International Journal of Public Health Asia Pacific
Open Access: e-Journal
ISSN: 2822-0587(Online)

Impact of lipid profile alterations on the severity of liver cirrhosis

Naung Latt Htun[1*], Yee Yee Than U[2], Ei Sandar U[3]

[1]Internal Medicine Doctor, Ministry of Health Brunei Darussalam: Bandar Seri Begawan, Brunei-Muara
[2]Specialist Assistant Surgeon, University of Medicine 2 Yangon, Myanmar
[3]Associate Professor, University of Medicine 1 Yangon, Myanmar

*Corresponding author: Naung Latt Htun, leonkhwar2@gmail.com

ABSTRACT

Background: Lipid derangements are commonly seen in chronic liver diseases. Estimating serum lipid profile allows better assessment of hepatic function and evaluation of the prognosis of patients with hepatic cirrhosis.

Objectives: This study was carried out to determine the lipid profile changes and the severity of liver cirrhosis.

Methods: It is a hospital-based cross-sectional descriptive study. A total of 119 patients who met the inclusion criteria were enrolled. Thorough history taking and physical examination were done. Measurement of serum lipid profile was done. The severity of liver cirrhosis was determined using the Child-Pugh score, and then the lipid profile changes, and the severity of liver cirrhosis were correlated.

Results: The mean age of the study population was 45.8 ± 10.6 years. Most patients were male (91.6%), and the remaining 8.4% were females. Alcohol was the most common underlying cause of liver cirrhosis (70.6%). Half of the participants were Child C (52.1%), followed by Child B (24.4%) and Child A (23.5%). The values of total cholesterol, triglyceride, Low-Density Lipoprotein (LDL), and High-Density Lipoprotein (HDL) cholesterol were decreased with increasing Child grading (P-value < 0.05). There was also a significant association between lipid profile changes and the severity of cirrhosis.

Conclusion: Lipid derangements are commonly seen in cirrhosis of the liver. It helps diagnose the severity of liver disease and acts as a prognostic sign. Therefore, lipid profile assessment should be advised in all cases with cirrhosis.

Keywords: Child-Pugh score, Liver cirrhosis severity, Lipid profile

1. Introduction

Cirrhosis is a common hepatological disorder encountered frequently in clinical settings. It is a pathologically defined condition that results from chronic liver damage leading to necrosis of liver cells, fibrosis, and nodular regeneration, ultimately causing significant distortion of liver architecture [1]. This progression of damage results from various underlying causes, such as viral hepatitis, alcohol abuse, and non-alcoholic fatty liver disease (NAFLD).

Cirrhosis contributes to around 170,000 deaths annually in Europe, and in the United States, it was the 12th leading cause of death, accounting for 37,890 deaths [2]. In Myanmar, the age-standardized incidence rate per 100,000 population is 34.3 (range: 28.5–40), with cases increasing from 12,459.9 in 1990 to 19,740.1 in 2019, representing a change of 58.4 and an annual change rate of 0.1 [3]. However, there was no documented data for liver cirrhosis and its related factors not only in Yangon but also in the research hospital.

Cirrhosis manifests with a wide range of clinical symptoms, from asymptomatic to severe liver failure. Common complications include gastrointestinal bleeding, ascites, encephalopathy, bacterial infections, renal failure, and hepatocellular carcinoma. Proper treatment depends on the underlying cause and the severity of liver damage, which is often assessed using the Child-Turcotte-Pugh (CTP) criteria [4].

Lipid metabolism, which is heavily regulated by the liver, is significantly disrupted in cirrhotic patients. The liver synthesizes lipids, lipoproteins, and apolipoproteins, essential for maintaining cellular function and homeostasis [5]. As cirrhosis progresses, lipid profile abnormalities worsen, indicating both the severity of the disease and its prognosis [6]. Thus, evaluating lipid profiles in cirrhotic patients provide valuable insight into disease progression. Therefore, this study was conducted to determine the lipid profile in patients with cirrhosis and to assess if it relates to the severity of cirrhosis.

2. Methods

2.1 Study Area

This study was carried out in the medical ward of Thingangyun Sanpya General Hospital.

2.2 Study Design

This study was a hospital-based, cross-sectional descriptive study from January 2018 to December 2018.

2.3 Sample size and sampling

The minimal sample size (n) was calculated using the following formula with a 95% confidence interval and 95% power of the test; the sample size was 119 patients. The required sample size was calculated using the formula [7]:

$$n = \frac{Np(1-p)z^2_{1-\frac{\alpha}{2}}}{d^2(N-1)+p(1-p)z^2_{1-\frac{\alpha}{2}}}$$

Were,

N = Available population of patients with cirrhosis of the liver in 2016 from Hospital Statistics (only one time counted for repeatedly admitted patients) = 300

$z_{1-\frac{\alpha}{2}}$=Confidence level = 95% (1.96)

d = Precision level = 5% (0.05)

p = Proportion of cirrhotic patients with lipid abnormalities = 0.15 (8)

n = Estimated required sample size = 119

2.4 Data Collection

After getting informed consent, all patients underwent a detailed history taking process according to the proforma. A thorough physical examination noting the stigmata of chronic liver insufficiency and the features of portal hypertension, ascites and splenomegaly was done. Ascites was detected by full flanks, shifting dullness, and fluid thrill. Fasting blood samples (5 ml fresh blood) were drawn from the anterior cubital vein under aseptic conditions and collected in clean and disposable plain tubes and Prothrombin Tube (PT) for estimation of serum bilirubin, albumin, lipid profile (serum cholesterol, triglyceride, HDL, LDL) and Prothrombin Time/International Normalized Ratio (PT/INR). To assess the severity of the disease, cirrhotic subjects were further segregated according to Child-Pugh-Torcotte classification as Child A [5, 6] mild, Child B [7-9] moderate, and Child C [10-15] severe, indicating the degree of hepatic reserve and function.

2.5 Data Analysis

Data was collected using proforma and the interviewer manually reviewed the collected data for completeness, consistency, and accuracy. After checking the data and code, data entry was done in Microsoft Excel 20. A check file was used for data validation, and data was edited if necessary. Data analysis was performed by using SPSS 16 statistical software. Frequent distribution and cross tables were constructed to describe discrete data. The association between categorical variables were analysed using the Chi-square test, Fisher's exact test, or other appropriate

statistical tests. The independent t-test was used to compare the continuous variables between the two groups. The level of significance was set at a P-value of < 0.05.

2.6 Ethical Clearance

This study obtained ethical approval from the institutional research ethics review committee, the University of Medicine (2), Yangon, Myanmar, in February 2020 [Reference no. Ethical (240/2017)].

3. Results

The study revealed that the mean age of the cirrhotic patients was 45.8 ± 10.6 years, with the majority (47.9%) lying within the 30–45 age group. This was followed by 38.7% in the 46–60 age group, while 8.4% were older than 60, and 5% were younger than 30. The youngest patient was 21, and the oldest was 73. On gender distribution, 91.6% of the patients were male, and 8.4% were female, resulting in a male-to-female ratio of 11:1.

The most common underlying cause of liver cirrhosis was alcohol consumption, accounting for 70.6% of cases. Viral infections such as Hepatitis B (HBV) and Hepatitis C (HCV) were responsible for 16% and 10.9% of cases, respectively, while other rare causes only 2.5%. According to Child-Pugh grading, 52.1% of the patients were classified as Child C, indicating severe cirrhosis; 24.4% were Child B, and 23.5% were Child A (Table 1).

Table 1: Child-Pugh Grading of Cirrhosis in Study Population (n=119)

Child Grading	Number (n)	Percentage (%)
Child Pugh Grade A	28	23.5
Child Pugh Grade B	29	24.4
Child Pugh Grade C	62	52.1
Total	119	100.0

Regarding lipid profiles, 64.7% of the patients had total cholesterol levels between 100–200 mg/dl, 29.4% below 100 mg/dl, and 5.9% above 200 mg/dl. For triglycerides, 54.6% had values between 100–200 mg/dl, 38.7% had levels below 100 mg/dl, and 6.7% were above 200 mg/dl. The distribution of LDL showed that 72.3% of patients had levels below 100 mg/dl, 26.1% between 100–150 mg/dl, and 1.7% above 150 mg/dl. Most patients (61.3%) had HDL levels below 30 mg/dl, 32.8% had HDL levels between 30–60 mg/dl, and only 5.9% had levels above 60 mg/dl.

The mean lipid profile values were as follows: total cholesterol 125.7 ± 41.4 mg/dl, triglycerides 119.2 ± 51.8 mg/dl, LDL 76.1 ±

36.7 mg/dl, and HDL 28.9 ± 19.1 mg/dl. When cross-tabulated with Child-Pugh grading, 85.7% of Child C patients had total cholesterol levels below 100 mg/dl (P < 0.001), and 67.4% had triglyceride levels below 100 mg/dl (P = 0.031). Furthermore, 68.6% of Child C patients had LDL levels below 100 mg/dl (P < 0.001), and 67.1% had HDL levels below 30 mg/dl (P < 0.001) (Table 2).

Table 2: Association with Child Grading and Lipid Profiles in study Population (n=119)

	Child Pugh Grade A (n = 28)		Child Pugh Grade B (n = 29)		Child Pugh Grade C (n = 62)	
	Number	**Percentage**	**Number**	**Percentage**	**Number**	**Percentage**
Total Cholesterol**						
<100	3	5.7	3	8.6	30	85.7
100 – 200	21	27.3	25	32.5	31	40.3
>200	5	71.4	1	14.3	1	14.3
Triglyceride*						
<100	6	13.0	9	19.6	31	67.4
100 – 200	20	30.8	16	24.6	29	44.6
>200	2	25.0	4	50.0	2	25.0
LDL**						
<100	9	10.5	18	20.9	59	68.6
100 – 200	18	58.1	10	32.3	3	9.7
>200	1	50.0	1	50.0	0	0.0
HDL**						
<30	5	6.8	19	26.0	49	67.1
30 – 60	21	53.8	8	20.5	10	25.6
>60	2	28.65	2	28.6	3	42.9

* P-value <0.05, ** <0.001

The mean total cholesterol values in Child A, Child B, and Child C were 158±42.5, 135.5±35.6, and 106.6±32.2. The total cholesterol levels were reduced with increased grading of Child score, which were significant at P-value < 0.001 (Figure 1).

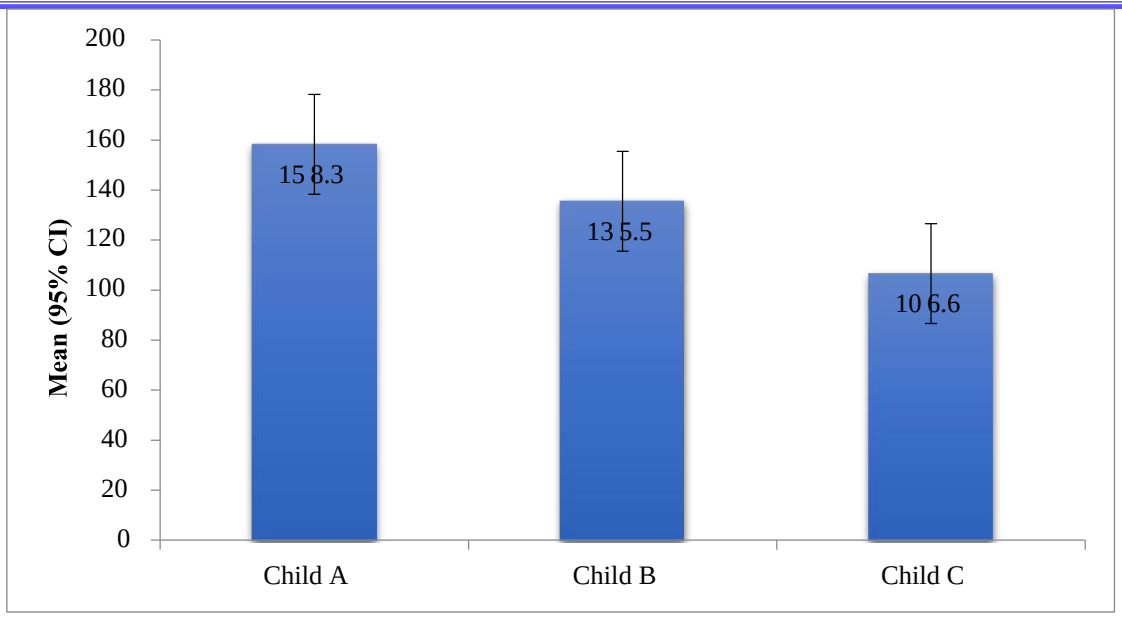

Figure 1: Comparison of total cholesterol by severity of cirrhosis (Child score) (n=119)

The mean values of HDL were 41.9±14.6 in Child A, 29.2±19.6 in Child B, and 22.9±17.9.3 in Child C. When HDL values were compared with the severity of cirrhosis according to the Child score, there was a statistically significant at P-value < 0.001 (Figure 2). These findings showed significant lipid abnormalities in patients with advanced cirrhosis.

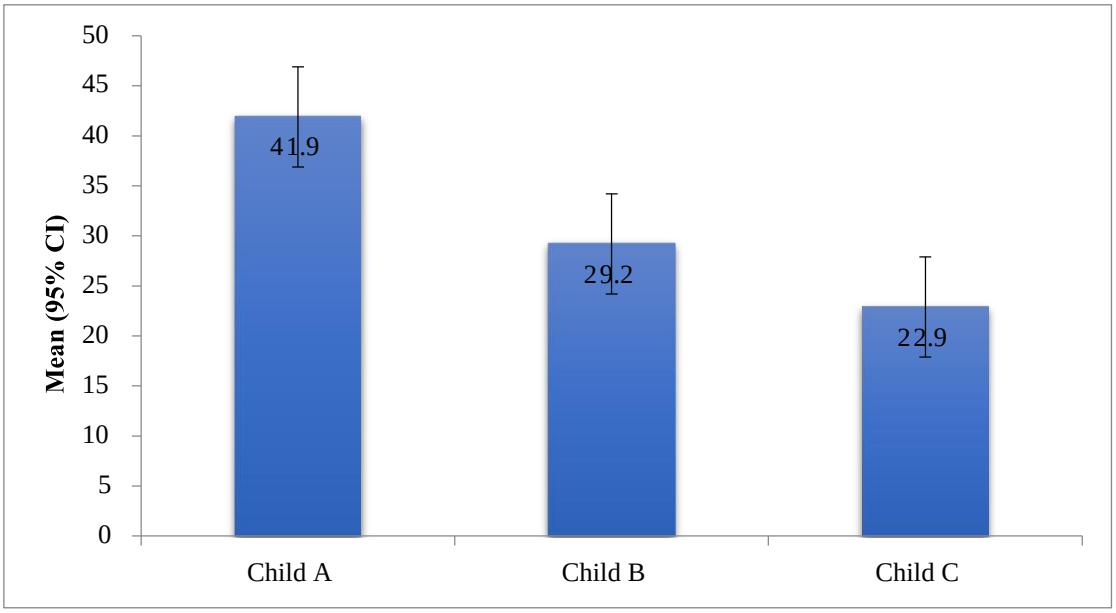

Figure 2: Comparison of HDL by severity of cirrhosis (Child score) (n=119)

4. Discussion

This hospital-based cross-sectional descriptive study involved 119 patients with liver cirrhosis who were admitted to the medical ward of Thingangyun Sanpya General Hospital from January to December 2018. The primary objective was to assess lipid profile abnormalities in these patients and correlate them with the disease severity using the Child-Pugh scoring system.

The age of the patients ranged from 21 to 73 years, with a mean age of 45.8 ± 10.6 years, like some studies conducted by *Kyaw-Swar-Lin (2006)* and *Suman et al. (2016)* [1,9], where the mean ages were 44.46 ± 10.79 years and 44.02 ± 10.62 years, respectively. The results were slightly younger than those observed in *Siregar and Tampubolon (2018)* [10], whose mean age was 51.36 ± 12.6 years, and older than the *Nway-Theint-Theint-Tin (2014)* study [11], which reported a mean age of 40 ± 15.08 years. The highest prevalence of cirrhosis in this study occurred among patients aged 30 to 45, like *Kyaw-Swar-Lin (2006)* and *Nway-Theint-Theint-Tin (2014)* [9,11].

A solid male preponderance was found, with 91.6% of the patients being male, resulting in a male-to-female ratio of 11.4:1. This finding reflected those of previous studies, such as *Kyaw-Swar-Lin (2006)* and *Nway-Theint-Theint-Tin (2014)* [9,11], which also reported male-dominated cases. In contrast, earlier studies by *Ko-Ko (1996)* [12] and *Thandar-Tun (2001)* [13] found many differences between genders, which might be attributed to the higher number of male alcoholics in this study.

The most common cause of cirrhosis in this study was chronic alcohol consumption, which covered 70.6% of cases. Chronic HBV and HCV infections accounted for 16% and 10.9%, respectively, while 2.5% had unknown causes. These findings are consistent with studies by *Kyaw-Swar-Lin (2006)* and *Suman et al. (2016)* [1,9], which also identified alcohol as the leading cause of cirrhosis. Regional differences and study populations may explain variations in cirrhosis ethology.

Most patients in this study were classified as Child C (52.1%), indicating late-stage disease, followed by 24.4% in Child B and 23.5% in Child A. These findings are like those of *Siregar and Tampubolon (2018)* [10], who reported 60% of patients in Child C. In contrast, *Kyaw-Swar-Lin's (2006)* study showed a higher proportion of patients in Child B (48.33%) and fewer in Child C (36.67%), suggesting variations in patient

presentation and disease severity across studies [9].

Lipid profile abnormalities were prevalent among the cirrhotic patients. The mean values for total cholesterol, triglycerides, LDL, and HDL were 125.7 ± 41.4, 119.2 ± 51.8, 76.1 ± 36.7, and 28.9 ± 19.1, respectively. These findings are comparable to those in studies by *Laxmi Nangliya et al. (2015)* and *Suman et al. (2016)* [1, 14], although there were slight differences in the absolute values.

In this study, lipid profile parameters—total cholesterol, triglycerides, LDL, and HDL—decreased with increasing severity of liver cirrhosis, as demonstrated by their correlation with Child-Pugh grading. Total cholesterol was 158 ± 42.5 in Child A, 135.5 ± 35.6 in Child B, and 106.6 ± 32.2 in Child C ($P < 0.001$), reflecting impaired liver function and metabolism as cirrhosis worsened. These results align with previous studies such as *Laxmi Nangliya et al. (2015)* and *Jatav et al. (2018)* [14, 15], although not all studies, like *Siregar and Tampubolon (2018)* [10], found significant associations.

However, this study had some limitations. The study's limitations include its single-centre design in specific hospital, which limits the generalizability of the findings to broader populations. Additionally, potential confounding factors, such as variations in diet, medication, genetic predispositions, and other underlying health conditions, might have influenced the results despite efforts to control for them. Furthermore, the lack of longitudinal follow-up prevents the assessment of whether changes in lipid profiles can predict long-term outcomes in cirrhosis patients.

The decline in triglycerides, LDL, and HDL levels as cirrhosis severity increased was also statistically significant, emphasizing the impact of hepatic dysfunction on lipid metabolism. In particular, the reduction in LDL levels was linked to decreased synthesis of apolipoproteins. Overall, this study highlighted the significant inverse relationship between lipid profiles and the severity of cirrhosis, underscoring the predictive value of lipid monitoring in liver disease. Furthermore, understanding the lipid-cirrhosis correlation leads in personalized treatments, risk stratification, targeted therapies, predictive monitoring, and dietary guidance, enhancing overall management and improving patient outcomes.

5. Conclusion

The liver is the principal site for the formation and clearance of lipoproteins. It receives fatty acids and cholesterol from peripheral tissues and diet, packages them into lipoprotein complexes, and releases these complexes back into circulation. Hence, it is unsurprising that liver diseases can affect plasma lipid levels in various ways. Cirrhosis of the liver occurred by different causes is often associated with dramatic reductions in plasma lipid levels due to reduced biosynthetic capacity. The study determined the lipid profiles in patients with liver cirrhosis and assessed whether they correlate with cirrhosis's severity. In this study, 119 patients with cirrhosis of the liver were studied. Total serum cholesterol, triglyceride, LDL, and HDL were then measured. Child-Turcotte-Pugh Score was calculated for each patient as an index for the extent of liver damage. This study found a significant decrease in total cholesterol, triglyceride, LDL, and HDL cholesterol levels. Then, a significant correlation was found between the severity of cirrhosis and change in serum lipid levels. Therefore, serum lipid profile may serve as a sensitive indicator of liver dysfunction in cirrhosis. Lipid profile should be advised in all cases with liver cirrhosis because it is essential for effective treatment and prognostic evaluation of patients with cirrhosis of the liver. However, further studies are needed to assess the predictive values of measuring lipid profiles to estimate the extent of liver damage in cirrhotic patients. Although the lipid profile is not routinely done in cirrhosis of liver patients in Myanmar, this study showed the importance and need for lipid profile assessment in all cirrhosis of liver patients.

Acknowledgement

My sincere gratitude goes to my institution and colleagues throughout this research.

References

[1] Suman C, Kumar BR, Prabhakar B. Lipid profile in assessing the severity of cirrhosis. J IAIM. 2016;3(6):113-23.
[2] Yoon Y-H, Chen CM. Surveillance report# 114: liver cirrhosis mortality in the United States: national, state, and regional trends, 2000–2017. 2019.
[3] Wang Y, Wang M, Liu C, Hao M, Wang W, Li Y, et al. Global burden of liver cirrhosis 1990–2019 and 20 years forecast: results from the global burden of disease study 2019. J Annals of Medicine. 2024;56(1):2328521.
[4] Gunnarsdottir SA, Olsson R, Olafsson S, Cariglia N, Westin J, Thjódleifsson B, et al. Liver cirrhosis in Iceland and Sweden: incidence, aetiology and outcomes. J Scandinavian journal of gastroenterology. 2009;44(8):984-93.

[5] Jarikre A, Momoh J. Plasma total cholesterol, high density lipoprotein cholesterol and low-density lipoprotein cholesterol levels in liver cirrhosis in Nigerians. J Nigerian Quarterly Journal of Hospital Medicine. 1996;6(3):157-9.
[6] Muhammed HP, Jayaraj K. Correlation of lipid profile in patients with severity of liver disease: a cross sectional study in a tertiary care hospital. J Int J Res Med Sci. 2016;5:326.
[7] Daniel WW, Cross CL. Biostatistics: a foundation for analysis in the health sciences: Wiley; 2018.
[8] Mehboob F, Ranjha FJPJMS. Dyslipidemia in chronic liver disease. 2007;1:103-5.
[9] Kyaw Swar L. Association between serum-ascitic albumin concentration gradient and the esophageal variceal bleeding in patients with cirrhosis of liver and ascites in North Okkalarpa General Hospital. Yangon: University of Medicine 2 Yangon; 2006.
[10] Siregar G, Tampubolon S, editors. Comparison of lipid profile between degrees of severity of hepatic cirrhosis in Haji Adam Malik General Hospital Medan. IOP Conference Series: Earth and Environmental Science; 2018: IOP Publishing.
[11] Nway Theint Theint T. Association between serum sodium level and the severity and complications of cirrhosis of liver in Magway General Hospital. Magway: University of Medicine Magway; 2014.
[12] Ko K. A Clinical Study of Patients with Ascites in North Okkalarpa General Hospital. Yangon: University of Medicine 2 Yangon; 1996.
[13] Thandar T. Significance of serum ascites albumin gradient in differential types of ascites in Medical Units of Mandalay General Hospital. Mandalay: University of Medicine Mandalay; 2001.
[14] laxmi Nangliya V, Sharma A, Mishra S. Evaluation of lipid profile in cirrhosis and their associatio the disease. 2015.
[15] Jatav JK, Shakya RK, Singh SJIJOSS. Study of lipid profile changes in cirrhosis of liver. 2018;6(3):108-14.