ORIGINAL RESEARCH PAPER

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Correlation between Thyroid-Stimulating Hormone and Lipid Profile in female patients of clinical and subclinical hypothyroidism

Abdulrahman Hefdhallah Amer Ph.D Research Scholar, Medical Lab. Technology, Pramukhswami Medical College, Karamsad. Sardar Patel University - Corresponding author

Dr. N. Haridas (Ph.D. Guide), Professor, Biochemistry Pramukhswami Medical College

ABSTRACT

Hypothyroidism is defined as a deficiency of thyroid activity. It occurs due to reduced secretion of the thyroid hormones, triiodothyronine (T3) and thyroxine (T4) and an increase in the thyroid stimulating hormone levels. Thyroid dysfunction has a great impact on lipids as well as a number of other cardiovascular risk factors. The objectives of the study were to find out the correlation between thyroid stimulating hormone and lipid profiles in female patients with clinical and subclinical hypothyroidism. The data for the present cross –sectional study were collected on 200 females with hypothyroidism, in the age range of 25 to 65 years from Shree Krishna Hospital, Karamsad, Anand Gujarat. The lipid profiles were done on Siemens Dimension Clinical Chemistry Analyzer. TSH, T3 and T4 were measured by direct Chemiluminescence Immunoassay using (ADVIA Centaur immunoassay analyzer).

Results:

In the present study, we observed that the mean values for various components of lipid profile and thyroid stimulating hormone were significantly greater in clinical hypothyroidism as compared to the subclinical hypothyroidism. Further, thyroid stimulating hormone showed a highly significant association with total cholesterol, low-density lipoprotein, and triglyceride. However, we found the negative correlation between TSH with high-density lipoprotein

Conclusion:

we concluded that the hypothyroid females have been suffering from dyslipidemia, which may be a risk factor for heart disease.

INTRODUCTION

Thyroid function regulates a wide array of metabolic parameters. It produces the thyroid hormones such as triiodothyronine (T3) and thyroxine (T4). They affect the growth and rate of function of many other systems in the body. The hormonal output of the thyroid is regulated by thyroid-stimulating hormone (TSH), which is produced by the anterior pituitary gland. The anterior pituitary gland itself is regulated by thyrotropin-releasing hormone (TRH) which is produced by the hypothalamus. Hypothyroidism is defined as a deficiency of thyroid activity. It occurs due to reduced secretion of T3 and T4 hormones from the thyroid gland that leads to hyper secretion of thyroid stimulating hormone (TSH). Hypothyroidism is a common metabolic disorder in the general population. Indeed, data from the third National Health and Nutrition Examination Survey (NHANES III) showed a 4.6% prevalence of hypothyroidism in the general population(Canaris, Manowitz, Mayor, & Ridgway, 2000).

Thyroid failure is more common in women more than men and its prevalence increases with age. Hypothyroid patients have increased levels of TC and LDLC (LITHELL et al., 1981), and some have high serum concentrations of triglycerides (Milionis et al., 2005; Pearce, 2016; Rizos, Elisaf, & Liberopoulos, 2011), while the levels of high density lipoprotein are decreased as compared to controls(Rani, Mehta, & Kaur, 2017; Shekhar, Chowdary, Das, Vidya, & Prabodh, 2011). Studies have shown that high density lipoprotein cholesterol is also increased in hypothyroidism(Jung et al., 2003). Another study reported that an estimated 108 million people are suffering from endocrine and metabolic disorders in India and the thyroid disorders are the most common among them(Rani et al., 2017).

In addition, some studies have shown that Subclinical Hypothyroidism had significantly higher levels of TC, LDL-C and ApoB, whereas levels of TG, HDL-C and ApoAI did not differ significantly compared with euthyroid controls(Rizos et al., 2011).

Lipid profile alterations in primary and subclinical hypothyroidism are controversial. There are hardly any studies from this region that intensify the association of lipids with thyroid hormones. Hence this study aims to determine the pattern of lipid profile abnormalities in female patients with primary and subclinical hypothyroidism.

Methodology:

In this cross-sectional study, 100 subjects (patients with clinical and sub-clinical hypothyroidism) were included with an average age of 39 years (20-55 years) of females that were attended to Shree Krishna Hospital, Karamsad. Subclinical hypothyroidism was established on the basis of elevated TSH level (>5.5 mIU/L) and normal T4 and T3 values, while clinical hypothyroidism was diagnosed as increased TSH level with lowered T3 and T4 levels. Fasting venous blood samples were collected and centrifuged, then separate the serum. TSH, T3 and T4 were measured by direct Chemiluminescence Immunoassay using (ADVIA Centaur immunoassay analyzer). T3 and T4 by Competitive principle while TSH by Two-site sandwich immunoassay principle. Estimation of serum total cholesterol by polychromatic endpoint method (Burtis, Ashwood, & Bruns, 2012; Meiattini, Prencipe, Bardelli, Giannini, & Tarli, 1978; Wallach, 2007). Estimation of serum triglycerides (TG) by the enzymatic dichromatic endpoint (Bucolo & David, 1973; Burtis et al., 2012; Sampson, Demers, & Krieg, 1975; Wallach, 2007). Estimation of serum High-density lipoprotein cholesterol (HDL-C) by dichromatic endpoint method(Assmann, Schriewer, Schmitz, & Hägele, 1983). Low-density lipoprotein cholesterol (LDL-C) was calculated by Friedewald formula(Li, Wilcken, & Dudman, 1994).

Statistical Analysis:

Descriptive statistics were computed with percentages and proportion. Group comparisons were done by Chi-square test, Pearson correlation and P-value, and the mean plus or minus standard deviation (±SD) by SPSS statistical computerized program. References management was done by Endnote X7 program.

Results:

Table 1: The mean value of the biochemistry parameters in clinical and subclinical hypothyroidism patients

Parameters	TSH (mU/L)	T3 (nmol/L)	T4 (nmol/L)
Clinical hypothyroidism	13.4 ± 3.6	0.161 ± 0.23	35.2 ± 11.1
Subclinical hypothyroidism	7.3 ± 2.4	2.3 ± 0.62	110 ± 12.4

Clearly, the mean level of TSH concentration increased in clinical hypothyroidism (13.4 mU/L) compared to Subclinical hypothyroidism (7.3 mU/L). However, the mean concentration of

T3 and T4 was normal with subclinical hypothyroidism (2.3 and 110 mU/L respectively) compared with a decreased in clinical hypothyroidism (0.16 and 35.2 mU/L respectively). In clinical hypothyroidism, the result was significant with TSH, T3, and T4 (P-value <0.001).but in subclinical hypothyroidism was significant with TSH and non-significant with T3 and T4 (P- value >0.05).

Table 2: Lipid profile levels in the hypothyroid patients (clinical and subclinical)

parameters	Clinical	subclinical
Cholesterol (mg/dl)	226.64 ± 19.48	211.34 ± 15.21
Triglyceride (mg/dl)	162.51 ± 20.11	148.33± 12.54
HDL-C (mg/dl)	39.70 ± 6.66	42.51 ± 4.8
LDL-C (mg/dl)	157.27 ± 23.79	136.32 ± 18.29

Patients with clinical hypothyroidism had a higher than mean concentration of total cholesterol, triglyceride and low-density lipoprotein cholesterol (LDL-C) Compared to patients with subclinical hypothyroidism, the mean level of high-density lipoprotein cholesterol (HDL-C) was higher in those with subclinical hypothyroidism than patients with clinical hypothyroidism. (See Table 2)

Table 3: Correlation between thyroid function test and serum lipid concentrations

subject	TSH	T3	T4			
	clinical	subclinical	clinical	Subclinical	clinical	subclinical
Cholesterol (mg/dl)	0.81 p<0.001	0.39 P=0.01	-0.79	-0.04	-0.94	-0.07
Triglyceride (mg/dl)	0.60 P=0.01	0.61 P=0.01	-0.78	-0.16	-0.75	-0.14
HDL-C (mg/dl)	-0.48 p=0.08	-0.56 P= 0.04	0.73	0.21	0.62	0.18
LDL-C (mg/dl)	0.55 P=0.01	0.41 P= 0.01	-0.70	-0.02	-0.65	-0.04

In clinical hypothyroidism patients a significant positive correlations between TSH and total cholesterol ® =0.81, p-value<0.001), triglycerides (r =0.6, p-value=0.01) and LDL (r =0.55, p-value=0.01) and significant negative correlation between TSH and HDL (r = -0.48, p-value=0.08) was observed. But in subclinical a significant weak positive correlation between TSH and total cholesterol (r =0.39, p-value=0.01), triglycerides (r =0.61, p-value=0.01) and LDL (r =0.41, p-value=0.01) and significant negative correlation between TSH and HDL (r = -0.56, p-value=0.04) was observed. In clinical hypothyroidism T3 and T4 showed negative relationship with total cholesterol (r=-0.79, r=-0.94, respectively), triglycerides (r = -0.78, r = -0.75, respectively) and LDL (r = -0.70, r = -0.65, respectively), and positive correlation with HDL (r = 0.73, r = 0.62, respectively).

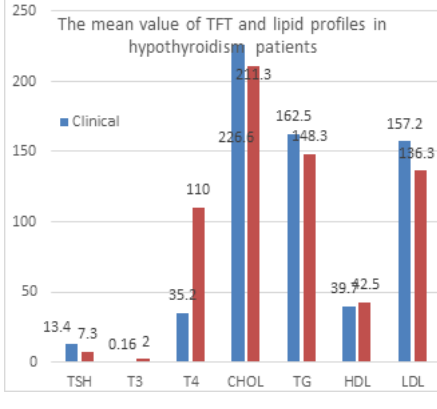

Figure 1: The mean value of TFT and lipid profiles in hypothyroidism patients.

Discussion:

Hypothyroidism can have an important effect on lipid profile(Rizos et al., 2011). Biochemical tests for thyroid dysfunction is critical in all dyslipidmic patients. The American Thyroid Association recommends that adults be screened for thyroid dysfunction by measurement of the serum TSH concentration, starting at age 35 years and every 5 years thereafter (Ladenson et al., 2000).

In this study, we explored the relationship between serum lipid levels and TSH in 200 patients with clinical and subclinical hypothyroidism females. We found the thyroid stimulating hormone had a significant positive association with total cholesterol, triglyceride and low-density lipoprotein in the present study. Shekhar et al. (2011) reported that the thyroid stimulating hormone had a significant positive correlation association with total cholesterol and low -density lipoprotein in hypothyroid patients (Shekhar et al., 2011).

The mean concentration of total cholesterol, triglyceride and low-density lipoprotein cholesterol (LDL-C) were higher in clinical hypothyroidism more than in subclinical hypothyroidism. However, the mean level of high-density lipoprotein cholesterol (HDL-C) was higher in those with subclinical hypothyroidism than patients with clinical hypothyroidism. It was similar in other study done at 2012(Shashi & Sharma, 2012). Several studies have searched for an association between TSH and serum lipids in euthyroid subjects compared to subclinical hypothyroidism (Efstathiadou et al., 2001; Humerah, Siddiqui, & Khan, 2016; Roy, Banerjee, & Dasgupta, 2015), but my study touched association between TSH and serum lipids in clinical and subclinical hypothyroidism.

Based on the AACE guidelines, the number of subclinical subjects having high serum TSH levels is increasing, which is quite significant. TSH > 10 mU/L was found in clinical hypothyroid subjects as per the laboratory reference range (Garber et al., 2012; Gharib et al., 2005). In our study, the mean level of TSH in clinical hypothyroidism was more than 10 mU/L, and in subclinical was increased slightly (TSH=7.3 mU/L).

Conclusion:

we concluded that the hypothyroid females have been suffering from dyslipidemia, which may be a risk factor for heart disease. There is a need for large studies designed to answer the question whether thyroid abnormalities are associated with CVD.

CONFLICTS OF INTEREST

To the best of our knowledge, no conflict of interest, financial or other, were exists.

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