

Serum Lipid Profile in Pre and Post Cholecystectomy Patients

KULDIP SINGH AHI, RAJINDER PAL SINGH, HARPREET KAUR, ASHISH MOUDGIL

ABSTRACT

Introduction: Gall stones are common in western world with an incidence of 1.4 per 100 person per year. Based on evidence more than 50% of patients with gallstones have some sort of lipid disorder. Cholecystectomy causes redistribution of bile acid pool in the entero-hepatic circulation and increases the frequency of cycling cause reduction in pool size thus exerting effect on lipid profile decreasing total cholesterol and LDL cholesterol levels.

Aim: Evaluating lipid profile of patients with gall stone pre- and post operatively on 7th day and one month and to establish the effect of cholecystectomy on lipid profile.

Materials and Methods: This prospective observational study included 60 patients of gall stones admitted to Surgery Department of Rajindra Hospital Patiala from July 2014 to June 2016 and who underwent cholecystectomy. The lipid profile was evaluated pre-operatively on the day of operation and post operatively on 7th day and one month after.

Results: The total serum lipid pre-operatively was mean value of 553.47 ± 140.86 mg% which increased to

562.58 ± 103.17 mg% on the 7th day and then decreased to 518.53 ± 86.76 mg% one month post-operatively. Serum triglycerides level increased initially to 159.47 ± 43.32 mg% on 7th day and then decreased significantly from mean value of 143.63 ± 69.05 mg% to 139.60 ± 60 mg% one month post-operatively. There was significant decrease in total serum cholesterol from pre-operative mean value of 193.17 ± 58.84 mg% to 186.3 ± 56.71 mg% on 7th day and further decreased to 166.95 ± 48.08 mg% one month post-operatively. Total serum LDL cholesterol level decreased significantly from pre-operative mean value of 153.90 ± 43.44 mg% to 132.08 ± 36.93 mg% on 7th day and decreased further to 117.52 ± 29.00 mg% one month post operatively. The serum HDL cholesterol level increased significantly from pre-operative level of 41.35 ± 5.4 mg% to 43.27 ± 6.3 mg% on 7th day and further to 54.10 ± 8.5 mg% one month post-operatively. Majority of patients had mixed type of gall stones.

Conclusion: Total serum lipids, serum cholesterol, serum LDL cholesterol and serum triglycerides levels decrease and serum HDL cholesterol increase after cholecystectomy.

Keywords: Biliary calculi, Cholesterol, Triglycerides

INTRODUCTION

Gall stones 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 [2]. Cholesterol stones contains 51% to 99% of pure cholesterol and mixed stones have cholesterol plus calcium salts, bile acids, phospholipids and bile pigments [3]. About 70% to 80% gall stones are mixed stones. Pure cholesterol stones are rare (<10%). Pigment stones contains less than 30% of cholesterol and classified as black or brown [4,5].

The process of gall stone formation is complex. Major factors that govern stone formation are: supersaturation of bile secreted, concentration of bile inside the gall bladder, crystal

nucleation and abnormal gall bladder emptying [6]. Females are 2-3 times more prone for gall stones than males invariably due to role of sex steroids and pregnancy also increasing risk for gall stone formation, with more risk associated with number of pregnancies. Oestrogen/oral contraceptives can increase secretion of cholesterol and decrease bile acids rendering super saturation of bile and increased lithogenicity [7].

Cholesterol super saturation of bile is most significant factor [8]. Cholesterol is insoluble in water, it is secreted from the canalicular membrane in unilamellar phospholipid vesicle. Cholesterol solubility in bile requires sufficient bile salt and phospholipid (predominantly phosphatidylcholine (lecithin)). If there is excess cholesterol or reduced phospholipids and/or bile acid, multi lamellar vesicles form causing nucleation

of cholesterol crystals which leads to stone formation. The secretion of cholesterol supersaturated lithogenic bile, bile acids pool, concentration and the type of phospholipids favoring cholesterol precipitation, gallbladder dysmotility aiding aggregation of cholesterol crystals and delayed large bowel transit times favoring reabsorption of deoxy-cholic acid, resection of ileum depleting the acid pool have all been implicated in gallstone formation [9].

Based on evidence more than 50% of patients with gallstones have some sort of lipid disorder [10]. Hyperlipidemia is generally characterized by high serum levels of total cholesterol, triglycerides, Low Density Lipoprotein (LDL), and low levels of High Density Lipoprotein (HDL). Gall stone association has been most consistently found with high levels of triglycerides and low HDL whereas, it is inconsistent with LDL and total cholesterol levels [11]. Gall bladder disease is more common in patients with hyperlipidemia Type IV [12]. An abnormality in lipid metabolism may arise from a combination of various factors such as high caloric diet, obesity, diabetes, medications (e.g., oral contraceptives) and genetic factors.

The metabolic factors are related with solubility of cholesterol in bile acids. The bile acids are produced in liver from cholesterol itself. The normal ratio of bile acid to cholesterol is 25:1 and the critical level of precipitation is 13:1. The concentration of bile salts in bile is reduced by factors which interrupt their normal enterohepatic circulation e.g., ileal disease, resection or gastric bypass surgery or biliary fistulas [13]. These diseases are associated with increased incidence of gall stones.

AIM

The aim of the present study was to evaluate the lipid profile of patients with gall stone pre and post-operatively and to establish the effect of cholecystectomy on lipid profile, 7 days and one month post cholecystectomy and also evaluating the correlation between the type of the stones and serum lipid profile.

MATERIALS AND METHODS

The present prospective observational study included 60 patients of gall stones disease admitted to the Department of Surgery at Rajindra Hospital, Government Medical College, Patiala, India from July 2014 to June 2016 who underwent cholecystectomy. Patients were evaluated and their complete biodata was recorded after taking detailed history. The diagnosis was based on the basis of clinical picture, supported by ultrasonography and confirmed pre-operatively. Informed consent was taken prior to the study. Approval for study was taken from the ethical committee of the hospital.

The patients suffering from the condition which are known to alter the lipid levels e.g., diabetes mellitus, renal failure, hypothyroidism, nephritic syndrome were excluded from

the study.

Complete lipid profile (which included total serum lipids serum cholesterol serum triglycerides HDL cholesterol, LDL cholesterol) was evaluated pre-operatively (on the day of operation) and post-operatively (on 7th day and after one month).

For lipid profile 10 ml blood sample was taken on the day of surgery (in the morning), and on 7th day and then after one month of cholecystectomy.

The gall stones were analyzed for the chemical nature of the stones and correlation was done between the type of the stone and serum lipid levels both pre-operatively and post-operatively.

RESULTS

Age Distribution: The age of the patients ranged from 10 years to 60 years with majority (35%) in the fourth decade followed by third and fifth decade i.e. 21.7% each. 18.3% patients were in the sixth decade and 3.3% were below 20 years. Out of total, 52 were female patients and 8 male patients. The 68% patients were having 2-4 children (68%), followed by patients having 0-1 children (28.3%).

Symptoms and Signs: 55 patients (91.7%) presented with history of pain in the right hypochondrium. Next common symptom was nausea and vomiting present in 55% cases followed by dyspepsia in 23 patients (38.3%). Murphy's sign was positive in 57 patients.

Lipid Profile

Serum Total Lipids: Pre-operatively the total serum lipids level ranged from 378-814 mg% (mean-553.47±140.86 mg%). Post-operatively on the 7th day, the total serum lipid level ranged from 410-780 mg% (mean-562.58±103.17 mg%). One month after cholecystectomy, the total serum lipid level ranged from 385 – 704 mg% (mean-518.53±86.76 mg%). There was significant rise in total lipid post-operatively on 7th day. But after 1 month of surgery, there was significant decline in the level of total serum lipids compared with total lipid level pre-operatively [Table/Fig-1,2].

Total Serum Cholesterol

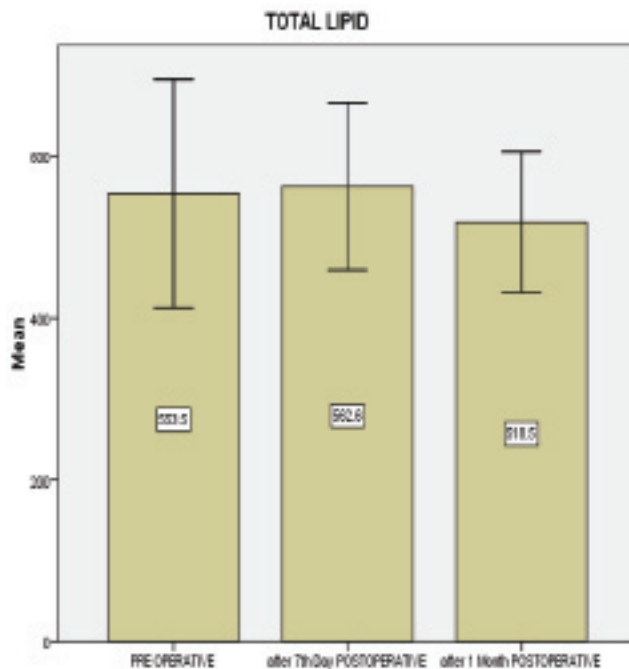
Pre-operatively the total serum cholesterol level ranges from 111-298 mg% with mean value of 193.17±58.84 mg%. Post-operatively on the 7th day, the total serum cholesterol level ranged from 110-280 mg% with mean value of 186.3±56.71 mg%.

One month after cholecystectomy, the total serum cholesterol level ranged from 104 – 246 mg% with mean value of 166.95±48.08 mg%.

There was significant decrease in the levels of total serum cholesterol levels, pre and post-operatively. This decrease is

Time of Sampling	Pre-operative (Mean in mg%)	7 th Day Post-operative (Mean in mg%)	1 Month Post-operative (Mean in mg%)
Type of Lipid			
Total Serum Lipid	553.47±140.86	562.6±103.17	518.53 ±86.76
Total Serum Cholesterol	193.2± 58.84	186.3±56.71	167.± 48.08
Total Serum HDL Cholesterol	41.35±5.4	43.27±6.3	54.10 ±8.5
Total Serum LDL Cholesterol	153.90±43.44	132.08±36.93	117.52±29.00
Total Serum Triglyceride	143.63±69.05	159.47±43.32	139.60±60

[Table/Fig-1]: Serum total lipid profile (mg%) in patients with gall stones pre-operatively, 7th and 1 month post-operatively.

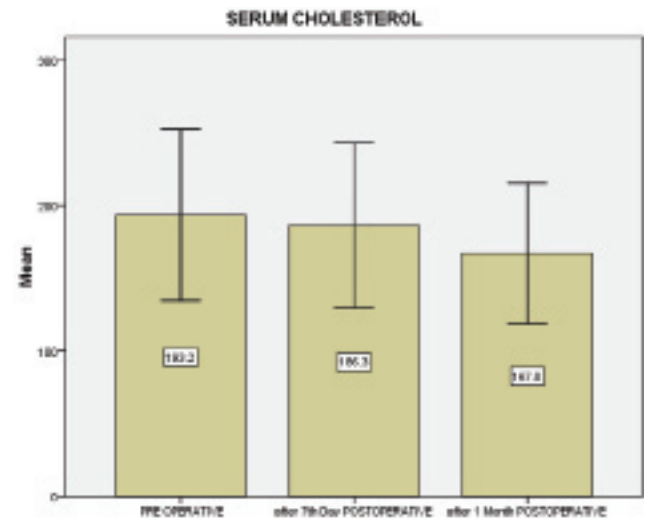


[Table/Fig-2]: Comparison of total lipids of patients in the study. (pre and post cholecystectomy).

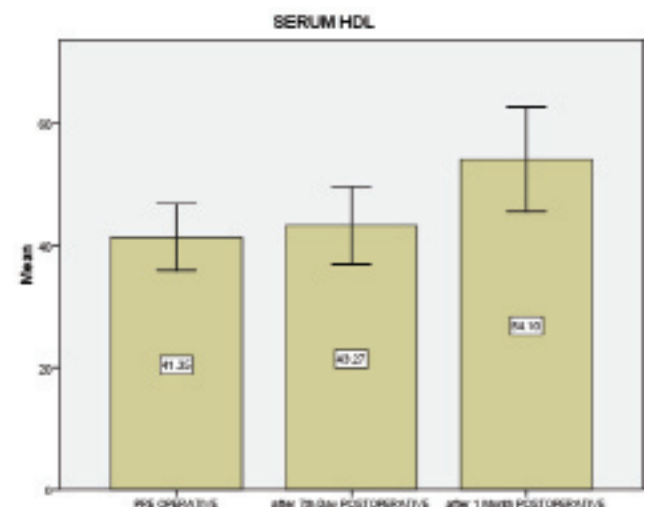
more after one month post-operatively as compared to the 7th post-operative day [Table/Fig-1,3].

Serum HDL Cholesterol

Serum HDL cholesterol pre-operatively the serum HDL cholesterol level ranged from 31-55 mg% with mean value of 41.35±5.4 mg%. Post-operatively on the 7th day, the serum HDL cholesterol level ranged from 32-58 mg% with mean value of 43.27±6.3 mg%. One month after cholecystectomy, the serum HDL cholesterol level ranged from 40-76 mg% with mean value of 54.10±8.5 mg%. The p-value is 0.0001 showing significant increase in level of HDL cholesterol on 7th



[Table/Fig-3]: Comparison of serum cholesterol levels in patients of the present study (pre and post operatively).



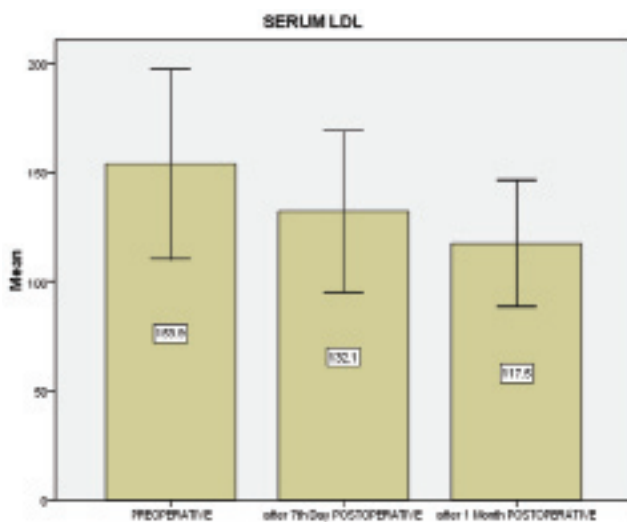
[Table/Fig-4]: Comparison of serum levels of HDL cholesterol levels in patients of gall stones pre and post operatively.

post-operative day and one month pre-operative [Table/Fig-1,4].

Serum LDL Cholesterol

Pre-operatively the total serum LDL cholesterol level ranged from 76-286 mg% with mean value of 153.90±43.44 mg%. Post-operatively on the 7th day, the total serum LDL cholesterol level ranged from 70-192 mg% with mean value of 132.08±36.93 mg%. One month after cholecystectomy, the total serum LDL cholesterol level ranged from 57-156 mg% with mean value of 117.52±29 mg%.

There is decrease in the levels of LDL cholesterol on the 7th post-operative day and one month post-operatively.



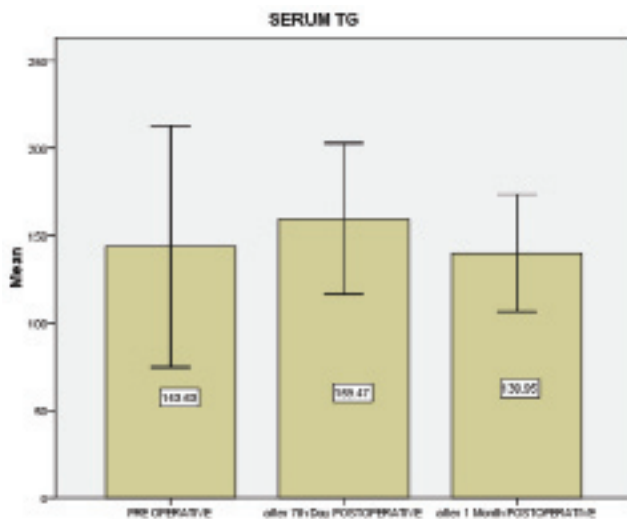
[Table/Fig-5]: Comparison of serum LDL-cholesterol level in patients of study (pre and post-operative).

This decrease is more after one month post-operatively as compared to the 7th post-operative day [Table/Fig-1,5].

Serum Triglycerides

Pre-operatively the total serum triglycerides level ranges from 44-265 mg% with mean value of 143.63 ± 69.05 mg%. Post-operatively on the 7th day, the total serum triglycerides level ranged from 70-255 mg% with mean value of 159.47 ± 43.32 mg%.

One month after cholecystectomy, the total serum triglycerides level ranged from 76–209 mg% with mean value of 139.60 ± 60 mg%. There was increase in the levels of serum TG on 7th post-operative day as compared with pre-operative level. But after one month there is significant decrease in serum TG levels [Table/Fig-1,6].



[Table/Fig-6]: Comparison of serum TG levels in the study (pre and post operatively).

Gall Stones

After cholecystectomy, the gall bladder was divided longitudinally and gall stones removed. Total 44 patients i.e., 73.3% had multiple stones in gall bladder. Sixteen patients i.e., 26.2% had single stone.

Physical Appearance

In 11 cases (18.3%) the stones were large >2cm diameter and rounded and yellow in colour. In 42 cases (70%) cases stones were multifaceted ranging from pale yellow to dark brown in colour. In seven cases (11.7%) cases, the stones were irregular in shape.

Chemical Composition

In 16 cases (26.7%) cases, the stones were pure cholesterol stones. In 3 cases (5%) the stones were pigment type. In remaining 41 cases (68.3%) the stones were of mixed type gall stones.

DISCUSSION

The maximum incidence of gall stone disease was noted in 31-40 years of age. Although, a fatty, fertile female of fifty, is the classical sufferer, the decrease in the maximum incidence of age group may be due to better diagnostic procedures and early reporting by the patients. The percentage of female patients in this study is in concordance with the studies done Pardhan SB et al., [14], Jindal N et al., [15] and Gaharwar A [16].

There is a close relationship between parity and cholelithiasis suggested in literature. This was in agreement regarding parity of patients in this study.

Bernstein RA et al., [17] and Murrayet FE et al., [18] also studied that parity increases the risk of gallstone disease.

Lipid Profile

The existence of relationship between gall stones and serum lipids is an old assumption based on fact that the majority of the gallstones contain cholesterol as one of the constituents.

None of the patients in the study group had serum total lipid above the upper limit of 900 mg%. Therefore, biochemical hyperlipidemia is an uncommon finding in the patients of cholelithiasis.

The present study showed that total serum lipid level increased on 7th post-operative day and there is significant decrease in total serum lipid level one month after surgery. Similar results have been found in literature where serum levels decreased post cholecystectomy.

Total Serum Cholesterol

Sixteen patients had mild hypercholesterolemia (levels >250 mg%) and 17 patients had serum cholesterol level less than lower limit of 150 mg%. In this study there is significant decrease in the level of total cholesterol post-operatively on

	Jindal N et al., [7]			Al-Kataan MAG et al., [19]		
	Pre-operative	7 th Day Post-operatively	1 Month Post-operatively	Pre-operative	7 th Day Post-operatively	1 Month Post-operatively
Total Serum Cholesterol	153.28±25.69	128.32±23.52	106.81±18.85	6.388±0.98	6.19±0.82	6.14±0.56
Total HDL Cholesterol	49.53±8.75	51.56±7.68	58.57±7.61	0.91±0.15	0.92±0.15	0.95±0.13
Total LDL Cholesterol	105.94±20.44	94.7±18.55	78.66±12.39	4.66±1.07	4.43±0.86	4.36±0.86
Total Triglycerides	142.67±92.73	125.08±47.28	85.16±25.53	1.94±0.78	1.97±0.52	1.82±0.42

[Table/Fig-7]: Comparative studies showing serum total lipid profile (mg%) in patients with gall stones pre-operatively, 7th and 1 month post-operatively.

the 7th day and which further decrease after one month post-operatively.

This is in accordance with the study conducted by Al-Kataan MAG et al., [19], Jindal N et al., [15] and Pettiti BD et al., [20]. In which they found that the total serum cholesterol levels in post cholecystectomy patients are lower than pre-operative levels [Table/Fig-7].

Roda E et al., evaluated that the lowering of cholesterol in post cholecystectomy period due to a more rapid circulation of the bile acid pool in fasting cholecystectomised patients leading to improved solubility of cholesterol in bile [21].

Serum HDL Cholesterol

None of the patients had serum HDL cholesterol levels above the normal limit of 75 mg% but 13 patients had serum HDL-cholesterol levels below the normal limit of 38 mg%.

In resonance with this study, Al-Kataan MAG et al., [19] and Jindal N et al., [15], also reported the significant increase (p-value 0.0001) in HDL-C in gallstone patients after cholecystectomy in both intervals when compared with the pre-operative levels. [Table/Fig-7].

Serum LDL Cholesterol Levels

Thirty three patients had serum LDL cholesterol levels more than upper limit of 153 mg %. But 14 patients had serum LDL cholesterol levels lower than the lower limit of 114 mg%.

Post cholecystectomy significant decrease in levels of LDL has also been inferred in literature in the studies conducted by Jindal N et al., [15], Pettiti DB et al., [20], Al-Kataan MAG et al., [19] [Table/Fig-7].

Serum Triglycerides Levels

Twenty patients in the study group had serum triglycerides levels higher than normal limit of 180 mg% pre-operatively. None of the patients had serum triglycerides levels below the lower limit of 30 mg%.

In study by Jindal N et al., there was continuous decrease in the levels of serum TGs on 7th post-operative day and one month after surgery. Study conducted by Al Kataan MAG et al., [19] showed that serum TGs levels increased on 7th day post-operatively. But decreased significantly after one month similar to our study [Table/Fig-7].

Stone Analysis

Pradhan SB et al., [14] reported 78.75% of gallstones as mixed stones followed by 12.5% cholesterol stones and 1.25% pigment stones. Saqib A et al., [22] also reported mixed type gallstones in 55.07% patients, cholesterol gallstones in 28.99% and pigmented gallstones in 15.94% patients. In concordance with literature we evaluated that mixed stones are most common type of gall stones and pure cholesterol stones follows next.

In a study conducted by ROME Group for epidemiology and prevention of cholelithiasis mean serum triglycerides were higher and serum cholesterol and LDL were decreased in both men and women with gall stone [23].

It is suggested that the source of biliary cholesterol in man is serum cholesterol chiefly HDL and free cholesterol [20]. Cholecystectomy causes redistribution of bile acid pool in the entero hepatic circulation and increases the frequency of cycling. This exert negative feedback on bile acid synthesis and cause reduction in pool size and hence exerts effect on lipid profile decreasing total cholesterol and LDL cholesterol levels [24].

CONCLUSION

This study was conducted on 60 diagnosed case of cholelithiasis. We studied the lipid profile of these patients pre-operatively and on 7th day and one month after cholecystectomy. Maximum incidence of gallstone disease in our study was found to be in 31-40 years of age group, with female:male ratio of 6.5:1. None of the patients in the study had biochemical hyperlipidemia, pre-operatively. The total serum lipid and serum triglycerides level increased on 7th post-operative day but decreased significantly one month after cholecystectomy.

In majority of the patients the pre-operative levels of total serum cholesterol were within normal range. There was significant decrease in total serum cholesterol and total serum LDL cholesterol 7th day post-operatively which decreased further after one month.

The serum HDL cholesterol level increased significantly on the 7th day post-operatively. There was further rise in the level one month after cholecystectomy.

Majority of patients had mixed type of gall stones.

From this study, it can be concluded, that serum total lipids, serum cholesterol. Serum LDL cholesterol and serum triglycerides levels decrease and serum HDL cholesterol increase after cholecystectomy. These result can be explained by fact that when significant increase in bile acids and phospholipids secretion rate after cholecystectomy occurs, that can lead to a definitive improvement in bile composition and a significant reduction in bile acid pool after operation that may occur due to rapid cycling around the entero hepatic circulation, leading to a significant reduction in total serum cholesterol. This can be accounted to fact that total cholesterol is the precursor to bile acids so this reduction in the bile acids pool leads to a significant reduction in total cholesterol after cholecystectomy.

As follow-up period was short, hence the long duration effect of these changes on lipid profile in these patients could not be judged. So further studies are required for long period follow-up.

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