National Journal of Physiology, Pharmacy and Pharmacology

RESEARCH ARTICLE

Alterations of lipid profile in subclinical hypothyroidism

Vishalaxi Jadhav, Shaktiprasad Hiremath

Department of Physiology, Karnataka Institute of Medical Sciences, Hubballi, Karnataka, India

Correspondence to: Vishalaxi Jadhav, E-mail: vishalaxij@gmail.com

Received: January 13, 2018; **Accepted:** April 09, 2018

ABSTRACT

Background: Thyroid hormones regulate a wide array of metabolic parameters and exert effects virtually on every organ system. Subclinical hypothyroidism is more common than overt hypothyroidism, and an apparently asymptomatic condition defined by slightly increased serum thyrotropin (TSH) concentrations, but normal serum-free T3 and free T4 hormone levels. **Aims and Objectives:** The aims of this study were to find a correlation between subclinical hypothyroidism (SCH) and the parameters of lipid profile. **Materials and Methods**: Study was carried out in 25 newly diagnosed subclinical hypothyroid subjects and compared with age- and sex-matched controls. Statistical analysis was done using regression analysis with alcula software. **Results**: SCH was more common in females and incidence increased as age advanced. Mean cholesterol, total triglycerides (TG), low-density lipoproteins (LDL), and very LDL (VLDL) increased proportionately with TSH level and high-density lipoproteins (HDL) decreased as TSH increased. **Conclusion**: SCH appears to be associated with dyslipidemia, that is, increased total cholesterol, TG, LDL, and decreased HDL.

KEY WORDS: Subclinical Hypothyroidism; Lipid Profile; Total Cholesterol; Triglycerides; Low-density Lipoproteins; High-density Lipoproteins; Very Low-density Lipoproteins; Dyslipidemia

INTRODUCTION

Thyroid hormones regulate a wide array of metabolic parameters and exert effects virtually on every organ system. Thyroid hormones known to play a vital role in regulating synthesis, metabolism, and transport of lipids.[1] Furthermore, known that alterations in thyroid function result in changes in the composition and transport of lipoproteins. Thus, thyroid dysfunctions are associated with dyslipidemia.[2]

Thyroid disorder is one of the most common endocrine disorder and hypothyroidism being more common than hyperthyroidism. Adipocytes express high levels of thyrotropin (TSH) receptors which function similar to those in thyroid, indicating that TSH participates in the regulation of adipocytes functions.[3]

Access this article online	
Website: www.njppp.com	Quick Response code
DOI: 10.5455/njppp.2018.8.0101909042018	

Subclinical hypothyroidism (SCH) is mild thyroid gland failure. Definition of SCH is not clearly established. SCH is an apparently asymptomatic condition defined by slightly increased serum TSH concentrations, but normal serum-free T3 (FT3) and free T4 (FT4) hormone levels.[4] The patient may be asymptomatic or may present with mild, non-specific symptoms of hypothyroidism such as myalgia, nausea, and constipation.

SCH occurs in 3%–8% of the general population, it is more common in females than males, its prevalence increases with age.[5]

Studies have reported, elevated levels of total cholesterol (TC) and low-density lipoproteins (LDL) in overt hypothyroidism and hyperlipidemia being a well-known cardiovascular risk factor.[6] Hence, the present study was focused to find

whether same changes exist in SCH also or not. Therefore, it is hypothesized that similar dysfunctions with decreased severity would occur in SCH.

There are limited studies on SCH in India. Furthermore, as studies on subclinical hypothyroid patients have shown variable results and as almost half of SCH patients may progress to overt hypothyroidism and the annual percent risk being increasing with the serum TSH levels,[7] research in this area is necessary.

As SCH is very common and reversible condition, and lipid profile being simple screening method, this has been included in this study. This may help in early detection and to put therapy or lifestyle modification in these patients to improve their quality of life.

Aim of Study

- To assess the correlation between TSH and parameters of lipid profile.
- To see whether even subclinical state of thyroid dysfunction can alter the lipid profile.

MATERIALS AND METHODS

The study was conducted in KIMS, Hubballi, Karnataka, India. The study was based on the interview, physical examination, and biochemical investigations, that is, lipid profile and TSH levels in 25 newly diagnosed patients of SCH of either sex.

SCH was defined as TSH between 5–10 μ IU/mL and normal free thyroid hormones without symptoms or with mild non-specific symptoms of hypothyroidism.

Blood samples for lipid profile were collected at 8 am after 12 h of overnight fasting. Hypercholesterolemia was considered if patients TC >200 mg%, LDL >130 mg%, triglycerides (TG) >250 mg%, and high-density lipoproteins (HDL) <35 mg%.

25 patients were evaluated for TSH and lipid profile. Correlation coefficient and linear regression were done between TSH and parameters of lipid profile using alcula software.

RESULTS

The study included 25 patients of either sex in the age group of 40–60 years. From the data, it was clear that SCH is more common in females than males. There was a positive correlation between TSH and TC values, that is, within the subclinical patients, the TC level increased as the TSH value increased. Correlation coefficient found to be $r = 0.89$ which suggests strong correlation [Figure 1]. There was positive correlation between TSH and TG with correlation coefficient $r = 0.96$ which suggests very strong correlation [Figure 2]. However, there was negative correlation between TSH levels and HDL levels of SCH patients, that is, as the TSH levels increased in these patients the HDL levels decreased. Correlation coefficient $r = -0.85$ is shown in [Figure 3]. We found positive correlation between TSH and LDL levels with correlation coefficient $r = 0.85$ [Figure 4]. Furthermore, there was positive correlation between TSH and VLDL levels of SCH patients. Correlation coefficient $r = 0.95$ which suggests strong correlation [Figure 5]. Thus, we found strong positive correlation between TSH and TG and also between TSH and VLDL levels. There was moderate positive correlation between TSH and TC and also between TSH and LDL. However, we found negative correlation between TSH and high-density lipoproteins levels.

DISCUSSION

Dyslipidemia in overt hypothyroidism is clearly established, and studies have shown beneficial effects of treatment with

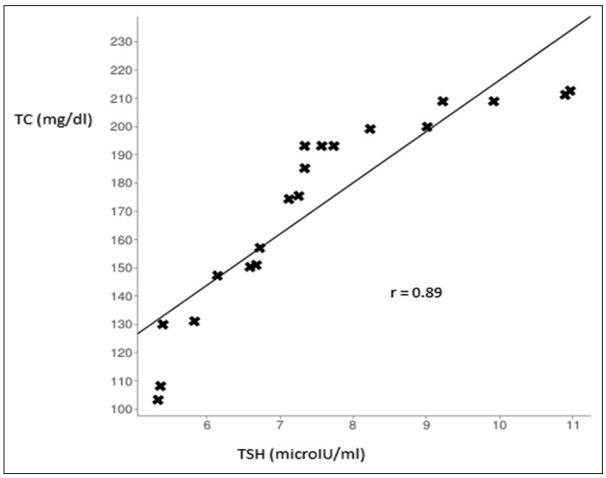

Figure 1: Correlation between thyrotropin and total cholesterol values

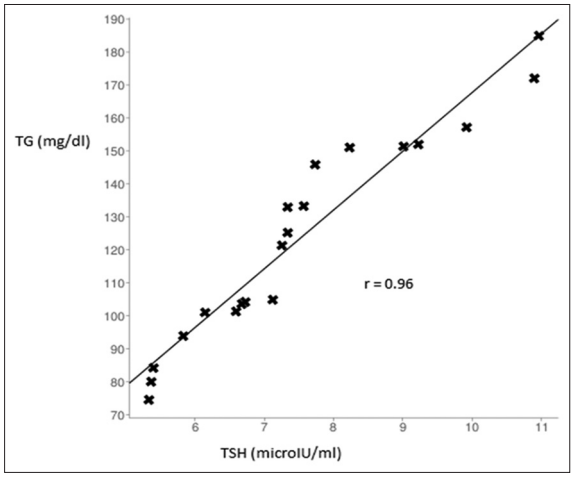

Figure 2: Correlation between thyrotropin and triglycerides

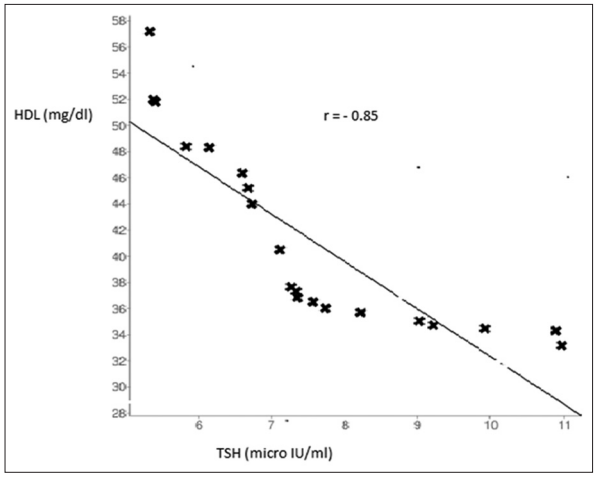

Figure 3: Correlation between thyrotropin levels and high-density lipoproteins levels

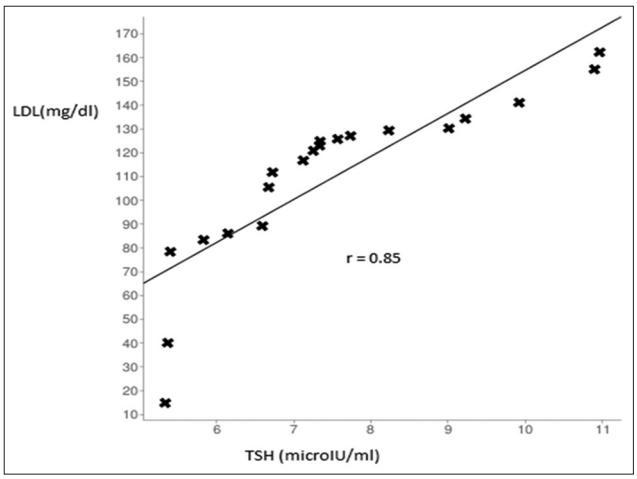

Figure 4: Correlation between thyrotropin and low-density lipoproteins levels

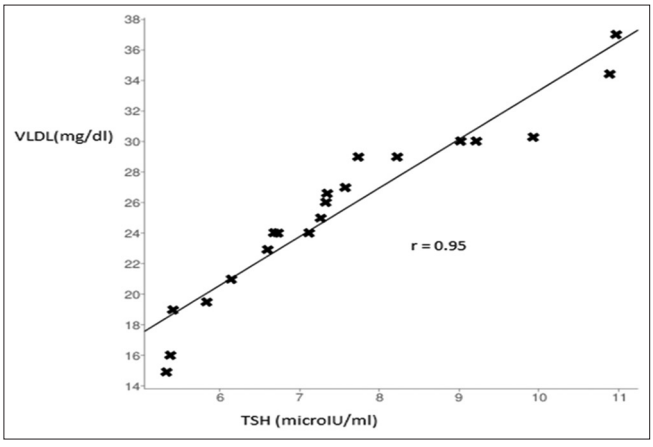

Figure 5: Correlation between thyrotropin and very low-density lipoproteins levels

levothyroxine on dyslipidemia in these subjects. However, studies on the effects of SCH on lipid profile and beneficiary effects of treatment in these patients are controversial. Hence, this topic is still open for further studies. The results of our study showed that there was a positive correlation between TSH, an indicator of thyroid function and lipid profile parameters (TC, TG, LDL, and VLDL) and negative correlation between TSH and HDL. As we plotted the values of different parameters of lipid profile against the values of TSH we found a linear relationship between them. We also found that even within normal limit, as TSH level increased TC level also increased, which indicates that changes in lipid profile start at the very early stage.

A meta-analysis which included 16 observable studies suggested that serum TC, LDL, and total TG increased in SCH as compared to euthyroid subjects.[8] An analysis of the aggregated data on the relationship between SCH and hypercholesterolaemia in middle-aged women indicated a dose relationship between the average TSH levels and TC levels in plasma.[9] In the cohort by Efstathiadou *et al*. showed subjects with SCH had significantly higher levels of TC, LDL-C, Apo B, and Lp(a), thus displaying a more atherogenic lipid profile.[6] In the study conducted by Alamdari *et al*., lipid profiles did not differ between subclinical hypothyroid and normal individuals.[1]

The strength of the present study is we have taken newly diagnosed patients with TSH levels between 5 and 10 μ IU/mL. The limitation is that cases were not compared with the controls and follow-up of cases was not done. The study results possibly suggests that the elevated TSH may be responsible for dyslipidemia as we have excluded other factors which can lead to dyslipidemia such as smoking, DM, and family history. Possible reason could be the decreased LDL-receptor's activity, resulting in decreased hepatic removal of cholesterol from the circulation and decreased catabolism of LDL and IDL.[10]

CONCLUSION

We conclude that even in SCH, the increase in TSH level increases the lipid parameters mainly TG, LDL, and VLDL. Thus, they are more prone to atherosclerosis and other cardiovascular risk. As SCH is a reversible condition we can take measures at this stage to halt the progression of the disease and improve quality of life.

REFERENCES

1. Alamdari S, Amouzegar A, Tohidi M, Gharibzadeh S, Kheirkhah P, Kheirkhah P, *et al*. Hypothyroidism and lipid levels in a community based study (TTS). Int J Endocrinol Metab 2016;14:e22827.
2. Jayasingh IA, Puthuran P. Subclinical hypothyroidism and the risk of hypercholesterolemia. J Fam Med Prim Care 2016;5:809-16.
3. Chen Y, Wu X, Xu Y. Changes in profile of lipids and adipokines in patients with newly diagnosed hypothyroidism

and hyperthyroidism. Sci Rep 2016;6:26174.
4. Galetta F, Franzoni F, Fallahi P, Rossi M, Carpi A, Rubello D, *et al*. Heart rate variability and QT dispersion in patients with subclinical hypothyroidism. Biomed Pharmacother 2006;60:425-30.
5. Fatourechi V, editor. Subclinical Hypothyroidism: An Update for Primary Care Physicians. Mayo Clinic Proceedings; 2009.
6. Efstathiadou Z, Bitsis S, Milionis HJ, Kukuvitis A, Bairaktari ET, Elisaf MS, *et al*. Lipid profile in subclinical hypothyroidism: Is L-thyroxine substitution beneficial? Eur J Endocrinol 2001;145:705-71.
7. Palmieri EA, Fazio S, Lombardi G, Biondi B. Subclinical hypothyroidism and cardiovascular risk. Treat Endocrinol 2004;3:233-44.
8. Liu XL, He S, Zhang SF, Wang J, Sun XF, Gong CM, *et al*. Alteration of lipid profile in subclinical hypothyroidism: A meta-analysis. Med Sci Monit 2014;20:1432-41.
9. Duntas LH. Thyroid Disease and Lipids. Thyroid 2002;12:287-93.
10. Rizos CV, Elisaf MS, Liberopoulos EN. Effects of thyroid dysfunction on lipid profile. Open Cardiovasc Med J 2011;5:76-84.

How to cite this article: Jadhav V, Hiremath S. Alterations of lipid profile in subclinical hypothyroidism. Natl J Physiol Pharm Pharmacol 2018;8(8):1120-1123.

Source of Support: Nil, **Conflict of Interest:** None declared.