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EVALUATION OF LIPID PROFILE IN PATIENTS WITH CIRRHOSIS CAUSED BY HEPATITIS C VIRUS AND ITS ASSOCIATION WITH CHILD-PUGH SCORE

Minhal Saeed[*1], Akbar Chaudhry[2], Sehrish Sarwar[3], Umaima Waris[4]

[*1]*MBBS, PGR General Medicine, Chaudhary Muhammad Akram Teaching and Research Hospital (CMATRH), Lahore*
[2]*MBBS, FCPS, MRCP, FRCP, FACC, Dean of Medical Sciences Azra Naheed Medical College, Lahore*
[3]*Assistant Professor of Gastroenterology, Chaudhary Muhammad Akram Teaching and Research Hospital (CMATRH), Lahore*
[4]*MBBS, FCPS Medicine Senior Registrar Medicine Department Chaudhary Muhammad Akram Teaching and Research Hospital (CMATRH), Lahore*

[*1]dr.minhalsaeed@gmail.com

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Corresponding Author: *
Minhal Saeed

Abstract

Background: *Hepatitis C virus (HCV) infection is yet the leading cause of chronic liver disease and cirrhosis, especially in developing country such as Pakistan. Liver in particular takes centre stage in lipid processing and with the progressive hepatic dysfunction of the cirrhosis, the serum lipid levels can all be changed greatly. But there are no extensive peripheral data to ascertain the relationship between the severity of liver disease and liver derangement of lipids.*

Objective: *To compare the relationship between the fasting lipid profiles and the Child-Pugh classification in patients with HCV induced liver cirrhosis.*

Methods: *A cross-sectional study was also carried out at Chaudhry Muhammad Akram Teaching and Research Hospital between 21 January 2025 and 21 June 2025. A total of 200 patients (with cirrhosis) 16-75 years of age were recruited with HCV infection. The patients were arbitrated into Child-Pugh classes; A, B, and C. Blood samples were also taken after fasting overnight in order to evaluate the level of total cholesterol, triglycerides, low-density lipoprotein (LDL), and high-density lipoprotein (HDL). A one-way ANOVA with post-hoc tests of Tukey was applied and $p<0.05$ was regarded to be statistically high.*

Results: *There were 200 patients involved in the research, 70 patients with a Class A of Child-Pugh, 80 patients with a Class B of Child-Pugh, and 50 patients with a Class C of Child-Pugh. Mean levels of total cholesterol, triglycerides, LDL, and HDL were significantly decreased with the failure of Child-Pugh classification ($p<0.001$ for all). The post-hoc was significant in showing that there was significant difference between the pair-wise association which implies that there was a strong inverse relationship between lipid profile and the severity of cirrhosis.*

Conclusion: *The relation between serum lipid profile and Child-Pugh class demonstrates statistical correlation that is negative in patients having HCV-related cirrhosis. The profiling of lipids could be an easy, low-cost addition to the*

assessment of liver health and the progress of the disease, especially in low-resource settings

INTRODUCTION

The liver diseases especially involving the hepatobiliary system are a major health issue of global concern (1). Chronic liver diseases leading to cirrhosis deteriorate the livelihood of affected people and cause high morbidity and mortality globally (2). Cirrhosis is the final office of multiple injured conditions of liver and it is defined by histologically diffuse hepatic fibrosis, regenerative nodules, and alteration of normal structure in the liver which leads to the disability of the liver function progressively (3). In the developing countries like Pakistan,cirrhosis is caused by a long-lasting infection of the hepatitis C virus (HCV) (4). The second higher burden of HCV in the world is in Pakistan and has a disastrous rate of its progression to cirrhosis (5). This progression correlates with irreversible liver damage whose only definite treatment at the decompensated phase is liver transplant (6).

Lipid metabolism revolves around the liver and a failure in its function will definitely affect serum lipid levels (6). Liver synthetic capacity of cirrhotic patients due to HCV gets reduced and thus causes decreased serum total cholesterol, triglycerides, low-density lipoprotein (LDL), and high-density lipoprotein (HDL) (7). A number of studies have also indicated negative relationship between lipid levels and the extent of cirrhosis based on Child-Pugh score, a well known clinical parameter applied to measure the level of liver disease and prognosis (8). Nevertheless, despite biological feasibility and occasional observations, local data provides limited evidence on this association (9).

Few studies have been done as far as the changes in lipid profile patterns are concerned in respect to different Child- Pugh classes especially in Pakistan where the burden of HCV has always been high. This knowledge gap makes it hard to ascertain the possibility that routine lipid profiling can help in the determination of severity or the prognosis of a disease. Thus, the purpose of the research is to check the lipid profile of patients who have been diagnosed with HCV and assess its relation with the Child-Pugh Classification .This association is of potential help to assess the liver disease with the help of lipid profiles as a non-invasive, cost-effective tool of tracking the progress of liver disease and aid in clinical decision making and risk stratification of cirrhotic patients.

MATERIAL AND METHODS

A cross-sectional study was carried out at the department of Medicine, Chaudhry Muhammad Akram Teaching and Research Hospital, Lahore after taking approval from ethical review comittee of hospital (IRB # ANMC/ IRB/ 2025/ 013). It was carried out from 21 January 2025 and 21 June 2025 for the assessment and correlation of Child-Pugh scores and fasting lipid profile in the patients of decompensated liver disease (DCLD) due to Hepatitis C (HCV). A sample size of 200 was calculated by using WHO sample size calculator with prevalence of Child-Pugh Class C at 11.47 percent with 95 of confidence interval and margin of error at 5 percent (9). In this study patients aged 16 to 75 of both genders having liver cirrhosis (presence of shrunken liver on ultrasound) due to hepatitis C were enrolled by using non-probability consecutive sampling technique. While the patients having Wilson's disease, hepatic steatosis, hepatocellular carcinoma, primary dyslipidemias, hypothyroidism and chronic renal failure were excluded from the study.

Two hundred patients who met this criteria were enrolled by OPD. Informed consent was taken and demographic information (including name, age, gender, .body mass index(BMI), duration of cirrhosis, history of smoking, diabetes , hypertension, feeding habits, hepatitis C (based on medical record) and Child-Pugh Score was recorded. After 8-10 hours of fasting period blood samples were taken in a 3cc disposable syringe and sent to hospital laboratory for assessment of lipid profile. Subsequently, patients were assessed in relation to their Child-Pugh scores. Thorough analysis of the reports was done and the values of total cholesterol, triglycerides, LDL, and HDL were recorded in relation to patient's Child Pugh Scores.

The data was analysed using the Statistical Package for Social Sciences (or SPSS, Version 26). The demographic data such as age, BMI, duration of cirrhosis, child-pugh score, and lipid profile were expressed in mean and standard deviation. On the other hand, frequency and percentage featured gender, history of smoking, diabetes, hypertension, socioeconomic status and feeding habits. The application of ANOVA and post hoc Tukey will allow the comparison of the deranged lipid profile among the groups of different Child-Pugh classes in one way. A significance level of p-value 0.05 will be adopted.

RESULTS

The study population comprised of 200 patients with liver cirrhosis caused by hepatitis C virus. The patients were assigned to three classes considering their Child-Pugh categorization as Class A (n=70), Class B (n=80) and Class C (n=50). The age of respondents had a median of 49.2 years (11.3 SD) and the M:F ratio was estimated as about 1.2:1. The lipid parameters (Total Cholesterol, Triglycerides, LDL, and HDL) between the three groups (Child-Pugh 1, Child-Pugh 2 and Child-Pugh 3) of patients were compared by the one way ANOVA and analyzed as shown in Table 1. The mean values of the total cholesterol, triglycerides, LDL, and HDL decreased statistically and significantly with increasing severity of the liver dysfunction as defined by the Child-Pugh classification ($p < 0.001$ concerning all the comparisons).

Table 1: Comparison of Mean Lipid Profile Across Child-Pugh Classes
(One-way ANOVA)

Lipid Parameter	Class A (Mean ± SD)	Class B (Mean ± SD)	Class C (Mean ± SD)	*p*-value
Total Cholesterol (mg/dL)	184.6 ± 18.5	162.8 ± 17.1	141.2 ± 14.3	<0.001
Triglycerides (mg/dL)	151.9 ± 14.7	132.6 ± 13.9	115.4 ± 12.1	<0.001
LDL (mg/dL)	112.7 ± 13.4	98.6 ± 12.2	84.3 ± 11.6	<0.001
HDL (mg/dL)	38.4 ± 6.2	35.1 ± 5.7	31.7 ± 5.1	<0.001

Additional pair-wise comparisons by Tukey HSD post hoc test indicated that the differences between pairs of Child-Pugh classes (A vs B; A vs C; and B vs C) were significant in all the parameters of the lipid spectrum. The comparisons between any two of the groups were statistically significant, indicating that the lower the Child-Pugh score, the more serum lipid levels decreased progressively, and the severest cases among them are presented by Class C patients.

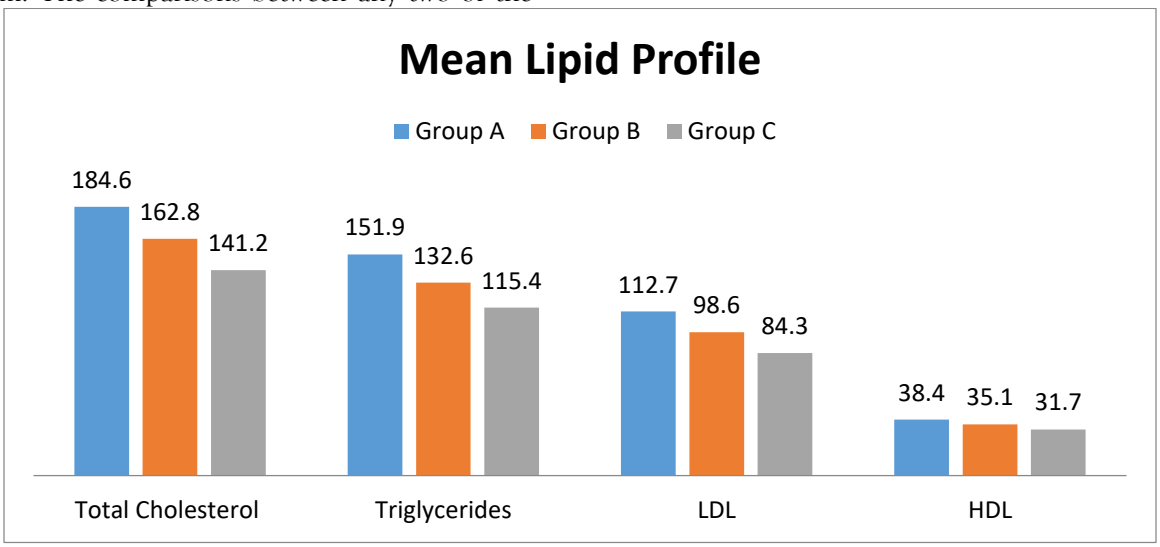

Figure 1: Comparison of Mean Lipid Profile Across Child-Pugh Classes

Table 2: Tukey's Post-Hoc Test for Lipid Profile Between Child-Pugh Groups

Lipid Parameter	Comparison Groups	Mean Difference (mg/dL)	95% CI	*p*-value
Total Cholesterol	A vs B	21.8	14.2 to 29.4	<0.001
	A vs C	43.4	35.1 to 51.7	<0.001
	B vs C	21.6	13.7 to 29.5	<0.001
Triglycerides	A vs B	19.3	11.6 to 26.9	<0.001
	A vs C	36.5	28.7 to 44.3	<0.001
	B vs C	17.2	9.8 to 24.6	<0.001
LDL	A vs B	14.1	7.9 to 20.3	<0.001
	A vs C	28.4	21.6 to 35.2	<0.001
	B vs C	14.3	7.2 to 21.4	<0.001
HDL	A vs B	3.3	1.1 to 5.5	0.003
	A vs C	6.7	4.4 to 9.0	<0.001
	B vs C	3.4	1.3 to 5.5	0.002

DISCUSSION

This paper explained the relationship between the components of lipid profile and the intensity of liver cirrhosis as a result of the hepatitis C virus (HCV), followed by Child Pugh classification. The results showed a statistically significant negative correlation between the parameters of lipid profile (total cholesterol, triglycerides, LDL and HDL) against Child-Pugh scores. The findings do not contradict those of other studies published earlier that affirm that the lipid levels drop steadily as liver dysfunction advances.

The liver is at the centre of lipid metabolism, including the production, oxidation, and transportation of lipoproteins (10,11). The progressive cirrhosis also impairs the hepatocellular mwtabolism and lowers the synthesis of lipoproteins. This dysfunction also provides the logical explanation to the decreased values of total cholesterol, triglyceride, LDL and HDL that we found in higher Child-Pugh classes in our sample. Child Class C patients always had the lowest lipid rates in correlation to the use of lipid profile as a substitute of disease severity (12).

We also have similar results in terms of inverse correlations in the serum lipid levels together with Child-Pugh score, as observed by Parikh et al. and Babli et al. These findings are similar to our results and were observed in one study (n=314) in which patients with Child-Pugh Class C displayed less total cholesterol, LDL and HDL than those with Classes A and B ($p<0.001$). Again, in another study of 122 patients, the percentage of patients with total cholesterol >200 mg/dL was more than 78 in class A patients whereas it was found that a larger number of class C patients had low lipid levels thus supporting our findings (13, 14).

The application of ANOVA and subsequent Tukey post -hoc analysis in the study we conducted imparts mathematical strength to the trends it captured. The entire lipid components demonstrated parallel and significant decrease among Class A and B and C. The regression lines in the scattered plots also indicated negative relationship and thus the strength of the relationship between the variables (15). The above clinical results indicate that indirectly,serum lipid profile may also be used as an indicator of hepatic synthetic activity and hence may also be useful in prognostication. Due to the simple and cost effective test of lipid profile, it can also be used as auxiliary to assess disease progression in cirrhotic patients particularly in a resource-poor environment (16-20).

This study however has its limits. First, the cross-sectional data fails to give a possibility of determining casualty or assessing the effects of consecutive lipid changes with proceeding advancement of cirrhosis. Second,only patients with hepatitis C associated cirrhosis were enrolled, therefore,the results cannot not be extrapolated to other etiologies. Third, conditions such as malnutrition or other infections were not controlled and can independently affect the levels of lipids.Further validation and generalization of such findings across other etiologies of cirrhosis

might be done by longitudinal follow-up and larger multi-center cohorts in future studies.

CONCLUSION

Serum lipid profile parameters and the severity of liver cirrhosis have got a strong negative correlation. Reduced levels of total cholesterol, triglycerides, LDL and HDL are significantly clustered to greater classes of Child-Pugh, which reveals elevated degrees of liver dysfunction. Periodic measurement of lipid profile can complement the evaluation in cirrhotic patients especially in the environment with limited labs and facilities to study advanced hepatic functions.

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