Original Article

Pattern of Lipid Profile in Patients with Cholelithiasis

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Abstract

Background: Cholelithiasis is one of the most common surgical problem and gastrointestinal diseases throughout the world but its pathogenesis remains unclear. Lipid in the blood play a key role in the aetiology of cholelithiasis. Especially in cholesterol gallstones formation blood lipids are altered which is suggestive of metabolic syndrome. Multiple studies have shown that there is an association between gallstones and abnormal lipids. There is no previous study to explore the pattern of lipid profile in patients with cholelithiasis in Bangladesh. The aim of this study was to evaluate the pattern of lipid profile in patients with cholelithiasis.

Methods: This cross sectional study was carried out on patients based on clinical and imaging features confirming symptomatic cholelithiasis patients. In this study 100 confirmed patients of cholelithiasis aged 30 to 70 years of both male & female were included as cases & 100 age & sex matched healthy subjects were included as controls. Serum total cholesterol, HDL-cholesterol & serum triglycerides level were estimated by enzymatic method. Serum LDL-cholesterol was calculated by Fried walds formula. The groups were compared by using Student's t-test, $p<0.05$ was considered statistically significant.

Results: There was a significant increase in serum total cholesterol, LDL- cholesterol, serum triglycerides and a significant decrease in HDL -cholesterol in cholelithiasis patients as compared to control subjects.

Conclusion: The study showed that elevated serum total cholesterol, LDL- cholesterol, serum triglycerides and decreased levels of HDL- cholesterol were present in patients with cholelithiasis.

Keywords: Cholelithiasis, Cholecystectomy, Lipid profile.

Introduction

Cholelithiasis is one of the most common gastrointestinal disorders, prevalent in about 10-15% of adults in the developed countries.[1] Most of the patients with this disease are asymptomatic.[2] Approximately 1-2% of asymptomatic patients will develop symptoms requiring cholecystectomy per year, making cholecy stectomy one of the most common operation performed by general surgeons.[3]

The risk factors for the development of cholelithiasis include repeated pregnancy, use of contraceptive pills, a family history of gall stones, serum lipids, dietary factors, chronic liver disease and possibly major abdominal surgery.[4] Cholelithiasis has been reported recently among female with advancing of age.[5] Age, gender, race, obesity, diabetes, dietary factors and parity have all been identified as significant risk factors for the development of gallstones.[6]

The role of serum lipids in the aetiology of cholelithiasis is very important and in cholesterol gallstones serum lipids are altered which is suggestive of metabolic syndrome.[7] The pathogenesis of cholesterol gallstones is known to be multifactorial with the key factors including cholesterol supersaturated bile, nucleation and growth of cholesterol monohydrate crystals and altered biliary motility.[8] The movement of cholesterol from the liver into the bile must be accompanied by the simultaneous secretion of phospholipid and bile salts. If this dual process is disrupted and more cholesterol enters the bile than can be solubilised by bile salts and lecithin present, the cholesterol may precipitate in the gall bladder, initiating the occurrence of cholesterol gallstone disease.[9] Of all gallstones found during cholecystectomy, cholesterol gallstones account for 80-90%.[10] Cholesterol gallstones are primarily made up of cholesterol crystals (70%) which are held together in an organic matrix of

glycoproteins, calcium salts, and bile pigments. They could be present either singly or multiply, in various sizes, shapes and surfaces.[11]

Patients of renal stones are most often evaluated for any underlying metabolic disorder but the same is not an established practice in gall stone patients. Evidence from 30 years ago show that about half of patients with gallstones will have an abnormal lipid profile. This would increase their risk of coronary artery disease and stroke.[12] Multiple studies have shown an association between gallstones and abnormal lipids. There is no previous study to explore the pattern of lipid profile in patients with cholelithiasis in Bangladesh. The aim of this study was to evaluate the pattern of lipid profile in patients with cholelithiasis & thereby determine the role of lipid abnormalities in pathogenesis of cholelithiasis.

Materials & Methods

This cross sectional study was carried out on patients with clinical and imaging features confirming symptomatic cholelithiasis admitted to Barakah General Hospital & Department of Surgery, Dhaka National Medical College from January 2015 to December 2015. A total number of 100 patients were included in this study, among which 76 were female and 24 were male in age group of 30-70 years. These were compared with 100 age and sex matched healthy controls. The patients with liver cirrhosis, viral hepatitis, renal failure, nephrotic syndrome, thyroid disease, asthma, diabetes mellitus, pancreatitis, gallbladder cancer & those taking antihyperlipidemic drugs were not included in this study.

5 ml of fasting venous blood was withdrawn aseptically from antecubital vein and collected into sterile test tube with prior informed consent from patients & control subjects. Serum total cholesterol, HDL-cholesterol & serum triglycerides level were estiimated by enzymatic method.[13] LDL-cholesterol was calculated by Fried walds formula.[14] Data were processed and analyzed by using computer software SPSS (Statistical Package for Social Sciences), Version-16. Quantitative data were expressed as mean±SD. Values of the different parameters were compared to see the difference between two groups by using student's t-test. $p<0.05$ was considered as significant and $p>0.05$ was taken as non significant. 95% confidence limit was taken as the level of significance.

Results

Table-I: Serum total cholesterol (mg/dl) in study subjects

Groups	Serum total cholesterol (mg/dl)			P value
	Mean	SD	*t*	
Case	220.19	9.22	24.72	0.0001
Control	190.75	7.52		

Table: I shows mean serum total cholesterol was (220.19 ± 9.22) mg/dl in case and it was (190.75 ± 7.52) mg/dl in control. A statistically significant mean difference was found, indicating case had higher serum total cholesterol than control.

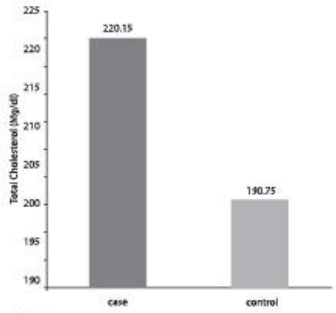

Fig I: Serum total cholesterol (mg/dl) in study subject

Table-II: Serum triglycerides (mg/dl) in study subjects

Groups	Serum triglycerides (mg/dl)			P value
	Mean	SD	*t*	
Case	193.15	6.33	59.79	0.0001
Control	147.02	4.40		

Table: II shows mean serum triglyceride was (193.15 ± 6.33) mg/dl in case and it was (147.02 ± 4.40) mg/dl in control. A statistically significant mean difference was found, indicating case had higher serum triglyceride than control.

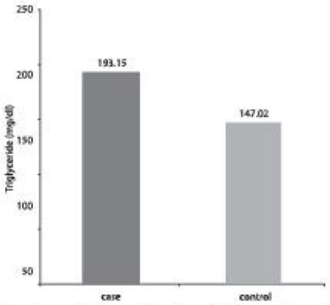

Fig II: Serum triglycerides (mg/dl) in study subjects

Table-III: Serum HDL-cholesterol (mg/dl) in study subjects

Groups	Serum HDL-cholesterol (mg/dl)			P value
	Mean	SD	*t*	
Case	37.13	2.27	-21.88	0.0001
Control	48.08	4.45		

Table: III shows mean serum HDL-cholesterol was (37.13 ± 2.27) mg/dl in case and it was (48.08 ± 4.45) mg/dl in control. A statistically significant mean difference was found, indicating case had lower serum HDL-cholesterol than control.

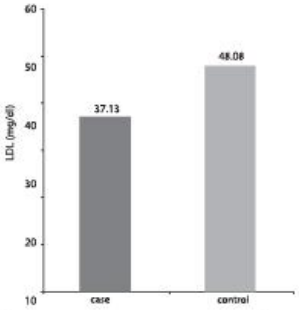

Fig III: Serum HDL-cholesterol (mg/dl) in study subjects

Table-IV: Serum LDL-cholesterol (mg/dl) in study subjects

Groups	Serum LDL-cholesterol (mg/dl)			P value
	Mean	SD	*t*	
Case	158.06	4.92	48.29	0.0001
Control	126.46	4.30		

Table: IV shows mean serum LDL-cholesterol was (158.06 ± 4.92) mg/dl in case and it was (126.46 ± 4.30) mg/dl in control. A statistically significant mean difference was found, indicating case had higher serum LDL-cholesterol than control

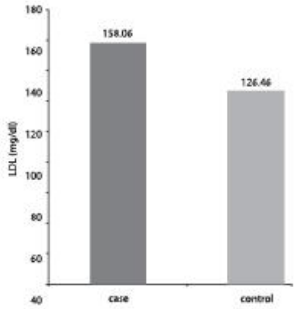

Fig IV: Serum LDL-cholesterol (mg/dl) in study subjects

Discussion

Cholelithiasis is one of the commonest surgical problems and one of the most common gastrointestinal diseases throughout the world but its pathogenesis remains unclear. Many theories have been proposed forward to explain the mechanism of stone formation. It is not fully clear that symptomatic gallstone disease is associated with a specific pattern of some biochemical abnormalities like lipid profile.[15]

Bile is the only significant pathway for elimination of excess cholesterol from the body, either as free cholesterol or as bile salts. Cholesterol is water insoluble and is rendered water soluble by aggregation with bile salts and lecithin co secreted into bile. When cholesterol concentration exceeds the solubilising capacity of bile, cholesterol can no longer remain dispersed and nucleates into the solid cholesterol monohydrate crystals. Three conditions must therefore be met to permit the formation of cholesterol gallstones: (i) Bile must be supersaturated with cholesterol, (ii) Nucleation must be kinetically favorable, (iii) Cholesterol crystals must remain in the gall bladder long enough to aggregate into stones. Nucleation is promoted by micro precipitated of inorganic or organic calcium salts, serving as nucleation sites for cholesterol stones. Gall bladder stasis plays a key role in permitting stone formation and growth. As bile becomes more concentrated during storage in gall bladder, cholesterol saturation of bile also may further increase. Since around half of the patients of cholelithiasis have abnormal lipid profile this would increase the incidence of coronary artery disease and stroke. Recent European studies have shown that hypertriglyceridaemia, hypercholesterolemia and low level of high density lipoprotein cholesterol (HDL) a common finding in patients with cholelithiasis.[12]

The present study was conducted to evaluate the pattern of lipid profile in patients with cholelithiasis. A total number of 100 diagnosed cases of cholelithiasis patients were included in this study. Among them 76 were female and 24 were male in age group of 30-70 years. These were compared with 100 age and sex matched healthy controls.

Virupaksha HS et al[16], Channa NA et al, found that lipids elevation in cholelithiasis, seems to play a major contributing role in the pathogenesis of gallstones in females of up to 45 years age.[17] The elevation of serum total cholesterol and TG levels in patients may be due to: Gallstone patients have abnormal secretory mechanism for bile acids and phospholipids, decrease bile acids and phospholipids (which solubilize cholesterol in the bile)

will increase cholesterol precipitation[18] and some of gallstone patients may present with metabolic syndrome which is a cluster of symptoms such as glucose intolerance, high total cholesterol, hyperinsulinemia, increased VLDL and/or total cholesterol, decrease HDL and hypertension who indicate that the metabolic syndrome is one of the risk factors for gallstone disease.[19]

In the present study, the mean serum total cholesterol was (220.19 ± 9.22) mg/dl in case and it was (190.75 ± 7.52) mg/dl in control. A statistically significant mean difference was found, indicating cholelithiasis patients had higher serum total cholesterol than control. This result agrees with results of the study of Dwivedi S et al[20], Naseem AC et al[21] & Rajaa NA et al.[22] The positive association between total cholesterol and cholelithiasis or gallstone disease had been seen not only in females but also in males.[23] One of the case-control studies reported lower concentrations for total cholesterol in gallstone patients than in control subjects in both genders separately[24] or collectively.[25] Population studies based on gallbladder screening had reported a positive relation,[26] an inverse relation[27] or no relation between total cholesterol and gallstone disease in both genders combined.[28] Some similar studies had found an inverse association with prevalent gallstones in females[29] but not in males.[30]

The mean serum triglyceride was (193.15 ± 6.33) mg/dl in case and it was (147.02 ± 4.40) mg/dl in control in present study. A statistically significant mean difference was found, indicating cholelithiasis patient had higher serum triglyceride than control. Some investigators reported a positive association between gallstone and serum triacylglycerol levels[27,28] whereas, others found no such association[29,30] Naseem AC et al[21] showed that positive association between gallstone disease and serum cholesterol and triacylglycerol levels.

In the present study, the mean serum HDL-cholesterol was (37.13 ± 2.27) mg/dl in case and it was (48.08 ± 4.45) mg/dl in control. A statistically significant mean difference was found, indicating cholelithiasis patients had lower serum HDL-cholesterol than control. Several epidemiologic studies have linked that the high serum triglyceride and low HDL-cholesterol due to increased activity of 3-hydroxy-3-methyl glutaryl-CoA reductase associated with gallstone formation.[31] Lower HDL-cholesterol increases biliary cholesterol secretion there by raising the level of cholesterol precipitation and gallstone formation.[32] Chen et al, found a positive association between gallstone disease and decreased HDL- cholesterol levels.[33]

The present study showed that the mean serum LDL-cholesterol was (158.06 ± 4.92) mg/dl in case and it was (126.46 ± 4.30) mg/dl in control. A statistically significant mean difference was found, indicating cholelithiasis patients had higher serum LDL-cholesterol than control. Pettiti D.B et.al,[34] Carl, Thijs and co-workers[35] observed that low serum HDL cholesterol levels and high serum LDL levels in patients with cholelithiasis which is consistent with the present study.

Conclusion

The present study demonstrates that elevated serum total cholesterol, LDL cholesterol, serum triglycerides and decreased levels of HDL cholesterol were present in patients with cholelithiasis. Considering the role of this altered lipid profile in pathogenesis of coronary artery disease, it would be prudent to screen all patients with cholelithiasis for dyslipidemia. This might be of value in the prevention & treatment of cholelithiasis.

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