ORIGINAL ARTICLE

# Lipid Profile in Alcoholic and Non Alcoholic Patients of Chronic Liver Disease – A Comparative and Analytical Study in a Rural-based Tertiary Care Centre

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## Abstract

**Background:** The liver is the principal site for formation and clearance of lipoproteins. Here we decided to conduct this study to assess the degree of alteration of serum lipid levels in alcoholic liver disease, to compare the different parameters and to find out if there is any correlation between extent of lipid profile changes and severity of chronic liver disease.

**Methods:** In this comparative, analytical, cross sectional, institution-based, single centre study, the different parameters of fasting lipid profile were compared among 150 randomly selected subjects – 50 each of alcoholic cirrhosis, non-alcoholic cirrhosis and healthy normal – from the OPD and Indoor Wards of department of General Medicine of Midnapore Medical College and Hospital situated in Paschim Medinipur district of West Bengal after taking their written and informed consent within a period from July 2015 to June 2016**.**

**Results:** All the parameters were significantly different in alcoholic and non-alcoholic cirrhosis when compared with the normal group, but when compared between the alcoholic and non-alcoholic cirrhosis groups only the difference in HDL Cholesterol was significant. There appears to be an inverse relationship between severity of liver disease (according to Child-Pugh grading) and Body Mass Index.

**Conclusions:** Serum lipid parameters were significantly lower in the cirrhotics than in the healthy normal group. Thus, studies of lipid profile may guide us in the prognosis and treatment of alcoholic cirrhosis in the near future.


## Introduction

Chronic liver disease affects people in the most productive years of their life and has a significant impact on global economy as a result of premature death, illness and disability.

The liver plays an important role in lipid metabolism and several stages of synthesis, transportation and degradation of lipoprotein.[1,2] The liver is the principal site for formation and clearance of lipoproteins. So the liver contributes to both the exogenous and endogenous cycles of lipid metabolism and transport of lipids through plasma. As the liver is involved in many steps of lipid metabolism and transport, therefore chronic liver disease can affect plasma lipid levels in a variety of ways.

Chronic liver disease due to various causes is often associated with drastic reductions in plasma triglycerides and cholesterol levels due to reduced lipoprotein biosynthetic capacity.

Nowadays alcoholic liver disease is a prime cause of morbidity and mortality throughout the world. Alcohol consumption causes fatty liver, alcoholic hepatitis and ultimately, alcoholic cirrhosis in some patients.

In Western countries alcohol is an important cause of liver cirrhosis, and it is gradually increasing in countries like Japan and India. Alcohol-related liver deaths account for up to 48% of cirrhosis-associated deaths in the United States, and are also major contributors to liver disease-related mortality in other countries.

As there is a high prevalence of chronic liver disease in this part of rural Eastern India where a vast majority of the population is of tribal origin, and especially as alcoholism is a leading cause, so I have decided to conduct this study to assess the degree of alteration of serum lipid levels in alcoholic liver disease, to compare the different parameters of lipid profile among alcoholic and non-alcoholic cirrhosis and healthy people, to find out if there is any correlation between extent of lipid profile changes and severity of chronic liver disease and to detect how serum lipid levels change with amount and duration of alcohol consumed.

## Materials and Methods

In this comparative, analytical, cross sectional, Institution-based, single centre study, we have randomly included a total of 150 subjects in three groups – 50 each of alcoholic cirrhosis, non-alcoholic cirrhosis and healthy normal – from the OPD and Indoor Wards of department of General Medicine of Midnapore Medical College and Hospital situated in Paschim Medinipur district of West Bengal after taking their written and informed consent within a period from July 2015 to June 2016.

The subjects were selected randomly, only they had to satisfy the inclusion and exclusion criteria. Patients

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**Table 1: Baseline characteristics of three study groups**

| Study groups | Alcoholic cirrhosis | Non-alcoholic cirrhosis | Healthy normal | Significance (p value) |
|---|---|---|---|---|
| Mean age (in years) | 45.22±9.056 | 43.06±8.054 | 43.02±6.826 | 0.296 |
| Male: Female | 80% : 20% | 84% : 16% | 84% : 16% | 0.830 |
| Poor socio-economic status | 92% | 92% | 94% | 0.238 |
| Portal HTN | 38% | 38% | | >0.05 |
| Coagulopathy | 42% | 44% | | >0.05 |
| Ascites | 54% | 28% | | <0.05 |
| Mean B.M.I. | 19.25±2.33 | 20.84±3.25 | 24.72±5.44 | <0.05 |
| Child pugh grade | | | | |
| Grade 1 | 20% | 40% | | |
| Grade 2 | 54% | 48% | | |
| Grade 3 | 26% | 12% | | |

**Table 2: Comparison of lipid profile among the three groups**

| Study groups | Alcoholic cirrhosis | Non-alcoholic cirrhosis | Healthy hormal | Significance (p value) | Std. error | 95% C.I. for mean | | Min | Max |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Lower bound | Upper bound | | |
| Total cholesterol | 131.02 ± 5.55 | 133.53 ± 5.14 | 163.72 ± 5.63 | 0.059 | 1.2949 | 140.201 | 145.318 | 118.6 | 175.2 |
| Serum triglyceride | 118.70 ± 5.60 | 121.15 ± 5.08 | 144.61 ± 6.12 | 0.079 | 1.0596 | 126.060 | 130.247 | 108.7 | 157.2 |
| LDL cholesterol | 73.66 ± 4.06 | 74.49 ± 3.44 | 92.29 ± 3.54 | 0.499 | 0.7648 | 78.639 | 81.661 | 65.9 | 99.8 |
| HDL cholesterol | 33.62 ± 1.61 | 34.81 ± 1.40 | 42.51 ± 1.79 | 0.001 | 0.3481 | 36.291 | 37.666 | 29.8 | 46.6 |
| VLDL cholesterol | 23.74 ± 1.12 | 24.23 ± 1.02 | 28.92 ± 1.22 | 0.079 | 0.2119 | 25.212 | 26.049 | 21.7 | 31.4 |

suffering from concomitant diseases which can alter the lipid profile like Diabetes Mellitus, Hypertension, Thyroid problem, Nephrotic syndrome, HIV, Cancer, acute pancreatitis, acute GI bleeding, renal failure, recent parenteral nutrition, chronic smokers, patients who were on glucose or lipid lowering drugs and patients with past history of hyperlipidemia and patients who refuse to be a part of the study were excluded.

The criteria for inclusion of cases were history of alcoholism with clinical, biochemical and ultrasonographic evidence of cirrhosis (and upper GI endoscopy and liver biopsy/FNAC, wherever feasible). A questionnaire of personal characteristics including history of alcoholism, type, quantity and duration of alcohol intake and demographic variables was completed for each patient. The amount of alcohol consumed in grams was calculated using the following formula: Volume of alcohol (in ml) × Density (0.794) = Weight in grams

Patient must have regular intake of alcohol for at least 10 years to be termed alcoholic.

The questionnaire also focused on whether the patients had developed complications of cirrhosis like coagulopathy, ascites, portal hypertension and/or encephalopathy helping in grading by a 3-point scale according to Child-Pugh criteria.

Fasting serum lipid profile - Serum triglyceride, Total cholesterol, VLDL, LDL and HDL cholesterol - was drawn from each of the subjects and analyzed by standard and appropriate technique.

Total serum Cholesterol was determined by CHOD/PAP (Cholesterol Oxidase-Peroxidase) method.

Serum Triglyceride was estimated by an enzymatic end point method (Glycerol Phosphate oxidase-Peroxidase).

The HDL Cholesterol was determined by Polyethylene Glycol precipitation test.

LDL Cholesterol was calculated by Friedewald's equation:

LDL-C = Total Cholesterol – (Triglycerides/5) – HDL-C.

VLDL Cholesterol was calculated as Serum Triglyceride/5.

Data collected during study was interpreted and analyzed statistically using appropriate biomedical software like SPSS for Windows 20.0 statistical package program, ANOVA (ANalysis Of VAriance) and Tukey's HSD post hoc test for multiple comparison and the qualitative data were compared using Chi-square tests.

## Results

From Table 1 it is evident that it is age and sex matched case control study in which an overwhelming majority of the subjects belong to poor socio-economic status with males outnumbering the females. It was found that the incidence of Portal Hypertension was identical among Alcoholic and Non- alcoholic patients of cirrhosis. Coagulopathy was slightly more in Non-alcoholics whereas ascites was much more in alcoholics.

Table 2 shows that all the parameters were significantly different in alcoholic and non-alcoholic cirrhosis when compared with the normal group, but when compared between the alcoholic and non-alcoholic cirrhosis groups only the difference in HDL Cholesterol was significant.

It was seen that in both Alcoholics and Non-alcoholics, those with Child-Pugh Grade 1 had B.M.I. 23 or more, majority of those with Grade 2 had B.M.I. between 18.5 and 27 and all those with Grade 3 had B.M.I. less than 23. So there appears to be an inverse relationship between severity of liver disease and Body Mass Index.

## Discussion

Derangement of serum cholesterol is a common observation in cirrhotics. Kackar et al. found that the serum cholesterol level decreases progressively with the progress of alcoholic cirrhosis.[3] Miller et al found that in cirrhosis without cholestasis, cholesterol and apo B levels were reduced.[4] LCAT activity and the proportion of plasma cholesterol esterified was also be markedly reduced. D'Arienzo A et al said in their study that a low serum cholesterol level is associated with a higher mortality rate in patients with liver cirrhosis.[5] Further comparison of the total cholesterol values in different Child Pugh Classes showed a direct relation between the severity of Liver damage and reduction in the cholesterol level. This was supported by study conducted by Spósito et al, Ahenaku et al, Jarikre AE et al and Mandal et al.[6-9] In a study performed by Cicognani there was an obvious decline in total cholesterol level in patients with

chronic liver disease in comparison with controls.[10]

The significantly lower serum triglyceride levels in cases of cirrhosis than in normal subjects is in full agreement with the study conducted by Ahenaku et al, Jarikre AE et al, Mandal et al and Varghese et al.[7-9,11] The mechanism responsible for reduction of triglyceride level in patient with cirrhosis could be poor nutrition and the reduced metabolism of free fatty acids in cirrhotics due to decreased reserve of liver parenchyma as suggested by Neil McIntyre.[1]

In our study the significant decrease in levels of serum LDL in patients with cirrhosis, when compared to healthy normal subjects, is in accordance with previous study by Ahenaku et al, Mandal et al, Varghese et al, Brier C et al and[7,9,11,12] we found that the reduction in the LDL level was proportionate to the severity of liver damage in cirrhotics as detected by the Child Pugh scoring system. This was supported by Subhan et al.[13]

The significant reduction in the level of serum HDL in our study in cases of cirrhosis when compared to healthy normal is consistent with a large volume of publications on this subject. Subhan et al observed that in patients with chronic liver parenchymal disease without cholestasis, HDL levels decline and become worse as the disease progresses.[13] The decrease in HDL in patients with cirrhosis can be attributed to decreased hepatic synthesis of HDL. This could be due to LCAT deficiency. Liver is the only source of this enzyme (LCAT) and serum levels of this enzyme are decreased in liver disorders. The decreased LCAT results in impairment of conversion of nascent HDL to mature HDL. This HDL reduction is also suggested by Ahenaku et al, Jarikre AE et al, Mandal et al, Varghese et al, Subhan et al, and many others studies around the world.[7,8,9,11,13] Selimoglu found that HDL level is lower in Child-Pugh B than Child-Pugh A and apo A level is the most affected factor in those with liver damage.[14] In our study, the change in HDL level was higher in Child A than B, and higher in Child B than C which shows that it is the severity of liver function that causes HDL level to decline.

In our study, we found that the VLDL levels were reduced in cirrhosis compared to the normal subjects and the reduction in VLDL levels correlates with the severity of liver disease.

Selimoglu and colleagues in their study showed that with the exception of serum triglyceride levels, other variables like serum HDL, LDL level decreased in cirrhotics.[14] However most of the studies conducted elsewhere showed all the lipid fragments in cirrhotics were lower than in control. Similar studies conducted by Edith N. Okeke and Mohammad Reza Ghadr showed significant derangement of lipid level in cirrhotics and a negative relation to extent of liver damage.[15,16] One study conducted by Brier C et al on lipoproteins in the plasma of patients with post alcoholic liver cirrhosis, showed that total cholesterol, HDL, VLDL, HDL-cholesterol were all decreased.[12] Perales and his colleagues showed that in chronic liver disease without cholestasis, there was a significant decline in lipid levels with the progression of disease process.[17] This finding is in keeping with our observations that in severe liver disease as the liver function deteriorates, more decline is observed in LDL, HDL and total cholesterol levels.

In our study most of the patients of alcoholic and non-alcoholic cirrhosis having Child-Pugh score 3 (more severe disease) had all the five serum lipid profile parameters and Body Mass Index (B.M.I) lower than those belonging to Child-Pugh score 2 or 1. Hence it can be reasonably concluded that the severity of chronic liver disease has an inverse relation with both serum lipid profile and B.M.I.

## Conclusion

The results of this study showed that all the five studied variables (serum total Cholesterol, triglyceride, LDL, VLDL and HDL Cholesterol) were significantly low in the cirrhotics than in the healthy normal group. Also, there were no significant differences among the alcoholics and non-alcoholics in the total Cholesterol, triglyceride, LDL and VLDL Cholesterol levels but a statistically significant difference was noted in HDL levels. Thus, studies of lipid profile may guide us in the prognosis and treatment of alcoholic cirrhosis in the near future.

## References


1. McIntyre N. Plasma lipids and lipoproteins in liver disease. *Gut* 1978; 19:526-30.
2. Kroon PA, Powell EE. Liver, lipoproteins and disease: I. Biochemistry of lipoprotein metabolism. *J Gastroenterol Hepatol* 1992; 7:214-24.
3. Kackar RR, Desai HG. Serum cholesterol in cirrhosis of liver. *J Assoc Physicians India* 2004; 52:1007.
4. Miller JP. Dyslipoproteinaemia of liver disease. *Baillieres Clin Endocrinol Metab* 1990; 4:807-32.
5. D'Arienzo A , Manguso F, Scaglione G, Vicinanza G, Bennato R, Mazzacca G. Prognostic value of progressive decrease in serum cholesterol in predicting survival in Child-Pugh C viral cirrhosis. *Scand J Gastroenterol* 1998; 33:1213-8.
6. Sposito AC, Vinagre CG, Pandullo FL, Mies S, Raia S, Ramires JA. Apolipoprotein and lipid abnormalities inchronic liver failure. *Braz J Med Biol Res* 1997; 30:1287-90.
7. Ahaneku JE, Taylor GO, Olubuyide IO, Agbedana EO. Abnormal lipid and lipoprotein patterns in liver cirrhosis with and without hepatocellular carcinoma. *J Pak Med Assoc* 1992; 42:260-3.
8. Jarike AE, Momoh JA. Plasma total cholesterol, high density lipoprotein cholesterol and low density lipoprotein cholesterol levels in liver cirrhosis in Nigerians. *Nig Qt J Hosp Med* 1996; 6:157–9.
9. Mandal SK, KoelinaSil, Chatterjee S, Ganguly J, Chatterjee K, PankajSarkar et al. A Study on Lipid Profiles in Chronic Liver Diseases. *Natl J Med Res* 2013; 3:70-72.
10. Cicognani C, Malavolti M, Morselli-Labate AM, Zamboni L, Sama C, Barbara L. Serum lipid and lipoprotein patterns in patients with liver cirrhosis and chronic active hepatitis. *Arch Intern Med* 1997; 157:792-796.
11. Varghese JS, Krisnaprasad K, Upadhuyay R, Revathy MS, Jayanthi V. Lipoprotein profile in cirrhosis of Liver. *Euro J Gastroenterol Hepatol* 2007; 19:521-522.
12. Brier C, Lisch HJ, Braunsteiner H. Lipoproteins, HDL-Apolipoproteins, activities of hepatic lipase and lecithin-cholesterol acyltransferase in the plasma of patients with post alcoholic end stage liver cirrhosis. *Klin Wochenschr* 1983; 61:929-31.
13. Subhan F, Khan I, Arif R, Khan A. Serum lipid profile as an indicator of the severity of liver damage in cirrhotic patients. *Rawal Medical Journal* 2012; 37:4
14. Selimoglu MA, Aydogdu S, Yagci RV. Lipid parameters in childhood cirrhosis and chronic liver disease. *Pediatr Int* 2002; 44:400-03.
15. Okeke EN, Daniyam CA, Akanbi M, Ugoya SO, Emmanuel I. Lipid profile of patients with liver cirrhosis in Jos, Nigeria. *Journal of Medicine in the Tropics* 2010; 12:56-59.
16. Ghadir MR, Riahin AA, Havaspour A, Nooranipour M, Habibinejad AA. The relationship between lipid profile and severity of liver damage in Cirrhotic patients. *Hepat Mon* 2010; 10:285-8.
17. Perales J, Angel Lasuncion M, Cano A, Martin-Scapa MA, Maties M, Herrera E. Changes in the lipid profile in chronic hepatopathies. *Med Clin (Barc)* 1994; 102:364-8.