CHARACTERISTICS OF SERUM LIPID LEVELS AND ASSOCIATED FACTORS IN PATIENTS WITH LIVER CIRRHOSIS AT THAI BINH GENERAL HOSPITAL

Nguyen Trong Dung[1]*, Tran Phuong Quynh[1], Le Thanh Binh[1], Ho Danh Nhan[1], Luong Hong Loan[1], Pham Viet Anh[1], Do Thi Hanh[1]

ABSTRACT

Objective: To describe serum lipid levels and associated factors in patients with liver cirrhosis treated at Thai Binh General Hospital in 2025.

Method: A retrospective cross-sectional study included 116 cirrhotic patients (01/2025–11/2025). Total cholesterol (TC), LDL-C, HDL-C, and triglycerides (TG) were analyzed and compared by sex, age, BMI, and serum albumin.

Results: Most patients were male (92.2%) and aged 40–60 years (53.4%); Child-Pugh B and C accounted for 50.0% and 41.4%, respectively. Mean TC, LDL-C, HDL-C, and TG were 3.86±1.82, 2.10±1.31, 0.87±0.74, and 1,49 [1,63]mmol/L. Dyslipidemia was present in 82.8%. Lipid levels did not differ by sex, age, or BMI ($p>0.05$), but were significantly higher in patients with albumin ≥35 g/L than <35 g/L ($p<0.05$).

Conclusion: Dyslipidemia is common in cirrhosis and is significantly associated with serum albumin, reflecting hepatic synthetic function.

Keywords: Liver cirrhosis, lipid profile, cholesterol, Child-Pugh.

I. INTRODUCTION

Liver cirrhosis is the end stage of many chronic liver diseases, characterized by diffuse fibrosis and regenerative nodules that distort hepatic architecture and progressively impair liver function. According to the World Health Organization (WHO), chronic liver disease and cirrhosis remain among the leading causes of death worldwide, with increasing trends in many developing countries, including Vietnam [1]. Beyond impaired detoxification and protein synthesis, cirrhosis markedly affects lipid metabolism—an important physiological function of the liver.

The liver is central to the synthesis, metabolism, and regulation of circulating lipids, including total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), and high-density lipoprotein cholesterol (HDL-C). As hepatocellular injury progresses and functional parenchyma is replaced by fibrotic tissue, the production of apolipoproteins, lipoproteins, and lipid-metabolizing enzymes declines, resulting in altered serum lipid profiles [2]. Prior studies have reported that TC, LDL-C, and HDL-C decrease with increasing cirrhosis severity, particularly in Child-Pugh classes B and C, whereas TG levels may vary depending on disease etiology and stage [3], [4].

Changes in serum lipids may therefore reflect not only metabolic disturbances but also impaired hepatic synthetic capacity. Evidence suggests that serum cholesterol is associated with albumin levels and Child-Pugh scores, supporting lipid parameters as potential adjunct markers for assessing disease severity and prognosis [5]. Nutritional status—commonly evaluated using body mass index (BMI) and serum albumin—may further influence lipid levels in cirrhotic patients [6].

In Vietnam, cirrhosis remains prevalent due to chronic hepatitis B and C infection, alcohol-related liver disease, and non-alcoholic fatty liver disease. However, local data on lipid abnormalities in cirrhosis, particularly analyses of lipid levels in relation to nutritional indicators in provincial hospital settings, are still limited. Therefore, this study aimed to describe serum lipid levels in patients with cirrhosis treated at Thai Binh General Hospital in 2025 and to evaluate factors associated with lipid levels in this population.

II. SUBJECTS AND METHODS

2.1. Study population, setting, and period

This study was conducted using medical records of 116 patients diagnosed with liver cirrhosis and classified according to the Child-Pugh scoring system at the Department of Gastroenterology, Thai Binh General Hospital, from January 2025 to November 2025.

Inclusion criteria: Patients with a confirmed diagnosis of liver cirrhosis, available Child-Pugh classification, and complete lipid profile results.

Exclusion criteria: Patients with severe acute illness, end-stage malignancy, conditions or medications known to significantly affect lipid metabolism, or incomplete medical records.

2.2. Study design and sample size

1. Thai Binh University of Medicine and Pharmacy
*Corresponding author: Nguyen Trong Dung
Email: trongdunga11k41@gmail.com
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Study design: A retrospective cross-sectional study.

The sample size was calculated using the formula for estimating a single proportion:

$$n = Z^2_{(1-\alpha/2)} \frac{p(1-p)}{d^2}$$

Where:

n = required sample size

α = 0.05 (confidence level of 95%)

Z = 1.96

p = estimated prevalence of dyslipidemia in cirrhotic patients (84% based on a previous study [7])

d = margin of error (0.067)

Substituting these values yielded a minimum required sample size of 116 patients.

2.3. Study variables and statistical analysis

Independent variables: Age, sex, body mass index (BMI, classified according to World Health Organization criteria), Child-Pugh class, etiology of cirrhosis, and serum albumin level.

Dependent variables: Total cholesterol (TC), LDL-C, HDL-C, and triglycerides (TG), expressed in mmol/L.

Dyslipidemia was defined according to American Heart Association (AHA, 2018) criteria as follows:

Total cholesterol (TC) ≥ 5.2 mmol/L

LDL-C ≥ 3.4 mmol/L

HDL-C < 1.0 mmol/L (male) or < 1.3 mmol/L (female)

Triglycerides (TG) ≥ 1.7 mmol/L

A patient was considered to have dyslipidemia if at least one lipid parameter was abnormal.

Descriptive statistics were used to summarize the characteristics of the study population. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation or median [interquartile range] depending on data distribution. Normality was assessed using the Shapiro–Wilk test.

Comparisons of lipid parameters between groups (sex, age, BMI, and serum albumin) were performed using ANOVA or Kruskal–Wallis tests as appropriate. A p-value < 0.05 was considered statistically significant.

Due to the retrospective descriptive design of the study, multivariable regression analysis was not performed. Data analysis was conducted using SPSS software.

2.4. Ethical considerations

This retrospective study was conducted using medical records without any intervention or modification of patient management. All personal information was anonymized and kept confidential, and data were used solely for research purposes.

The study adhered to the principles of biomedical research ethics, ensuring scientific integrity, objectivity, and non-commercial intent.

III. RESULTS

Table 1. General characteristics of the study population

Characteristic	n	%
Sex		
Male	107	92.2
Female	9	7.8
Age group		
< 40 years	3	2.6
40–59 years	62	53.4
≥ 60 years	51	44.0
Occupation		
Farmer	42	36.2
Worker	19	16.4
Government officer	1	0.9
Retired	4	3.4
Self-employed	50	43.1
Comorbidities		
Diabetes mellitus	28	24.1
Dyslipidemia	3	2.6
Acute/chronic kidney disease	2	1.7

Comment: Among the 116 patients, males predominated (92.2%). The 40–59-year age group accounted for the highest proportion (53.4%), followed by those aged ≥60 years (44.0%). Most patients were self-employed (43.1%) or farmers (36.2%). Diabetes mellitus was the most common comorbidity (24.1%), whereas pre-existing dyslipidemia and kidney disease were less frequent.

Table 2. Distribution of cirrhosis severity according to Child-Pugh classification

Child-Pugh class	n	%
A	10	8.6
B	58	50.0
C	48	41.4
Total	116	100

Comment: Most patients were classified as Child-Pugh B (50.0%) and C (41.4%), while only 8.6% were in class A.

Table 3. Mean serum lipid levels in the study population

Lipid parameter	Central tendency	Minimum	Maximum
Total cholesterol (TC)	3.86 ± 1.82	0.81	12.46
HDL-C	0.87 ± 0.74	0.28	3.47
LDL-C	2.10 ± 1.31	0.39	8.57
Triglycerides (TG)	1.49 [1.63]	0.03	6.95

Comment: Mean TC and LDL-C levels were within the low-to-moderate range, HDL-C levels were reduced, and TG showed wide variability among patients.

Table 4. Prevalence of dyslipidemia in the study population

Lipid status	n	%
Dyslipidemia	96	82.8
No dyslipidemia	20	17.2
Total	116	100

Note: *Among patients with dyslipidemia, different patterns of lipid abnormalities were observed, including isolated or combined reductions in HDL-C, LDL-C, and TC, as well as elevated triglycerides*

Comment: Dyslipidemia was highly prevalent, affecting 82.8% of patients.

Table 5. Association between lipid levels and nutritional status (BMI and serum albumin)

Lipid levels according to BMI				
Nutritional Status	**Cholesterol**	**LDL-C**	**HDL-C**	**Triglyceride**
BMI < 18.5	3.54 ± 0.96	1.92 ± 0.82	0.91 ± 0.40	1.66 [2.72]
18.5 ≤ BMI < 23	3.86 ± 2.01	2.17 ± 1.42	0.86 ± 0.85	1.48 [1.36]
BMI ≥ 23	4.09 ± 1.61	2.26 ± 1.22	0.87 ± 0.48	1.58 [2.53]
p	0.504	0.785	0.451	0.932
Lipid levels according to serum albumin				
Albumin Status	Cholesterol	LDL-C	HDL-C	Triglyceride
Albumin < 35 g/l	3.58 ± 1.92	2.06 ± 1.41	0.77 ± 0.80	1.29 [1.18]
Albumin ≥ 35 g/l	4.63 ± 1.22	2.42 ± 0.98	1.11 ± 0.45	2.36 [2.15]
p	<0.001	0.012	<0.001	<0.001

Note: *Data are presented as mean ± standard deviation for normally distributed variables and median [interquartile range] for non-normally distributed variables.*

Comment: No significant differences in lipid levels were observed across BMI categories (p>0.05). In contrast, patients with serum albumin ≥35 g/L had significantly higher TC, LDL-C, HDL-C, and TG levels compared to those with albumin <35 g/L (p<0.05).

Table 6. Comparison of lipid levels by sex

Gender	Cholesterol	LDL-C	HDL-C	Triglyceride
Male	3.87 ± 1.85	2.16 ± 1.34	0.87 ± 0.76	1.51 [2.03]
Female	3.82 ± 1.45	2.08 ± 1.01	0.81 ± 0.50	1.30 [1.02]
p	0.849	0.821	0.962	0.256

Comment: No statistically significant differences in lipid parameters were observed between male and female patients (p>0.05).

Table 7. Comparison of lipid levels by age group

Age Group	Cholesterol	LDL-C	HDL-C	Triglyceride
< 40	4.77 ± 1.67	2.97 ± 1.35	0.99 ± 0.36	2.58 ± 0.90
40 – 60	3.81 ± 1.89	2.13 ± 1.36	0.76 ± 0.49	1.52 [1.42]
> 60	3.87 ± 1.76	2.15 ± 1.26	0.98 ± 0.96	1.30 [2.11]
p	0.483	0.412	0.245	0.304

Comment: No statistically significant differences in lipid parameters were observed among age groups (p>0.05).

IV. DISCUSSION

In this study, the prevalence of dyslipidemia among patients with liver cirrhosis was 82.8%, with a general trend toward decreased total cholesterol (TC), LDL-C, and HDL-C levels, while triglyceride (TG) levels showed substantial inter-individual variability. These findings are consistent with previous studies by Ghadir et al. (2010) [3] nd Cicognani et al. (1997) [4], which demonstrated progressive reductions in serum cholesterol levels in advanced cirrhosis. Similarly, Kim et al. (2025) [8] reported that low LDL-C levels were associated with unfavorable clinical outcomes, while Janicko et al. (2013) [5] reported an association between serum cholesterol levels and survival outcomes in cirrhotic patients. These observations suggest that reduced lipid levels in cirrhosis do not represent a cardioprotective state but rather may reflect impaired hepatic synthetic function.

From a pathophysiological perspective, the liver is the primary site for cholesterol and apolipoprotein synthesis, particularly apolipoprotein A1, the main structural component of HDL-C. Progressive loss of functional hepatocyte mass due to diffuse fibrosis leads to reduced lipoprotein production and decreased serum cholesterol levels [2]. The marked reduction in HDL-C observed in this study may be related to impaired apolipoprotein A1 synthesis and may also be influenced by systemic inflammation commonly present in advanced cirrhosis.

Triglyceride levels demonstrated wide variability, suggesting heterogeneity in metabolic profiles among patients. This variability may be related to differences in cirrhosis etiology (e.g., alcohol-related liver disease versus viral hepatitis), insulin resistance, and nutritional status, as previously described by Sohail et al. (2020) [11] and Nogueira and Cusi (2024) [10]. In some patients, particularly those with alcohol-related liver disease or metabolic comorbidities, triglyceride levels may remain relatively preserved, whereas in advanced hepatic dysfunction, TG levels may decline due to impaired hepatic synthesis.

The high prevalence of dyslipidemia in this study (82.8%) is comparable to findings reported by Javid et al. (2016) [7] and Naung Latt et al. (2025) [14], upporting the notion that lipid abnormalities are common in patients with liver cirrhosis. However, unlike dyslipidemia in metabolic syndrome, which is typically characterized by elevated TC and LDL-C levels, lipid alterations in cirrhosis are mainly characterized by reductions in cholesterol and HDL-C, reflecting hepatic dysfunction rather than primary metabolic dysregulation.

We found significantly higher TC, LDL-C, HDL-C, and TG levels in patients with serum albumin ≥35 g/L. This finding aligns with the results of Janicko et al. (2013) [5] and the European Association for the Study of the Liver (EASL) Clinical Practice Guidelines (2019, updated 2022) [13], which emphasize the close relationship between serum cholesterol and hepatic synthetic capacity. Both albumin and cholesterol are synthesized by hepatocytes; therefore, their parallel changes likely reflect the degree of preserved functional liver mass. In contrast, no significant association was observed between lipid levels and BMI, which

may be explained by the limited accuracy of BMI in assessing nutritional status in cirrhotic patients due to ascites and peripheral edema.

No significant differences in lipid parameters were observed according to sex or age group, consistent with the findings of Sohail et al. (2020) [11]. This suggests that in advanced liver disease, the severity of hepatic dysfunction may exert a stronger influence on lipid alterations than demographic characteristics.

This study has several limitations, including its retrospective design, single-center setting, and relatively modest sample size. Additionally, multivariable analyses were not performed to control for potential confounding factors. Nevertheless, the findings provide valuable real-world data from a provincial hospital setting and highlight the potential role of serum lipid parameters as accessible markers reflecting hepatic synthetic function in clinical practice.

V. CONCLUSION

In this study of 116 patients with liver cirrhosis, the prevalence of dyslipidemia was 82.8%. The mean levels of total cholesterol, LDL-C, HDL-C, and triglycerides were 3.86 ± 1.82 mmol/L, 2.10 ± 1.31 mmol/L, 0.87 ± 0.74 mmol/L, and 1,49 [1,63] mmol/L, respectively.

No significant differences in lipid parameters were observed according to sex, age group, or BMI ($p > 0.05$). TC, LDL-C, HDL-C, and TG levels were significantly higher in patients with serum albumin ≥35 g/L compared to those with albumin <35 g/L ($p < 0.05$).

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