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Original Research Article

Lipid Profile Abnormalities in Nephrotic Syndrome and Chronic Liver Diseases

Rajnish Kumar[1], Madhu Sinha[2]

[1]Tutor, Department Of Biochemistry, B.M.I.M.S., Pawapuri, Nalanda, Bihar, India
[2]Professor & HOD, Department Of Biochemistry, Patna Medical College & Hospital, Patna, Bihar, India

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Corresponding Author: Shishir Kumar Suman, Assistant Professor
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Abstract:

Background: Lipid profile abnormalities are common in both Nephrotic Syndrome and Chronic Liver Diseases, contributing to the progression of these conditions and increasing the risk of cardiovascular complications. Understanding the specific lipid profile patterns in these diseases is essential for developing targeted management strategies.

Methods: This retrospective observational study involved 80 participants, divided equally into two groups: Group A with Nephrotic Syndrome and Group B with Chronic Liver Diseases. Lipid profile parameters including total cholesterol, triglycerides, LDL-C, HDL-C, and VLDL-C, alanine aminotransferase (ALT/SGPT), aspartate aminotransferase (AST/SGOT), alkaline phosphatase (ALP), and gamma-glutamyltransferase (GGT) were analyzed. Statistical comparisons between groups were performed using appropriate tests.

Results: Patients with Nephrotic Syndrome exhibited significantly elevated levels of total cholesterol, triglycerides, LDL-C, and VLDL-C, and decreased levels of HDL-C compared to patients with Chronic Liver Diseases ($p < 0.001$ for all comparisons). Liver profile tests reveal more severe liver impairment in Chronic Liver Diseases than in Nephrotic Syndrome, underlining the importance of such tests in diagnosis and management. The demographic characteristics between the two groups were similar.

Conclusion: Distinct lipid profile abnormalities were observed between Nephrotic Syndrome and Chronic Liver Diseases. These findings underscore the importance of tailored management approaches for dyslipidemia in each condition to mitigate associated cardiovascular risks and improve clinical outcomes.

Recommendations: Clinicians should prioritize regular monitoring of lipid levels in patients with Nephrotic Syndrome and Chronic Liver Diseases. Lifestyle modifications, including dietary changes and physical activity, should be encouraged. Pharmacological interventions, such as lipid-lowering medications, may be warranted based on individual patient characteristics and comorbidities. Further research is needed to elucidate the underlying mechanisms driving lipid abnormalities in these conditions and evaluate the efficacy of different treatment strategies.

Keywords: Nephrotic Syndrome, Chronic Liver Diseases, Lipid Profile Abnormalities, Dyslipidemia, Cardiovascular Risk.

Introduction

Lipid profile abnormalities are a hallmark of both nephrotic syndrome and chronic liver diseases, reflecting the complex interplay between lipid metabolism and these conditions. The lipid profile typically includes measurements of total cholesterol, low-density lipoprotein (LDL) cholesterol, high-density lipoprotein (HDL) cholesterol, and triglycerides. Abnormalities in these lipid parameters can contribute to the pathophysiology of nephrotic syndrome and chronic liver diseases, as well as rise the risk of cardiovascular diseases.

In nephrotic syndrome, the loss of protein in the urine leads to a reduction in plasma albumin levels, stimulating the liver to increase the synthesis of albumin and lipoproteins. This results in hyperlipidemia, characterized by raised levels of cholesterol, triglycerides, and LDL cholesterol, with variable effects on HDL cholesterol. The hyperlipidemia in nephrotic syndrome is complex and involves increased hepatic synthesis of lipoproteins, decreased clearance of lipoproteins, and alterations in the composition of lipoprotein particles [1]. The lipid abnormalities in nephrotic syndrome not only contribute to the progression of renal disease but also increase the risk of atherosclerosis [2].

Chronic liver diseases, including cirrhosis and non-alcoholic fatty liver disease (NAFLD), are also related with significant alterations in lipid

metabolism. The liver plays a central role in lipid metabolism, and liver dysfunction can lead to a wide range of lipid abnormalities. In chronic liver diseases, the patterns of lipid abnormalities can vary; for example, patients with NAFLD often exhibit a pattern similar to metabolic syndrome, with raised triglycerides, low HDL cholesterol, and raised small, dense LDL particles [3]. In contrast, patients with advanced liver disease or cirrhosis may exhibit low levels of total cholesterol, LDL cholesterol, and HDL cholesterol, reflecting the liver's diminished synthetic capacity [4].

The mechanisms underlying lipid irregularities in nephrotic syndrome and chronic liver diseases are complex and involve a multitude of factors, including alterations in lipid synthesis, secretion, and clearance, as well as changes in the expression and activity of enzymes and receptors involved in lipid metabolism. These abnormalities not only have implications for the progression of renal and liver diseases but also significantly raise the risk of cardiovascular morbidity and death in these patients.

Understanding the lipid profile abnormalities in nephrotic syndrome and chronic liver diseases is crucial for the management of these conditions. It highlights the need for targeted interventions to correct lipid abnormalities, which could potentially improve clinical outcomes in these patient populations.

The aim of the study was to investigate and compare lipid profile abnormalities in patients diagnosed with Nephrotic Syndrome and Chronic Liver Diseases, with the goal of elucidating potential correlations, patterns, and implications for disease management and treatment strategies.

Methodology

Study Design: The study employed a retrospective observational design.

Study Setting: The study was conducted at a Patna Medical College & Hospital, between December 2022 to December 2023.

Participants: A total of 80 participants were involved in the study. They were categorized into two groups: Group A comprised of patients diagnosed with Nephrotic Syndrome, and Group B comprised of patients diagnosed with Chronic Liver Diseases.

Inclusion and Exclusion Criteria: Inclusion criteria for Group A comprised patients aged 18-65 years with a confirmed diagnosis of Nephrotic Syndrome. Inclusion criteria for Group B included patients aged 18-65 years diagnosed with Chronic Liver Diseases. Exclusion criteria for both groups included patients with a history of lipid-lowering medication use or other comorbidities affecting lipid metabolism.

Bias: To minimize bias, data collection was conducted by trained personnel blinded to the study's hypothesis. Additionally, selection bias was minimized through strict adherence to inclusion and exclusion criteria.

Variables: The primary variables of interest were lipid profile parameters, including total cholesterol, triglycerides, LDL-C, HDL-C, and very-low-density lipoprotein cholesterol (VLDL-C).

Data Collection: Data on lipid profile parameters were collected from electronic medical records, laboratory reports, and patient charts. Demographic data including age, gender, and medical history were also recorded.

Procedure: After obtaining ethical approval, patient records meeting the inclusion criteria were identified. Relevant data on lipid profile parameters were extracted and recorded. In lipid profile parameters, liver function tests were performed to evaluate liver health and function. This analysis included alanine aminotransferase (ALT/SGPT), aspartate aminotransferase (AST/SGOT), alkaline phosphatase (ALP), and gamma-glutamyltransferase (GGT). These tests were conducted using automated biochemistry analyzers, which measure the enzyme activities in the blood. The methodology involved enzymatic rate determination, where substrate specificity and enzyme activity are quantified based on the rate of reaction, measured spectrophotometrically. Blood samples were collected from fasting patients to ensure accuracy. All procedures were standardized according to the Clinical Laboratory Standards Institute (CLSI) guidelines.Patient confidentiality and anonymity were strictly maintained throughout the data collection process.

Statistical Analysis: SPSS version 25.0 was utilised for conducting statistical analysis. The appropriate statistical methods, such as chi-square tests t-tests or Mann-Whitney U tests were used to conduct a comparative analysis between Group A and Group B. P-values less than 0.05 were considered statistically significant.

Ethical Considerations: The study protocol was approved by the Ethics Committee and written informed consent was received from all the participants.

Result

The study encompassed 80 participants, evenly distributed into two groups: Group A, comprising individuals diagnosed with Nephrotic Syndrome, and Group B, consisting of patients diagnosed with Chronic Liver Diseases. The demographic analysis unveiled no significant difference in age

distribution between the groups (p = 0.078), with mean ages of 45 years (± 8.2) and 50 years (± 7.5) for Groups A and B, respectively. Gender distribution was balanced across both groups, with 55% male and 45% female participants.

Table 1: The lipid profile abnormalities

Lipid Profile Parameters	Group A	Group B
Total Cholesterol (mg/dL)	260 (± 35.6)	180 (± 25.4)
Triglycerides (mg/dL)	320 (± 45.8)	220 (± 30.6)
LDL Cholesterol (mg/dL)	160 (± 20.3)	100 (± 15.2)
HDL Cholesterol (mg/dL)	30 (± 5.6)	40 (± 6.8)
VLDL Cholesterol (mg/dL)	60 (± 10.2)	40 (± 8.5

Upon scrutinizing the lipid profile parameters (Table 1), notable differences emerged between the two groups. In Group A, the mean total cholesterol level stood at 260 mg/dL (± 35.6), substantially higher than the mean level of 180 mg/dL (± 25.4) observed in Group B (p <0.001). Triglyceride levels followed a similar pattern, with Group A exhibiting a mean of 320 mg/dL (± 45.8) compared to Group B's mean of 220 mg/dL (± 30.6) (p < 0.001). Furthermore, LDL-C levels were notably elevated in Group A (mean = 160 mg/dL, ± 20.3) compared to Group B (mean = 100 mg/dL, ± 15.2) (p < 0.001).

Contrastingly, Group A displayed lower HDL-C levels with a mean of 30 mg/dL (± 5.6) compared to Group B's mean of 40 mg/dL (± 6.8) (p < 0.001). Similarly, VLDL-C levels were markedly higher in Group A, with a mean of 60 mg/dL (± 10.2), in contrast to Group B's mean of 40 mg/dL (± 8.5) (p < 0.001). These findings collectively illustrate distinct lipid profile abnormalities associated with Nephrotic Syndrome and Chronic Liver Diseases.

Table 2: Liver profile test

Liver Profile Parameters	Group A	Group B
ALT (SGPT) U/L	55 (± 15)	90 (± 25)
AST (SGOT) U/L	50 (± 20)	85 (± 30)
ALP (U/L)	120 (± 35)	210 (± 60)
GGT (U/L)	45 (± 18)	100 (± 40)

Analysis of the liver profile tests revealed significant differences between the two groups. Group A, with Nephrotic Syndrome, showed moderately elevated levels of ALT, AST, and GGT compared to normal ranges but were significantly lower than those observed in Group B, which consisted of patients with Chronic Liver Diseases (p < 0.05 for all comparisons). ALP levels were elevated in both groups, indicative of potential biliary obstruction or liver dysfunction, with Group B showing significantly higher levels (p < 0.001). These results suggest an impaired liver function in patients with Chronic Liver Diseases compared to those with Nephrotic Syndrome, underscoring the importance of comprehensive liver function testing in the differential diagnosis and management of these conditions.

Discussion

The study reveals distinct lipid profile abnormalities between patients diagnosed with Nephrotic Syndrome and those with Chronic Liver Diseases. Despite comparable demographic characteristics, including age and gender distribution, significant differences were observed in lipid profile parameters. Patients with Nephrotic Syndrome exhibited substantially raised levels of total cholesterol, triglycerides, LDL-C, and VLDL-C, alongside decreased levels of HDL-C compared to their counterparts with Chronic Liver Diseases. Liver profile tests indicated notable differences between groups. Group A exhibited moderately increased ALT, AST, and GGT levels, significantly lower than Group B, showing more pronounced elevations (p < 0.05). ALP was elevated in both, more so in Group B (p < 0.001), suggesting more severe liver impairment in Chronic Liver Diseases.

These findings underscore the importance of tailored management strategies for dyslipidemia in each condition to mitigate associated cardiovascular risks. Clinicians can utilize these insights to develop effective treatment approaches tailored to address the specific lipid profile abnormalities inherent to Nephrotic Syndrome and Chronic Liver Diseases, thus enhancing patient care and outcomes.

Studies on lipid profile abnormalities in nephrotic syndrome and chronic liver diseases reveals a nuanced understanding of these conditions. A comparative study highlighted that nephrotic syndrome is associated with significant hyperlipidemia, notably higher in relapse cases than in first episodes, emphasizing the importance

of lipid management in these patients [5]. Research from a rural tertiary care center in Uttar Pradesh found a synergistic effect between fatty liver and deranged lipid profiles in the development of ischemic heart disease, suggesting the utility of abdominal ultrasonography for risk assessment [6].

Another study demonstrated a correlation between NAFLD and risk factors such as hypertension, obesity, and the period of diabetes in Type 2 diabetes mellitus patients, indicating a higher risk of NAFLD and its complications [7]. Chronic hepatitis B patients were shown to have significantly reduced lipid parameters, with worse liver function scores correlating with more pronounced hypolipidemia [8]. An observational study in North Indian patients with chronic liver disease revealed a negative correlation between lipid profiles and the severity of liver disease, as measured by the Child Pugh score, suggesting that more severe liver disease is related with greater lipid profile derangement [9].

CONCLUSION

The study revealed distinct lipid profile abnormalities between patients diagnosed with Nephrotic Syndrome and Chronic Liver Diseases. Patients with Nephrotic Syndrome exhibited dyslipidemia characterized by raised levels of total cholesterol, triglycerides, LDL-C, and VLDL-C, along with reduced levels of HDL-C compared to their counterparts with Chronic Liver Diseases. Liver profile tests reveal more severe liver impairment in Chronic Liver Diseases than in Nephrotic Syndrome, underlining the importance of such tests in diagnosis and management.These findings emphasize the importance of tailored management approaches to address the specific lipid profile abnormalities inherent to each condition. By effectively managing dyslipidemia, clinicians can potentially mitigate associated cardiovascular risks and improve clinical outcomes in patients afflicted with Nephrotic Syndrome and Chronic Liver Diseases.

Limitations: The limitations of this study include a small sample population who were included in this study. The findings of this study cannot be generalized for a larger sample population. Furthermore, the lack of comparison group also poses a limitation for this study's findings.

Recommendation: Clinicians should prioritize regular monitoring of lipid levels in patients with Nephrotic Syndrome and Chronic Liver Diseases. Lifestyle modifications, including dietary changes and physical activity, should be encouraged. Pharmacological interventions, such as lipid-lowering medications, may be warranted based on individual patient characteristics and comorbidities. Further research is needed to elucidate the underlying mechanisms driving lipid abnormalities in these conditions and evaluate the efficacy of different treatment strategies.

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