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The study of serum lipid profile in patients with cirrhosis of liver

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ABSTRACT

Background: Cirrhosis of liver is a chronic condition of hepatocellular failure due to different etiology which leads multiple complications and increases the morbidity and mortality. The aim of the study was to study the lipid profile in patients with cirrhosis and to assess if it relates to the severity of the cirrhosis. Hence, abnormal lipid profile may be the surrogate marker of the severity of cirrhosis of liver. **Aims and Objectives:** Study lipid profiles in cirrhotic patients and compare with healthy population and to relate severity of cirrhosis of liver with the finding of abnormal lipids. **Materials and Methods:** This study was a cross-sectional study conducted in the department of internal medicine over a period of 6 months. It was carried on 51 cirrhotic patients and 50 non-cirrhotic subjects who attended the outpatient and inpatient department. The cirrhosis of liver was established with history, examination, and investigations. **Results:** The mean total cholesterol (TC), triglycerides (TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL), and very LDL (VLDL), respectively, of non-cirrhotic subjects was found to be higher than cirrhotic patients, respectively. All lipid profiles TC, TG, HDL, LDL, and VLDL value found to be ($P<0.05$) which were statically significant. Serum TC, TG, HDL, LD, and VLDL level decreased more in Child-Turcotte-Pough Criteria (CTP) Class C as compared to CTP Class B. The TC, HDL, and LDL belonged cases to the CTP class C and B showed ($P<0.05$) found statistical significance, which can be further correlated with the severity of cirrhosis. In the present study, the level of TG and VLDL was ($P>0.05$) found statistically non-significant. **Conclusion:** All the lipid parameters decrease in cirrhotic patients as compare to non-cirrhotic subjects and progressively lower the parameters as severity of liver disease increased.

Key words: Alcohol; Cirrhosis; Dyslipidemia; Liver

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INTRODUCTION

Cirrhosis is defined by three main morphologic characteristics bridging fibrous septa linking portal tracts with one another and portal tracts with terminal hepatic veins; parenchymal nodules containing hepatocytes encircled by fibrosis, and disruption of the architecture of the entire liver.[1]

Global prevalence of cirrhosis from autopsy studies ranges from 4.5% to 9.5% of the general population. Hence, we estimate that more than 50 million people, that is, adult population, would be affected with chronic liver disease. Globally, alcohol, nonalcoholic steatohepatitis and viral hepatitis currently are the most common causative factors. The prevalence of cirrhosis is likely to be underestimated as almost a third of the patients remain asymptomatic.[2]

The study done by Maskey et al., in Dharan in one hundred and five patients with title clinical profile of patients with cirrhosis of liver in a tertiary care hospital, Dharan, Nepal, found that alcohol related liver disease was the most common cause of cirrhosis (86%) of liver in Nepal.[3]

The liver plays a key role in the metabolism of plasma lipids and lipoproteins. As majority of endogenous cholesterol is synthesized in the hepatic microsomes, synthesis and metabolism of cholesterol are impaired in chronic liver

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disease resulting in a decrease in plasma levels. Severe metabolic impairment in cirrhosis can produce a worsening of the serum lipoprotein pattern. High-density lipoprotein (HDL cholesterol and its major apolipoproteins have been shown to be reduced in cirrhosis, as also the serum levels of low-density lipoprotein low-density lipoprotein (LDL) cholesterol.[4]

Mehboob et al., in 2007 studied 160 patients with chronic liver diseases and found that there were significant declines in the serum total cholesterol (TC) and triglycerides (TG) levels of patients.[5]

Perales et al., found that in patients with chronic liver disease LDL, HDL, and very LDL (VLDL) levels decline and become worse as the disease progresses. Cicognanic and team concluded an obvious decline in TC level in patients with chronic liver disease in comparison with controls.[6]

Aims and objectives

The general objective of this study was to assess the lipid profile in cirrhosis of liver patients and compare with the healthy population.

The specific aim of this study was to know the severity of liver cirrhosis with the different lipids parameter.

MATERIALS AND METHODS

This is a cross-sectional study conducted at Lumbini Medical College and Teaching hospital, Pravas, Palpa in the department of Internal medicine from May to November 2021. The study was approved by Institutional Review Committee and written consent was obtained from all the patients.

From the previous study, the prevalence of Cirrhosis was range from 4.5% to 9.5% in global general population.[2] With the help of this P-value, I considered that 7% for sample size was calculation 2 P(1-P) 2 using standard sample size calculation (n)=(Z 1-α/2×)/d where, n=Sample size, P=estimated prevalence for this study (7%) z=1.96 at 95% confidence interval, α=type 1 error (0.05), d=margin of error (5%) so in our study calculated minimum sample size was 101 and divided into two groups. Hence, for our study, minimum sample size for one group was 50. A targeted sample size of 51 cirrhotic patients admitted to the hospital was studied during the study period of May 2021 and November 2021. Written informed consent was taken from each patient before enrolment in study. Detailed history, clinical examination, and investigations performed were studied regarding the diagnosis and etiology of cirrhosis of liver.

Inclusion criteria

All patients aged 18 years or above diagnosed to have cirrhosis of liver from clinical and investigative modalities were included in the study.

A case of clinical cirrhosis of liver was defined as a patient having at least one clinical sign of hepatocellular failure and one sign of portal hypertension along with at least three ultrasound (USG) findings suggestive of cirrhosis of liver.[7-10]

The clinical signs of hepatocellular failure were

1. Jaundice
2. Hepatic encephalopathy
3. Skin changes: Spider angiomas and palmer erythema
4. Endocrine changes: Breast atrophy, gynecomastia, and testicular atrophy.

The clinical signs of portal hypertension were

1. Gastroesophageal varices presenting as hematemesis, melena, or seen during upper gastrointestinal endoscopy
2. Splenomegaly
3. Ascites.

USG findings taken into consideration for diagnosis of cirrhosis of liver were

1. Liver surface nodularity and coarse echotexture,
2. Caudate lobe hypertrophy (decreased caudate to right lobe ratio)
3. Hepatic venous blood flow pattern alteration as
   - Dilatation of the portal vein (>13 mm),
   - Dilatation of the splenic vein (>11 mm), and
4. Splenomegaly (>13 cm).[11-13] The diagnosis of alcoholic cirrhosis was made on the basis of history of any form of alcohol consumption >80 g/dL in men and >40 g/dL in women for 10 years in the absence of other risk factors for cirrhosis.[14]

Exclusion criteria

Patients with any of the following were excluded from the study since these are the conditions where lipid profiles are already abnormal:

1. Diabetes mellitus
2. Malignancies
3. Chronic renal failure
4. Acute pancreatitis
5. Patients with known family history of hyperlipidemia
6. Patients under recent parenteral nutrition
7. Patients with history of taking lipid lowering drugs.

Dyslipidemia is defined according to the Third Report of the National Cholesterol Education Program Adult Treatment Panel III.[15]

The lipid profile of cirrhotic patients was compared with healthy persons who visited the general health check-up clinic of the LMCTH. The exclusion criteria applied to the cirrhotic population were also applied to these persons. A serum alanine transaminase was obtained, in the healthy persons to rule out presence of pre-existent liver disease along with fasting blood sugar and serum creatinine.

The severity of liver cirrhosis has assessed by Child-Turcotte-Pugh score,[16,17] takes into consideration two signs (ascites and encephalopathy) and three laboratory values (serum bilirubin level in (μmoL/L), Albumin in g/dL and prothrombin time prolonged second or INR) with scores 1–3 for the evaluation of cirrhotic patients. Based on this evaluation, patients are classified in three Groups A, B, and C. Child-Turcotte-Pough Criteria (CTP) Score is obtained by adding the score for each parameter. CTP Class A=5–6 points, Class B=7–9 points, and Class C=10–15 points.

Five ml of venous blood was collected after overnight fasting of 12 h in all the subjects for estimation of serum TC, HDL, LDL, VLDL, and TG by standard enzymatic method. Statistical analysis was done using software SPSS version 20. All the parameters are measured in Mean±SD. Independent student t-test has been used to find significance of study parameters between two groups. Moreover, Pearson correlation has been used to find significance correlation between cirrhosis and lipid profiles.

RESULTS

In our study, there were total 101 participants among them 51 (50.49%) patients were cirrhotic (case) and 50 (49.50%) participants were healthy individual (control). The age distribution for both groups was from 20 years and above 80 years. The maximum number of participants was in the 50–59 years in both groups (case and control), out of this 19 (54.28%) were in case and 16 (45.72%) were in control, respectively. Similarly, minority of participants were in the age group above 80 years where only two cases were participant (Figure 1).

The mean TC, TG, HDL, LDL, and VLDL, respectively, of non-cirrhotic subjects was found to be higher than Cirrhotic patients. All lipid profile values TC, TG, HDL, LDL, and VLDL value found to be ($P<0.05$) which were statically significant (Table 1).

Serum TC, TG, HDL, LDL, and VLDL level decreased more in CTP Class C as compared to CTP Class B. The TC, HDL, and LDL belonged cases to the CTP Class C and B showed ($P<0.05$) found statistical significance); which can be further correlated with the severity of cirrhosis. In the present study, the level of TC and VLDL was ($P>0.05$) found statistically non-significant (Table 2). Only two patients were belonging to CTP Class A so that it could not be analyzed statistically and not shown in table.

DISCUSSION

In our study, there were total 101 subjects among them 51 (50.49%) patients were cirrhotic (case) Group A and 50 (49.50%) participants were healthy individual (control) Group B. In this study, most of the participants were in the age group of 50–59 years in both groups (case and control), out of this 19 (54.28%) were in cirrhotic Group A and 16 (45.72%) were in non-cirrhotic Group B, respectively.

Similarly, many studies have also revealed, the majority of participants age ranged from 40 to 59 years that have consistently shown a positive relationship between age and cirrhosis of liver.[3,18,19] However, our study finding was unlike the other study.[4] Hence, most of the patients were visiting in our hospital at this age group for alcohol-related problem.

In our study, it was found that there was lower level of TC, TG, HDL, LDL, and VLDL in cirrhotic patients (Group A) than non-cirrhotic (Group B). Hence, it revealed that all lipid parameters were statistically significantly lower ($P<0.05$) in cirrhotic patients. Hence, our study showed that there was decreased level of lipid in cirrhotic subjects.

Cicognani et al., conducted study, serum lipid and lipoprotein patterns in patients with liver cirrhosis, and chronic active hepatitis, the results revealed that serum TC, HDL, and LDL-cholesterol were significantly lower ($P<0.001$) in cirrhotic patients as compared to control subjects.[6]

Similar type of studies done by many authors and revealed results like our study, Ghadir et al., study showed that cirrhotic patients had lower levels of serum TC, TG, HDL, and LDL cholesterol in compared to non-cirrhotic patients and statistically significant ($P<0.05$).[18]

Phukan et al., study aimed to find out the serum lipid profile in alcoholic cirrhosis: A study in a teaching hospital of North-east India. There was significant decrease HDL and LDL ($P<0.05$) in cirrhotic patients as compared to the healthy controls.[4]

Some studies have reported that TC and HDL levels were significantly raised in non-cirrhotic patients compared with cirrhotic patients and in same study, LDL was higher

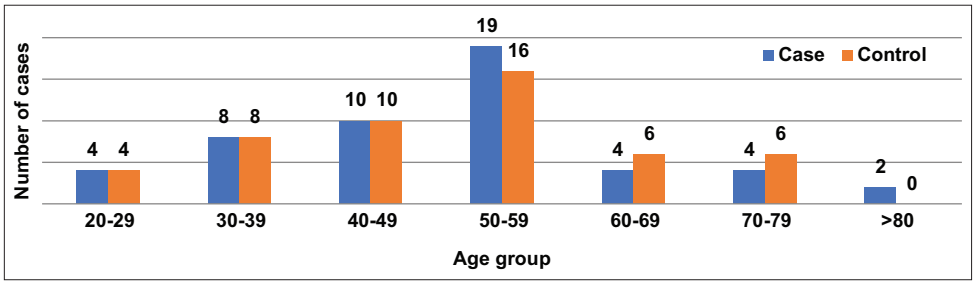

Figure 1: Demographic details of participants according to age in cirrhotic and non-cirrhotic

Table 1: Comparison of lipid parameters between cirrhotic and non-cirrhotic groups

Lipid Profile	Mean±SD		P-value
	Case	Control	
TC	179.65±39.77	199.82±18.24	0.002
TG	158.27±38.88	172.70±24.85	0.029
HDL	36.71±4.70	49.02±3.24	0.005
LDL	111.28±37.08	126.26±19.22	0.013
VLDL	31.65±7.77	34.54±4.97	0.029

HDL: High-density lipoprotein, TC: Total cholesterol, VLDL: Very low density lipoprotein, LDL: Low density lipoprotein, TG: Triglycerides

Table 2: Comparison of CTP class with serum lipid profile status of cases

Lipid profile	Mean±SD CTP Class		P-value
	B (n=28)	C (n=21)	
TC	194.85±34.65	160.04±27.08	<0.001
TG	170.85±54.92	144.46±16.43	0.05
HDL	38.05±5.00	34.23±2.35	0.004
LDL	122.63±36.05	96.92±27.04	0.008

HDL: High-density lipoprotein, TC: Total cholesterol, LDL: Low density lipoprotein, TG: Triglycerides, CTP: Child-Turcotte-Pough Criteria

in non-cirrhotic compared with cirrhotic patients and difference was not statistically significance.[20]

However, an author study reported that there may be increase TC and LDL in alcoholic cirrhotic patients.[21]

Hence, it can be said that in alcoholic cirrhosis patients, dyslipidemia may be seen.[4]

Similarly, in our study, we have found that mean TC±SD, mean TG±SD, mean HDL±SD, mean LDL±SD), and mean VLDL±SD values were lower in Child-Pugh C than Child-Pugh B and mean TC, HDL, and LDL values ($P<0.05$) which were statistically significance; however, mean TG and VLDL values ($P>0.05$) which revealed statistically not significant. Hence, all different lipids level was decreasing with increasing the severity of the cirrhosis of liver.

Another observational study found that in patients with chronic liver disease LDL, HDL, and VLDL levels decline and become worse as the disease progresses, this finding positively correlate with our observational study that in severe liver disease as the liver function deteriorates, more decrease the TC, TG, HDL, LDL, and VLDL and concluded an obvious decline in TC level in patients with chronic liver disease in comparison with controls.[6]

Jatav et al., reported the finding the TC and HDL level declined more in CTP Class C as compared to CTP Class B ($P=0.03$ found statistical significance); which can be further correlated with the severity of cirrhosis. The level of LDL, TG, and VLDL was observed low in cases belongs to the CTP Class C in comparison to CTP Class B patients (P-value found statistically non-significant.[19]

The study done by Phukan team and found TC, HDL and LDL decrease gradually with increased severity of cirrhosis.[4]

These observations may be explained by the fact that in chronic liver disease unusually low levels TC, LDL, HDL, and TG are found due to decreased biosynthetic capacity of liver increase severity of liver disease.

The study indirectly pointed out that there is decreasing various lipid profiles level in cirrhotic patients and with severity of progression of liver conditions. Hence, lipid profile may be the surrogate marker to estimate the severity of liver disease.

Limitations of the study

Small in sample size.

Could not include the participants from all geographical area.

CONCLUSION

We found that all different lipid profiles level decreasing in chronic liver disease cirrhosis as compare with non-cirrhotic. However, some lipid parameters are statistically significant some are not. We also found that all lipid profiles level decreasing as the severity of cirrhosis increasing. Hence, the study of lipid profile may be the surrogate

marker of cirrhosis of liver with severity of cirrhosis of liver.

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TP- Definition of intellectual content, literature survey, prepared first draft of manuscript, implementation of study protocol, data collection, data analysis, manuscript preparation, and submission of article; **RG-** Data collection and statistical analysis and interpretation; and **SP-** Editing, coordination, and manuscript revision.

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