.5%)
BMI >23–27	11 (9.9%)	18 (16.2%)
BMI >27–30	2 (9.5%)	6 (28.6%)
P-value (BMI)	0.626	0.391

Table-II. Stratification of biliary complications by Age, Gender, and BMI

DISCUSSION

In this prospective study, the frequency of biliary complications following laparoscopic cholecystectomy was found to be 11.1% for bile leakage and 18.7% for post-cholecystectomy syndrome. These rates reported by Gujjula SR et al.¹³, Ibrahim EE et al.¹⁴ and Brady PG et al.¹⁵, in previous studies, where bile leak incidence ranged from 0.3% to 2.7% but some authors such as Ahmad N et al.¹⁶, reported higher rates, especially in resource-limited settings or among less experienced surgical teams. The slightly higher frequency in our study may be attributed to differences in patient selection, surgical

technique, or perioperative monitoring protocols.

The occurrence of post-cholecystectomy syndrome in 18.7% of patients aligns with findings reported by Rizwan et al., and Lee et al., who also observed persistent symptoms in a notable proportion of patients postoperatively.^{17,18} However, some studies have reported higher rates, suggesting possible underdiagnosis or variations in follow-up duration and diagnostic criteria.^{19,20} Our study used MRCP and ultrasound to confirm the diagnosis, which may have led to more accurate detection.

Notably, this study found no statistically significant association between bile leak or post-cholecystectomy syndrome with age, gender, or BMI. In contrast, Gujjula et al.^{13,19}, and Rizwan M et al, reported a higher incidence of bile leak in obese patients and females, possibly due to anatomical challenges and surgical complexity in those subgroups.

Overall, the findings support the safety of laparoscopic cholecystectomy while also highlighting the need for vigilance regarding postoperative complications. Standardized definitions and structured follow-up protocols, as used in this study, may enhance complication detection and timely intervention.

This study was conducted at a single center, which may limit the generalizability of the findings. The use of a non-probability convenience sampling technique introduces potential selection bias.

The sample size was relatively small, which could affect the statistical power of subgroup analyses. Follow-up duration was limited to six months, possibly missing late-onset complications. Only one surgeon performed all procedures, which, while controlling for surgical variability, may affect external validity. Lastly, advanced diagnostic tools like ERCP or MRCP were only used when symptoms appeared, potentially underestimating asymptomatic complications.

CONCLUSION

Biliary complications following laparoscopic

cholecystectomy were relatively infrequent and showed no significant association with demographic variables.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION

1	Maryam Samad: Manuscript writing, drafting, proof reading, data collection.
2	Sheema Amin: Drafting, Stat analysis.
3	Sidra Iqbal: Data collection, manuscript writing, proof reading.
4	Rizmi Tahir: Data collection.
5	Ishrat Alam: Study design, drafting.