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Original Research Article

Evaluation of Lipid Profile in Patients Suffering from Hypothyroidism in Indore (M.P), India

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Abstract:

Background: Dyslipidemia is considered a risk factor for the development of cardiovascular disease. While overt hypothyroidism is known to be linked with lipid abnormalities, the relationship between subclinical hypothyroidism (SCH) and specific lipid patterns remains unclear. This study aimed to evaluate lipid abnormalities in patients with subclinical hypothyroidism (SCH) and to explore the relationship between lipid levels and thyroid-stimulating hormone (TSH).

Methods: In this cross-sectional, case-control study, serum lipid levels were assessed in 87 patients with subclinical hypothyroidism (SCH) and compared with 101 age- and sex-matched euthyroid controls.

Results: The study found that total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) were significantly higher ($p < 0.05$) in patients with subclinical hypothyroidism (SCH) compared to the control group. Although triglycerides (TG) and very low-density lipoprotein cholesterol (VLDL-C) levels were elevated in SCH patients, the difference was not statistically significant when compared to the controls. High-density lipoprotein cholesterol (HDL C) was slightly lower in SCH patients than in the control group.

Conclusions: Patients with subclinical hypothyroidism (SCH) have higher levels of total cholesterol (TC) and low density lipoprotein cholesterol (LDL-C) compared to euthyroid individuals. Other lipids, such as triglycerides (TG) and very low-density lipoprotein cholesterol (VLDL-C), may show slight increases, while high-density lipoprotein cholesterol (HDL-C) may be modestly reduced in these patients. There is also a positive correlation between LDL-C and TC levels with TSH levels.

Keywords: Antithyroid peroxidase antibodies, Thyroid-stimulating hormone, Free thyroxine, Atherosclerosis

Introduction

Subclinical hypothyroidism (SCH) is characterized by an elevated serum thyroid-stimulating hormone (TSH) level, while serum free thyroxine (FT4) remains within the normal range. [1] This condition, also referred to as mild thyroid failure, is fairly prevalent, affecting approximately 3% to 8% of individuals without a prior diagnosis of thyroid disease. [2,3] One of the significant clinical concerns related to hypothyroidism, including both overt and subclinical forms, is its impact on lipid metabolism. [4,5] Overt hypothyroidism is well established as a risk factor for developing hypertension, cardiovascular disease, and atherosclerosis, making its management crucial. [6] In overt hypothyroidism, the associated lipid abnormalities typically include elevated levels of total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), and triglycerides (TG). [5]

While the relationship between SCH and dyslipidemia remains a topic of ongoing debate, several studies have documented notable alterations in lipid profiles among patients with SCH. [7-10] Specifically, significant increases in TC, LDL-C, and TG have been observed in multiple research studies involving patients with subclinical hypothyroidism. [11-13] Therefore, the present study aims to further explore lipid abnormalities in individuals diagnosed with SCH and investigate the potential correlation between lipid levels and TSH concentrations. By understanding this relationship better, clinicians may be able to optimize the management of lipid imbalances in SCH patients, potentially mitigating cardiovascular risk factors.

Methods

The study was designed as a cross-sectional case-control study conducted at INDEX medical college indore M.P . A total of 87 patients diagnosed with subclinical hypothyroidism (cases) and 101 euthyroid individuals (controls) were recruited from the hospital's outpatient department (OPD).

The study took place over a period of two years, from March 2022 to February 2023. Approval from the institute's ethical committee was obtained before the commencement of the study. Additionally, informed consent was obtained from all participants prior to their inclusion in the study.

Inclusion Criteria

For Cases: Individuals with raised serum TSH level (greater than5.5 µIU/mL), normal Free thyroxine (T4) (0.89-1.76 ng/dL) and normal free triiodothyronine (T3) (2.30-4.20 pg/mL) levels.

For Control: Age and sex matched subjects who have normal serum TSH level (0.35-5.5 µIU/mL), normal Free T4 (0.89- 1.76ng/dL)and normal freeT3(2.30-4.20pg/mL)levels.

Exclusion Criteria: Participants with conditions or disorders known to influence lipid profiles—such as nephrotic syndrome, renal failure, obesity (BMI > 30 kg/m²), malnutrition (BMI < 18.5 kg/m²), smoking, alcoholism, and diabetes—were excluded from the study. [14,15] Additionally, individuals on any medication were not included.

Following a comprehensive questionnaire and physical examination, all participants underwent the following investigations: fasting serum thyroid-stimulating hormone (TSH), free thyroxine (T4), free triiodothyronine (T3),antithyroid peroxidase antibody (anti-TPO), complete blood count (CBC), fasting plasma glucose, and postprandial plasma glucose (measured 2 hours after 75 g of oral glucose). Kidney function tests (KFT), including serum urea and creatinine, and liver function tests (LFT), comprising serum bilirubin, albumin, SGOT, SGPT, and alkaline phosphatase, were also conducted. Additional assessments included a 24-hour urinary protein collection, as well as measurements of serum total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), high density lipoprotein cholesterol (HDL-C), and very low density lipoprotein cholesterol (VLDL-C).

The CBC was analyzed using the Sysmex XP-100 (Transasia) analyzer. LFT, KFT, and plasma glucose levels were evaluated with the Randox RX Imola clinical chemistry analyzer. Free T4, free T3, TSH, and anti-TPO were measured through chemiluminescent immunoassay. A value of anti-TPO greater than 60 U/mL was considered positive. The direct measurement of TC, HDL-C levels, and TG was performed using the Randox RX Imola clinical chemistry analyzer, while LDL-C and VLDL-C levels were calculated using Friedewald's formula. [16]

Statistical analysis

Statistical analyses were done using Microsoft excel 2010.

Results

Table 1 presents the baseline variables for both the case group (SCH patients) and the control group. The lipid profile comparison between the case group (SCH patients) and the control group is illustrated in Table 2 and Figure 1.

Table1: Baseline characteristic of case and controls.

	Case	Control	P value
Age	32.30±6.55	31.87±6.79	0.662
Sex(M:F)	9:78	12:89	0.739
BMI(kg/m²)	23.81±2.33	24.21±3.13	0.32
TSH (µIU/ml)	8.13±1.87	2.32±0.79	<0.001
FreeT4(ng/dl)	0.98±0.04	1.49±0.08	<0.001
AntiTPO+(%)	51.72	25.74	<0.001

Table2: Comparison of lipid profile of case and controls.

Lipids(mg/dL)	Case	Control	P value
TC	188.09±23.81	179.67±21.29	0.011
LDL-C	107.41±15.47	98.63±20.05	0.001
TG	148.25±51.38	140.97±37.22	0.275
VLDL-C	29.65±10.28	28.19±7.44	0.275
HDL-C	51.03±14.56	52.85±7.49	0.301

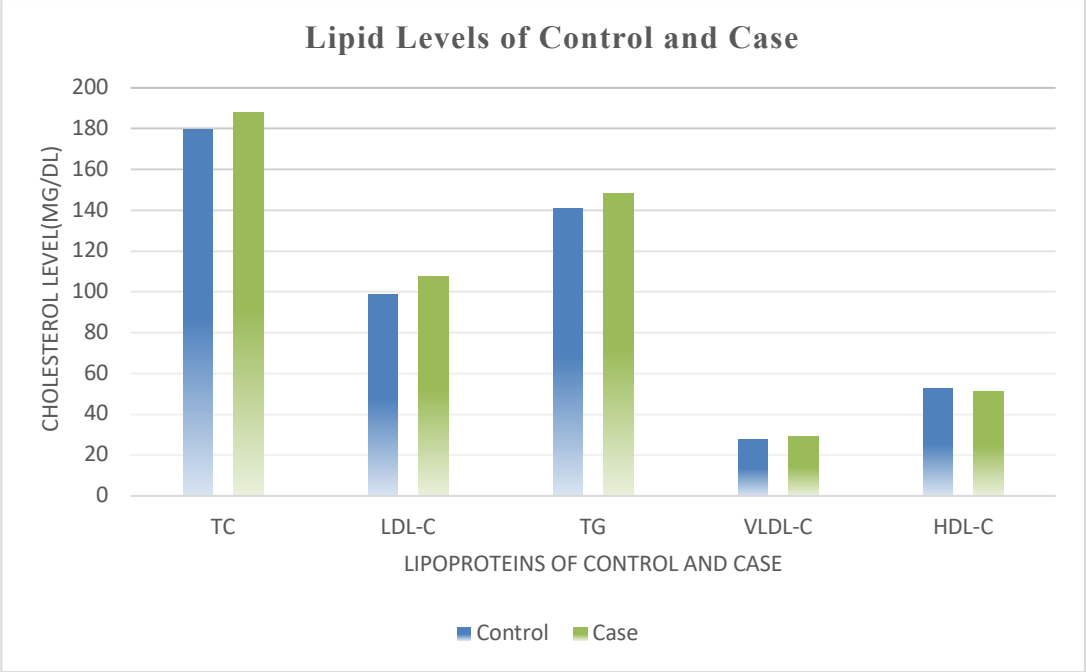

Figure 1: Lipid levels in both goups

Discussion

Dyslipidemia is recognized as a potential risk factor for the development of cardiovascular disease [17,18]. While overt hypothyroidism is well-documented to be associated with dyslipidemia [19,20], the relationship between subclinical hypothyroidism (SCH) and abnormal lipid profiles remains less definitive. Various studies have explored this association, yielding mixed results. For instance, an analysis of 8,586 adults from the National Health and Nutrition Examination Survey III database found no significant association between SCH and alterations in total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C), triglycerides (TG), or high-density lipoprotein cholesterol (HDL-C) after adjusting for factors such as age, race, sex, and the use of lipid-lowering drugs [21]. Similarly, Vierhapper et al. reported no significant differences in serum TC, LDL-C, HDL-C, or TG between SCH patients and a euthyroid control group [22].

Contrastingly, our study found that both TC and LDL-C levels were significantly elevated ($p < 0.05$) in SCH patients compared to the control group. Although TG and very low-density lipoprotein cholesterol (VLDL-C) levels were higher in the SCH group, the differences were not statistically significant. HDL-C levels were only marginally lower in SCH patients compared to the controls (Table 2). This finding is partially supported by Laway et al., who observed significantly higher mean levels of TC, TG, and VLDL-C in SCH patients compared to controls ($p < 0.05$) [23]. Similarly, Asranna et al. found significantly elevated mean TC and LDL-C levels in SCH patients but did not observe significant differences in mean HDL-C, VLDL-C, or TG levels between the two groups [24].

Further support comes from studies such as that of Bandyopadhyay et al., who reported significantly elevated TC and LDL-C levels in SCH patients aged 40-50 years, along with increased TG in the same age group [25]. Guntaka et al. also observed a significant rise in TC and LDL-C in SCH subjects compared to controls [26]. Marwaha et al. found that adult SCH patients with TSH levels >10 mIU/L had significantly higher serum TC and LDL-C levels compared to controls [27]. Additionally, a statewide health fair in Colorado involving 25,862 participants demonstrated that fasting TC, TG, and LDL-C levels were significantly higher in SCH patients than in euthyroid individuals [28].

Not all studies align with our findings, however. For example, in a study of 1,534 Chinese adults, Lai et al. observed significantly higher TG levels and lower HDL-C levels in SCH patients compared to euthyroid individuals [29].

In our study, we found a positive correlation between TSH levels and both LDL-C and TC ($p < 0.05$), which aligns with the findings of Santi et al., who also reported a positive correlation between TSH levels and these lipid parameters in SCH patients [30].

Conclusion

Patients with subclinical hypothyroidism (SCH) exhibit elevated total cholesterol (TC) and low-density lipoprotein cholesterol (LDL-C) levels

compared to individuals with normal thyroid function (euthyroid). Additionally, other lipid parameters such as triglycerides (TG) and very low-density lipoprotein cholesterol (VLDL-C) may show slight increases, while high-density lipoprotein cholesterol (HDL-C) tends to be marginally reduced in SCH patients. Notably, there is a positive correlation between thyroid-stimulating hormone (TSH) levels and both LDL-C and TC concentrations. Since dyslipidemia is a known risk factor for cardiovascular disease development, it is crucial to closely monitor the lipid profiles of patients with SCH to mitigate potential cardiovascular complications.

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