

# Lipid Serum Profile in Patients with Viral Liver Cirrhosis

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## Key Words

Serum lipids · Cirrhosis · Viral hepatitis

## Abstract

**Objective:** Our main aim was to investigate the serum lipid levels in a series of patients with liver cirrhosis of viral origin.

**Subjects and Methods:** The study comprised 90 patients, 60 with viral liver cirrhosis, equally divided between hepatitis virus C (HCV) and B (HBV) etiologies, and 30 control patients with no known liver pathology. Patients were investigated during a 5-year period in the 1st Medical Clinic of the Emergency County Hospital of Craiova, Romania. The following series of serum lipid parameters were recorded: lipemia, total cholesterol and cholesteryl ester, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, very-low-density lipoprotein (VLDL) cholesterol and triglyceride (TG) values. Statistical analysis of these parameters was performed using the ANOVA test followed by Tukey multiple comparison tests to compare replicate means;  $p < 0.05$  was considered statistically significant. **Results:** We observed significantly lower values for serum lipids (543.5 and 549.37 mg/dl in the HBV and HCV cirrhosis subgroups, compared with 649.9 mg/dl in controls), total cholesterol (143.6 and 147.9 vs. 198.0 mg/dl, respectively), cholesteryl esters (83.6 and 80, compared to 147.9 mg/dl, respectively), LDL cholesterol (91.6 and 88.5 vs. 132.4 mg/dl) in both cirrhosis groups when compared with controls ( $p < 0.001$ ), as well as HDL cholesterol (32.1 and 36.9 vs. 47.3 mg/dl,  $p < 0.05$ ). How-

ever, TG and VLDL cholesterol values of controls and cirrhosis groups were similar ( $p > 0.05$ ). We did not register any differences between the two cirrhosis groups ( $p > 0.05$ ). **Conclusion:** Our data showed that both HCV and HBV cirrhosis severely impaired liver lipid metabolism. Late stages of the disease resulted in a pseudonormalization of VLDL cholesterol and TG values.

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## Introduction

The liver plays a central role in lipid metabolism, as several pathways are, at least in part, dependent to this site [1]. Major metabolic processes take place at this level, involving the production, transportation and storage of apoproteins and lipoproteins, as well as catabolism of various lipids and excretion of cholesterol and phospholipids. An alteration in liver functions resulting from cellular injury leads to changes in the serum concentration of cholesterol and lipoproteins [2–5].

Infection with hepatitis C (HCV) or B (HBV) viruses leads to hepatic damage, which in turn relates to changes in alterations of the lipid metabolism [6–10]. Different mechanisms are involved, dependent on the stage of the liver disease and the metabolic state [11–13]. Low levels of plasma cholesterol and lipoproteins, as well as lower triglyceride (TG) values are usual in chronic liver diseases. However, the number of studies which included patients

with advanced cirrhosis remains low. The present study comparatively evaluated plasma levels of serum lipids, total cholesterol and cholesteryl ester, high-density lipoprotein (HDL) cholesterol, low-density lipoprotein (LDL) cholesterol, very-low-density lipoprotein (VLDL) cholesterol and TG in three age and gender-matched groups, two with HCV or HBV cirrhosis and one control group.

## Subjects and Methods

This study was conducted in the 1st Medical Clinic of the Emergency County Hospital, Craiova, Romania, from January 2006 to January 2011. A total of 90 patients were selected, as follows: 30 with hepatic cirrhosis of HCV origin, 30 with hepatic cirrhosis of HBV origin and 30 patients with no known liver diseases. The diagnosis of cirrhosis was established on anamnestic, clinical and laboratory findings, imaging (ultrasonography and upper endoscopy) and liver biopsy. No patients underwent antiviral therapy. All the patients live in the same geographic area, with similar body mass indices and similar dietary habits. All the patients were in advanced stages of cirrhosis (Child B and C). Exclusion criteria were primary disproteinemia or disproteinemia associated with other pathologies (diabetes mellitus, nephrotic syndrome, hypothyroidism or other metabolic syndromes); body mass index >30 and alcohol consumption as well as prior treatments with estrogens,  $\beta$ -blockers, diuretics or cortisol medication.

Serum lipids, total cholesterol and cholesteryl ester, HDL cholesterol, LDL cholesterol, VLDL cholesterol and TG values were measured using colorimetric enzyme methods (Kobas 6000 analyzer; Roche Diagnostics, USA).

Statistical analysis of these parameters was performed using the ANOVA test followed by Tukey multiple comparison tests; Bartlett's statistic was used to test for equal variances;  $p < 0.05$  was considered statistically significant. All statistical calculations were performed using the Graph Pad Prism software (InStat, USA).

## Results

Patients were similar in terms of gender and age (table 1). All three groups were similar in terms of age distribution (median ages 50.87, 49.83 and 47.93 years, respectively), ranging between 30 and 70 years. The male population was predominant in our cohort, with a total of 57 men (63.3%) and a similar gender distribution in all three groups. Bartlett's statistic showed normal distribution of the variances in all samples.

The comparisons of serum values for lipids, total cholesterol, cholesteryl esters, HDL, LDL and VLDL cholesterol and TG for all three groups are given in table 2. The differences between the controls and both cirrhotic groups for serum lipids ( $p < 0.001$ ), total cholesterol ( $p < 0.001$ ), cholesteryl esters ( $p < 0.001$ ), HDL ( $p < 0.05$ ) and LDL cholesterol ( $p < 0.001$ ) were statistically significant. However, there was no statistically significant difference between TG and VLDL cholesterol values of controls and any of the two cirrhosis groups ( $p > 0.05$ ). Also, cirrhotic patients had similar values for all serum parameters, irrespective of the viral etiology ( $p > 0.05$ ).

**Table 1.** Gender and age distribution of study groups

	Male	Female	Mean age $\pm$ SD (range)
HBV cirrhosis	20	10	50.87 $\pm$ 8.72 (34–66)
HCV cirrhosis	18	12	49.83 $\pm$ 5.84 (38–56)
Controls	19	11	47.93 $\pm$ 11.53 (30–70)

**Table 2.** Serum values of all studied parameters

	HBV cirrhosis	HCV cirrhosis	Controls	p value
Serum lipids	543.5 $\pm$ 90.0	549.37 $\pm$ 76.1	642.9 $\pm$ 55.2	0.00082
Total cholesterol	143.6 $\pm$ 31.8	147.9 $\pm$ 36.9	198.0 $\pm$ 24.3	0.00073
Cholesteryl ester	83.60 $\pm$ 15.86	80.0 $\pm$ 22.0	147.9 $\pm$ 36.9	0.00077
HDL cholesterol	32.1 $\pm$ 5.5	36.9 $\pm$ 6.9	47.3 $\pm$ 4.3	0.0278
LDL cholesterol	91.6 $\pm$ 24.9	88.5 $\pm$ 31.2	132.4 $\pm$ 27.3	0.00091
VLDL cholesterol	20.8 $\pm$ 4.5	18.9 $\pm$ 7.0	20.7 $\pm$ 3.5	0.069
TG	104.8 $\pm$ 22.1	99.4 $\pm$ 35.7	104.8 $\pm$ 17.3	0.071

Results are shown as means  $\pm$  standard deviation. All values are calculated in milligrams per deciliter.

tients with advanced stages of liver disease, irrespective of their viral etiology. No changes were observed in TG levels of the three groups. No differences were observed between the patients with HBV and HCV either, thereby proving that the advanced stages of liver disease and subsequent organ failure were similar, irrespective of the viral etiology.

As we had previously shown [9], cholesterol and TG levels were influenced by the etiology and severity of chronic viral hepatitis, being in direct relation with the histological activity score and steatosis. The present study has taken the paradigm further, proving that the etiological differences that existed with the onset of cirrhosis were leveled at the advanced stage due to the inherent hepatocyte damage.

Previous studies [2, 3, 5, 6, 14] had established a connection between liver damage due to viral infection and a decline in cholesterol and apolipoprotein metabolism. This relationship was further demonstrated by recent basic and clinical research aimed at uncovering the mechanisms behind these alterations [7, 10, 13, 15]. While the interference from viral infection is clearly established, only a limited number of studies further details how liver cirrhosis, especially in advanced stages, alters lipid metabolism.

Our findings confirmed previous studies [7, 8, 10, 16, 17] that revealed an alteration of lipid metabolism in advanced stages of viral liver cirrhosis principally because hepatocyte alteration was already profound. Patients were preselected in advanced disease stages, thus hepatocyte alteration was already profound.

Several studies found lower TG levels in HCV- or HBV-infected patients without cirrhosis. In our study, however, TG levels were similar in all three groups. This is probably due to the fact that in late stages of hepatic disease, the activity of TG lipase (the enzyme responsible for hydrolyzing ester linkages of TGs) is severely impaired [6].

## Conclusions

HCV and HBV cirrhosis severely impaired liver lipid metabolism, thus resulting in low serum values of total cholesterol, cholesteryl ester, HDL and LDL cholesterol. However, VLDL cholesterol and TG levels were not affected in late stages of liver disease.

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