Journal of Surgical Radiology

Site: https://journalsurgrad.com/

ISSN Print 2156-213X| ISSN Online: 2156-4566 Volume: 05 Issue: 07 Open Access

Research Article

EFFECT OF CHOLECYSTECTOMY ON SERUM LIPID PROFILE AND COMMON BILE DUCT DIAMETER: A PROSPECTIVE OBSERVATIONAL STUDY

Dr. Punam Choursiya[1], Dr. Anuradha Chaudhary[2], Dr. Vijay Singh Tanwar[3], Dr. Abhishek Galkate[4], Dr. Mukesh Dhurve[5], Dr. Vijay Verma[6]

[1]Post Graduate Resident, Department of General Surgery, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, Madhya Pradesh, India

[2]Associate Professor, Department of General Surgery, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, Madhya Pradesh, India

[3]Post Graduate Resident, Department of General Surgery, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, Madhya Pradesh, India

[4]Post Graduate Resident, Department of General Surgery, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, Madhya Pradesh, India

[5]Assistant Professor, Department of General Surgery, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, Madhya Pradesh, India

[6]Associate Professor, Department of Radiology, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, Madhya Pradesh, India

*Corresponding Author
Dr. Punam Choursiya
poonamcc8@gmail.com

Article History
Received: 09.06.2026
Revised: 25.06.2026
Accepted: 05.07.2026
Published: 15.07.2026

Citations:
Choursiya P, Chaudhary A, Tanwar VS, Galkate A, Dhurve M, Verma V. Effect of cholecystectomy on serum lipid profile and common bile duct diameter: A prospective observational study. J Surg Radiol, V5 (7) 198-202

Abstract: ***Introduction:*** Cholecystectomy is the definitive treatment for symptomatic gallstone disease. Its postoperative effects on serum lipid profile and common bile duct (CBD) morphology are clinically important but incompletely characterized. **Methods:** A prospective observational study was conducted at Gandhi Medical College, Bhopal, enrolling 90 patients undergoing elective cholecystectomy for symptomatic cholelithiasis. Serum lipid profiles (total cholesterol, triglycerides, LDL-C, HDL-C) and CBD diameter by ultrasonography were measured preoperatively, at discharge, and at 3 and 6 months postoperatively. Statistical analysis was performed using EPI Info 7.0. **Results:** The cohort was predominantly female (70%) with a mean age concentrated in the 41–50 year group. At 6 months, total cholesterol declined significantly from 214.97±15.52 to 182.41±16.31 mg/dL ($p < 0.001$), triglycerides from 177.97±26.73 to 145.34±26.46 mg/dL ($p < 0.001$), and LDL-C from 139.64±18.07 to 115.62±18.33 mg/dL ($p < 0.001$), while HDL-C increased from 42.15±3.87 to 50.03±3.81 mg/dL ($p < 0.001$). CBD diameter increased progressively from 4.29±0.33 mm preoperatively to 5.81±0.37 mm at 6 months ($p = 0.025$). No significant differences were observed across age, BMI, glycemic, or surgical approach subgroups. **Conclusion:** Cholecystectomy is associated with significant improvement in atherogenic lipid parameters and a predictable, physiological dilatation of the CBD. Mild postoperative CBD enlargement in asymptomatic patients should be interpreted as a normal adaptive response rather than pathological obstruction.

Keywords: Cholecystectomy; lipid profile; common bile duct diameter; cholelithiasis; postcholecystectomy; dyslipidemia; ultrasonography

INTRODUCTION

Gallstone disease is one of the most prevalent hepatobiliary disorders worldwide, with a global prevalence of 10–20% in adults. The condition predominantly affects females, individuals with obesity, metabolic syndrome, and those of advancing age. Laparoscopic cholecystectomy has become the gold standard for definitive management and is among the most frequently performed abdominal operations globally.

The gallbladder functions as a dynamic reservoir, storing and concentrating bile during fasting and releasing it in response to cholecystokinin following meals. Removal of the gallbladder eliminates this storage function, leading to continuous and unregulated bile flow from the liver into the duodenum. Such alterations may influence enterohepatic circulation, bile acid pool size, and hepatic cholesterol turnover, with potential consequences for systemic lipid homeostasis.

Gallstone disease and dyslipidemia share overlapping metabolic pathways. Elevated total cholesterol, increased low-density lipoprotein (LDL-C), reduced high-density lipoprotein (HDL-C), and hypertriglyceridaemia are recognized risk factors for cholesterol stone formation. However, published data on postoperative lipid changes following cholecystectomy remain inconsistent, with some studies reporting improvement and others showing minimal or no change. A second important postoperative change is adaptation in CBD diameter. In the absence of a gallbladder reservoir, bile storage may shift to the extrahepatic

biliary tree, leading to mild ductal dilatation. Distinguishing physiological dilatation from early obstructive pathology—such as retained stones or strictures—represents a practical diagnostic challenge. Simultaneous prospective evaluation of both lipid parameters and CBD dimensions in the same cohort has been limited.

The present study was therefore designed to prospectively evaluate the effect of cholecystectomy on serum lipid profile and CBD diameter in patients with symptomatic cholelithiasis, to clarify the metabolic and anatomical consequences of gallbladder removal, and to guide postoperative counselling and rational radiological interpretation.

AIMS AND OBJECTIVES

Primary Aim: To evaluate the effect of cholecystectomy on serum lipid profile and CBD diameter in patients with gallstone disease.

Primary Objectives:

1. To compare serum lipid profile and CBD diameter in the preoperative and postoperative periods.
2. To establish the effect of cholecystectomy on lipid parameters and CBD dimensions over 6 months.
3. To evaluate postoperative CBD diameter changes by serial ultrasonography.

Secondary Objective: To assess the influence of BMI and random blood sugar (RBS) on postoperative outcomes.

MATERIALS AND METHODS

Study Design and Setting

A prospective observational study was conducted in the Department of General Surgery, Gandhi Medical College and Associated Hamidia Hospital, Bhopal, India. Ethics committee approval was obtained prior to study initiation (Institutional Ethics Committee, Gandhi Medical College, Bhopal). Written informed consent was obtained from all participants.

Inclusion criteria: Age >18 years; symptomatic gallstone disease confirmed by ultrasonography; willingness to participate and attend follow-up visits.

Exclusion criteria: Patients on lipid-lowering agents; history of renal failure, cardiac failure, or morbid obesity; immunocompromised status; refusal to consent. Sample size was calculated using the formula $n = Z^2pq/d^2$, based on a 6% prevalence of cholecystectomy in India (95% CI, 5% error), yielding n = 87, rounded to 90. Consecutive sampling was used.

Study Procedure

Preoperative investigations included fasting lipid profile and abdominal ultrasonography for CBD diameter measurement. CBD diameter was measured in the longitudinal plane at the level of the porta hepatis (inner wall-to-inner wall), using a Phillips HD 11 XE ultrasound machine (The Netherlands). Patients underwent elective open or laparoscopic cholecystectomy. Postoperative assessments were performed at discharge, 3 months, and 6 months.

Statistical Analysis

Data were analysed using EPI Info 7.0. Continuous variables are presented as mean ± standard deviation; categorical variables as frequencies and percentages. Paired t-test was used for preoperative–postoperative comparisons of continuous variables. One-way ANOVA was applied for subgroup comparisons. Chi-square test was used for categorical associations. Pearson's correlation coefficient assessed linear relationships. A p-value <0.05 was considered statistically significant.

RESULTS

Demographic and Clinical Characteristics

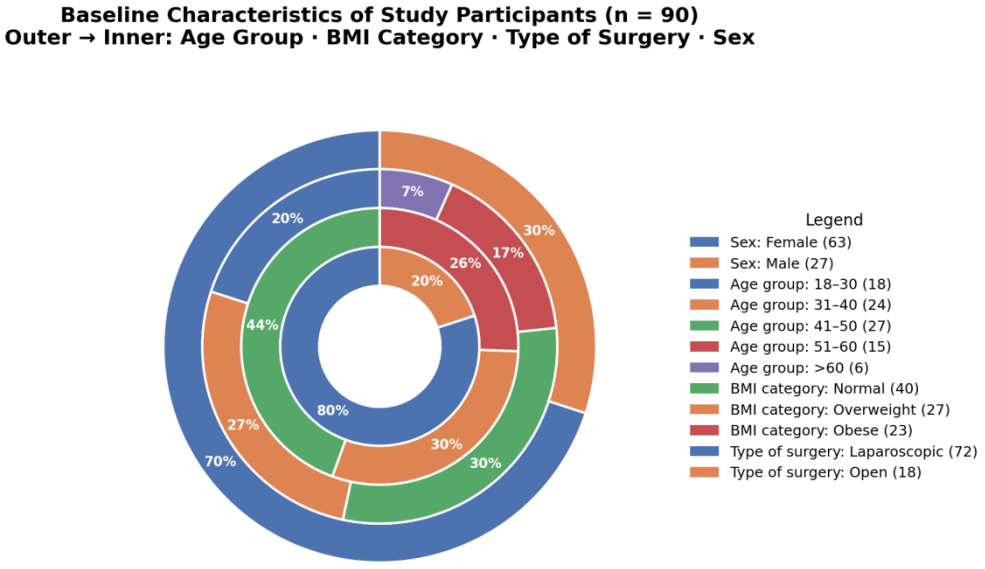
A total of 90 patients were enrolled. The majority were in the 41–50 year age group (30.0%), followed by 31–40 years (26.7%), 18–30 years (20.0%), 51–60 years (16.7%), and >60 years (6.7%). Females predominated (70.0%; female-to-male ratio 2.3:1), consistent with the known epidemiology of gallstone disease. Body mass index was normal in 44.4%, overweight in 30.0%, and obese in 25.6% of participants. Laparoscopic cholecystectomy was performed in 80.0% of cases and open cholecystectomy in 20.0%.

Table 1: Baseline characteristics of study participants (n = 90)

Characteristic	Category	n (%)
Sex	Female	63 (70.0%)
	Male	27 (30.0%)
Age group (years)	18–30	18 (20.0%)
	31–40	24 (26.7%)
	41–50	27 (30.0%)
	51–60	15 (16.7%)
	>60	6 (6.7%)

Characteristic	Category	n (%)
BMI category	Normal	40 (44.4%)
	Overweight	27 (30.0%)
	Obese	23 (25.6%)
Type of surgery	**Laparoscopic**	**72 (80.0%)**
	Open	**18 (20.0%)**

Figure 1: Distribution of baseline demographic and clinical characteristics (n = 90)



Serum Lipid Profile Changes

All four lipid parameters showed statistically significant changes from preoperative baseline to 6 months postoperatively (Table 2). Total cholesterol declined by 32.56 mg/dL (15.1%), triglycerides by 32.63 mg/dL (18.3%), and LDL-C by 24.02 mg/dL (17.2%). HDL-C increased by 7.88 mg/dL (18.7%). Early beneficial changes were already evident at discharge.

Table 2: Serial serum lipid profile (mean ± SD, mg/dL)

Lipid Parameter	Preoperative	At Discharge	3 Months	6 Months	p-value*
Total Cholesterol	214.97±15.52	206.34±15.80	—	182.41±16.31	<0.001
Triglycerides	177.97±26.73	168.02±26.75	—	145.34±26.46	<0.001
LDL-C	139.64±18.07	132.16±18.02	—	115.62±18.33	<0.001
HDL-C	42.15±3.87	43.64±3.90	—	50.03±3.81	<0.001

**Paired t-test, preoperative vs. 6 months. LDL-C = low-density lipoprotein cholesterol; HDL-C = high-density lipoprotein cholesterol.*

CBD Diameter Changes

Mean CBD diameter increased progressively at each follow-up interval (Table 3). Categorical analysis showed a statistically significant shift toward larger diameter categories between discharge and 6 months ($\chi^2 = 5.035$, df = 1, p = 0.025): all 64 patients (100%) with discharge CBD <5 mm had moved to the 5–6.5 mm category by 6 months, while 7.7% of patients in the 5–6.5 mm group at discharge progressed to >6.5 mm.

Table 3: Serial CBD diameter measurements (mean ± SD, mm)

Time Point	Mean CBD Diameter (mm)	SD
Preoperative	4.29	0.33
At Discharge	4.73	0.32
3 Months	5.21	0.33
6 Months	5.81	0.37

Subgroup Analyses

Postoperative lipid parameters and CBD diameter at 6 months did not differ significantly across age groups, BMI categories, random blood sugar categories, or type of surgery (open vs. laparoscopic). CBD diameter at 6 months was 5.82±0.38 mm after laparoscopic and 5.75±0.32 mm after open cholecystectomy (p = 0.452). Correlation between BMI

and CBD diameter at 6 months was negligible (r = 0.041, p = 0.704). A weak but statistically significant negative correlation was identified between RBS and triglycerides at 6 months (r = −0.210, p = 0.047).

DISCUSSION

This prospective study demonstrated that cholecystectomy is associated with significant and sustained improvement in all four major lipid parameters within 6 months, alongside a predictable, gradual physiological dilatation of the CBD.

Lipid Profile

The significant postoperative decline in total cholesterol (214.97 to 182.41 mg/dL), triglycerides (177.97 to 145.34 mg/dL), and LDL-C (139.64 to 115.62 mg/dL), with a concomitant rise in HDL-C (42.15 to 50.03 mg/dL), is consistent with prior literature. Menezes et al. reported comparable reductions in total cholesterol, triglycerides, and LDL-C with a rise in HDL-C at 6 months (all $p < 0.001$).[1] Reddy et al. similarly demonstrated significant lipid improvement at 12 months.[2] The shorter 12-week study by Aydın et al. showed a significant decrease in total cholesterol and LDL-C, though triglycerides and HDL-C did not reach significance within this narrower timeframe,[3] suggesting that metabolic adaptation may be more evident over a longer follow-up.

The underlying mechanism likely involves altered enterohepatic bile acid circulation following gallbladder removal. Continuous bile flow without the regulated burst-release pattern may increase faecal bile acid losses, upregulating hepatic bile acid synthesis from cholesterol and thereby reducing the available cholesterol pool. Enhanced bile acid signalling through farnesoid X receptor (FXR) and TGR5 pathways may additionally modulate hepatic lipid synthesis. The clinical relevance of these changes is underscored by data from Wang et al., who demonstrated that total cholesterol ≥200 mg/dL was an independent risk factor for recurrent CBD stones (OR = 4.558, 95% CI 1.625–12.787, p = 0.004), while HDL-C ≥40 mg/dL was protective (OR = 0.207, 95% CI 0.114–0.376, $p < 0.001$).[4] The postoperative total cholesterol of 182.41 mg/dL in the present cohort falls below this threshold, potentially conferring biliary protective benefits.

CBD Diameter

Progressive CBD dilatation from 4.29 to 5.81 mm over 6 months is consistent with the published physiological range. Bhalerao et al. reported postoperative CBD increase from 4.2±0.5 mm to 5.6±0.6 mm ($p < 0.001$),[5] and Reddy et al. documented enlargement from 4.38 to 5.6 mm at 12 months ($p < 0.01$).[2] Paudel et al. similarly found significantly larger CBD in post-cholecystectomy patients than in controls (6.1±1.2 vs. 4.4±0.9 mm, $p <$ 0.001).[6] Pavlović et al., using MRCP, demonstrated even larger absolute values (6.0 to 7.9 mm at 6 months), reflecting a methodological difference in imaging modality.[7]

Importantly, the categorical analysis in the present study showed that dilatation remained largely within the mild-to-moderate range (5–6.5 mm), with only 2.2% of patients exceeding 6.5 mm. This supports the interpretation endorsed by Brunet et al.[2] and Alam et al.[8] that postoperative CBD enlargement in asymptomatic patients without biochemical abnormalities represents physiological compensatory remodelling rather than obstructive pathology. Accordingly, mild CBD dilatation on imaging in asymptomatic post-cholecystectomy patients should prompt clinical and biochemical correlation rather than reflexive further investigation.

Subgroup Analyses

The absence of significant differences in postoperative outcomes across age, BMI, glycemic status, and surgical approach subgroups suggests that the metabolic and anatomical benefits of cholecystectomy are broadly applicable across the patient population and are not restricted to particular demographic or clinical subsets. This broad consistency enhances the generalisability of the findings for routine surgical practice.

STRENGTHS AND LIMITATIONS

Strengths of this study include its prospective design, serial multi-point follow-up, simultaneous evaluation of both lipid and biliary outcomes, and standardised imaging protocol. Limitations include the single-centre design, a 6-month follow-up period, absence of a parallel non-operative control group, and incomplete accounting for dietary change, physical activity, and medication use as potential confounders. The open cholecystectomy subgroup was relatively small, limiting comparative power.

CONCLUSION

Cholecystectomy for symptomatic gallstone disease is associated with significant improvement in serum lipid profile, characterised by reductions in total cholesterol, triglycerides, and LDL-C, with a concurrent rise in HDL-C over 6 months, and with a predictable, physiological dilatation of the common bile duct. These changes occur uniformly across age, BMI, glycaemic, and surgical approach subgroups. Clinicians should be aware that mild postoperative CBD dilatation in asymptomatic patients without biochemical abnormalities represents a normal adaptive response and should not be misinterpreted as obstructive pathology. Larger multicentre studies with extended follow-up are warranted to confirm these findings and to explore their long-term cardiovascular and biliary implications.

DECLARATIONS

Ethics Approval and Consent to Participate: The study was approved by the Institutional Ethics

Committee, Gandhi Medical College, Bhopal. Written informed consent was obtained from all participants.

Funding: No external funding was received for this study.

Conflicts of Interest: The authors declare no conflicts of interest.

Author Contributions: PC: study design, data collection, manuscript drafting. VST: data collection, patient follow-up, manuscript review. AG: data collection, patient follow-up, manuscript review. AC: co-supervision, manuscript review. MD: data collection, manuscript review. VV: radiological co-supervision, manuscript review.

REFERENCES

1. Menezes JVF, Katamreddy R. The effect of cholecystectomy on the lipid profile of patients with gallstone disease: a prospective study. Int Surg J. 2019;6(11):4112-4116.
2. Reddy S, Ali I, Athavale VS, Nichkaode PB. A comparative study of serum lipid profile and common bile duct dimensions in pre and post cholecystectomy patients. Natl J Med Res. 2024;14(2):66-71.doi:10.55489/njmr.14022024997.
3. Aydin A, Ozturk D. Effects of cholecystectomy on lipid profile. J Exp Clin Med. 2022;39(4):1246-1248.doi:10.52142/omujecm.39.4.54.
4. Wang SF, Wu CH, Sung KF, Tsou YK, Lin CH, Lee CW, et al. The impact of metabolic factors and lipid-lowering drugs on common bile duct stone recurrence after endoscopic sphincterotomy with following cholecystectomy. J Pers Med. 2023;13(10):1490. doi:10.3390/jpm13101490.
5. Bhalerao S, Batra P, Utaal MS, Sasan C. Evaluation of effect of cholecystectomy on common bile duct diameter using ultrasonography and liver function test: a prospective study. Int Surg J. 2018;5(4). doi:10.18203/2349-2902.isj20181103.
6. Paudel R, Karki S, Suwal S, Palikhe A, Mandal D, Manandhar M. Comparative study of common bile duct diameter between normal and post cholecystectomy cases using trans-abdominal ultrasonography.Kathmandu Univ Med J. 2022;20(77):66-69.
7. Pavlović T, Trtica S, Troskot Perić R. Bile duct diameter changes after laparoscopic cholecystectomy: a magnetic resonance cholangiopancreatography prospective study. Croat Med J. 2020;61(3):239-245.
8. Alam MS, Ahmad S, Khan A, Amin S, Tahir R. Post-cholecystectomy biliary dilatation. Pak J Med Health Sci. 2023;17:2249.
9. Hela S, Maitra D. Age-related variation in the diameter of the common bile duct and its association with anthropometric parameters: an ultrasonographic study in an Eastern Indian cohort. Cureus. 2025;17(10):e95232.
10. Brunet C, Dupont P, Crampagne C, et al. Biliary adaptation after cholecystectomy. J Gastroenterol Hepatol 2011;26(9):1465.