Biological and Clinical Sciences Research Journal
eISSN: 2708-2261; pISSN: 2958-4728
www.bcsrj.com
DOI: https://doi.org/10.54112/bcsrj.v2023i1.312
*Biol. Clin. Sci. Res. J., Volume, **2023**: 312*
Original Research Article

ASSOCIATION BETWEEN LIPID PROFILE OF CIRRHOTIC PATIENTS AND PROGNOSTIC SCORES

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(Received, 15th December 2022, Revised 09th April 2023, Published 06th Jun 2023)

Abstract: *The retrospective study was conducted in the Hepatology & Medicine Department of the hospital from January 2022 to January 2023 to assess the association of the lipid profile of cirrhotic patients with scores including MELD and Child-Pugh. The study included patients aged > 18 years who had cirrhosis due to hepatitis C infection. Demographic data, biochemical parameters, and MELD and Child-Pugh scores of the participants were recorded. Data were analyzed using SPSS version 23.0. Results showed a statistically significant inverse correlation between lipid fractions and Child-Pugh score (P<0.001). The higher MELD score was correlated with lower TG (P=0.003), VLDL (P=0.030), LDL (P<0.001), HDL (P<0.001), and TC (P<0.001) levels. There is a significant association between MELD and Child-Pugh prognostic markers and reduced lipid profiles of cirrhotic patients. These results suggest using a lipid profile as a supplemental tool for evaluating liver disease.*

Keywords: Liver cirrhosis, Hepatitis C, Prognostic markers, Lipid profile

Introduction

Chronic liver disease is becoming increasingly prevalent. Cirrhosis is among the leading cause of mortality globally (Zhai et al., 2021). The prevalence of cirrhosis in Pakistan is 13.5% (Bilal et al., 2019). The lipid profile has an important role in energy transformation, cellular metabolism, and regulation of cell membrane potential. Lipid has an important role in lipid production and transformation, accumulation of lipoproteins and Apo proteins, lipid catabolism, and removal of excess lipoproteins and cholesterol. Lipids are an important constituent of the cell membrane. They control cell function and regulate hemostasis. Lipids obtain fatty acid and cholesterol from peripheral tissues and diet and form complexes like lipoproteins which are released into circulation (Mahmood et al., 2021).

In chronic liver disease, lipoprotein synthesis is reduced, reducing plasma triglyceride levels. Very low-density lipoprotein (VLDL) is formed by the esterification of long-chain fatty acid; lipoprotein lipase hydrolyzes VLDL in adipose tissue, heart, and muscles (Björnson et al., 2017). About 70% of low-density lipoprotein (LDL) is metabolized by endocytosis in the liver (Wang et al., 2018). Normal liver functioning is important for the smooth functioning of the body. Cirrhosis alters lipid metabolism and reduces glycogen reserves, inducing malnutrition and lipolysis. Previous studies show that cirrhosis alters lipid metabolism, particularly causing hypobetalipoproteinemia. and hypocholesterolemia (Abdelhai Sonbol et al., 2023; Gad Allah et al., 2022), and these modifications are associated with the progression of liver disease. Alteration of lipid profile in cirrhotic patients involve complex mechanism and requires detailed research. The burden of chronic liver disease is increasing among the local population. Thus, this study aims to assess the association of lipid profiles of cirrhotic patients with scores including MELD and Child-Pugh.

Methodology

The retrospective study was conducted in the Hepatology & Medicine Department of the hospital from January 2022 to January 2023. The study included patients aged > 18 years who had cirrhosis due to hepatitis C infection. Patients with

hepatocellular carcinoma, HIV, hepatic steatosis, cystic fibrosis, hypothyroidism, primary dyslipidemia, and chronic kidney disease were excluded. Informed consent of the participants was taken. The ethical board of the hospital approved the study. Demographic data, biochemical parameters (triglyceride (TG) levels, high-density lipoprotein (HDL), low-density lipoprotein (LDL), very low-density lipoprotein (VLDL), total cholesterol (TC)) and MELD (Model for End-Stage Liver Disease) and Child-Pugh (A, B, C) scores of the participants were recorded.

Lipid profile was considered hypocholesterolemic when HDL <40 mg/dL, TC <100mg/dL, LDL <70 mg/dL, VLDL <16 mg/dL, and hypotriglyceridemia when TG <70 mg/dL. Regarding the MELD score, patients were classified as those with <15, 15-10, and >20.

Data were analyzed using SPSS version 23.0. Quantitative data were represented as mean and standard deviation and qualitative data as frequency and percentage. ANOVA and t-tests were used for the comparison of quantitative variables. The chi-square test was used for adjusted variables. Pearson's correlation coefficient was used to evaluate the association between qualitative and quantitative variables. P value < 0.05 was considered statistically significant.

Results

A total of 150 patients were included in the study. The mean age of the participants was 59.4±9.5 years. The majority of participants were male (62%). 67 (44.6%) patients had a Child-Pugh score of A. 16 (10.6%) patients had MELD score > 20.

The association between lipid profile and Child-Pugh classification is shown in Table I. There was a significant decrease in serum TC level with disease progression. Score A was associated with high VLDL levels (VLDL ≥16 mg/dL), while scores B and C with low levels (VLDL<16 mg/dL). Patients with score C had lower serum TG (<70 mg/dL), while those with score A had higher levels (≥100 mg/dL). Those with score C had low HDL levels (<40 mg/dL), while those with score A had intermediate values (41-58 mg/dL).

The association between lipid profile and MELD score is shown in Table II. Patients with a MELD score ≥20 had lower LDL (<70 mg/dL), TC (<100 mg/dL) levels, and VLDL (<16 mg/dL), while those with a score <15 had higher levels. Those with higher MELD scores had HDL <40 mg/dL, while MELD <15 had moderate levels (40-59 mg/dL).

A statistically significant inverse correlation between lipid fractions and the Child-Pugh score (P<.001) was found. The higher MELD score was correlated with lower TG (P=.003), VLDL (P=.030), LDL (P<.001), HDL (P<.001), and TC (P < .001) levels.

Table I Association between lipid profile and Child-Pugh score

Characteristic	Child-Pugh A n=69	Child-Pugh B n=46	Child-Pugh C n=35	P value
Cholesterol				
<100	2 (2.8%)	4 (8.6%)	16 (45.7%)	<0.001
100-149	22 (31.8%)	28 (60.8%)	14 (40%)	
≥150	45 (65.2%)	14 (30.4%)	5 (14.2%)	
VLDL				
<16	24 (34.7%)	30 (65%)	27 (77.1%)	<0.001
≥16	45 (65.2%)	16 (34.7%)	8 (22.8%)	
LDL				
<70	17 (24.6%)	23 (50%)	25 (71.4%)	<0.001
70 - 99	24 (34.7%)	17 (36.9%)	6 (17.1%)	
≥100	28 (40.5%)	6 (13.04%)	4 (11.4%)	
HDL				
<40	10 (14.4%)	13 (28.2%)	24 (68.5%)	<0.001
40 - 59	47 (68.1%)	23 (50%)	9 (25.7%)	
≥60	12 (17.3%)	10 (21.7%)	2 (5.7%)	
TG				
<70	17 (24.6%)	21 (45.6%)	19 (54.2%)	0.003
70 - 99	26 (37.6%)	18 (39.1%)	9 (25.7%)	
≥100	26 (37.6%)	7 (15.2%)	7 (20%)	

Table II Association between lipid profile and MELD score

Characteristic	MELD <15 n=97	MELD 15-19 n=36	MELD ≥20 n=17	P value
Cholesterol				
<100	5 (5.1%)	8 (22.2%)	8 (47.0%)	<0.001
100-149	40 (41.2%)	19 (52.7%)	6 (35.2%)	
≥150	52 (53.6%)	9 (25%)	3 (17.6%)	
VLDL				
<16	43 (44.3%)	23 (63.8%)	14 (82.3%)	0.006
≥16	54 (55.6%)	13 (36.1%)	3 (17.6%)	
LDL				
<70	41 (42.2%)	20 (55.5%)	13 (76.4%)	0.003
70 - 99	31 (31.9%)	10 (27.7%)	2 (11.6%)	
≥100	25 (25.7%)	6 (16.6%)	2 (11.6%)	
HDL				
<40	30 (30.9%)	17 (47.2%)	13 (76.4%)	<0.001
40 - 59	51 (52.5%)	14 (38.8%)	2 (11.6%)	
≥60	16 (16.4%)	5 (13.8%)	2 (11.6%)	
TG				
<70	37 (38.1%)	14 (38.8%)	10 (58.8%)	0.061
70 - 99	33 (34.02%)	15 (41.6%)	4 (23.5%)	
≥100	27 (27.8%)	7 (19.4%)	3 (17.6%)	

Discussion

In this study, we assessed the association between MELD and Child-Pugh score and liver disease progression. The results showed that a lower lipid profile signifies increased liver impairment. Hypotriglyceridemia and hypocholesterolemia were significantly correlated with MELD and Child-Pugh scores. These results align with previous studies' findings, which reported altered lipid metabolism in cirrhotic patients (Feng et al., 2021; Trieb et al., 2020). Liver fibrosis and the onset of cirrhosis has shown to reduce lipoprotein and TC. TC serum level decreases due to decreased production of ACAT (acyl-CoA: cholesterol acyltransferase) enzyme (Ojeda-Granados et al., 2021). The prognosis of cirrhosis is based on etiology, comorbid disease, severity of disease, and complications.

Different clinical and laboratory evaluation systems are developed for the staging of liver disease. MELD and Child-Pugh scores are widely used prognostic markers (Ojeda-Granados et al., 2021). Analysis of the association between liver function and Child-Pugh classification showed that Child-Pugh score C was associated with lower HDL, LDL, VLDL, TG, and TC levels. These were in line with a previous study by Dave et al., which evaluated HDL, LDL, VLDL, and TC levels in patients with cirrhosis and HCV and correlated these values with the Child-Pugh score (Dave et al., 2019). It was observed that cirrhotic patients had reduced HDL, LDL, and TC levels, and reduction was associated with Child-Pugh C. Peng et al. evaluated the association between hypocholesterolemia and advanced cirrhosis and reported Child-Pugh C and reduced cholesterol levels in patients with viral cirrhosis (Peng et al., 2020).

There was a significant association between the progression of MELD and reduction in lipid profile except for TG. Results showed a significant inverse correlation between lipid markers and prognostic criteria (MELD and Child-Pugh score). A previous study showed that in decompensated cirrhosis, LDL, HDL, TC, and TG level decreases with an increase in MELD score (Ballester et al., 2021). A study conducted by Mylavarapu et al. reported that TC level was a significant independent predictor of mortality (Mylavarapu et al., 2022). Conducted a study on cirrhosis due to different etiologies and reported that patients with HDL <30 mg/dL need a transplant within a year (Yu et al., 2022). The limitation of this study is that it is a single-centered study with a small sample size and no control group. A larger study is recommended for further evaluation.

Conclusion

There is a significant association between MELD and Child-Pugh prognostic markers and reduced lipid profiles of cirrhotic patients. These results suggest using lipid profiles as an additional tool for evaluating liver disease.

Conflict of interest

The authors declared an absence of conflict of interest.

[Citation Raza, A., Khan, M.S.N2., Khan, A.R., Naeem, M., Serwer, S., Aslam, M.A. (2023). Association between lipid profile of cirrhotic patients and prognostic scores. *Biol. Clin. Sci. Res. J.*, **2023***: 312*. doi: https://doi.org/10.54112/bcsrj.v2023i1.312]

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