

Original Research Article

A study of lipid profile in subclinical hypothyroidism in tertiary care hospital, Kolkata, India

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ABSTRACT

Background: Objective was to study lipid profile in patients of subclinical hypothyroidism in tertiary centre in Kolkata, West Bengal and compare the same with matched controls.

Methods: This observational study (single exposure) was conducted May 2019 to Nov 2019 at Department of Medicine, KPC Medical College, Jadavpur, Kolkata in subjects diagnosed with Sub Clinical Hypothyroidism [defined as normal T3 or FT3, normal T4 or FT4, and with increased TSH. Sixty patients with subclinical hypothyroidism were selected after careful exclusion; lipid profile was compared with matched controls.

Results: Between the two groups (group I - controls vs. group II - cases), the values were as follows: Mean serum total T3 value was 114.03±29.22 ng/dl vs. 106.15±36.24 ng/dl (p = 0.3476); mean total T4 was 7.07±1.69 µg/dl vs. 6.86±1.31 µg/dl (p = 0.535); mean TSH was 3.17±1.28 µIU/ml vs. 9.77±4.19 µIU/ml (p <0.0001). Lipid profile pattern (group I vs. group II) was as follows: Mean total cholesterol (TC) 125.50±9.18 mg/dl vs. 162.07±42.32 mg/dl (p <0.0001), mean triglycerides (TG) is 136.65±14.82 mg/dl vs. 148.90±65.27 mg/dl (p = 0.3236), low-density lipoprotein (LDL)-cholesterol is 62.17±7.40 mg/dl vs. 98.81±33.26 mg/dl (p <0.0001), high-density lipoprotein (HDL)-cholesterol 39.17±6.62 mg/dl vs. 34.27±9.63 mg/dl (p = 0.0702), very low-density lipoprotein (VLDL) levels are 34.54±15.38 mg/dl vs. 32.08±13.21 mg/dl (p = 0.5245).

Conclusions: Subclinical hypothyroidism is associated with increased serum total cholesterol and LDL-Cholesterol levels. Therefore, there is a potential association between Subclinical hypothyroidism and atherosclerosis.

Keywords: Cardiovascular risk, Lipid profile, Subclinical hypothyroidism

INTRODUCTION

Subclinical hypothyroidism (mild hypothyroidism or biochemical hypothyroidism) is defined as normal serum Total T4 or free T4 (FT4) and Total T3 or free T3 (FT3) levels in the presence of elevated serum thyroid stimulating hormone (TSH) levels.¹⁻³

The prevalence of this condition in adults is 5-10%. It is higher in women than in men and increases with age, reaching a peak of 22% in women and 15% in men over

75 years of age.^{4,5} The etiology and nature of SCH are the same as in overt hypothyroidism.

The symptoms related to SCH are nonspecific and depend on individual sensitivity to different circulating.⁶ Though SCH can affect various organ systems, the cardiovascular system is the major target. In SCH patients, the cardiac hemodynamic changes reported are diastolic dysfunction, increased systemic vascular resistance (SVR), and reduced systolic function that are similar to those observed in overt hypothyroidism.⁷

SCH could impair vascular function by inducing an increase in SVR and arterial stiffness and by altering endothelial function and thereby potentially increasing the risk of atherosclerosis and coronary artery disease.^{8,9} Moreover, an inconsistent change to atherogenic lipids may also add to the cardiovascular risks.¹⁰

Cardiovascular risk in SCH is controversial, as some of the studies have shown an increase in myocardial infarction and heart failure, whereas others did not find any increase in cardiovascular disease or mortality.¹¹⁻¹³ This discrepancy could be due to differences in study population (age, sex), methods of evaluation of cardiovascular disease, TSH range that defines SCH and differences in adjustments for known risk factors for cardiovascular disease.

As SCH is being diagnosed more frequently in young and middle-aged people, there is a need to know the effect of SCH on cardiovascular risk factors in young in tertiary centre in West Bengal. Therefore, the objective of this study is to analyze the relation between SCH and serum lipid parameters in this subgroup.

METHODS

This observational study (single exposure) was conducted from May 2019 to Nov 2019 at Department of Medicine, KPC Medical College, Jadavpur, Kolkata in subjects diagnosed with Sub Clinical Hypothyroidism [defined as normal T3 or FT3, normal T4 or FT4, and with increased TSH.

Inclusion criteria

- Mentally alert and conscious subjects with full knowledge about the matter participated in the study. Informed consent was taken prior to conduct of the study. Total 144 subjects were included in the study.
- 60 patients (54 females and 6 males) were included in the present study and 60 age- and sex-matched and regularly menstruating healthy controls, who were evaluated for Thyroid Function test were randomly recruited from staff and volunteers

Exclusion criteria

- Patients with other comorbidities like history of diabetes mellitus, pregnancy, coronary heart disease, obesity, acute illness, post-menopausal status and other disorders that affect lipid metabolism were excluded.
- Patients who were exposed to thyroid hormone therapy or lipid-lowering agent in the past 6 months were also excluded. The investigators themselves have taken interviews of all study subjects.

Informed consent was obtained from both cases and controls; this study was approved by the ethical committee.

Blood samples were drawn at 08:00 h after an overnight fast in a sterile bottle. Serum was separated for the estimation of serum TSH, T3, T4, and total cholesterol (TC), triglyceride (TG), high-density lipoprotein (HDL), low-density lipoprotein (LDL), which were derived from TC and TG, using Friedwald's Formula [$LDL = TC - (HDL + TG/5)$], Very low-density lipoprotein (VLDL) derived from TG.^{7,9}

T3, T4, and TSH were estimated by using quantitative solid phase enzyme-linked immune sorbent assay (ELISA), whereas TC was estimated with photometric determination according to the CHOD PAP method; TG and HDL were estimated by using the enzymatic colorimetric method.

Statistical analysis was done with the Student t test, where all values were expressed as mean \pm SEM, and value of $p \leq 0.05$ was considered statistically significant.

RESULTS

As SCH is defined as elevated levels of TSH with respect to normal levels of T3 and T4; hence, T3 and T4 levels were matched with a group I (controls) and group II (Cases).

In group I individuals, the mean serum T3 level was 114.03 ± 29.22 ng/dl. In group II individuals, the mean serum T3 level is 106.15 ± 36.24 ng/dl ($p = 0.3476$).

In group I individuals, the mean serum T4 level is 7.07 ± 1.69 μ g/dl. In group II individuals, the mean serum T4 level is 6.86 ± 1.31 μ g/dl ($p = 0.535$).

The levels of TSH are significantly higher in group II (9.77 ± 4.19 μ IU/ml) compared to group I (3.17 ± 1.28 μ IU/ml), $p < 0.0001$, which is considered to be statistically significant.

There is a significant increase in the serum TC level in group II individuals (162.07 ± 42.32 mg/dl) when compared to group I (125.50 ± 9.18 mg/dl), $p < 0.0001$; this difference is considered to be statistically significant.

There is also a significant increase in serum LDL-Cholesterol in group II individuals (98.81 ± 33.26 mg/dl) when compared to group I individuals (62.17 ± 7.40), $p < 0.0001$, which is statistically significant.

There is no significant difference in serum HDL-Cholesterol among the group I (39.17 ± 6.62 mg/dl) and group II (34.27 ± 9.63 mg/dl), $p = 0.0702$, which is not quite statistically significant. In group I individuals, the mean serum TG is 136.65 ± 14.82 mg/dl. In group II individuals, the levels are 148.90 ± 65.27 , $p = 0.3236$, which is not statistically significant. A small increase in serum TG level in group II compared to group I may be noted [Table 1] and [Figure 1].

There is no significant difference in serum VLDL levels among the group I (34.54 ± 15.38) and group II (32.08 ± 13.21) $p=0.5245$, which is statistically insignificant.

Table 1: Comparison of different parameters of Thyroid hormones and Lipid profiles between case and control and statistical significance.

Parameter	Group I	Group II	p value
T3 (ng/dl)	114.03±29.22	106.15±36.24	0.3476
T4 (µg/dl)	7.07 ± 1.69	6.86 ± 1.31	0.535
TSH (µIU/ml)	3.17±1.28	9.77±4.19	<0.0001
Total Cholesterol (mg/dl)	125.50±9.18	162.07±42.32	<0.0001
TG (mg/dl)	162.07±42.32	148.90±65.27	0.3236
LDL (mg/dl)	62.17±7.40	98.81±33.26	<0.0001
HDL (mg/dl)	39.17±6.62	34.27±9.63	0.0702
VLDL (mg/dl)	34.54±15.38	32.08±13.21	0.5245

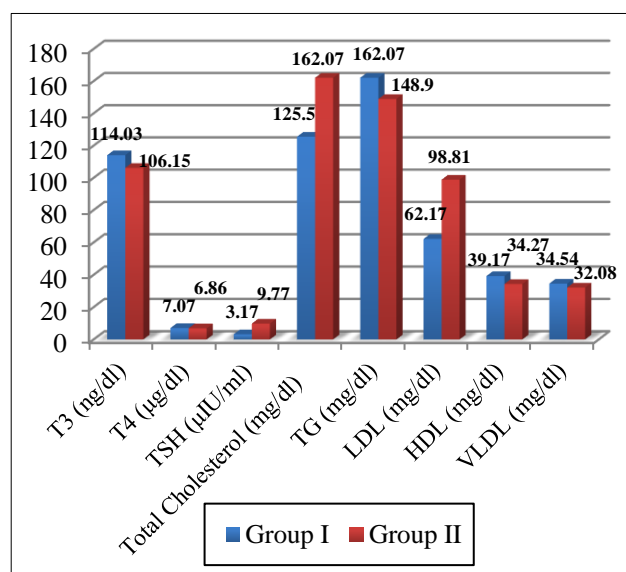


Figure 1: Different parameters of Thyroid hormones and Lipid profiles between Group I and Group II.

DISCUSSION

The present study was conducted among the subclinical hypothyroid patients attending our tertiary care hospital, KPC Medical College, Jadavpur, Kolkata. The possible correlation between SCH and serum concentrations of lipids was evaluated.

The pathophysiology of dyslipidemia in hypothyroidism is not exactly known. However, the proposed mechanisms for dyslipidemia in hypothyroidism are as follows:

- Primary accumulation of LDL cholesterol due to reduction in the number of cell surface receptors for LDL results in decreased catabolism of LDL.¹⁴
- Diminished secretion of cholesterol into bile has been demonstrated in hypothyroid rats.¹⁵
- Reduced cholesteryl ester transfer (the net transfer of cholesterol from HDL to LDL and VLDL) in hypothyroidism may minimize the increase in serum LDL cholesterol concentrations.¹⁶
- Reduced lipoprotein lipase activity is responsible for the development of hypertriglyceridemia in hypothyroidism although the rate of TG synthesis is normal.¹⁴

The relationship between subclinical hypothyroidism and serum lipids remains controversial.¹⁷

In several cross-sectional studies, subclinical hypothyroidism was found to be associated with a variable and somewhat inconsistent increase in TC and in LDL-C, higher plasma oxidized LDL-C levels, and inconsistent changes in serum levels of HDL-C.^{5,18-22} As expected, the lipid pattern is more abnormal in individuals with serum TSH greater than 10 mIU/liter, and it is more deranged in those who smoke.^{20,22}

In our study, TC and LDL-C were significantly increased and non-significantly elevated serum TG levels were seen in group II subjects when compared to group I. There was no significant difference in the levels of HDL-C and VLDL-C in two groups. These results correlated well with the Colorado thyroid disease prevalence study, which showed that TC and LDL-C in SCH were significantly higher than that in euthyroidism but TG and HDL-C were not significantly different.⁵

CONCLUSION

Subclinical hypothyroidism (SCH) is associated with increased serum TC and LDL-C levels. Therefore, there is a potential association between subclinical hypothyroidism and atherosclerosis. Larger studies are needed to prove this association in Indian patients.

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