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Research Article

Correlation between Thyroid Stimulating Hormone and Cholesterol and Triglyceride level in Udaipur Population

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Abstract: A series of studies reported that a high level of TSH was associated with a deleterious change of serum lipids, with an increase of lipid abnormalities. The present study evaluated the relationship between TSH and cholesterol and triglyceride level. A total number of 600 subjects (250 males and 350 females) from Udaipur with a mean age of 41.56±8.37 years were selected for the present study. All the subjects were classified into three categories depending upon the TSH level. The TSH value of the subjects of the first category (A) was <5.0 and of second category (B) was between 5.0-10.0 and of third category (C) was >10.0 µIU/ml. On comparing the concentration of cholesterol and triglyceride of all the three categories it was found that values of (B) were significantly higher than (A) and similarly values of (C) were significantly higher than (B). The TSH level is directly propotional to the lipid level. The higher the level of TSH the more is the derangement of the lipid values. Maintaining the serum TSH levels in an appropriate range will achieve homeostasis of the lipid levels and slow the progression of atherosclerosis in coronary heart disease patients.
Keywords: Thyroid Stimulating Hormone (TSH), Cholesterol, Triglyceride, Coronary Heart Disease (CHD)

INTRODUCTION

Thyroid hormones are recognized as catabolic hormones and they regulate various processes of metabolism [1]. The relationship between thyroid hormones and lipid metabolism is clearly displayed in patients suffering from thyroid dysfunctions. Overt hypothyroid patients show elevated total cholesterol (TC) and triglyceride (TG) levels while overt hyperthyroid patients show reduced lipid levels [2]. These observations have been shown to extend into the subclinical hypo/hyperthyroid range [2], suggesting that apart from thyroid hormones, thyroid-stimulating hormone (TSH) exerts independent effects on lipid metabolism.

Abnormal thyroid hormone metabolism may lead to different forms of heart disease and hypothyroidism, in particular, is a well-known cause of accelerated coronary atherosclerosis [3, 4]. Elevated TSH levels have recently aroused interest due to the potential for TSH to induce injury, especially in patients with coronary heart disease (CHD). A series of studies reported that a high level of TSH was associated with a deleterious change of serum lipids, with an increase of lipid abnormalities [5-8], however this issue has been the subject of considerable debate [9], and several studies have not observed such an association [10,11].

Interestingly, in vivo and in vitro research by our laboratory on the function of TSH has shown that TSH, independent of thyroid hormones, can up regulate the expression of hepatic 3-hydroxy-3-methyl-glutaryl coenzyme A reductase (HMGCR), which is rate limiting enzyme in cholesterol synthesis, and increase the cholesterol content in the liver [12]. Therefore, we hypothesized that TSH, independent of thyroid hormones, would be positively associated with the serum cholesterol level.

The present study evaluated the relationship between TSH and the Cholesterol and Triglyceride levels. The present study yielded insights into potential effects of TSH on serum lipids and suggested that it is necessary to routinely test thyroid function in CHD patients. Maintaining serum TSH levels in an appropriate range will achieve homeostasis of the lipids levels and slow the progression of atherosclerosis in CHD patients.

MATERIALS AND METHODS

A total number of 600 subjects (250 males and 350 females) with a mean age of 41.56 ± 8.37 years were selected for the present study. The female subjects selected for the study were all premenstrual in nature.

The following criteria were used for exclusion:

1. Hypothalamus and/or pituitary gland diseases, diabetes mellitus or other endocrine diseases;
2. Thyroid diseases such as overt hyper/hypothyroidism, thyroid cancer and thyroid nodules;
3. Intake of drugs that influence serum lipids or thyroid function within the past 3 months;
4. Cerebral vascular disease, a malignant tumour, hereditary hyperlipidemia, or serious liver or renal dysfunctions and;
5. Pregnancy

The study was done from June 2011 to August 2011 at Amolak Diagnostics Private Limited, Udaipur. The blood of the subjects was collected between 8:00 A.M. and 10:00 A.M. after an overnight fast of at least ten hours. The serum was extracted immediately and analysed for serum TSH and serum Cholesterol and Triglyceride levels.

Chemiluminescent procedures (Cobas e411, Roche) were employed to determine TSH of the patients. The levels of serum total cholesterol (TC) and triglyceride was determined using a Fully Auto analyser (Cobas Integra 400 Plus, Roche). The laboratory reference ranges were 150-250 mg/dl for serum cholesterol, less than 150 mg/dl for serum triglyceride and 0.3-5.0 µIU/ml for serum TSH.

RESULTS

All the subjects were classified into three categories depending upon the TSH level. First category (A) included the subjects with value of TSH less than 5.0 µIU/ml, second category (B) included the subjects with value of TSH between 5.0-10.0 µIU/ml and the subjects with value of TSH more than 10.0µIU/ml were included in the third category.

	Group A	Group B	Group C
	TSH value <5.0µIU/ml	TSH value between 5.0-10.0µIU/ml	TSH value >10.0µIU/ml
	Mean±SD	Mean±SD	Mean±SD
Cholesterol	136.1±15.3	210.4±17.4	259.6±23.1
Triglyceride	110.4±11.2	210.3±16.2	289.4±30.3

200 subjects (males and females) were analyzed in each category.

DISCUSSION

All the three categories were compared for serum cholesterol and triglyceride concentration and it was found that values of group B were significantly high as compared to values of group A. Similarly values of group C were found to be significantly high as compared to group B. The difference between values of group A and group C were found to be significantly very high. The serum concentration of cholesterol and triglyceride of group B were 54.5% and 90.4 % high as compared to group A while serum concentration of cholesterol and triglyceride of group C were 23.3% and 37.6% high as compared to group B. The percentage variation of between group A and C was found to be 90.7% and 162.1% higher for serum cholesterol and triglyceride respectively. The above study clearly showed the association between TSH levels and serum cholesterol and triglyceride levels. The TSH level is directly proportional to the lipid level. The higher the level of TSH the more is the derangement of lipid values. Dyslipidemia has been shown to be a common feature of thyroid dysfunction [1]. The present study reported the relationship between TSH level and the lipid status. The principle finding is that the prevalence of hypercholesterolemia and hyper triglyceridemia increased as the serum TSH level increased. Thyroid function has an important role in the risk stratification of these patients with suspected CHD and should be routinely tested in the patients at risk of CHD.

Recently, the associations between TSH and the serum lipid status have become a popular area of research. Interestingly, most of the research regarding the association between TSH and the serum lipid status has been carried out in euthyroid subjects. Several studies have already found positive correlations between TSH and lipid profiles. The HUNT study, which was performed in Norway, showed linear and significant increases in the serum TC, LDL and TG levels with a TSH level that increased within the reference range [13]. Similar results were also obtained in euthyroid populations of Korean [14], Latin American [15] and Spanish [16] individuals. It is essential to evaluate the effects of TSH on lipid profiles independent of the thyroid hormone levels.

CONCLUSION

In conclusion, we found that serum TSH levels are positively and linearly associated with serum cholesterol and triglyceride levels. Furthermore, the level of hypercholesterolemia and hyper triglyceridemia increased with an increasing serum TSH level; it is biologically and clinically significant. As previously mentioned that TSH can increase cholesterol synthesis by up regulating HMGCR independent of the thyroid hormones, the present finding suggests that TSH elevations increases the total cholesterol level showed a direct clinical effect of TSH on the total cholesterol

level. Maintaining the serum TSH levels in an appropriate range will achieve a homeostasis of the lipid levels and slow the progression of atherosclerosis in CHD patients.

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