

Analysis of Lipid Profile Alterations in Patients Undergoing Laparoscopic Cholecystectomy: An Institutional Based Study

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ABSTRACT

Background: Laparoscopic cholecystectomy (LC) has emerged as one of the most notable advancements in modern surgery. The association between gallstone disease and dyslipidemia is well recognized, and recent research indicates that cholecystectomy can bring about beneficial changes in lipid metabolism. In this context, the present study was undertaken to analyze lipid profile alterations in patients undergoing laparoscopic cholecystectomy.

Materials & Methods: This study evaluated changes in lipid profiles in 50 patients with symptomatic cholelithiasis undergoing cholecystectomy, with preoperative and six-month postoperative values compared. Clinical, biochemical, and histopathological assessments were performed, and statistical analysis using SPSS identified significant alterations ($p < 0.05$).

Results: The mean age of participants was 45.8 years. Among the 50 patients, females predominated (76%) compared to males (24%). A higher proportion of patients resided in urban areas (72%) compared to rural regions (36%). A statistically significant reduction was observed in total cholesterol, LDL, VLDL, and triglyceride levels postoperatively ($p < 0.05$). Conversely, HDL levels showed a significant increase after

surgery ($p < 0.001$). These findings indicate an overall improvement in lipid metabolism following cholecystectomy.

Conclusion: The present study indicates that cholecystectomy not only alleviates gallstone-related symptoms but also contributes to better metabolic outcomes.

Key words: Laparoscopic cholecystectomy, Lipid.

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INTRODUCTION

Laparoscopic surgery has increasingly been integrated across multiple surgical specialties because of its clear advantages over traditional open surgery (OS). These benefits include reduced intraoperative blood loss, decreased postoperative pain, lower complication and morbidity rates, faster resumption of oral intake, and shorter hospital stays. Despite these advantages, the adoption of PLS in hepatobiliary and pancreatic (HBP) surgery has progressed more slowly, primarily due to its technical complexity, the demanding operative environment, and the extended learning curve required for safe and effective performance.^{1,2}

Among HBP procedures, laparoscopic cholecystectomy (LC) stands out as a remarkable success story. Unlike other advanced HBP surgeries that necessitate intricate reconstructions or anastomotic techniques, LC is technically simpler, associated with a relatively short learning curve, and can be performed with reproducible outcomes even by surgeons in the early phase of their laparoscopic training. Importantly, the reported conversion

rate of LC to open surgery is only about 5%, highlighting its safety and reliability.^{3,4}

The established advantages of LC include reduced morbidity and mortality, earlier initiation of oral feeding, shorter hospitalization, quicker return to normal social and occupational activities, and even a moderate cost benefit compared with OS. Since its first description in 1989, LC has gained worldwide acceptance and rapidly evolved into the standard of care for gallbladder (GB) diseases. Its role is now extensively described in both general surgical and specialized HBP surgical literature, underscoring its position as a cornerstone procedure in modern minimally invasive surgery.^{5,6}

The relationship between gallstone disease and dyslipidemia has been extensively established. Recent evidence suggests that cholecystectomy may lead to favorable modifications in lipid profile parameters.⁷ Hence, the present study was conducted to analyze lipid profile alterations in patients undergoing laparoscopic cholecystectomy.

MATERIALS & METHODS

50 participants had symptomatic cholelithiasis and were admitted for elective cholecystectomy (laparoscopic or open). After obtaining informed consent, detailed clinical history, examination, and baseline investigations were performed, including serum amylase, fasting thyroid profile, and pre-operative fasting lipid profile. Cholecystectomy specimens underwent histopathological evaluation, and gallstones were classified as cholesterol, pigment, or mixed stones. Follow-up lipid profile assessments were carried out six months postoperatively and compared with preoperative values. Statistical analysis was conducted using SPSS. Descriptive statistics summarized categorical and continuous variables. p -value <0.05 was considered statistically significant.

RESULTS

Table 1 summarizes the demographic distribution of the study participants. The mean age was 45.8 years, indicating a predominance of middle-aged individuals in the study cohort. Out

of the 50 patients, a larger proportion were females (76%), while males accounted for 24%. In terms of residence, urban dwellers (72%) formed the majority, whereas rural residents constituted 36%. This suggests that gallstone disease leading to cholecystectomy was more commonly encountered among urban females in this sample. Table 2 illustrates the comparative changes in lipid profile parameters before and after cholecystectomy. A marked and statistically significant reduction was seen in total cholesterol (191.3 to 151.7 mg/dL), LDL (161.7 to 113.7 mg/dL), VLDL (42.8 to 32.7 mg/dL), and triglycerides (190.8 to 161.8 mg/dL), with p values <0.05 across all parameters. Conversely, HDL showed a significant postoperative increase (32.3 to 45.9 mg/dL; $p < 0.001$), indicating an improvement in the cardioprotective lipid fraction. These findings highlight the beneficial impact of cholecystectomy on overall lipid metabolism, suggesting that surgical removal of the gallbladder may contribute to improved lipid homeostasis and reduced cardiovascular risk over time.

Table 1: Demographic data

Variable	Number	Percentage
Mean age (years)	45.8	
Males	12	24
Females	38	76
Rural residence	18	36
Urban residence	32	72

Table 2: Lipid profile

Parameter	Preoperative follow-up	Postoperative follow-up	P value
Total cholesterol (mg/dL)	191.3	151.7	0.000*
HDL (mg/dL)	32.3	45.9	0.000*
LDL (mg/dL)	161.7	113.7	0.000*
VLDL (mg/dL)	42.8	32.7	0.003*
Triglycerides (mg/dL)	190.8	161.8	0.002*

DISCUSSION

The development of cholesterol gallstones is primarily attributed to disturbances in lipid metabolism, wherein hepatic secretion of cholesterol into the bile becomes disproportionately higher compared to other lipid constituents such as bile salts and phospholipids. This imbalance favors supersaturation of bile with cholesterol, creating a biochemical environment conducive to stone formation. Several contributory mechanisms have been identified, including accelerated nucleation of cholesterol monohydrate crystals, their aggregation through interaction with biliary mucin glycoproteins, and impaired contractility or hypomotility of the gallbladder, which delays bile emptying and promotes stasis. Despite these well-recognized mechanisms, the precise molecular pathways governing these events remain incompletely elucidated. Nonetheless, multiple clinical and experimental studies have consistently demonstrated a strong association between gallstone formation and dyslipidemia, suggesting that systemic alterations in lipid metabolism not only

predispose to biliary cholesterol supersaturation but also perpetuate the pathological sequence leading to gallstone disease.⁷⁻¹⁰ Hence; the present study was conducted to analyze lipid profile alterations in patients undergoing laparoscopic cholecystectomy.

The mean age was 45.8 years, indicating a predominance of middle-aged individuals in the study cohort. Out of the 50 patients, a larger proportion were females (76%), while males accounted for 24%. In terms of residence, urban dwellers (72%) formed the majority, whereas rural residents constituted 36%. This suggests that gallstone disease leading to cholecystectomy was more commonly encountered among urban females in this sample. A marked and statistically significant reduction was seen in total cholesterol (191.3 to 151.7 mg/dL), LDL (161.7 to 113.7 mg/dL), VLDL (42.8 to 32.7 mg/dL), and triglycerides (190.8 to 161.8 mg/dL), with p values <0.05 across all parameters. Conversely, HDL showed a significant postoperative increase (32.3 to 45.9 mg/dL; $p < 0.001$), indicating an improvement in the

cardioprotective lipid fraction. These findings highlight the beneficial impact of cholecystectomy on overall lipid metabolism, suggesting that surgical removal of the gallbladder may contribute to improved lipid homeostasis and reduced cardiovascular risk over time. Malik et al. conducted a prospective study to investigate the relationship between dyslipidaemia and cholelithiasis, as well as the impact of cholecystectomy on lipid metabolism. A total of 73 patients presenting with symptomatic gallstones were enrolled. Serum lipid parameters, including total cholesterol, triglycerides, LDL, and HDL, were measured before surgery, on the third postoperative day, and again six months after the procedure. Importantly, none of the participants received lipid-lowering agents or dietary modifications during the study period. Their findings revealed that 80% of female patients and 71.4% of male patients demonstrated preoperative lipid abnormalities. Following cholecystectomy, significant reductions were observed in total cholesterol, triglycerides, and LDL cholesterol, both in the immediate postoperative period and at six months. However, HDL levels showed no significant alteration over the same duration. The authors concluded that cholecystectomy induces a noteworthy decline in plasma lipid concentrations, a change that could have long-term implications in reducing the risk of coronary artery disease among these patients.¹¹ Giasuddin ASM evaluated the serum lipoprotein(a) [Lp(a)] status in Bangladeshi patients with cholelithiasis and the effect of cholecystectomy on its levels. The study included 44 adult patients with cholelithiasis and 30 healthy controls. The results demonstrated that patients had significantly elevated serum Lp(a) compared to controls (NC: 29.07 ± 14.1 vs. Patients Serum-Lp: 290.84 ± 110.93 , $p < 0.001$). Biliary Lp(a) was relatively low (37.12 ± 28.61) and did not differ significantly from controls. Postoperatively, Lp(a) levels decreased (203.70 ± 90.13) but remained significantly higher than controls ($p < 0.001$). Analysis of proportions further confirmed significant associations between abnormal Lp(a) levels and cholelithiasis ($p < 0.001$). The authors concluded that cholelithiasis exerts a complex influence on Lp(a) metabolism, suggesting a possible metabolic role of the gallbladder, thereby necessitating further research.¹²

CONCLUSION

The present study concludes that laparoscopic cholecystectomy results in significant improvement in lipid profile parameters, highlighting a positive correlation between preoperative and postoperative values. This indicates that cholecystectomy not only alleviates gallstone-related symptoms but also contributes to better metabolic outcomes.

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