

Research Article

A study of lipid profile in patients of subclinical hypothyroidism in rural area of Western Uttar Pradesh, India

Manoj Kumar^{1*}, Raveendra S. Rajpoot²

¹Department of Medicine, U.P. Rural Institute of Medical Sciences and Research, Saifai, Etawah, Uttar Pradesh, India

²Department of Physiology, U.P. Rural Institute of Medical Sciences and Research, Saifai, Etawah, Uttar Pradesh, India

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*Correspondence:

Dr. Manoj kumar,

E-mail: mkumarrims@gmail.com

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ABSTRACT

Background: Dyslipidemia is thought to confer risk of cardiovascular disease development. Overt hypothyroidism is associated with lipid abnormalities. However, the relationship between subclinical hypothyroidism (SCH) and pattern of lipid abnormalities is unclear. The aim of this study was to assess lipid abnormalities in patients of subclinical hypothyroidism (SCH) and investigate relationship between lipid level and TSH.

Methods: Serum lipid levels of 87 patients with subclinical hypothyroidism (SCH) and 101 age and sex matched euthyroid controls were evaluated in this cross sectional case control study.

Results: In this study total cholesterol (TC) and low density lipoprotein cholesterol (LDL-C) were significantly elevated (p value <0.05) in patients with subclinical hypothyroidism (SCH) as compared to control group. Triglycerides (TG) and very low density lipoprotein cholesterol (VLDL-C) were also high in these patients as compared to control but the difference was not statistically significant. High density lipoprotein cholesterol (HDL-C) was marginally lower in these patients than control.

Conclusions: Total cholesterol (TC) and low density lipoprotein (LDL-C) are higher in patients with subclinical hypothyroidism (SCH) as compared to euthyroid individuals. Other lipid like Triglycerides (TG) and very low density lipoprotein cholesterol (VLDL-C) may be marginally elevated whereas high density lipoprotein cholesterol (HDL-C) may be slightly reduced in these patients as compared to euthyroid individuals. There is also a positive correlation of LDL-C and TC with TSH level. As abnormal lipids are associated with development of cardiovascular diseases, lipid profile in these patients needs careful monitoring.

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

INTRODUCTION

Subclinical hypothyroidism (SCH) is defined as serum thyroid-stimulating hormone (TSH) level above the upper limit of normal despite normal levels of serum free thyroxine (FT4).¹ Subclinical hypothyroidism or mild thyroid failure is a common problem, with a prevalence of 3% to 8% in the population without known thyroid disease.^{2,3} Hypothyroidism is one of the main causes of

abnormal lipid metabolism.^{4,5} Patients with overt hypothyroidism are at risk of hypertension, cardiovascular disease, and atherosclerosis.⁶ Lipid abnormalities in overt hypothyroidism includes elevated total cholesterol (TC), low density lipoprotein cholesterol (LDL-C) and triglycerides (TG).⁵ Although the association between subclinical hypothyroidism (SCH) and dyslipidemia is still controversial, changes in lipid profile in these patients have been observed in several

studies.⁷⁻¹⁰ Many studies have reported significant increase in TC, and LDL-C and TG in patients with SCH.¹¹⁻¹³ Present study aimed to find lipid abnormalities in patients of subclinical hypothyroidism (SCH) and investigate relationship between lipid level and TSH.

METHODS

This study was a cross sectional case control study carried out at U.P. Rural Institute of Medical Sciences and Research. 87 patients of subclinical hypothyroidism (case) and 101 euthyroid controls were recruited from OPD of the hospital. Study was conducted during March 2014 to February 2016 (2 year). Study was initiated after taking permission from institute ethical committee. Informed consent was taken from all participants before including in study.

Inclusion criteria

For cases

Individuals with raised serum TSH level (greater than 5.5 μ IU/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 μ IU/mL), normal Free T4 (0.89-1.76 ng/dL) and normal free T3 (2.30-4.20 pg/mL) levels.

Exclusion criteria

Subjects having conditions/disorders known to affect lipid profile like nephrotic syndrome, renal failure, obesity (BMI>30 kg/m²), malnutrition (BMI<18.5 kg/m²), smoking, alcoholism, and diabetes were excluded from study.^{14,15} Patients on any medicine were also excluded from study.

After detailed questionnaire and physical examination all participants were subjected to following investigations: fasting serum thyroid stimulating hormone (TSH), free thyroxin (T4), free triiodothyronine (T3), antithyroid

peroxidase antibody (anti TPO), complete blood count (CBC), fasting plasma sugar, post prandial plasma sugar (2 hour after 75gm of oral glucose), kidney function test (KFT) (serum urea and creatinine), liver function test (LFT) (serum bilirubin, albumin, SGOT, SGPT and alkaline phosphatase), 24 hour urinary protein, serum total cholesterol (TC), low density lipoprotein cholesterol (LDL-C), triglycerides (TG), high density lipoprotein cholesterol (HDL-C), very low density lipoprotein cholesterol (VLDL-C).

CBC was estimated using analyser sysmex xp-100 (transasia). LFT, KFT, and plasma Sugar were estimated using randox rximola clinical chemistry analyser. Free T4, free T3, TSH and Anti TPO were measured by chemiluminescent immunoassay. Value of anti TPO >60U/mL were considered positive. Direct estimation of TC, HDL-C levels and TG were done using randox rximola clinical chemistry analyser. Low and very low density lipoprotein cholesterol (LDL-C and VLDL-C) were calculated employing the Friedewald's formula.¹⁶

Statistical analysis

Statistical analyses were done using Microsoft excel 2010 Data analysispak and IBM SPSS statistics version 23. Continuous variables were presented as mean and standard deviation and categorical variables were presented as percentage or ratio. Unpaired t test and chi-squared test were used for comparison of continuous and categorical variables respectively. Pearson correlation test was used to find relationship between TSH and lipid level. Correlation was expressed as Pearson correlation coefficient(r). A 'p' value <0.05 were considered significant.

RESULTS

Baseline variable of case (SCH patients) and control is presented in Table 1. Comparison of lipid profile of case (SCH patients) and control is shown in Table 2 and Figure 1.

Correlation analysis of total cholesterol (TC) and low density lipoprotein (LDL-C) with TSH is shown in Figure 2 and 3 respectively.

Table 1: Baseline characteristics of case (SCH patients) 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/m ²)	23.81±2.33	24.21±3.13	0.32
TSH (μ IU/ml)	8.13±1.87	2.32±0.79	<0.001
Free T4 (ng/dl)	0.98±0.04	1.49±0.08	<0.001
Anti TPO+(%)	51.72	25.74	<0.001

Table 2: Comparison of lipid profile of case (SCH patients) 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±14.76	52.85±7.59	0.301

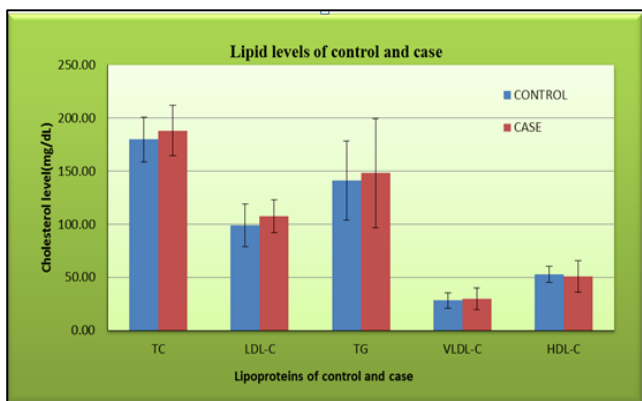


Figure 1: Mean cholesterol level in control and cases. Error bars indicates standard deviation.

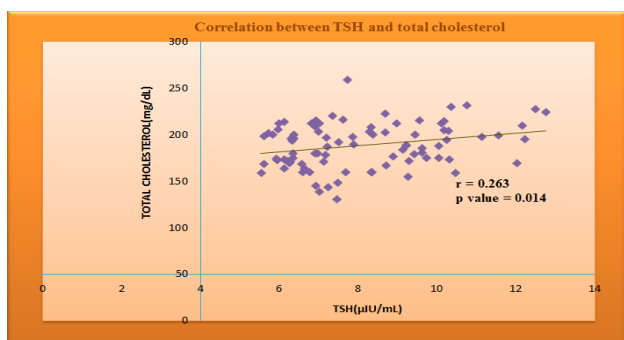


Figure 2: Correlation between total cholesterol and TSH; r=correlation coefficient.

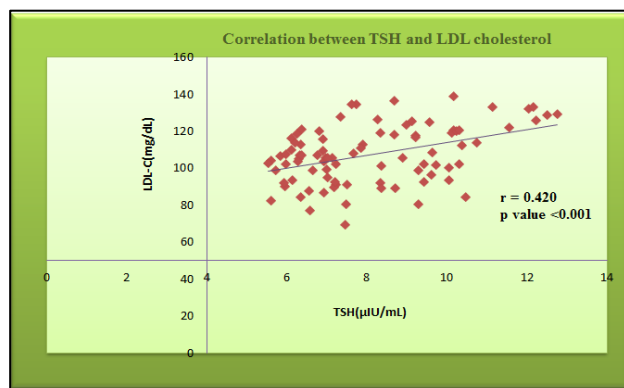


Figure 3: Correlation between LDL cholesterol and TSH; r=correlation coefficient.

DISCUSSION

Dyslipidemia is thought to confer risk of cardiovascular disease development.^{17,18} Overt hypothyroidism is associated with dyslipidemia.^{19,20} However, the relationship between subclinical hypothyroidism (SCH) and abnormal lipid profile is still unclear. Among 8586 adults from the National Health and Nutrition Examination Survey III database, SCH was not associated with alterations in TC, LDL-C, TG, or HDL-C after adjustment for age, race, sex, and using lipid-lowering drugs.²¹ Vierhapper et al reported that there were no significant differences in serum TC, LDL-C, HDL-C, or TG between patients with SCH and the euthyroid control group.²²

However, in our study TC and LDL-C were significantly high (p value <0.05) in SCH patients as compared to control group. TG and VLDL-C were higher in SCH patients as compared to control group but the difference was not statistically significant. HDL-C was marginally lower in SCH patients than control (Table 2). Laway et al also observed significantly high Mean serum total cholesterol (TC), triglycerides (TG) and very low-density cholesterol (VLDL-C) in patients with SCH as compared to controls (P<0.05).²³ Similarly Asranna et al found significantly higher Mean total cholesterol and mean LDL-C levels in SCH as compared to controls; however they also observed that there was no significant difference in the mean HDL-C, VLDL-C, and TG between SCH and controls.²⁴ Similarly Bandyopadhyay et al observed significantly elevated TC and LDL-C in SCH patients of age group 40-50 year. They also observed high TG in SCH patients in same age group.²⁵ Guntaka et al also observed significantly increased TC and LDL-C in SCH subjects compared to control.²⁶ Marwaha et al also observed significantly higher Serum total cholesterol (TC), and LDL-C in adult patients of SCH with TSH >10mIU/L compared to controls.²⁷ Among 25862 participants in a statewide health fair in Colorado, fasting TC, TG, and LDL-C levels were significantly greater in patients with SCH than those euthyroid subjects.²⁸ Unlike our study Lai et al observed significantly higher TG and lower HDL-C in patients with SCH than euthyroid individuals in their study on 1534 Chinese adults.²⁹

In our study LDL-C and TC were positively correlated with TSH level (p value<0.05) (Figure 2 and 3) in patients of SCH. Santi et al also observed a positive correlation of LDL-C and TC with TSH such patients.³⁰

CONCLUSION

Patients of SCH have higher TC and LDL-C than euthyroid individuals. Other lipid like TG, VLDL-C may be marginally elevated whereas HDL-C may be slightly reduced in these patients as compared to euthyroid individuals. There is also a positive correlation of LDL-C and TC with TSH level. As abnormal lipids are

associated with development of cardiovascular diseases, lipid profile in these patients needs careful monitoring.

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