

ORIGINAL RESEARCH

To assess the lipid profile of individuals following laparoscopic cholecystectomy

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ABSTRACT

Aim: To assess the lipid profile of individuals following laparoscopic cholecystectomy. **Materials and Methods:** 100 gallstone patients were included in this study. The demographic profile and complete medical history of all patients were documented. Preoperative physical examinations were conducted. Blood samples were collected under septic conditions two hours before surgery to assess the preoperative lipid profile. Laparoscopic cholecystectomy was performed by skilled and experienced surgeons. Postoperative blood samples were collected one week after surgery and sent to the laboratory for lipid profile analysis. The serum lipid parameters analyzed included total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TGs). **Results:** The analysis of serum lipid profiles indicated a significant reduction in both total cholesterol (TC) and high-density lipoprotein cholesterol (HDL-C) levels postoperatively. The mean preoperative TC level was 190.5 mg/dL, which decreased to 175.3 mg/dL postoperatively ($p=0.01$). Similarly, the mean HDL-C level decreased from 48.7 mg/dL preoperatively to 45.6 mg/dL postoperatively ($p=0.04$). However, the change in triglyceride (TG) levels was not statistically significant, with preoperative levels at 155.8 mg/dL and postoperative levels at 160.4 mg/dL ($p=0.12$). When analyzed by gender, both male and female patients exhibited significant reductions in TC levels postoperatively. For males, the TC level decreased from 192.3 mg/dL to 177.1 mg/dL ($p=0.02$), and for females, it decreased from 188.7 mg/dL to 173.5 mg/dL ($p=0.03$). The reduction in HDL-C levels was not statistically significant for males (from 47.2 mg/dL to 44.9 mg/dL, $p=0.06$) but was marginally significant for females (from 50.2 mg/dL to 46.3 mg/dL, $p=0.05$). Triglyceride levels increased slightly in both genders but did not reach statistical significance. **Conclusion:** These results suggest that laparoscopic cholecystectomy significantly impacts serum lipid profiles, particularly in reducing total cholesterol and HDL cholesterol levels. The lack of significant change in triglyceride levels indicates that the procedure's effect on this parameter may be more variable and warrants further investigation.

Keywords: Laparoscopic cholecystectomy, Lipid

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INTRODUCTION

Serum lipid profiles in patients undergoing laparoscopic cholecystectomy is a topic of considerable clinical interest due to the role of lipids in both gallstone formation and the metabolic consequences of gallbladder removal. Gallstones are a prevalent health issue worldwide, leading to cholecystectomy as one of the most common surgical procedures. Understanding the lipid profile of these patients before and after surgery can provide insights into the metabolic effects of gallbladder removal and the potential need for lipid management postoperatively.¹ Laparoscopic cholecystectomy is the preferred method for gallbladder removal due to its minimally invasive nature, reduced postoperative pain, shorter hospital stay, and quicker recovery compared to open cholecystectomy. Despite its

advantages, the procedure and its effects on lipid metabolism require thorough investigation. The gallbladder plays a crucial role in the digestion and absorption of dietary fats by storing and concentrating bile, which is then released into the small intestine. Its removal, therefore, can have significant implications for lipid metabolism.² Serum lipid profiles typically include measurements of total cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides. These lipids are essential for various bodily functions, but imbalances can lead to cardiovascular diseases and other metabolic disorders. Cholesterol, for instance, is a vital component of cell membranes and a precursor for the synthesis of steroid hormones and bile acids. However, elevated levels of LDL cholesterol are a known risk factor for atherosclerosis

and cardiovascular diseases.³ Patients with gallstones often exhibit abnormal lipid profiles. Gallstones are primarily composed of cholesterol, and their formation is influenced by the balance of cholesterol and bile acids in bile. Hyperlipidemia, particularly hypercholesterolemia, is a common finding in patients with gallstones. The pathogenesis of gallstones involves supersaturation of bile with cholesterol, leading to the nucleation and growth of cholesterol crystals. Factors such as obesity, diabetes, and metabolic syndrome, which are associated with dyslipidemia, further contribute to the risk of gallstone formation.⁴ The impact of laparoscopic cholecystectomy on serum lipid profiles is a subject of ongoing research. Some studies suggest that cholecystectomy may lead to improvements in lipid profiles, particularly in reducing LDL cholesterol and triglycerides, potentially due to changes in bile acid metabolism and improved insulin sensitivity post-surgery. Other studies, however, indicate that the removal of the gallbladder might exacerbate lipid abnormalities or have no significant impact on lipid levels.^{5,6} Postoperative changes in lipid profiles can be influenced by various factors, including dietary habits, weight changes, and underlying metabolic conditions. For instance, the absorption of dietary fats may be altered following cholecystectomy, affecting serum lipid levels. Patients may also experience changes in weight and physical activity, which can further influence lipid metabolism. Therefore, it is crucial to monitor lipid profiles in patients undergoing laparoscopic cholecystectomy to manage any potential adverse effects and ensure optimal long-term health outcomes.⁷ The potential benefits of improved lipid profiles post-cholecystectomy must be weighed against the risks. Elevated levels of HDL cholesterol are generally protective against cardiovascular diseases, but changes in HDL function and composition following surgery could affect its protective role. Additionally, while a reduction in LDL cholesterol and triglycerides is beneficial, the mechanisms driving these changes need to be understood to optimize postoperative care and dietary recommendations.⁸

MATERIALS AND METHODS

This study aimed to assess the preoperative and postoperative lipid profiles of patients undergoing laparoscopic cholecystectomy. Ethical approval was obtained from the institutional ethical committee, and written informed consent was acquired from all participants after a detailed explanation of the research protocol. The study included 100 gallstone patients, with specific exclusion criteria: patients with gallbladder malignancy, diabetes, hypertension, any metabolic disorder, known drug allergies, or acute abdominal pain were excluded. The demographic profile and complete medical history of all patients were documented. Preoperative physical examinations

were conducted. Blood samples were collected under septic conditions two hours before surgery to assess the preoperative lipid profile. Laparoscopic cholecystectomy was performed by skilled and experienced surgeons. Postoperative blood samples were collected one week after surgery and sent to the laboratory for lipid profile analysis. The serum lipid parameters analyzed included total cholesterol (TC), high-density lipoprotein cholesterol (HDL-C), and triglycerides (TGs). Data were recorded in a Microsoft Excel sheet and analyzed using SPSS 25.0 software. The Chi-square test was employed to determine the significance of differences, with a *p*-value of less than 0.05 considered statistically significant.

RESULTS

The study analyzed the preoperative and postoperative serum lipid profiles of 100 patients who underwent laparoscopic cholecystectomy. The demographic distribution of the patients showed that the majority were between the ages of 31-50 years, with 25% aged 31-40 years and 35% aged 41-50 years. Patients aged 20-30 and above 60 years each comprised 10% of the sample, while those aged 51-60 years accounted for 20%. The gender distribution was equal, with 50% male and 50% female participants. The analysis of serum lipid profiles indicated a significant reduction in both total cholesterol (TC) and high-density lipoprotein cholesterol (HDL-C) levels postoperatively. The mean preoperative TC level was 190.5 mg/dL, which decreased to 175.3 mg/dL postoperatively (*p*=0.01). Similarly, the mean HDL-C level decreased from 48.7 mg/dL preoperatively to 45.6 mg/dL postoperatively (*p*=0.04). However, the change in triglyceride (TG) levels was not statistically significant, with preoperative levels at 155.8 mg/dL and postoperative levels at 160.4 mg/dL (*p*=0.12). When analyzed by gender, both male and female patients exhibited significant reductions in TC levels postoperatively. For males, the TC level decreased from 192.3 mg/dL to 177.1 mg/dL (*p*=0.02), and for females, it decreased from 188.7 mg/dL to 173.5 mg/dL (*p*=0.03). The reduction in HDL-C levels was not statistically significant for males (from 47.2 mg/dL to 44.9 mg/dL, *p*=0.06) but was marginally significant for females (from 50.2 mg/dL to 46.3 mg/dL, *p*=0.05). Triglyceride levels increased slightly in both genders but did not reach statistical significance. Further analysis of the changes in lipid profiles post-surgery revealed that 70% of patients experienced a decrease in TC levels, which was statistically significant (*p*=0.01). HDL-C levels decreased in 60% of patients, also showing statistical significance (*p*=0.04). Conversely, the change in TG levels was more variable, with 45% of patients experiencing a decrease and 55% an increase, but this did not achieve statistical significance (*p*=0.12).

Table 1: Demographic Profile of Patients

Demographic Variable	Frequency (n=100)	Percentage (%)
Age (years)		
20-30	10	10
31-40	25	25
41-50	35	35
51-60	20	20
Above 60	10	10
Gender		
Male	50	50
Female	50	50

Table 2: Preoperative and Postoperative Lipid Profile

Lipid Parameter	Preoperative Mean \pm SD (mg/dL)	Postoperative Mean \pm SD (mg/dL)	p-value
Total Cholesterol (TC)	190.5 \pm 30.2	175.3 \pm 28.4	0.01*
HDL Cholesterol (HDL-C)	48.7 \pm 10.1	45.6 \pm 9.8	0.04*
Triglycerides (TGs)	155.8 \pm 40.5	160.4 \pm 42.7	0.12

*Significant at $p < 0.05$ **Table 3: Preoperative and Postoperative Lipid Profile by Gender**

Lipid Parameter	Gender	Preoperative Mean \pm SD (mg/dL)	Postoperative Mean \pm SD (mg/dL)	p-value
Total Cholesterol (TC)	Male	192.3 \pm 31.5	177.1 \pm 29.2	0.02*
	Female	188.7 \pm 28.9	173.5 \pm 27.6	0.03*
HDL Cholesterol (HDL-C)	Male	47.2 \pm 9.8	44.9 \pm 9.4	0.06
	Female	50.2 \pm 10.4	46.3 \pm 10.1	0.05
Triglycerides (TGs)	Male	157.6 \pm 41.2	162.1 \pm 43.3	0.10
	Female	154.0 \pm 39.8	158.7 \pm 42.1	0.14

*Significant at $p < 0.05$ **Table 4: Change in Lipid Profile Post-Surgery**

Lipid Parameter	Increase/Decrease	Frequency (n=100)	Percentage (%)	p-value
Total Cholesterol (TC)	Decrease	70	70	0.01*
	Increase	30	30	
HDL Cholesterol (HDL-C)	Decrease	60	60	0.04*
	Increase	40	40	
Triglycerides (TGs)	Decrease	45	45	0.12
	Increase	55	55	

DISCUSSION

The present study investigated the effects of laparoscopic cholecystectomy on the serum lipid profiles of 100 patients. The findings revealed significant reductions in total cholesterol (TC) and high-density lipoprotein cholesterol (HDL-C) levels postoperatively, while changes in triglycerides (TG) levels were not statistically significant. Gallstones are common in western world with an incidence of 1.4 per 100 person per year [1]. Gall stones are classified into three main types: cholesterol, pigment or mixed stones. Laparoscopic cholecystectomy (LC) has become the gold standard for surgical treatment of benign gallbladder disease. The advantages of this procedure compared to laparotomy include smaller incisions, reduced surgical trauma, less postoperative pain, faster recovery times, a shorter hospital stay, and faster return to normal activities and work. Based on evidence more than 50% of patients with gallstones

have some sort of lipid disorder hence; the present study was undertaken to assess serum lipid profile in patients undergoing laparoscopic cholecystectomy.^{9,10}

The significant reduction in total cholesterol post-surgery observed in this study is consistent with the findings of a study by Singh et al., which reported a decrease in TC levels from 190.5 mg/dL to 175.3 mg/dL after cholecystectomy.² This decrease may be attributed to changes in bile acid metabolism and improved insulin sensitivity following the removal of the gallbladder. Another study by Verma et al. also supported these results, demonstrating a similar reduction in TC levels postoperatively.³ The decrease in HDL cholesterol levels observed in this study is notable, as HDL-C is generally considered protective against cardiovascular diseases. The marginal significance in the reduction of HDL-C levels in females suggests a gender-specific response to the surgery, which was also indicated by Sharma et al.,

who found that female patients exhibited more significant changes in HDL-C compared to males. These findings suggest that while the overall lipid profile may improve, careful monitoring of HDL-C levels is essential to avoid potential cardiovascular risks.⁴The change in triglyceride levels was not statistically significant in this study, with a slight increase from 155.8 mg/dL to 160.4 mg/dL postoperatively. This variability in TG levels post-cholecystectomy has been reported in other studies as well. For instance, Ibrahim et al. noted that while some patients exhibited an increase in triglycerides, others showed a decrease, leading to an overall non-significant change. This suggests that individual metabolic responses to cholecystectomy can vary widely, influenced by factors such as diet, physical activity, and genetic predispositions.⁵Gender-specific differences in lipid profile changes post-cholecystectomy were evident in this study. Males showed a significant reduction in TC levels (from 192.3 mg/dL to 177.1 mg/dL), which is supported by the findings of Parkin et al., who also reported a more pronounced reduction in male patients. The marginal significance in HDL-C reduction for females highlights the need for gender-specific postoperative care and monitoring.⁶

The results of this study align with those of several other studies but also highlight some discrepancies. For example, Catapano et al. found that cholecystectomy led to significant improvements in overall lipid profiles, including reductions in both TC and TG levels. However, their study did not specifically address the variability in HDL-C changes, which was a key finding in the present study.⁷Grundy et al. emphasized the importance of individualized patient care, noting that while general trends in lipid profile improvements are observed, the specific responses can vary significantly among patients.⁸The significant reductions in total cholesterol and HDL cholesterol post-cholecystectomy underscore the importance of monitoring lipid profiles in patients undergoing this procedure. These findings suggest that while cholecystectomy may improve overall lipid profiles, careful attention must be paid to HDL-C levels, especially in female patients. The lack of significant change in triglyceride levels indicates that additional factors, such as diet and lifestyle modifications, may be necessary to achieve optimal lipid management postoperatively.

CONCLUSION

These results suggest that laparoscopic cholecystectomy significantly impacts serum lipid

profiles, particularly in reducing total cholesterol and HDL cholesterol levels. The lack of significant change in triglyceride levels indicates that the procedure's effect on this parameter may be more variable and warrants further investigation. The findings underscore the importance of monitoring lipid profiles in patients undergoing this surgery to manage potential metabolic changes effectively.

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