Section: Pathology

Original Research Article

SEVERITY MATTERS: LIPID ABNORMALITIES IN OVERT VERSUS SUBCLINICAL HYPOTHYROIDISM

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ABSTRACT

Background: Thyroid hormones play a vital role in regulating lipid metabolism. Hypothyroidism, both overt and subclinical, is associated with alterations in serum lipid levels that may increase cardiovascular risk. The severity of dyslipidemia may vary with the degree of thyroid dysfunction and serum TSH levels, highlighting the importance of evaluating lipid abnormalities in patients with hypothyroidism. The study was conducted to evaluate lipid profile abnormalities in patients with overt and subclinical hypothyroidism and to assess their correlation with serum TSH levels.

Materials and Methods: The study was conducted on adult patients diagnosed with primary hypothyroidism. Based on thyroid function tests, participants were categorized into overt hypothyroidism and subclinical hypothyroidism. Fasting lipid profile parameters including total cholesterol, LDL-cholesterol, HDL-cholesterol, and triglycerides were analyzed. Statistical comparisons between groups were performed, and correlation between TSH and lipid parameters was assessed.

Results: Individuals with overt hypothyroidism had markedly increased total cholesterol, LDL cholesterol, and triglyceride levels when compared to patients with subclinical hypothyroidism. Although less pronounced, patients with subclinical hypothyroidism also exhibited higher total cholesterol and LDL cholesterol levels relative to normal reference ranges. Furthermore, serum TSH levels showed a significant positive association with total cholesterol, LDL cholesterol, and triglycerides, whereas no meaningful relationship was found between TSH and HDL cholesterol levels.

Conclusion: Both overt and subclinical hypothyroidism are associated with dyslipidemia, with more pronounced abnormalities in overt hypothyroidism. Routine lipid profile assessment in hypothyroid patients may help in early identification and reduction of cardiovascular risk.

Keywords: Hypothyroidism, Subclinical hypothyroidism, Dyslipidemia, Lipid profile, TSH.

INTRODUCTION

Hypothyroidism is a frequently encountered hormonal disorder affecting the endocrine system characterized by reduced thyroid hormone production, resulting in widespread metabolic disturbances. Thyroid hormones influence lipid synthesis, mobilization, and degradation by regulating hepatic LDL receptor expression and lipoprotein metabolism.[1,2] Consequently, reduced thyroid hormone activity leads to impaired clearance of atherogenic lipoproteins.[3]

Overt hypothyroidism is a well-recognized cause of secondary dyslipidemia, particularly hypercholesterolemia and hypertriglyceridemia.[3,4] Subclinical hypothyroidism, defined by elevated serum TSH with normal circulating thyroid hormone levels, is often asymptomatic but increasingly detected during routine screening.[5] The clinical significance of lipid abnormalities in subclinical hypothyroidism remains debated, especially regarding cardiovascular risk.[6]

Recognizing the link between thyroid dysfunction and abnormalities in lipid metabolism is crucial for early management and prevention of atherosclerotic cardiovascular disease [1]. Therefore, the present study was undertaken to compare lipid profile parameters in patients with overt and subclinical hypothyroidism and to evaluate their correlation with serum TSH levels.

MATERIALS AND METHODS

The study was conducted in the Department of Pathology in collaboration with the Department of Medicine at a tertiary care teaching hospital. Ethical clearance was obtained from the Institutional Ethics Committee before starting the study. A total of 140 patients were selected for the study based on the inclusion and exclusion criteria.

Inclusion Criteria

Patients aged 18 years and above newly diagnosed with overt hypothyroidism or subclinical hypothyroidism and not receiving thyroid hormone replacement therapy or lipid-lowering medications.

Exclusion Criteria

Secondary hypothyroidism, diabetes mellitus, chronic kidney disease, chronic liver disease, pregnancy, and medications affecting lipid metabolism.

Diagnostic Criteria

Overt hypothyroidism: Elevated TSH with reduced free T4 Subclinical hypothyroidism: Elevated TSH with normal free T4.[5]

Following an overnight fast, venous blood samples were collected for evaluation of thyroid function tests and lipid profile parameters. Statistical analysis was performed using SPSS version 25.0, and a p-value of less than 0.05 was considered indicative of statistical significance.

RESULTS

Table 1: Demographic Characteristics of the Study Population

Variables	Overt Hypothyroidism (n=70)	Subclinical Hypothyroidism (n=70)
Mean age (years)	42.5 ± 8.6	40.2 ± 7.9
Male, n (%)	22 (33.6%)	25 (35.7%)
Female, n (%)	48 (66.4%)	45 (64.3%)

The table presents the baseline demographic characteristics of participants in the overt hypothyroidism and subclinical hypothyroidism groups, each comprising 70 patients. The mean age of patients with overt hypothyroidism was 42.5 ± 8.6 years, whereas in the subclinical hypothyroidism group it was 40.2 ± 7.9 years, indicating comparable age distribution between the two groups.

With respect to gender distribution, females constituted the majority in both groups. In the overt hypothyroidism group, 48 patients (66.4%) were female and 22 (33.6%) were male. Similarly, in the subclinical hypothyroidism group, 45 patients (64.3%) were female and 25 (35.7%) were male. Overall, the demographic profile shows a female predominance in both categories with relatively similar age and gender distribution between the groups. Both groups were age-matched with a female predominance, which is consistent with the known epidemiology of hypothyroidism.

Table 2: Comparison of Lipid Profile Parameters Between Overt and Subclinical Hypothyroidism

	Overt Hypothyroidism (Mean ± SD)	Subclinical Hypothyroidism (Mean ± SD)	p-value
Total Cholesterol	249.1 ± 31.7	202.0 ± 19.8	<0.001
LDL-Cholesterol	167.7 ± 31.0	129.0 ± 21.1	<0.001
HDL-Cholesterol	44.0 ± 4.7	43.1 ± 4.4	0.18
Triglycerides	191.5 ± 68.5	155.6 ± 35.0	<0.01

Total cholesterol, LDL-cholesterol, and triglyceride levels were significantly higher in overt hypothyroidism compared to subclinical hypothyroidism, while HDL-cholesterol showed no statistically significant difference.

Table 3: Correlation Between Serum TSH Levels and Lipid Parameters

Lipid Parameter	Correlation Coefficient (r)	p-value
Total Cholesterol	+0.62	<0.001
LDL-Cholesterol	+0.58	<0.001
HDL-Cholesterol	−0.12	0.18
Triglycerides	+0.46	<0.01

Serum TSH levels showed a significant positive correlation with total cholesterol, LDL-cholesterol, and triglycerides, whereas HDL-cholesterol did not show a significant correlation.

DISCUSSION

The study highlights marked alterations in lipid profiles among patients with hypothyroidism, with more pronounced dyslipidemia in overt cases. The increase in total cholesterol and LDL cholesterol levels may be related to diminished hepatic LDL receptor activity and decreased removal of LDL particles from the bloodstream, as reported by Liu and Peng et al,[1] and Duntas and Brenta et al.[2]

Subclinical hypothyroidism also showed increased total cholesterol and LDL-cholesterol, although less pronounced. Similar observations were reported in meta-analyses by Abreu et al,[6] and Liu et al,[7] which demonstrated mild but clinically relevant dyslipidemia in subclinical hypothyroidism. These lipid abnormalities may contribute to long-term cardiovascular risk, consistent with the findings of Cappola and Ladenson et al.[4]

The positive correlation between TSH and atherogenic lipid parameters observed in this study suggests a dose-dependent relationship between thyroid dysfunction severity and dyslipidemia. Comparable associations have been described in community-based and population studies by Alamdari et al,[8] and Asvold et al.[9] The lack of significant association between TSH and HDL-cholesterol in the present study is also in agreement with prior observations reported by Rizos et al.[3]

Overall, these findings support the concept that even mild thyroid dysfunction influences lipid metabolism and justify routine lipid screening in patients with elevated TSH levels, as recommended in clinical and guideline-based studies by Catapano et al,[10] and Willard et al.[11]

Limitations

The study has certain limitations that should be acknowledged. The cross-sectional design restricts the ability to establish a causal relationship between hypothyroidism and alterations in lipid parameters. As the study was conducted at a single centre, the findings may have limited generalizability to broader populations. Additionally, important lifestyle factors such as dietary habits and body mass index (BMI), which could potentially influence lipid levels, were not evaluated, and their confounding effects cannot be excluded.

CONCLUSION

Both overt and subclinical hypothyroidism are linked to disturbances in lipid metabolism, with more marked abnormalities observed in overt cases. Identifying and treating lipid alterations at an early stage in patients with hypothyroidism may help lower the risk of cardiovascular complications. Therefore, routine evaluation of lipid profiles should be considered in individuals diagnosed with hypothyroidism.

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