SERUM LIPIDS IN HYPOTHYROIDISM : OUR EXPERIENCE

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ABSTRACT

In order to determine whether the screening of lipid profile is justified in patients with hypothyroidism we estimated serum lipids in cases having different levels of serum TSH. 60 patients of hypothyroidism in the age group of 20 to 60 yrs were studied for thyroid profile over a period of one year. On the basis of serum TSH level the cases were divided into three groups: In the first group TSH concentration was $8.8 \pm 2.99 \mu\text{IU/ml}$, 95% confidence interval (CI) 8.8 ± 1.07 , whereas serum total cholesterol and LDL-chol levels were 196 ± 37.22 and $126 \pm 29.17 \text{ mg/dl}$ respectively. The statistical analysis of these two groups showed a significant correlation between raised TSH levels and serum total cholesterol and LDL-chol ($P < 0.05$ & $P < 0.01$) respectively. We conclude that hypothyroidism is associated with changes in lipid profile.

KEY WORDS

Hypothyroidism, TSH, Lipid profile, Dyslipidemia, Cholesterol,

INTRODUCTION

Hypothyroidism is defined as a deficiency of thyroid activity. It results from reduced secretion of both T_4 and T_3 . (1) Biochemically decrease in T_4 and T_3 concentrations lead to hyper secretion of pituitary TSH and an amplified increase in serum TSH levels. This is a key laboratory finding, particularly in the early detection of thyroid failure. Hypercholesterolemia is favored due to the hormone deficit and to the decreased activity of the lipoprotein lipase (2). Development of atherosclerosis in cholesterol-fed animals is enhanced by the presence of hypothyroidism and reduced when thyroid hormone is administered (3). The present study aims to assess the association of hypothyroidism with lipid abnormalities.

MATERIALS AND METHODS

This study was conducted at Himalayan Institute of Medical Sciences. 60 patients (mostly females) clinically diagnosed as hypothyroidism, in the age group of 20 to 60 yrs. were studied, over a period of one year. Patients with TSH level above $6 \mu\text{IU/ml}$ (since the upper limit of normal range given

by kit manufacture is $6 \mu\text{IU/ml}$) were considered to be having hypothyroidism. As per serum TSH level the cases were divided into three groups: Group I with levels of 6-20 $\mu\text{IU/ml}$, group II with levels of 21-40 $\mu\text{IU/ml}$ and group III with levels above 40 $\mu\text{IU/ml}$. This resulted in a sampling distribution different from the general population. Patients were selected in such a way that the groups were comparable in size and age distribution. Apart from these criteria, the selection was random. After noting the name, age and sex, venous samples were drawn after 12 hours of overnight fasting. Serum was separated and assays were performed within 24 hrs. Serum T_3 & T_4 were measured by micro plate competitive enzyme Immunoassay & TSH measured by micro plate immunoenzymetric assay (Monobind, Costa Mesa, USA). (4, 5)

The concentration of serum total cholesterol, HDL cholesterol and triglycerides were measured by a timed-end point method (using Synchron CX5 auto analyzer) and LDL cholesterol was calculated by Friedwald's formula. (6) Data collected was subjected to standard statistical analysis, such as confidence interval (CI), correlation (r) and t –test.

RESULTS AND DISCUSSION

Results are given in the table. In group-I subjects the mean value of T_3 , T_4 and TSH was found to be $0.8 \pm 0.35 \text{ ng/ml}$, $5.8 \pm 1.87 \mu\text{g/dl}$ and $8.8 \pm 2.99 \mu\text{IU/ml}$ respectively. The mean levels of total serum cholesterol, HDL-chol, LDL-chol and

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Table 1
Levels of T3, T4, TSH and Lipid profile in different groups

Parameters	Normal Range	Group I (n=30)	Group II (n=15)	Group III (n=15)
T3 (ng/ml)	0.8 –1.9	0.8±0.35	0.6±0.38	0.6±0.52
95% Confidence Interval		(0.12)	(0.19)	(0.26)
T4 (µg/dl)	5.0-13.0	5.8 ±1.87	4.4 ±2.36	2.0 ±1.84
95% Confidence Interval		(0.67)	(1.19)	(0.93)
TSH (µIU/ml)	0.3-6.0	8.8±2.99	33±3.83	67±10.82
95% Confidence Interval		(1.07)	(1.94)	(5.47)
Total cholesterol (mg/dl)	130-220	196±37.22	203±36.40	301±70.4
95% Confidence Interval		(13.31)	(18.42)*	(35.65)*
Triglycerides (mg/dl)	35 –160	144±67.93	144±69.52	223±63.91
95% Confidence Interval		(24.30)	(35.18)	(32.34)
HDL cholesterol (mg/dl)	35-55	41±7.48	38±7.29	42±10.64
95% Confidence Interval		(2.67)	(3.69)	(5.38)
LDL Cholesterol (mg/dl)	up to 150	126±29.17	136±37.33	214±61.64
95% Confidence Interval		(10.44)	(18.89)**	(31.19)**

n = number of subject; *p= <0.05; **p= <0.01; values are Mean ± SD; Parenthesis indicate 95% CI

Note: Normal values of T3, T4, TSH were taken as recommended by the kit manufacture.

triglycerides were found to be 196±37.22, 41±7.48, 126 ± 29.17 and 144 ± 67.93 mg/dl respectively. Correlation coefficient (r) between TSH level and lipid parameters was calculated.

In group-II patients the mean T3, T4 and TSH levels were 0.6±0.38 ng/ml, 4.4±2.36 µg/dl and 33±3.83 µIU/ml respectively. The mean value of total cholesterol, HDL-Chol, LDL-Chol and triglycerides were found to be 203±36.40, 38±7.29, and 136±37.33 mg/dl respectively. The mean values of T3, T4 and TSH (in group III) were found to be 0.6±0.52 ng/ml, 2.0 ± 1.84 µg/dl and 67.57±10.82 µIU/ml respectively. The mean levels of total serum cholesterol, HDL-chol, LDL-chol and Triglycerides were found to be 301±70.46, 42±10.64, 214±61.44 and 223±63.91 mg/dl respectively.

These results suggest that the effect of hypothyroidism in the lipid metabolism is more marked in patients with higher serum TSH levels (TABLE). Even mild elevations of TSH are associated with changes in lipid profile significant enough to raise the cardiovascular risk (7). The higher prevalence of hypothyroidism among middle aged women, associated with an increase in total plasma cholesterol. (8) This is in agreement with our findings showing that hyperlipidemia is associated with hypothyroidism. Hypothyroidism result in a small increase in low density lipoprotein (LDL)-C, total serum cholesterol and decrease in high density lipoprotein (HDL)-C that enhance the risk for development of atherosclerosis and coronary artery

disease, there is no clear evidence to date that hypothyroidism causes clinical heart disease. (9) Hypothyroidism increases the oxidation of plasma cholesterol mainly because of (i) an altered pattern of binding and (ii) due to the increased levels of cholesterol, which presents substrate for oxidative stress. Hypothyroidism is often accompanied by diastolic hypertension that, in conjunction with the dyslipidemia, may promote atherosclerosis. However, thyroxine therapy, in a thyrotropin (TSH) suppressive dose, usually leads to a considerable improvement of the lipid profile. (10) From this study it can be concluded that hypothyroidism is associated with lipid disorders that are characterized by normal or lightly elevated total cholesterol levels, increased LDL-chol and lower HDL-chol.

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