Section: General Medicine

Original Research Article

STUDY OF THYROID AND LIPID PROFILE IN NON-ALCOHOLIC FATTY LIVER DISEASE

Kevin D'souza[1], Sandhya R[2], Ramya S S[3], Partha R P[4], Anand A V[5]

[1]*Assistant Professor, Department of General Medicine, Karwar Institute of Medical Sciences, Karwar, Karnataka, India.*
[2]*Assistant Professor, Department of General Medicine, Vydehi Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India.*
[3]*Assistant Professor, Department of General Medicine, JSS Institute of Medical Sciences and Research Centre, Mysore, Karnataka, India.*
[4]*Senior Resident, Department of General Medicine, SS Institute of Medical Sciences and Research Centre, Davangere, Karnataka, India.*
[5]*Consultant Physician, Department of General Medicine, KLE Hospital - Bengaluru (KLE Academy of Higher Education and Research)*

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Corresponding Author:
Dr. Sandhya R,
Assistant Professor, Department of General Medicine, Vydehi Institute of Medical Sciences and Research Centre, Bangalore, Karnataka, India.
Email: rsandhya_94@yahoo.com

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ABSTRACT

Background: Non-alcoholic fatty liver disease (NAFLD) is one of the most common chronic liver diseases worldwide and is closely associated with metabolic abnormalities, including dyslipidaemia and thyroid dysfunction. Thyroid hormones regulate hepatic lipid metabolism, fatty acid oxidation, and cholesterol homeostasis. Emerging evidence suggests that hypothyroidism may contribute to the development and progression of NAFLD. This study aims to study and evaluate the relationship between dyslipidemia and thyroid function among non-diabetic patients with NAFLD.

Materials and Methods: This cross-sectional study was conducted in the Department of General Medicine, SSIMS and RC, Davangere, over a period of two years. Ninety-six adult patients with ultrasonographically diagnosed NAFLD fulfilling the inclusion and exclusion criteria were enrolled. Detailed clinical history, physical examination, thyroid function tests (TSH, T3, T4), fasting lipid profile, fasting blood sugar, postprandial blood sugar, and HbA1c were recorded. Statistical analysis was performed using SPSS version 27.0. A p-value <0.05 was considered statistically significant.

Results: Among the 96 patients, the mean age was 60.68±12.95 years, and 53.1% were female. Grade 1 NAFLD was present in 82.3% of patients and Grade 2 NAFLD in 17.7%. Dyslipidaemia was present in 51.0% of patients, the most common abnormality being combined hypertriglyceridaemia and hypercholesterolaemia (61.2%). Mean TSH, T3, and T4 values were 6.71±4.92 IU/mL, 1.15±0.54 µg/dL, and 9.24±2.82 µg/dL, respectively. Newly diagnosed hypothyroidism was present in 26.0% of patients, and hypothyroidism with dyslipidaemia was observed in 17.7%, of whom 82.4% had combined hypertriglyceridaemia and hypercholesterolaemia.

Conclusion: Dyslipidaemia and hypothyroidism are common among non-diabetic NAFLD patients. Routine screening for thyroid dysfunction and lipid abnormalities may facilitate early diagnosis and reduce the risk of cardiovascular complications and progression of liver disease.

Keywords: Non-alcoholic fatty liver disease, Dyslipidaemia, Hypothyroidism, Thyroid-stimulating hormone, Lipid profile.

INTRODUCTION

Non-alcoholic fatty liver disease (NAFLD) represents a spectrum of liver disorders ranging from simple steatosis to non-alcoholic steatohepatitis, fibrosis, cirrhosis, and hepatocellular carcinoma. NAFLD is increasingly recognised as the hepatic manifestation of metabolic syndrome and is strongly associated with obesity, insulin resistance, dyslipidaemia, hypertension, and endocrine abnormalities.[1-6]

Thyroid hormones play an essential role in lipid metabolism and energy homeostasis. They regulate hepatic fatty acid oxidation, cholesterol metabolism,

lipolysis, and thermogenesis. Alterations in thyroid function, particularly hypothyroidism, can result in dyslipidaemia, insulin resistance, and hepatic fat accumulation. Recent studies have suggested a close relationship between NAFLD and thyroid dysfunction, even among non-diabetic individuals.[7-19]

MATERIALS AND METHODS

This cross-sectional study was conducted in the Department of General Medicine, SSIMS and RC, Davangere.

2.1 Study Population

Patients attending the Medicine Outpatient Department or admitted to SSIMS and RC Hospital with ultrasonographically diagnosed NAFLD were included.

2.2 Sample Size

The sample size was calculated using the formula $n = Z^2pq/d^2$. Using a prevalence of 38.6%, a confidence level of 95%, and an allowable error of 10%, the calculated sample size was 91.05. Considering a non-response rate of 5%, the final sample size was 96 patients.

2.3 Inclusion Criteria

- Patients aged ≥18 years.
- Ultrasonographically diagnosed NAFLD.
- Both male and female patients.

2.4 Exclusion Criteria

- Other causes of liver disease including viral hepatitis, chronic alcohol consumption.
- Pregnancy.
- Patients receiving thyroid supplements or glucocorticoids.
- Diabetes mellitus.

2.5 Data Collection

All enrolled patients underwent detailed clinical evaluation, ultrasonography of the abdomen, thyroid function testing (TSH, T3, T4), fasting lipid profile, fasting blood sugar, postprandial blood sugar, and HbA1c estimation.

2.6 Statistical Analysis

Data were analysed using SPSS version 27.0. Results were expressed as mean ± standard deviation and as frequencies with percentages. Associations between categorical variables were assessed using the Chi-square test or Fisher's exact test, as appropriate. Statistical significance was set at $p<0.05$.

RESULTS

A total of 96 patients with NAFLD were studied.

3.1 Demographic Characteristics

The mean age of the study population was 60.68±12.95 years. The age distribution is shown in Table 1.

Table 1: Age distribution of the study population (N = 96)

Age (years)	Frequency (n)	Percentage (%)
20–40	9	9.4
41–60	37	38.5
61–80	45	46.9
>80	5	5.2
Total	**96**	**100.0**

Females constituted 53.1% of the study population and males 46.9%.

3.2 NAFLD Grading

Table 2: Distribution of patients according to NAFLD grade

NAFLD Grade	Frequency (n)	Percentage (%)
Grade 1	79	82.3
Grade 2	17	17.7
Grade 3	0	0.0
Total	**96**	**100.0**

3.3 Dyslipidaemia

Dyslipidaemia was observed in 49 patients (51.0%). The distribution of the different types of dyslipidaemia among these patients is shown in Table 3.

Table 3: Types of dyslipidaemia among patients with dyslipidaemia (n = 49)

Type of Dyslipidaemia	Frequency (n)	Percentage (%)
Hypertriglyceridaemia with hypercholesterolaemia	30	61.2
Hypertriglyceridaemia alone	10	20.4
Hypercholesterolaemia alone	7	14.3
High LDL with hypertriglyceridaemia	2	4.1
Total	**49**	**100.0**

3.4 Glycaemic Profile

Table 4: Glycaemic profile of the study population

Parameter	Mean	Standard Deviation
Fasting Blood Sugar (FBS)	94.79	10.37
Postprandial Blood Sugar (PPBS)	148.26	17.07
HbA1c (%)	5.85	0.36

3.5 Thyroid Profile

Table 5: Thyroid function profile of the study population

Thyroid Function Test	Mean	Standard Deviation
T3 (µg/dL)	1.15	0.54
T4 (µg/dL)	9.24	2.82
TSH (IU/mL)	6.71	4.92

3.6 Thyroid Dysfunction

Newly diagnosed hypothyroidism was observed in 25 patients (26.0%) with p-value <0.05 which is statistically significant.

3.7 Coexistence of Dyslipidaemia and Hypothyroidism

Hypothyroidism with dyslipidaemia was present in 17 patients (17.7%). Among these patients:

- Hypertriglyceridaemia with hypercholesterolaemia: 82.4%
- Hypertriglyceridaemia alone: 17.6%

DISCUSSION

The age distribution in the present study revealed that the majority of patients (46.9%) belonged to the 61–80 years age group, with a mean age of 60.68±12.95 years. These findings align with epidemiological data indicating that the prevalence of NAFLD increases with age, possibly due to the cumulative burden of metabolic dysfunction over time.[20]

The gender distribution was relatively balanced, with a slight female predominance (53.1%). While several studies have demonstrated a higher prevalence in men due to visceral adiposity and alcohol intake patterns, others suggest an increased risk in postmenopausal women due to reduced oestrogen levels and altered lipid metabolism.[21]

Dyslipidaemia was present in 51% of the study population. The most prevalent form was combined hypertriglyceridaemia and hypercholesterolaemia (61.2%). This pattern supports the known atherogenic lipid profile associated with NAFLD, characterised by elevated triglycerides, increased LDL-C, and reduced HDL-C.[22]

Hypothyroidism, even in subclinical forms, can lead to hepatic lipid accumulation via decreased LDL receptor expression, impaired clearance of LDL particles, and reduced activity of lipoprotein lipase. Bano et al. reported that elevated TSH levels are independently associated with hepatic steatosis, even after adjusting for metabolic parameters.[23]

In our study, 17.7% of patients had both dyslipidaemia and hypothyroidism. Among these, 82.4% had combined hypertriglyceridaemia and hypercholesterolaemia. This triad of NAFLD, dyslipidaemia, and hypothyroidism represents a metabolic cluster predisposing individuals to accelerated atherosclerosis and cardiovascular disease.[24]

Limitations

- Diagnosis of NAFLD was based on ultrasonography rather than liver biopsy.
- Thyroid function was assessed only at baseline.
- Single-centre design with a relatively small sample size.
- Longitudinal assessment of thyroid function and NAFLD progression was not performed.

CONCLUSION

This study highlights a significant prevalence of dyslipidaemia and newly diagnosed hypothyroidism among non-diabetic NAFLD patients, reinforcing the metabolic complexity of this condition.

Routine screening for thyroid dysfunction and lipid profile abnormalities should be considered in all patients diagnosed with NAFLD, regardless of diabetic status. Early intervention may reduce cardiovascular risk and delay progression to advanced liver disease.

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