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Original Research Article

# A Study of Lipid Profile in Subclinical Hypothyroidism at a Tertiary Care Hospital in Kerala

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**Conflict of interest: Nil**

**Abstract**

**Introduction:** Subclinical hypothyroidism (SCH) is a prevalent endocrine condition defined by elevated thyroid-stimulating hormone (TSH) levels with normal free thyroxine (FT4). SCH has been linked to lipid metabolism abnormalities, contributing to an increased risk of cardiovascular disease. Early identification and management of dyslipidemia in SCH patients are vital for cardiovascular risk reduction.

**Aims:** To evaluate and compare the lipid profile of patients with subclinical hypothyroidism and euthyroid individuals.

**Materials and Methods:** This cross-sectional observational study was carried out in the Department of Physiology, Government Medical College, Kozhikode, Kerala 673008, from June 2018 to June 2019. It included 80 subjects aged 18–60 years: 40 patients diagnosed with SCH (elevated TSH with normal FT4) and 40 age- and sex-matched euthyroid controls.

**Results:** The mean age of SCH patients (46.2 ± 7.8 years) and controls (45.5 ± 8.1 years) was comparable ($p = 0.58$). Serum FT4 levels were similar between groups (1.11 ± 0.14 ng/dL vs. 1.13 ± 0.13 ng/dL, $p = 0.49$), but SCH patients had significantly higher TSH levels (8.52 ± 2.0 µIU/mL vs. 2.15 ± 0.75 µIU/mL, $p < 0.001$). SCH patients showed significantly elevated total cholesterol ($p = 0.02$), triglycerides ($p = 0.03$), and LDL-C ($p = 0.01$), along with lower HDL-C ($p = 0.009$). Atherogenic indices like the total cholesterol/HDL ratio ($p = 0.02$) and LDL/HDL ratio ($p = 0.008$) were also higher in SCH patients.

**Conclusion:** Patients with subclinical hypothyroidism showed significantly higher TSH levels and adverse lipid profile changes, including increased total cholesterol, triglycerides, LDL-C, and reduced HDL-C. Atherogenic ratios were also elevated, indicating higher cardiovascular risk. Routine lipid monitoring in SCH patients is recommended to enable early intervention and reduce long-term complications.

**Keywords:** Subclinical Hypothyroidism, Lipid Profile, Dyslipidemia, Total Cholesterol, Triglycerides, LDL, HDL.

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## Introduction

Subclinical hypothyroidism (SCH) is a prevalent endocrine disorder characterized by elevated serum thyroid-stimulating hormone (TSH) levels with normal free thyroxine (FT4) levels [1]. Although often asymptomatic, SCH has been associated with various metabolic disturbances, including alterations in lipid metabolism [2, 3].

Thyroid hormones play a crucial role in regulating lipid metabolism. Hypothyroidism, both overt and subclinical, has been linked to dyslipidemia, characterized by elevated total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and triglyceride (TG) levels, along with decreased high-density lipoprotein cholesterol (HDL-C) levels [4,5]. These lipid abnormalities are of particular concern as they may contribute to an increased risk of cardiovascular diseases [4].

The relationship between SCH and lipid profile alterations remains a subject of ongoing research. While some studies have reported significant changes in lipid parameters among SCH patients [5, 6], others have found no substantial differences when compared to euthyroid individuals [7, 8]. This inconsistency underscores the need for further investigation to elucidate the impact of SCH on lipid metabolism and its potential cardiovascular

implications [9, 10]. The aim of this study is to evaluate the lipid profile in patients with subclinical hypothyroidism attending a tertiary care hospital in Kerala. The objectives are to assess the levels of total cholesterol, triglycerides, low-density lipoprotein cholesterol, and high-density lipoprotein cholesterol in these patients, to compare these lipid parameters with age- and sex-matched euthyroid controls, and to determine the association between subclinical hypothyroidism and dyslipidemia, thereby providing insight into the potential cardiovascular risk in this population.

## Materials and Methods

**Study Design:** This was a cross-sectional observational study

**Study Settings:** Physiology, Government Medical College, Kozhikode, Kerala 673008.

**Study Duration:** One year from June 2018 – June 2019

**Study Population:** Patients aged 18–60 years attending the outpatient department and diagnosed with subclinical hypothyroidism (elevated TSH with normal free T4) were included. Age- and sex-matched euthyroid individuals were recruited as controls.

**Sample Size:** 80 patients diagnosed with subclinical hypothyroidism

### Inclusion Criteria

- Adults aged 18–60 years
- Diagnosed with subclinical hypothyroidism (TSH > reference range, normal free T4)
- Willing to provide informed consent

### Exclusion Criteria

- Overt hypothyroidism or hyperthyroidism
- History of cardiovascular disease, diabetes mellitus, renal or hepatic disorders
- Patients on lipid-lowering therapy or thyroid medications
- Pregnancy or lactation

### Study variables

- Age (years)
- TSH (μIU/mL)
- Free T4 (ng/dL)
- Total Cholesterol (mg/dL)
- Triglycerides (mg/dL)
- LDL-C (mg/dL)
- HDL-C (mg/dL)
- Total Cholesterol / HDL
- LDL / HDL

**Statistical Analysis:** Data from the study were analyzed using SPSS software, with continuous variables (e.g., age, liver enzyme levels) expressed as mean ± SD and compared using t-tests or Mann–Whitney U tests. Categorical variables (e.g., gender, CBD stones, and complications) were presented as frequencies and percentages, and compared using Chi-square or Fisher's exact tests. Diagnostic accuracy (sensitivity, specificity, PPV, NPV, and accuracy) was calculated for MRCP-first and EUS-first strategies, using ERCP/intraoperative findings as the reference. Kaplan-Meier analysis may be used for time-to-intervention comparisons. A p-value < 0.05 was considered significant.

## Result

**Table 1: Demographic Characteristics of Study Participants (n=80)**

| Parameter | SCH Patients (n=40) | SD | Controls (n=40) | SD | p-value |
|---|---|---|---|---|---|
| Age (years) | 46.2 | 7.8 | 45.5 | 8.1 | 0.58 |

**Table 2: Thyroid Function Tests**

| Parameter | SCH Patients (n=40) | SD | Controls (n=40) | SD | p-value |
|---|---|---|---|---|---|
| TSH (μIU/mL) | 8.52 | 2.0 | 2.15 | 0.75 | <0.001 |
| Free T4 (ng/dL) | 1.11 | 0.14 | 1.13 | 0.13 | 0.49 |

**Table 3: Lipid Profile – Total Cholesterol and Triglycerides**

| Parameter | SCH Patients (n=40) | SD | Controls (n=40) | SD | p-value |
|---|---|---|---|---|---|
| Total Cholesterol (mg/dL) | 43.1 | 6.5 | 46.5 | 7.2 | 0.02 |
| Triglycerides (mg/dL) | 165.4 | 42.8 | 148.6 | 40.2 | 0.03 |

**Table 4: Lipid Profile – LDL and HDL**

| Parameter | SCH Patients (n=40) | SD | Controls (n=40) | SD | p-value |
|---|---|---|---|---|---|
| LDL-C (mg/dL) | 111.3 | 21.9 | 99.4 | 19.8 | 0.01 |
| HDL-C (mg/dL) | 38.5 | 6.2 | 42.0 | 5.7 | 0.009 |

**Table 5: Lipid Ratios**

| Parameter | SCH Patients (n=40) Me | SD | Controls (n=40) | SD | p-value |
|---|---|---|---|---|---|
| Total Cholesterol / HDL | 3.95 | 0.70 | 3.50 | 0.64 | 0.02 |
| LDL / HDL | 2.92 | 0.65 | 2.36 | 0.59 | 0.008 |

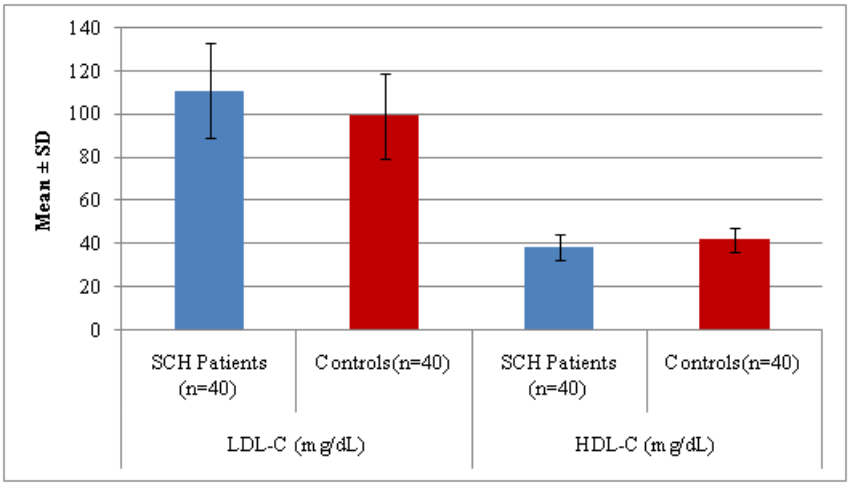


**Figure 1: Lipid Profile – LDL and HDL**

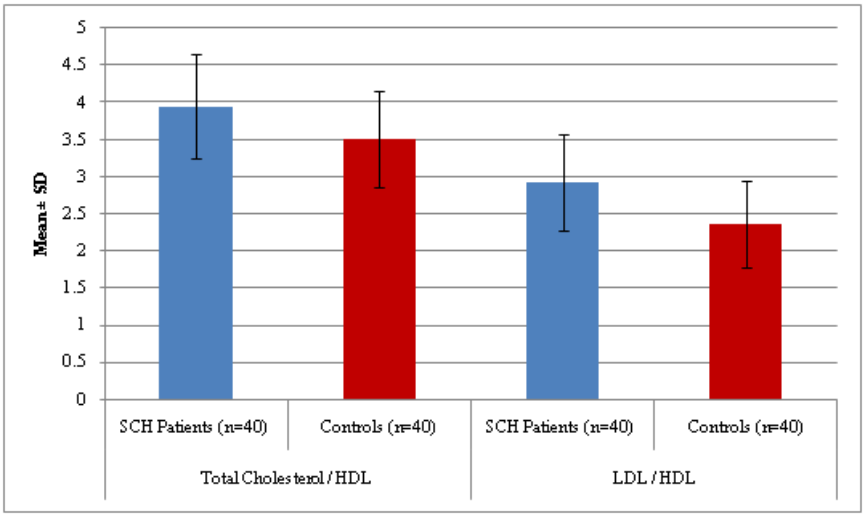


**Figure2: Lipid Ratios**

In our study, the mean age of SCH patients (n=40) was 46.2 ± 7.8 years, and the mean age of controls (n=40) was 45.5 ± 8.1 years. The difference between the two groups was not statistically significant (p = 0.58).

In our study, the mean serum TSH level in SCH patients (n=40) was 8.52 ± 2.0 µIU/mL, compared to 2.15 ± 0.75 µIU/mL in controls (n=40). This difference was highly statistically significant (p < 0.001).The mean serum Free T4 level in SCH patients was 1.11 ± 0.14 ng/dL, while in controls it was 1.13 ± 0.13 ng/dL. The difference between the two groups was not statistically significant (p = 0.49).

In our study, the mean total cholesterol level in SCH patients (n=40) was 43.1 ± 6.5 mg/dL, compared to 46.5 ± 7.2 mg/dL in controls (n=40). This difference was statistically significant (p = 0.02). The mean serum triglyceride level in SCH patients was 165.4 ± 42.8 mg/dL, while in controls it was 148.6 ± 40.2 mg/dL. The difference was statistically significant (p = 0.03).

In our study, the mean LDL-C level in SCH patients (n=40) was 111.3 ± 21.9 mg/dL, compared to 99.4 ± 19.8 mg/dL in controls (n=40). This difference was statistically significant (p = 0.01), and the mean HDL-C level in SCH patients was 38.5 ± 6.2 mg/dL, while in controls it was 42.0 ± 5.7 mg/dL. The difference was statistically significant (p = 0.009).

In our study, the mean Total Cholesterol/HDL ratio in SCH patients (n=40) was 3.95 ± 0.70, compared to 3.50 ± 0.64 in controls (n=40). This difference was statistically significant (p = 0.02), indicating a higher atherogenic index in SCH patients. The mean LDL/HDL ratio in SCH patients was 2.92 ±

0.65, while in controls it was 2.36 ± 0.59. The difference was statistically significant (p = 0.008), suggesting increased cardiovascular risk in SCH patients compared to controls.

## Discussion

Our study observed that patients with subclinical hypothyroidism (SCH) exhibited significant alterations in their lipid profiles compared to euthyroid controls. Specifically, SCH patients had elevated total cholesterol, triglycerides, low-density lipoprotein cholesterol (LDL-C), and lower high-density lipoprotein cholesterol (HDL-C) levels. These findings align with several studies that have investigated the lipid disturbances associated with SCH.A study by Asranna et al. reported that individuals with SCH had higher levels of total cholesterol, LDL-C, and triglycerides compared to euthyroid controls, suggesting a potential risk for cardiovascular diseases in this population [11]. Similarly, Laway et al. found that SCH patients had significantly higher levels of total cholesterol and LDL-C, reinforcing the association between SCH and dyslipidemia [12].In contrast, some studies have reported no significant differences in lipid profiles between SCH patients and controls. For instance, a study by Al-Odat et al. found no significant association between SCH and abnormalities in serum cholesterol or triglyceride levels [13]. These discrepancies may be attributed to variations in study design, sample size, and diagnostic criteria for SCH. The elevated lipid levels observed in our study could be attributed to the hypothyroid state, which is known to influence lipid metabolism. Thyroid hormones play a crucial role in lipid metabolism by regulating the expression of genes involved in cholesterol synthesis and catabolism. A deficiency in thyroid hormones, as seen in SCH, can lead to increased cholesterol synthesis and decreased clearance, resulting in elevated serum lipid levels [14, 15].Furthermore, the altered lipid profile in SCH patients may have clinical implications. The increased levels of total cholesterol and LDL-C are well-established risk factors for atherosclerosis and cardiovascular diseases. Therefore, the lipid abnormalities observed in SCH patients may contribute to an increased risk of cardiovascular events [16, 17].However, it is important to note that the relationship between SCH and cardiovascular risk remains a topic of debate. Some studies have suggested that the cardiovascular risk associated with SCH may be modest and not clinically significant. For example, a study by Nair et al. found no significant association between SCH and cardiovascular risk in their cohort [18].In conclusion, our study adds to the growing body of evidence suggesting that SCH is associated with significant alterations in lipid profiles. These lipid disturbances may contribute to an increased risk of cardiovascular diseases in SCH patients [19, 20]. However, further large-scale, longitudinal studies are needed to better understand the clinical implications of these findings and to determine whether treatment of SCH to normalize thyroid function can mitigate the associated cardiovascular risks.

## Conclusion

Patients with subclinical hypothyroidism (SCH) exhibited significant alterations in their lipid profiles compared to euthyroid controls. SCH was associated with elevated total cholesterol, triglycerides, LDL-C, and decreased HDL-C, along with higher atherogenic indices, indicating an increased risk of cardiovascular disease. These findings highlight the importance of early detection and monitoring of lipid parameters in SCH patients to prevent future cardiovascular complications.

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