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ORIGINAL ARTICLE

A Study on Serum Lipid Profiles in Patients with Liver Cirrhosis

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ABSTRACT

Background: Liver disease can influence serum lipid levels in a variety of ways. Cirrhosis of liver owing to various causes is frequently accompanied with substantial declines in serum triacylglycerol (TAG) and cholesterol levels due to diminished lipoprotein synthesis ability. Objective: The purpose of the study was to analyze serum lipid profile in patients with liver cirrhosis and compare these levels with lipid status of healthy people.

Method: A cross-sectional analytical study was done from January 2024 to December 2024 at the department of Biochemistry, Shaheed Ziaur Rahman Medical College and Hospital, Bogura. With due consent total 100 cases were selected from department of medicine. Among them, 50 patients were with cirrhosis of liver and 50 were healthy individuals. Serum triacylglycerol (TAG) total cholesterol, HDL-C and LDL-C level were tested for all. Data interpretations were done using software SPSS 2.0.

Result: The study revealed stepwise decrease in serum lipid levels in patients with liver cirrhosis. Serum total cholesterol, Serum triacylglycerol (TAG), Serum HDL & Serum LDL was respectively 139.6±36.9, 117.2±61.5 37.9±20.6 & 37.9±20.6 mg/dl in cases and 165.1±35.3, 158.0±57.3, 41.4±9.8 & 102.5±40.7 mg/dl in healthy controls and, 'P' values were respectively 0.001^{s}, 0.001^{s}, 0.291^{ns} & 0.002^{s}.

Conclusion: According to the study, serum lipid profile declines in patients with liver cirrhosis. So, a routine biochemical evaluation of lipid status is an important step to determine disease prognosis of liver cirrhosis.

Keywords: Cirrhosis, serum lipid profiles, triacylglycerol, cholesterol, risk factors.

INTRODUCTION

Three primary morphologic features of liver cirrhosis are parenchymal nodules with hepatocytes surrounded by fibrosis, disruption of the liver's overall architecture and bridging fibrous septa connecting portal tracts with one another and portal tracts with terminal hepatic veins [1]. The prevalence of liver cirrhosis varies by gender, ethnic group and geographic location. Chronic Liver Disease (CLD) is a leading cause of mortality and morbidity worldwide [2]. Liver disease is expected to be the 12th greatest cause of death in the United States [3]. Liver related mortality is mainly caused by complications of CLD, such as advanced cirrhosis and hepatocellular carcinoma (HCC). Non-alcoholic Fatty Liver Disease (NAFLD)-related cirrhosis appears to be a growing cause of CLD and HCC [4]. Decompensated or unstable liver disease, characterized by ascites, spontaneous bacterial peritonitis, hepatic coma, or variceal hemorrhage due to portal hypertension, affects 2% to 10% of patients with viral hepatitis and approximately 25% of patients with alcoholic liver disease. The degree of cirrhosis is critical to examine since it predicts patient mortality, surgical results, and the likelihood of complications including variceal hemorrhage in men [3]. Established cirrhosis has a 10-year death rate of 34-66%, depending on the cause; alcoholic cirrhosis has a poorer prognosis than

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than primary biliary cirrhosis and cirrhosis owing to hepatitis. The risk of death from all causes is increased twelvefold in alcoholic cirrhosis [5]. Aside from other disorders that induce liver harm, nothing is clearly known about modulators of cirrhosis risk. Recent research suggests that drinking coffee may protect against cirrhosis, particularly alcoholic cirrhosis [6]. There are several alterations in the plasma lipids and lipoproteins of patients with liver disease. The composition of lipoproteins is determined by the activity of the plasma enzyme lecithin cholesterol acyltransferase (LCAT). When LCAT activity is high, plasma lipoproteins functioning are normal; when it is low, lipoprotein functions are compromised. Changes in plasma lipoproteins are linked with changes in the lipid content of the cellular membrane. Cirrhosis of the liver causes a significant deformation in hepatic architecture. Chronic liver illness is typically associated with low levels of triacylglycerol (TAG) and cholesterol due to diminished hepatic biosynthetic capacity [7]. Derangement of blood lipid profile is a typical finding in cirrhotic patients. Given all of these key aspects and perspectives, the purpose and goal of this study is to investigate and assess the serum lipid profile in patients with liver cirrhosis. This study will bridge the gap, create a new venue for discussion, and provide knowledge and information about the medical workup of patients with liver cirrhosis. To the best of our knowledge, there have been few published studies on dyslipidemia in cirrhosis in Bangladesh, however this topic has been extensively studied around the world.

MATERIAL AND METHODS

From January 2024 to December 2024, this cross-sectional study was conducted at Department of Biochemistry, Shaheed Ziaur Rahman Medical College, Bogura, Bangladesh. With due consent total 100 cases were selected from department of medicine. Among them, 50 patients were with cirrhosis of liver and 50 were apparently healthy individuals. Study population was divided into two groups.

Group A: Study subject
Group B: Healthy individuals.

Inclusion criteria:

a) For Study subjects
i. Age group: 30 to 60 years
ii. Sex: Both male and female
iii. Diagnosed case of cirrhosis of liver
Diagnosis was done based on**:** Biochemical evidence
Reduced serum albumin <3.5gm/dl
Prolonged prothrombin time> 12 Seconds.
Radiological evidence (by ultrasound of hepatobiliary system)
Increased liver echo-pattern
Portal vein diameter >1.3 cm
Spleen size >13cm longitudinally
iv. Patients willing to participate in this study.

b) For healthy individuals**:**
i. Age: 30 to 60 years
ii. Sex: Both male and female
iii. Subjects with normal liver function test
iv. No history of any type of hepatitis
v. No history of lipid lowering agent intake.

Exclusion criteria:

i. Age: Below 30 years and above 60 years
ii. Subjects: on lipid lowering agents
iii. H/o dyslipidemia
iv. Any acute illness
v. Subjects suffering from chronic debilitating diseases (Renal failure, COPD Diabetes mellitus, Malignancy, Hepatitis).
vi. Subjects suffering from malnutrition
vii. Pregnancy.

Study Procedure and Design: Patients attending at Department of Medicine, Shaheed Ziaur Rahman Medical College, Bogura who were diagnosed as cirrhosis of liver and admitted for evaluation, were the source of the study. The purposive type sampling technique was applied to collect sample from the study population, as per inclusion and exclusion criteria. Complete clinical evaluation including history, physical examination, relevant laboratory investigations (serum fasting lipid profile, serum bilirubin, serum total protein, serum albumin, AST, ALT, serum alkaline phosphatase, prothrombin time) were done and the measured values were recorded in the data collection sheet.

Data Collection, processing & analysis:

1. The demographic information, relevant history, examination findings, investigation report, serum lipid profile, of all the study subjects were recorded in the data collection sheet.
2. After compilation, the data was presented in the form of tables, figures and graphs as necessary.
3. Statistical analysis of the results was done by using computer-based software, Statistical Package for Social Science (SPSS) (SPSS Inc, Chicago, IL, USA).
4. Qualitative data were expressed as frequency and percentage and were analyzed by Chi-square test (χ^2 test). Quantitative variables were expressed by mean±SD. Values of different parameters were compared to see the difference between two groups using Student's t-test. Different Child-Pugh classes were compared by ANOVA test (F-test). Spearman's correlation was used to correlate serum lipid level with

different CTP classes. A probability 'p' value < 0.05 was considered as statistically significant. 95% confidence limit was taken as the level of significance.

RESULTS

Figure-1 shows the age distribution of the study subjects. Most of the study subjects belonged to age group >40 years. In this group, 36(72.0%) were cases and 30(60.0%) were controlled. Belong to the group 30-40 years, the frequency of case and control were 14(28.0%) and 20(40.0%) respectively. In case group, the mean age was 48.62±9.08 years (Range 30-60 yrs) and in control group, the mean age was 45.30±8.92 years (Range 30-60 yrs).

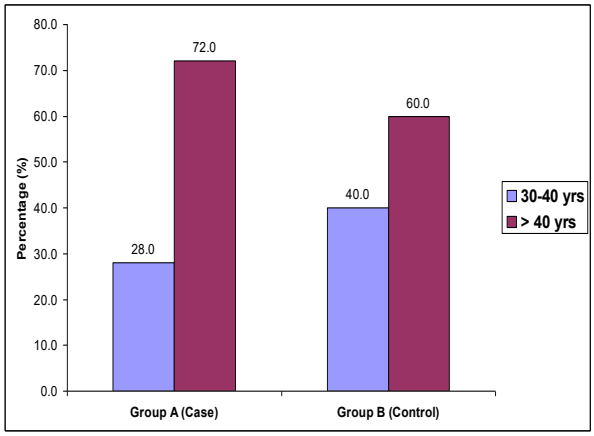


Figure-1: Bar diagram showing age distribution

Table-1 shows there were 41(82.0%) of male and 9(18.0%) of female cirrhotic patients enrolled in this study. In control group 43(86.0%) were male and 7(14.0%) were female. Among the total of 100 study subject's male and female were 84 and 16 accordingly.

Table -1: Distribution of the study subjects by sex (n=100)

Sex	Group A (Case) N (%)	Group B (Control) N(%)	χ^2 & 'P' value
Male	4 1(82.0)	43 (86.0)	0.298
Female	9 (18.0)	7 (14.0)	P=0.585^{ns}
Total	50 (100.0)	50 (100.0)	

In Table-2 the Serum total cholesterol (TC), triacylglycerol (TAG)) and LDL-cholesterol showed significant difference between case and control in which Serum total cholesterol level was 139.6±36.9 in cirrhotic patients and 165.1±35.3 in control group (p=0.001), the Serum triacylglycerol (TAG) level was 117.2±61.5 in cirrhotic patients and 158.0±57.3 in control group (p=0.001), the Serum LDL level was 80.4±25.6 in cirrhotic patients and 102.5±40.7 in control group (p=0.002). The Serum HDL level was 37.9±20.6 in cirrhotic patients and 41.4±9.8 in control group and did not show statistically significant difference between case and control (p=0.291).

Table-2: Comparison of lipid profile in two study groups

Lipid profile	Group A (Case) (n=50) No. (%)	Group B (Control) (n=50) No. (%)	P value
Serum total cholesterol (mg/dl)	139.6±36.9	165.1±35.3	0.001^{s}
Serum triacylglycerol (TAG) (mg/dl)	117.2±61.5	158.0±57.3	0.001 ^{s}
Serum HDL (mg/dl)	37.9±20.6	41.4±9.8	0.291^{ns}
Serum LDL (mg/dl)	37.9±20.6	102.5±40.7	0.002 ^{s}

Table-3 displays comparison of lipid profile in Child Turcotto-Pugh classification by Serum albumin for cirrhosis of liver. Here Serum LDL-C and TAG showed statistically significant difference among the study subjects and the level were, 93.83±34.07 (p=0.001) for LDL-C and 122.17±41.39 (p=0.04) for TAG. The Serum TC and HDL-C did not show statistically significant difference among the study subjects in which the Serum total cholesterol level was 145.67±36.31 (p=0.14) and the Serum HDL-C level was 33.33±12.11 (p=0.56).

Table-3: Comparison of lipid profile in Child Turcotto-Pugh classification by serum albumin g/dL for cirrhosis liver in Group A (n=50)

Lipid profile	Child Turcotto-Pugh Classification by Serum albumin g/dL			F value	P value
	1 Mean±SD	2 Mean±SD	3 Mean±SD		
TC	145.67±36.31	151.67±30.13	129.85±39.65	2.04	0.14^{ns}
TAG	122.17±41.39	143.83±78.32	97.54±44.60	3.32	0.04^{s}
HDL	33.33±12.11	35.11±8.81	41.0±27.14	0.59	0.56 ^{ns}
LDL	93.83±34.07	90.78±17.72	70.15±24.58	5.15	0.001^{s}

In Table-4 Here none of the four components of lipid profile show significant difference among the study subjects where the serum TC level was 142.90±38.55 (p=0.49), the serum triacylglycerol (TAG) level was 120.36±66.31 (p=0.79), the serum HDL level was 40.31±22.28 (p=0.31) and the serum LDL level was 81.15±27.52 (p=0.91).

Table-4: Comparison of lipid profile in child turcotto-Pugh classification by serum bilrubin mg/dL for cirrhosis liver in Group A (n=50)

Lipid profile	Turcotto-Pugh Classification by Serum Bilrubin mg/dL			F value	P value
	1 Mean±SD	2 Mean±SD	3 Mean±SD		
TC	142.90±38.55	129.50±19.92	126.00±39.42	0.71	0.49 ns
TAG	120.36±66.31	104.67±21.00	107.20±60.06	0.23	0.79 ns
HDL	40.31±22.28	31.50±6.92	27.40±14.66	1.20	0.31 ns
LDL	81.15±27.52	79.50±9.14	75.80±25.78	0.09	0.91 ns

Table-5 shows correlation between lipid profile and serum albumin in cirrhotic patients according to CTP classification. Here insignificant positive correlation between TC, TAG and serum albumin but significant positive correlation with LDL and negative correlation with HDL was found where Correlation – Coefficient or 'r' - value was +0.220 (p=0.124) for TC, +0.170 (p=0.239) for TAG, +0.379 (p=.007) for LDL and -0.418 (p=0.003) for HDL. This means there is strong negative correlation between serum HDL level and severity of the disease, and the relationship is statistically significant.

Table-5: Correlation between components of lipid profile with serum albumin in study group (n=50)

Parameters	Group A (Case) (n=50)	
	r	p
TC	+ 0.220	0.124
TAG	+ 0.170	0.239
HDL	+0.379	0.007s
LDL	- 0.418	0.003s

In Table-6 Here all the components of lipid profile showed negative correlation but all were statistically insignificant except HDL-C in which Correlation–Coefficient or 'r' – values was -0.167 (p=0.246) for TC, -0.098 (p=0.497) for TAG, - 0.026 (p=0.859) for LDL, -0.302 (p=0.033) for HDL.

Table-6: Correlation between components of lipid profile with serum bilirubin in study group (n=50)

Parameters	Group A (Case) (n=50)	
	r	P
TC	- 0.167	0.246
TAG	- 0.098	0.497
HDL	- 0.026	0.859
LDL	-0.302	0.033s

DISCUSSION

The incidence of liver disease in Bangladesh is steadily growing. It is one of the leading causes of mortality and morbidity in both urban and rural populations. It affects all age groups, from children to the elderly. The current study aimed to measure and compare blood triacylglycerol, total cholesterol, LDL-cholesterol, and HDL-cholesterol levels in patients with cirrhosis of the liver and healthy people. A correlation coefficient was also calculated between various parameters of liver function and lipid profile. The study's findings revealed that the mean concentrations of all four analyzed variables (total cholesterol, TAG, LDL, and HDL cholesterol levels) were lower in the study population than in the controls. Only HDL showed no statistical significance ($p<0.05$). This discovery is consistent with the findings of Sanjay et al. (2013), and Ramcharan and coworkers (2011) [11, 12], and these data help to support the idea that serum lipid levels are lower in individuals with liver cirrhosis. Our study indicated that the majority of participants were over 40 years old, with a mean age of 48.62±9.08 years (range 30-60 years). There was no statistically significant difference among the study individuals' ages. The study included 41 (82.0%) male and 9 (18.0%) female cirrhotic patients. There was no statistically significant difference in the study subjects' sex. Serum total cholesterol levels were 139.6±36.9 in study participants and 165.1±35.3 in the control group. A statistically significant difference was discovered among the study participants (p=0.001). Serum triacylglycerol levels were 117.2 ± 61.5 in study participants and 158.0 ± 57.3 in the control group. A statistically significant difference was discovered among the study participants (p=0.001). Serum HDL-C levels were 37.9±20.6 in patients and 41.4±9.8 in the control group. There was no statistically significant difference among the study subjects (p = 0.291). Serum LDL-C levels were 80.4 ± 25.6 in patients and 102.5 ± 40.7 in the control group. A statistically significant difference was discovered among the study participants (p=0.002). The study population had lower total cholesterol, triacylglycerol, LDL-C, and HDL-C levels than the control group, with the exception of HDL, which was not statistically significant (P value <.05). The same findings were reported by Sanjay et al. (2013)

[11], who discovered that, with the exception of serum triacylglycerol (TAG) levels, other variables such as serum HDL-C and LDL-C levels declined in cirrhosis. In 2007, Mehbob F et al conducted a study of 160 patients with chronic liver disorders [13]. The patients' serum total cholesterol and TAG levels decreased significantly. Siagris conducted another trial in Greece on 155 HCV-infected patients and 138 healthy people who acted as the reference group, finding that patients had lower serum total cholesterol levels than the comparison group. Our investigation found a significant difference in serum LDL-C and TAG levels among study patients with cirrhosis of the liver, with levels of 93.83±34.07 (p=0.001) and 122.17±41.39 (p=0.04), respectively. The study patients had a serum total cholesterol level of 145.67±36.31 (p=0.14) and a serum HDL-C level of 33.33±12.11 (p=0.56), with no statistically significant differences. In this study, Correlation between lipid profile and serum albumin in cirrhotic patients according to CTP classification, the Correlation-Coefficient or 'r' value was -0.418 (p=0.003) for HDL-C, indicating a strong negative correlation between serum HDL-C level and disease severity, and the relationship is statistically significant. Correlation between lipid profile and blood bilirubin in cirrhotic patients according to CTP categorization. Correlation coefficients or 'r' values were 0.167 (p=0.246) for TC, - 0.098 (p=0.497) for TAG, - 0.026 (p=0.859) for LDL, and -0.302 (p=0.033) for HDL. This means that, while blood TC, TAG, LDL, and HDL levels are all negatively correlated with disease severity, only HDL is statistically significant. Sorensen et al. (2013) [14] found that mean cholesterol, HDL-cholesterol, and LDL-cholesterol concentrations were significantly lower in liver cirrhosis of both alcoholic and non-alcoholic etiology. The triacylglycerol (TAG) level decreased only in NALC and was lower than in alcoholic ones. These findings contradict the reported drop in HDL-cholesterol. In cirrhosis alone, total cholesterol and HDL-cholesterol values were reduced, which could be attributed to cellular necrosis. A favorable association identified between albumin and HDL-cholesterol in cirrhosis further validates the foregoing suggestion (Haechem et al., 2007). Mohammad Reza Ghadr (2010) found considerable lipid derangement in cirrhotics and a negative relationship with the extent of liver injury [10.11]. Salimoghlou (2002) discovered that HDL levels are lower in Child-Pugh B than in Child-Pugh A, and apo-A level is the most affected factor in individuals with liver injury [8]. Perales and colleagues (1994) shown that in chronic liver disease without cholestasis, lipid levels declined significantly as the disease progressed [9]. Jarmay K demonstrated in 2005 that increasing hepatic parenchymal injury causes a drop in TC, HDL, and LDL levels but not TAG levels [7]. Low plasma levels of TAG, TC, HDL, LDL, apo A, and apo B were found in patients with hepatocellular cancer. It was speculated that this could be due to hepatocellular impairment, which also predicts a poor prognosis. The severity of liver function leads HDL levels to drop. Patients with chronic liver parenchymal disease without cholestasis have lower LDL and HDL levels, which worsen as the disease progresses. In a study conducted by Cicognamic, total cholesterol levels were significantly lower in cirrhosis patients than in controls, which differs from our study. We found a strong association between the course of liver injury and serum lipid levels. Child A's lipid profile was not statistically different from that of Child C (P value >0.05). One explanation for the significant discrepancy could be changes in patient characteristics and etiology of cirrhosis in our study. Hypolipidemia is more worse in cases of hepatitis C virus infection, particularly genotype 3a, and it is strongly connected to viral load and viral response [13]. In our country, the most frequent HCV genotype is 3a. It is suggested that a lipid profile be performed in all cases of chronic liver disease, particularly those caused by HCV genotype 3a.

CONCLUSION

This study found a stepwise reduction in serum lipid profile as the Child-Pugh class worsened. As a result, a routine biochemical examination of lipid status in patients with liver cirrhosis is a critical stage in the treatment process for determining disease progression. Further research is needed to determine the predictive utility of assessing lipid profiles as a means of estimating the extent of liver damage in cirrhotic patients.

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