Short Communication

Dyslipidemia in hypothyroid subjects with Hashimoto's thyroiditis

Somasundaram Hariharan[1], Somanath Padhi[2], Jayaprakash Sahoo[1], Rajlaxmi Sarangi[3]

[1]Department of Endocrinology & Metabolism, Pondicherry Institute of Medical Sciences, Pondicherry, India.
[2]Department of Pathology, Pondicherry Institute of Medical Sciences, Pondicherry, India.
[3]Department of Biochemistry, Pondicherry Institute of Medical Sciences, Pondicherry, India.
Correspondence to: Jayaprakash Sahoo, E-mail: jppgi@yahoo.com

Received April 3, 2015. Accepted April 7, 2015

Abstract

Background: The relationship between hypothyroidism and dyslipidemia is poorly understood.

Objective: We aimed to describe the relationship between serum thyroid-stimulating hormone (TSH) and fasting lipid profile.

Materials and Methods: This prospective study recruited 50 hypothyroid subjects with Hashimoto's thyroiditis who attended the endocrinology clinic of a teaching hospital from August 2011 to October 2011.

Results: Serum TSH showed positive correlation with serum total cholesterol, triglyceride, and low-density lipoprotein cholesterol, but had negative correlation with high-density lipoprotein cholesterol ($P > 0.05$).

Conclusion: Hypothyroidism leads to atherogenic lipid profile. However, our observation needs to be further validated by larger prospective studies.

KEY WORDS: Dyslipidemia, Hashimoto's thyroiditis, hypothyroidism

Introduction

Primary hypothyroidism is a relatively common disease affecting 5% to 10% of general population.[1,2] Hashimoto's thyroiditis (HT) is the most common etiology of primary hypothyroidism in iodine-sufficient areas worldwide.[3] Hypothyroidism is one of the treatable causes of dyslipidemia. However, association of dyslipidemia with hypothyroidism is complex and poorly understood.[3] We aimed to further describe this association among a cohort of hypothyroid subjects with HT.

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2015.03042015266	

Materials and Methods

This prospective study recruited 50 hypothyroid subjects with HT who attended the endocrinology clinic of our institute from August 2011 to October 2011. The Institutional Ethics Committee approved the study and informed consent was obtained from all subjects in accordance with the declaration of Helsinki. Hypothyroidism was defined as serum thyroid-stimulating hormone (TSH) level greater than 4.2 mIU/l (reference; 0.27–4.2 mIU/l, electrochemiluminescence immunoassay, COBAS INTEGRA 400 PLUS, Roche Diagnostics). The diagnosis of HT was based on raised serum thyroid peroxidase (TPO) antibody titer (greater than 40 IU/L, reference; up to 40 IU/L, enzyme-linked immunosorbent assay) and/or thyroid fine-needle aspiration cytology.

Fasting lipid profile such as serum total cholesterol (TC), triglyceride (TG), and high-density lipoprotein (HDL) cholesterol was measured in 18 of 50 subjects by enzyme assays (COBAS e411 auto analyzer, Roche Diagnostics, Germany). The serum low-density lipoprotein (LDL) cholesterol was

Table 1: Baseline serum TSH and fasting lipid profile in hypothyroid subjects with Hashimoto's thyroiditis

Parameters	Mean + SD	Range
Serum TSH (mIU/l)	51.65 ± 52.47	4.66–150
Serum total cholesterol (mmol/l)	4.80 ± 1.15	3.15–7.76
Serum triglyceride (mmol/l)	1.48 ± 0.68	0.57–3
Serum LDL cholesterol (mmol/l)	3.04 ± 0.84	1.91–5.30
Serum HDL cholesterol (mmol/l)	1.03 ± 0.13	0.77–1.29

TSH, thyroid stimulating hormone; LDL, low-density lipoprotein; HDL, high-density lipoprotein.

Table 2: Correlation between serum TSH and different lipid parameters

Parameters	Pearson's correlation coefficient	*P*-value
Total cholesterol (mmol/l)	0.07	0.77
Triglyceride (mmol/l)	0.10	0.69
LDL cholesterol (mmol/l)	0.14	0.58
HDL cholesterol (mmol/l)	–0.39	0.10

TSH, thyroid stimulating hormone; LDL, low-density lipoprotein; HDL, high-density lipoprotein.

measured by Friedewald formula.[4] The subjects with serum TG > 4.51 mmol/l were excluded from the study.

The parameters were expressed as mean ± standard deviation (SD). Pearson's correlation coefficient was used to determine the association between serum TSH and lipid parameters. *P*-value ≤ 0.05 was considered statistically significant and SPSS 16 software was used for the analysis.

Results

Our study included 15 females and 3 males with age ranging from 23 to 77 years (mean ± SD: 43.55 ± 12.67 yrs). The baseline serum TSH and fasting lipid parameters and their correlation among the subjects are presented in Tables 1 and 2, respectively. Serum TSH showed positive correlation with serum TC ($r = 0.07$), TG ($r = 0.10$), and LDL ($r = 0.14$), but negative correlation with HDL cholesterol ($r = –0.39$); though it has not reached the statistical significance ($P > 0.05$).

Discussion

The effect of serum thyroid hormones on lipid profile is a complex phenomenon. Thyroid hormone has various effects on both synthesis and degradation of lipids in vivo. Although thyroid hormones decrease serum LDL cholesterol by increasing its clearance through LDL receptors on the liver, low-serum TG is maintained by the stimulation of tissue lipoprotein lipase enzyme.[5,6] It decreases the serum HDL by increasing the activity of cholesteryl-ester transfer protein (CETP), hepatic lipase, and the expression of HDL receptors on the liver.[5–7] It also promotes reverse cholesterol transport through increased fecal excretion of bile acids by stimulating the activity of cholesterol 7α-hydroxylase enzyme in the liver.[7] Overall, it decreases all lipid parameters in serum.

The chronic inflammation associated with HT and insulin resistances accompanying hypothyroidism have also contributions to altered lipid profile in these patients. Chronic inflammation leads to increased oxygen-free radicals production through COX-dependent pathway in patients with HT.[8] This increased oxidative stress is responsible for formation of oxidized LDL in serum, which is a risk factor for atherosclerosis. Singh et al. demonstrated the importance of insulin resistance in the pathogenesis of dyslipidemia due to hypothyroidism.[9]

However, there is no uniform relationship between serum TSH and lipid profile (TC, TG, LDL, and HDL) in the literature.[9–12] Hypothyroidism leads to an increase in all lipid parameters with a positive correlation with serum TSH in one study,[10] whereas only high-serum TC and LDL cholesterol without any correlation with TSH were documented in another study from India.[11] Although Kota et al.[12] found negative correlation between serum TSH and HDL, they were positively correlated with other lipids (TC, TG, and LDL). Similarly, serum TSH had negative correlation($r = –0.39$) with HDL in our study ($P > 0.05$). In addition, the differential effect of degree of hypothyroidism on dyslipidemia in these patients has been reported by Singh et al.[9] Although high-serum TG and LDL were seen in both subclinical and overt hypothyroid patients, high total cholesterol and low HDL were seen only in overt hypothyroid group. These different effects can be explained by variations in parameters such as ethnicity, gender, age, use of drugs, degree of hypothyroidism, associated insulin resistance, and sample size in different studies.

No study is without limitations. The sample size in our study was small and we did not take into consideration other factors affecting dyslipidemia in patients with hypothyroidism.

Conclusion

To summarize, hypothyroidism leads to atherogenic lipid profile among subjects from India, where the prevalence of cardiovascular diseases is already high. Routine screening of lipid parameters among larger population of hypothyroid subjects may throw more light on this association in future.

References

1. Hollowell JG, Staehling NW, Flanders WD, Hannon WH, Gunter EW, Spencer CA, Braverman LE. Serum TSH, T_4, and thyroid antibodies in the United States population (1988 to 1994): National Health and Nutrition Examination Survey (NHANES III). J Clin Endocrinol Metab 2002;87:489–99.
2. Usha Menon V, Sundaram KR, Unnikrishnan AG, Jayakumar RV, Nair V, Kumar H. High prevalence of undetected thyroid disorders in an iodine sufficient adult south Indian population. J Indian Med Assoc 2009;107(2):72–7.

3. Biondi B, Cooper DS. The clinical significance of subclinical thyroid dysfunction. Endocr Rev 2008;29:76–131.
4. Rifai N, Warnick RW, McNamara JR, Belcher JD, Grinstead GF, Frantz ID Jr. Measurement of low-density-lipoprotein cholesterol in serum: a status report. Clin Chem 1992;38:150–60.
5. Duntas LH. Thyroid disease and lipids. Thyroid 2002;12(4): 287–93.
6. Lam KS, Chan MK, Yeung RT. High-density lipoprotein cholesterol, hepatic lipase and lipoprotein lipase activities in thyroid dysfunction: effects of treatment. Q J Med 1986;59:513–21.
7. Johanssen L, Rudling M, ScanlanTS, Lundasen T, Webb P, Baxter J, Angelin B, Parini P. Selective thyroid receptor modulation by GC-1 reduces serum lipids and stimulates steps of reverse cholesterol transport in euthyroid mice. Proc Natl Acad Sci USA 2005;102:1297–302.
8. Taddei S, Caraccio N, Virdis A, Dardano A, Versari D, Ghiadoni L, Ferrannini E, Salvetti A, Monzani F. Low grade systemic inflammation causes endothelial dysfunction in patients with Hashimoto's thyroiditis. J Clin Endocrinol Metab 2006;91(12):5076–82.
9. Singh BM, Goswami B, Mallika V. Association between insulin resistance and hypothyroidism in females attending a tertiary care hospital. Indian J Clin Biochem 2010;25(2):141–5.
10. Tagami T, Tamanaha T, Shimazu S, Honda K, Nanba K, Nomura H, Sakane Ueda Y, Usui T, Shimatsu A, Naruse M. Lipid profiles in the untreated patients with Hashimoto's thyroiditis and the effects of thyroxine treatment on subclinical hypothyroidism with Hashimoto's thyroiditis. Endocr J 2010;57(3):253–8.
11. Sridevi A, Vivekanand B, Giridhar G, Mythili A, Subrahmanyan KAV. Insulin resistance and lipid alternations in subclinical hypothyroidism. IJEM 2012;16:S345–6.
12. Kota SK, Meher LK, Krishna SVS, Modi KD. Hypothyroidism in metabolic syndrome. IJEM 2012;16:S332–3.

How to cite this article: Hariharan S, Padhi S, Sahoo J, Sarangi R. Dyslipidemia in hypothyroid subjects with Hashimoto's thyroiditis. Int J Med Sci Public Health 2015;4:1307-1309

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