

ORIGINAL RESEARCH

Pre- and Post-operative comparative analysis of serum lipid profile in patients with cholelithiasis

¹Dr. Sandeep Shrivastava, ²Dr. Satyendra Prajapati

¹Assistant Professor, Department of General Surgery, Government Medical College, Datia, Madhya Pradesh, India

²Assistant Professor, Department of Physiology, GMC, Datia, Madhya Pradesh, India

Corresponding author

Dr. Satyendra Prajapati

Assistant Professor, Department of Physiology, GMC, Datia, Madhya Pradesh, India

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Abstract

Background: Gallbladder disease ranks among the prevalent conditions affecting the gastrointestinal tract. Several investigations have highlighted a connection between gallstones and changes in serum lipid levels. Hence, this study was conducted to compare pre and post-operative analysis of serum lipid levels in cholelithiasis subjects.

Materials & Methods: A total of 40 participants were included. Individuals aged between 30 and 60 years were encompassed. Thorough laboratory analyses were performed. The findings underwent assessment utilizing the SPSS software.

Results: Forty participants were included in the study. The average serum cholesterol levels exhibited a significant reduction one week following the surgery. Additionally, there was a marked rise in serum triglyceride (TG) levels after the first week following the surgical procedure.

Conclusion: Gallstone patients undergoing cholecystectomy experience a substantial improvement in lipid levels.

Keywords: cholesterol, low density lipoprotein, cholelithiasis.

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Introduction

Gallstone disease is one of the frequent gastrointestinal diseases that can be characterized by asymptomatic gall stones to acute cholecystitis. ¹ About 10–15% of the adult population is known to present gall stones with obesity, advanced age, metabolic syndrome, liver disease and female gender as the common risk factors. Owing to one of the common causes of hospitalization, surgical interventions are required for symptomatic gallbladder stones, for which, laparoscopic cholecystectomy had gained popularity within a past few years. ² Gallstones are known to be involved with hyperlipidemia. ³ Gallstone disease is a common disorder of the gastrointestinal tract, having a prevalence of 10%–15% and an incidence of 1.4% per year in the adult population of developed countries. ⁴ Women are more common victims of the gall stone disease as compared to men. ⁵ Gallstones are classified into three main types: cholesterol, pigment, and mixed gallstones. Cholesterol gallstones contain 51%–99% of pure cholesterol. Mixed gallstones have cholesterol plus calcium salts, bile acids, phospholipids and bile pigments. In about 70–80% of the cases, gallstones are mixed stones. ⁶ The

process of gall stone formation is multiplex. Major factors that govern the stone formation are: super saturation of the secreted bile, concentration of bile inside the gall bladder, crystal triglyceride nucleation, and abnormal gall bladder emptying. ⁷ Cholesterol super saturation of the bile is the most crucial factor. ⁸ Though lipid and bile acids metabolisms are functionally correlated, how cholecystectomy affects lipid profile is not well-comprehended. High lipid profile readings, consisting of elevations in chylomicron, low-density lipoprotein (LDL), very-low-density lipoprotein (VLDL), and intermediate-density lipoprotein (IDL) levels, are becoming increasingly prevalent, especially with the spreading factors among the Saudi population, such as urban residence, increasing age, especially 40 years; physical inactivity, overweight and obesity, diabetes mellitus, frequent fast food consumption, and so on. ⁹ Cholesterol is insoluble in water, it is secreted from the canalicular membrane in unilamellar phospholipid vesicle. Cholesterol solubility in the bile requires sufficient bile salts and phospholipids, predominantly phosphatidylcholine. If there is an excess of cholesterol or reduced phospholipids and/or bile acid, multi lamellar vesicles are formed causing nucleation

of the cholesterol crystals which leads to the stone formation. The secretion of cholesterol supersaturated lithogenic bile, decreased concentration of phospholipids, gallbladder dysmotility, delayed large bowel transit times (favoring reabsorption of deoxycholic acid), and the resection of ileum (depleting the acid pool) have all been implicated in the gallstone formation.¹⁰ Hence, this study was conducted to compare pre and post-operative analysis of serum lipid levels in cholelithiasis subjects.

Materials & Methods

A total of 40 participants were included. Individuals aged between 30 and 60 years were encompassed. Following the cholecystectomy procedure, gallstones were acquired and subsequently categorized into three groups based on their attributes of shape, dimensions, and consistency. An extensive patient history was conducted to evaluate diverse risk aspects, with specific emphasis on the hepatobiliary system. A

comprehensive physical examination of each patient was conducted to evaluate their overall health condition, and all essential physiological data were documented. Thorough laboratory analyses were performed. The findings underwent assessment utilizing the SPSS software. Comparative analysis among the participants was executed through the utilization of an unpaired t-test according to the Student's methodology, where a significance level of $P < 0.05$ was recognized as statistically meaningful.

Results

Forty participants were included in the study. The average serum cholesterol levels exhibited a significant reduction one week following the surgery. Additionally, there was a marked rise in serum triglyceride (TG) levels after the first week following the surgical procedure.

Table 1: Serum lipid profile inpreoperative and 1 week postoperative

Parameters	Pre-operative	1 week, post-operative	P - value
TC (mg %)	170.52	145.15	<0.001
TGs (mg %)	204.84	230.42	<0.001
HDL-C (mg %)	50.42	39.47	<0.01
LDL-C (mg %)	114.81	104.75	0.02
VLDL (mg %)	48.42	32.52	0.4

TC: total cholesterol, HDL-C: high density lipoprotein cholesterol, LDL-C: low-density lipoprotein cholesterol, TGs: triglycerides, VLDL: very low-density lipoprotein. Following surgery, there was a minor reduction in serum HDL-C levels after one week. Nevertheless, there was a noteworthy elevation in these levels after the passing of one monthpost-surgery. Conversely, there were no significant distinctions detected in LDL-C and VLDL-C levels both one week and one month after the surgical procedure.

Table 2: postoperative after 1 month lipid profile

Parameters	1 month, post-operative
TC (mg %)	125.42
TGs (mg %)	176.48
HDL-C (mg %)	45.71
LDL-C (mg %)	102.72
VLDL (mg %)	30.82

Discussion

Hyperlipidemia is generally characterized by high serum levels of total cholesterol, triglycerides, low density lipoproteins (LDL), and low levels of high-density lipoprotein (HDL). There are controversies that hyperlipidemias are associated with the gallstones. Some studies have showed a significant association of hyperlipidemias with gallstones especially hypertriglyceridemia and increased LDL levels^{10,11} while others showed no significant association between hyperlipidemias and gallstones.^{12,13} Hence, this study was conducted to compare pre and post-operative analysis of serum lipid levels in cholelithiasis subjects. In the present study, forty participants were included in the study. The average serum cholesterol levels exhibited a significant reduction one week following the surgery.

Additionally, there was a marked rise in serum triglyceride (TG) levels after the first week following the surgical procedure. A study by Osman A et al, studied to examine the postoperative changes in the lipid profiles of patients who underwent cholecystectomy. These lipid profiles include levels of low-density lipoprotein (LDL), triglycerides (TG), high-density lipoprotein (HDL), total cholesterol (TC), and the Chol/HDL ratio. The retrospective study included 55 patients who underwent cholecystectomy between 2013 and 2017. Biochemical parameters, which include LDL, TG, HDL, and TC levels, were collected using the hospital's recording system, in addition to the calculation of the Chol/HDL ratio. Statistically significant changes included a reduction in the mean LDL values in the two-, four-, and six-month

postoperative periods ($P = 0.029, 0.000, \text{ and } 0.008$, respectively), increased mean TG levels one-week postoperatively ($P = 0.034$), decreased mean TC levels at four ($P = 0.049$) and six months ($P = 0.026$) after cholecystectomy, and increased Chol/HDL ratio at two and 12 months postoperatively ($P = 0.03, \text{ and } 0.022$, respectively). From the results, it can be concluded that cholelithiasis is associated with abnormal lipid profiles and that undergoing cholecystectomy may improve them and reduce the future risk of developing coronary artery disease.¹⁴ In the present study, there was a minor reduction in serum HDL-C levels after one week of surgery. Nevertheless, there was a noteworthy elevation in these levels after the passing of one month post-surgery. Conversely, there were no significant distinctions detected in LDL-C and VLDL-C levels both one week and one month after the surgical procedure. Another study by Batajoo H et al, a retrospective study of females who underwent cholecystectomy for gallstone disease was carried out. A total of 133 patients were divided into two age groups ≤ 40 and >40 years. In age group ≤ 40 years, there were 72 cases with no controls, whereas, in >40 years, 61 cases were compared with 67 controls. The serum lipid profile were collected and compared according to the age groups. The groups were compared by using Student's t-test, $p < 0.05$ was considered statistically significant. In age group >40 years serum LDL of gallstone patients were statistically significantly raised ($P < 0.05$) (95% CI -22.077; -850) compared with controls and serum total cholesterol and triglycerides were not statistically significantly high ($P > 0.05$). Serum HDL and VLDL were lower in gallstone patients but not statistically significant ($P > 0.05$) compared to control group. The study showed that serum LDL level was statistically significant in females >40 years of age, whereas other parameters were not statistically significantly different.¹⁵ Jindal N et al, total of 71 patients with gallstone (Group A) and 96 without gallstone (Group B) were studied prospectively. Patients in both groups were investigated for GSD. Total cholesterol (TC), triglycerides (TG), high density lipoprotein cholesterol (HDL-c), low density lipoprotein cholesterol (LDL-c), atherogenic index (AI) and fasting glucose (FG) levels were estimated in both groups pre-operatively. Further, same parameters were studied in Group A post-operatively at 1 week and 1 month intervals. The serum levels of TC, TGs, LDL-c, AI and FG were found to be higher and levels of serum HDL-c were lower in gallstone patients than that of the control group, though not statistically significant. In patients with gallstone, significant decrease in TC, LDL-c, TG, AI and increase in HDL-c levels were observed post-cholecystectomy at both intervals. Post-operatively, rise in serum glucose levels at 1 week interval and decrease at 1 month interval were noticed in patients with GSD. GSD is associated with abnormal lipid profile and serum

glucose. Cholecystectomy leads to a significant decrease in these parameters except HDL-c in patients with GSD. The presence of gall stones should be perceived in the context of metabolic disorder, which may be investigated and treated. Asymptomatic gallstone patients may also be treated surgically resulting in improvement of above mentioned biochemical parameters.¹⁶ Gill GS et al, conducted study on 50 patients with gallstones and 30 healthy volunteers for comparison of lipid levels. Subsequently, cholecystectomy was conducted on patients with gallstones and pre- and post-operative lipid levels were compared. There was a significant decrease in total cholesterol, and triglycerides levels and increase in high-density lipoprotein levels after 1 month of surgery, while low-density lipoprotein levels and very low-density lipoprotein were not statistically changed. Cholecystectomy can significantly improve lipid levels in patients with gallstones.¹⁷ Channa NA et al.¹⁸ and described that the serum cholesterol levels were not statistically significant in the gallstones patients as compared to the control group. Similar results were also demonstrated by Öner C et al.¹⁹ in their study. In contrast to the above results, Al-Saadi N et al.²⁰ found that the serum cholesterol levels were significantly elevated in the gallstones patients as compared to the control group. Although the saturation of bile with cholesterol has definite role in pathogenesis of gallstones but association of gallstones and high level of serum cholesterol levels in patients is controversial in literature and can be explained by multiple factors like genetics, geographical, social and dietary habits in pathogenesis of different type of gallstones.

Conclusion

Gallstone patients undergoing cholecystectomy experience a substantial improvement in lipid levels.

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