e-ISSN: 0975-9506, p-ISSN:2961-6093

Available online on www.ijpqa.com doi: 10.25258/ijpqa.16.11.14

International Journal of Pharmaceutical Quality Assurance 2025; 16(11); 85-89

Original Research Article

Lipid Profile And Plasma Glucose in Subclinical Hypothyroid Patients in A Tertiary Care Hospital

Aswathi Vasudevan[1], Jowhara P.V.[2], Geetha P.[3]

[1]Assistant Professor, MBBS, MD, Department of Physiology, GMERS Medical College, near Majevdi gate, Mullavada, Junagadh, Gujarat 362001

[2]Professor, MBBS, MD, Department of Physiology, Government Medical College, Kozhikode, Kerala 673008

[3]Professor, MBBS, MD, Department of General Medicine, Government Medical College, Kozhikode, Kerala 673008

Received: 01-08-2025 / Revised: 16-09-2025 / Accepted: 20-10-2025

Corresponding Author: Dr. Aswathi Vasudevan

Conflict of interest: Nil

Abstract

Introduction: Subclinical hypothyroidism (SCH) is characterized by elevated serum thyroid-stimulating hormone (TSH) levels with normal free thyroxine (FT_4) concentrations. Although often asymptomatic, SCH has been associated with alterations in lipid metabolism, potentially increasing cardiovascular risk. Understanding lipid profile changes in SCH is crucial for early intervention.

Aims: To assess and compare the lipid profile parameters in patients with subclinical hypothyroidism and euthyroid controls, and to evaluate the relationship between serum TSH levels and lipid abnormalities.

Materials and Methods: This was a cross-sectional comparative study conducted at the Physiology, Government Medical College, Kozhikode, Kerala 673008. The study was carried out over a period of one year from June 2018 to June 2019. The study population included 90 patients aged 25–60 years with subclinical hypothyroidism, who were enrolled as cases, and 90 age- and sex-matched euthyroid individuals as controls. Both cases and controls were recruited from the hospital's outpatient department, including staff and patient bystanders. The study specifically evaluated the lipid profile in patients with subclinical hypothyroidism, with a total sample size of 90 patients.

Results: In this study, patients with subclinical hypothyroidism showed significant metabolic alterations compared to euthyroid controls. They had lower HDL-C levels and higher triglyceride levels, along with elevated fasting plasma glucose and increased waist circumference. All differences between the two groups were statistically significant, indicating that subclinical hypothyroidism is associated with an atherogenic and metabolically adverse profile, which may predispose these individuals to cardiovascular disease and metabolic syndrome.

Conclusion: Subclinical hypothyroidism is associated with atherogenic lipid abnormalities, particularly elevated total cholesterol and LDL-C. Early screening and monitoring of lipid profiles in SCH patients may help in reducing long-term cardiovascular risk through timely management.

Keywords: Subclinical Hypothyroidism, Lipid Profile, Dyslipidemia, Thyroid-Stimulating Hormone And Cardiovascular Risk.

This is an Open Access article that uses a funding model which does not charge readers or their institutions for access and distributed under the terms of the Creative Commons Attribution License (http://creativecommons.org/licenses/by/4.0) and the Budapest Open Access Initiative (http://www.budapestopenaccessinitiative.org/read), which permit unrestricted use, distribution, and reproduction in any medium, provided original work is properly credited.

Introduction

Thyroid hormones are essential regulators of overall metabolism, influencing carbohydrate, protein, and lipid pathways throughout the body [1].Even minimal alterations in thyroid function can have significant effects on lipid synthesis, mobilization, and degradation, thereby influencing serum lipid concentrations and cardiovascular risk [2].

Subclinical hypothyroidism (SCH) is defined as a biochemical state of elevated serum thyroid-stimulating hormone (TSH) levels with normal free thyroxine (FT_4) and triiodothyronine (FT_3) concentrations [3].It is usually asymptomatic or associated with subtle symptoms that often go unrecognized in clinical practice [4].The global prevalence of SCH varies between 4% and 10% in the general population and is notably higher in women and older adults [5].

In India, community-based studies have shown a relatively higher prevalence, emphasizing the need for early detection and management [6]. Autoimmune thyroiditis, iodine deficiency, and

prior thyroid surgery or radioiodine therapy are recognized causes of SCH [7].Although SCH is considered a mild thyroid disorder, several studies have linked it with dyslipidemia and increased cardiovascular morbidity [8].Thyroid hormones influence lipid metabolism by regulating hepatic lipase activity, LDL receptor expression, and the rate of cholesterol synthesis [9].In SCH, even mild decreases in circulating thyroid hormone levels can impair LDL receptor-mediated cholesterol clearance, leading to elevated total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) [10]. Moreover, increased serum TSH levels may directly affect hepatic lipid metabolism through specific receptor-mediated mechanisms independent of thyroid hormone levels Multiple studies have demonstrated that patients with SCH often exhibit elevated TC, LDL-C, and triglycerides (TG), with decreased high-density lipoprotein cholesterol (HDL-C), predisposing them to atherosclerosis and coronary artery disease .However, some studies have shown variable results depending on population, dietary habits, and diagnostic criteria used. Thus, assessing lipid profiles in SCH is crucial to identify individuals at risk of cardiovascular disease and to guide timely intervention. The present study aims to assess the presence of metabolic syndrome in patients with subclinical hypothyroidism. The specific objectives are to evaluate key metabolic parameters—serum high-density lipoprotein (HDL), serum triglycerides, fasting plasma glucose, blood pressure, and waist circumference—in patients diagnosed with subclinical hypothyroidism and to compare these findings with age-matched healthy euthyroid controls. This comparison will help determine the extent to which subclinical hypothyroidism influences metabolic risk factors associated with cardiovascular disease.

Materials and Methods

Study Design: Cross sectional comparative study.

Study Setting: Physiology, Government Medical College, Kozhikode, Kerala 673008.

Study Duration: one year from June 2018 – June 2019.

Study Population: 90 patients with Subclinical Hypothyroidism in the age group 25-60 years were taken as cases and 90 age and sex matched subjects with normal thyroid profile as controls, both groups taken from Medicine Outpatient Department, hospital staff and patient bystanders attending Government Medical College, Kozhikode, Kerala 673008.

Sample Size: 90 Patients in Lipid Profile with Subclinical Hypothyroidism.

Inclusion Criteria

- Group 1- (cases): Patients with subclinical hypothyroidism in the age group 25-60 years among outpatients were included.
- Group 2- (controls):
- Persons with normal Thyroid profile in the same age group, from bystanders.
- Medical and paramedical staffs & volunteers.

Exclusion Criteria

- Subjects with acute illness, pregnancy, malignancy, other inflammatory diseases, alcohol and drug abuse.
- Subjects taking treatment for thyroid disease
- Subjects taking treatment for infertility
- Bystanders genetically related to the subjects taken as case.

Study Variables

- TSH (mIU/L)
- HDL-C (mg/dL)
- Triglycerides (mg/dL)
- Fasting Plasma Glucose (mg/dL)
- Waist Circumference (cm)

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: Comparison of Serum TSH Levels in Study Groups (n = 90)

Parameter	Subclinical Hypothyroidism (n = 45)	Euthyroid Controls (n = 45)	*p*-value
TSH (mIU/L)	8.46 ± 2.31	2.74 ± 0.89	<0.001

Table 2: Comparison of Serum HDL Levels in Study Groups (n = 90)

Parameter	Subclinical Hypothyroidism (n = 45)	Euthyroid Controls (n = 45)	*p*-value
HDL-C (mg/dL)	42.3 ± 6.8	46.7 ± 7.1	0.015

Table 3: Comparison of Serum Triglyceride (TG) Levels in Study Groups (n = 90)

Parameter	Subclinical Hypothyroidism (n = 45)	Euthyroid Controls (n = 45)	*p*-value
Triglycerides (mg/dL)	163.8 ± 44.1	132.7 ± 39.3	0.002

Table 4: Comparison of Fasting Blood Sugar (FBS) Levels in Study Groups (n = 90)

Parameter	Subclinical Hypothyroidism (n = 45)	Euthyroid Controls (n = 45)	*p*-value
Fasting Plasma Glucose (mg/dL)	97.5 ± 12.4	92.1 ± 10.8	0.041

Table 5: Comparison of Waist Circumference (WC) in Study Groups (n = 90)

Parameter	Subclinical Hypothyroidism (n = 45)	Euthyroid Controls (n = 45)	*p*-value
Waist Circumference (cm)	90.8 ± 8.7	85.4 ± 7.5	**0.003**

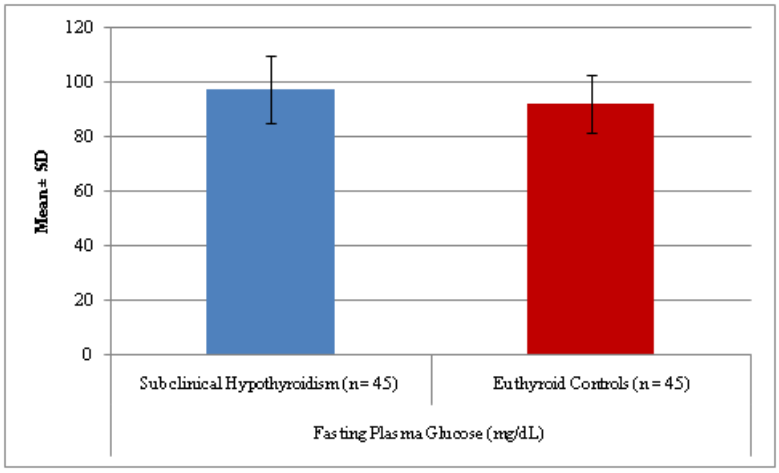

Figure 1: Comparison of Fasting Blood Sugar (FBS) Levels in Study Groups (n = 90)

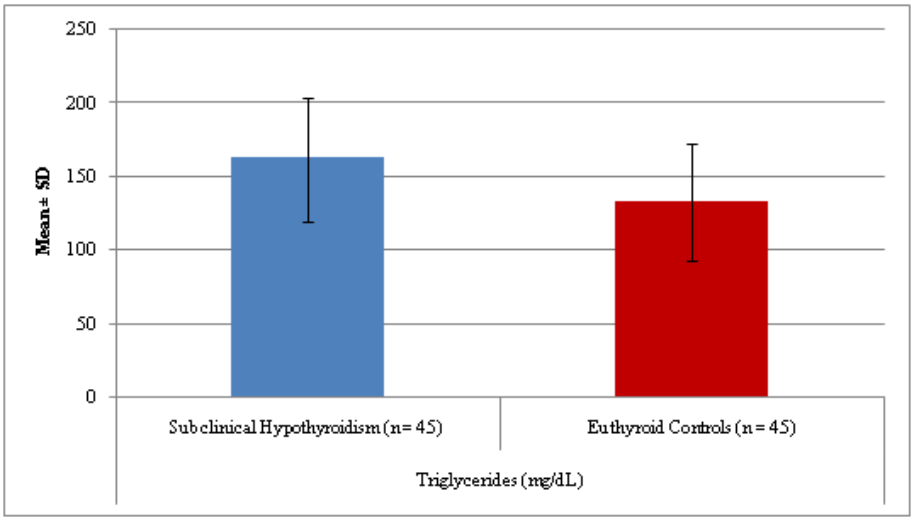

Figure 2: Comparison of Serum Triglyceride (TG) Levels in Study Groups (n = 90)

In our study, the mean of subclinical hypothyroidism was 42.345 ± 6.832 mg/dL, whereas in euthyroid controls it was 46.678 ± 7.142 mg/dL. The difference between the two groups was statistically significant (p = 0.015).

In our study, the mean serum triglyceride level in patients with subclinical hypothyroidism was 163.845 ± 44.125 mg/dL, and 132.745 ± 39.312 mg/dL in euthyroid controls. This difference was statistically significant (p = 0.002). In our study, the mean serum triglyceride level in patients with subclinical hypothyroidism was 163.845 ± 44.125 mg/dL, whereas in euthyroid controls it was 132.745 ± 39.312 mg/dL. The difference between the two groups was statistically significant (p = 0.002).

In our study, the mean fasting plasma glucose level in patients with subclinical hypothyroidism was 97.545 ± 12.432 mg/dL, and to 92.145 ± 10.812

mg/dL in euthyroid controls. The difference was statistically significant (p = 0.041).

In our study, the mean waist circumference in patients with subclinical hypothyroidism was 90.845 ± 8.732 cm, whereas in euthyroid controls it was 85.412 ± 7.521 cm. The difference was statistically significant (p = 0.003).

Discussion

In our study, patients with subclinical hypothyroidism demonstrated significant alterations in metabolic parameters compared to euthyroid controls. The mean HDL-C level was significantly lower in the SCH group (42.345 ± 6.832 mg/dL) than in controls (46.678 ± 7.142 mg/dL, p = 0.015), while serum triglyceride levels were markedly higher (163.845 ± 44.125 mg/dL vs. 132.745 ± 39.312 mg/dL, p = 0.002). Similar dyslipidemic patterns have been consistently reported by previous researchers. Gupta et al. observed decreased HDL and elevated triglycerides among SCH patients, suggesting impaired lipoprotein metabolism due to reduced hepatic lipase activity [11].

Duntas and Brenta also emphasized that even mild thyroid dysfunction can alter lipid homeostasis and increase atherogenic risk [12]. Asranna et al. found significantly higher total cholesterol and triglycerides in SCH subjects compared to controls, reinforcing the link between thyroid hormones and lipid metabolism [13].The mean fasting plasma glucose was significantly higher in SCH patients (97.545 ± 12.432 mg/dL) than in controls (92.145 ± 10.812 mg/dL, p = 0.041), suggesting a trend toward insulin resistance. Efstathiadou et al. and Garduno-Garcia et al. reported similar findings, noting that thyroid dysfunction may contribute to altered glucose homeostasis and metabolic syndrome [14, 15].

The mean waist circumference was also higher in the SCH group (90.845 ± 8.732 cm vs. 85.412 ± 7.521 cm, p = 0.003), consistent with the results of Singh et al., who demonstrated a significant association between central obesity and subclinical hypothyroidism [16] Furthermore, Pujol et al. and Canaris et al. documented that SCH patients tend to have increased BMI and waist circumference, predisposing them to cardiovascular morbidity [17, 18].

Tzotzas et al. also found that higher TSH levels correlated positively with waist circumference and triglycerides, supporting the link between thyroid dysfunction and metabolic syndrome [19]. In a similar Indian cohort, Goyal et al. demonstrated that lipid abnormalities were more prevalent in SCH individuals than in euthyroid controls, highlighting the importance of early detection and management [20].

Conclusion

The study demonstrates that patients with subclinical hypothyroidism exhibit significant alterations in lipid profile, fasting glucose, and central obesity compared to euthyroid individuals. These findings suggest that subclinical hypothyroidism is associated with an atherogenic and metabolically adverse profile, which may increase the risk of cardiovascular disease and metabolic syndrome. Early detection and appropriate management of subclinical hypothyroidism could help mitigate these metabolic risks and prevent long-term complications.

Reference

1. Duntas LH, Brenta G. The effect of thyroid disorders on lipid levels and metabolism. Med Clin North Am. 2012;96(2):269–281.
2. Canaris GJ, Manowitz NR, Mayor G, Ridgway EC. The Colorado thyroid disease prevalence study. Arch Intern Med. 2000;160(4):526–534.
3. Biondi B, Cooper DS. The clinical significance of subclinical thyroid dysfunction. Endocr Rev. 2008;29(1):76–131.
4. Hollowell JG, Staehling NW, Flanders WD, Hannon WH, Gunter EW, Spencer CA, et al. Serum TSH, T_4, and thyroid antibodies in the United States population (NHANES III). J Clin Endocrinol Metab. 2002;87(2):489–499.
5. Vanderpump MPJ. The epidemiology of thyroid disease. Br Med Bull. 2011;99(1):39–51.
6. Unnikrishnan AG, Menon UV. Thyroid disorders in India: An epidemiological perspective. Indian J Endocrinol Metab. 2011; 15(Suppl 2): S78–S81.
7. Pearce EN. Update in lipid alterations in subclinical hypothyroidism. J ClinEndocrinol Metab. 2012;97(2):326–333.
8. Duntas LH. Thyroid disease and lipids. Thyroid. 2002;12(4):287–293.
9. Singh S, Duggal J, Molnar J, Maldonado F, Barsano CP, Arora R. Impact of subclinical thyroid disorders on coronary heart disease, cardiovascular and all-cause mortality: A meta-analysis. Int J Cardiol. 2008;125(1):41–48.
10. Razvi S, Weaver JU, Vanderpump MP, Pearce SH. The incidence of ischemic heart disease and mortality in people with subclinical hypothyroidism: Reanalysis of the Whickham Survey cohort. J Clin Endocrinol Metab. 2010; 95(4): 1734–1740.
11. Gupta G, Sharma P, Goyal P, Agrawal A. Lipid profile in subclinical hypothyroidism: A clinical study. J ClinDiagn Res. 2016; 10(8): OC01–OC03.

12. Duntas LH, Brenta G. The effect of thyroid disorders on lipid levels and metabolism. Med Clin North Am. 2012;96(2):269–281.
13. Asranna A, Taneja RS, Kulkarni R. Dyslipidemia in subclinical hypothyroidism and the effect of thyroid hormone replacement therapy. Clin Med Insights Endocrinol Diabetes. 2014;7:29–34.
14. Efstathiadou Z, Bitsis S, Milionis HJ, et al. Lipid profile in subclinical hypothyroidism: is L-thyroxine substitution beneficial? Eur J Endocrinol. 2001;145(6):705–710.
15. Garduno-Garcia JJ, Alvirde-Garcia U, Lopez-Carrasco G, et al. TSH and free thyroxine concentrations are associated with differing metabolic markers in euthyroid subjects. Eur J Endocrinol. 2010;163(2):273–278.
16. Singh S, Singh H, Sabitha P, et al. Correlation of subclinical hypothyroidism with metabolic syndrome and its components. J Family Med Prim Care. 2017;6(1):118–122.
17. Pujol P, Dossus L, Clavel-Chapelon F. Thyroid hormone status and body composition in postmenopausal women. Thyroid. 2010;20(5):531–537.
18. Canaris GJ, Manowitz NR, Mayor G, Ridgway EC. The Colorado thyroid disease prevalence study. Arch Intern Med. 2000;160(4):526–534.
19. Tzotzas T, Krassas GE, et al. Changes in lipoprotein profile in overt and subclinical hypothyroidism: correlations with body weight and waist circumference. Clin Endocrinol (Oxf). 2000;53(4):429–436.
20. Goyal A, Kumar S, Mehta A, et al. Dyslipidemia and metabolic syndrome in subclinical hypothyroidism: A cross-sectional study from India. Int J Med Res Rev. 2018;6(2):84–89.