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Effect of Hypothyroidism on lipid profile

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Abstract

Objective: To study the effects of subclinical and overt hypothyroidism on serum levels of low density lipoprotein(LDL), total cholesterol(TC), high density lipoprotein (HDL) and triglycerides(TG). And also to compare the results with normal healthy individuals and with previously published reference data. Lipid profile was estimated in 119 cases of subclinical hypothyroidism and 46 cases of overt hypothyroidism patients attending OPD of a major tertiary health care centre in Punjab.

Method: The study was done in the department of Biochemistry, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar. The serum TSH, FT3, FT4 was done by enhanced chemiluminescence technique using vitros Eci- ortho Clinical Diagnostics and lipid profile on semi autoanalyser. The cases were divided into two groups after studying the thyroid profile i.e. subclinical hypothyroidism characterized by elevated serum TSH with normal FT4 and overt hypothyroidism characterized elevated TSH with low FT4.The values of lipid profile parameters was compared in patients and normal healthy individuals.

Results: The descriptive data was given as mean ± standard deviation. The statistical analysis was done by ANOVA and student t test. Although in subclinical hypothyroidism the mean serum levels of total cholesterol, LDL was high as compared to controls but the difference was not statistically significant. The mean levels of total cholesterol and LDL in patients of overt hypothyroidism was higher as compared to controls. And the difference was statistically significant.

Conclusion: Thyroid diseases can have important effect on serum levels of total cholesterol, LDL, HDL and triglycerides. So, biochemical investigations such as serum FT4, FT3, TSH for thyroid dysfunction should be done in all patients having abnormal lipid profile so that the underlying thyroid disorders can be correlated and necessary intervention can be done as early as possible. Moreover this test is cost effective method for screening thyroid dysfunctions as compared to other investigations.

Introduction

Thyroid diseases are common endocrine disorders in India. According to projections from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases,[(1)] Thyroid dysfunctions manifest either as hyper or hypothyroidism. Dyslipidemia is an elevation of plasma cholesterol, triglycerides or both or low HDL level that contributes to the cardiovascular problems. The aim of the study was to evaluate the effects of subclinical and overt hypothyroidism on serum levels of total cholesterol, LDL, HDL and triglycerides in hospital based population attending the OPD of a major tertiary health care centre in Punjab. The study underlines the importance of screening for thyroid dysfunction in hospital based population with abnormal lipid profile. Frequent laboratory monitoring will be beneficial in these patients in preventing the complications.

Methods

This study was done in the department of Biochemistry, Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar. Cases were drawn from the outdoor and various indoor wards of Sri Guru Ram Das Institute of Medical Sciences and Research, Amritsar. The patients and controls were screened for serum Thyroid profile and complete lipid profile and the values were compared with that of normal healthy subjects. The serum TSH, FT4, FT3 estimation was done by enhanced Chemiluminescence technique using vitros Eci- ortho Clinical Diagnostics and lipid profile was estimated by semiautoanalyzer. The cases were divided into two groups after studying the thyroid profile i.e. subclinical hypothyroidism and overt hypothyroidism.

Sample Collection: Blood sample was taken after an overnight fast i.e. approximately on 12 hrs of fasting, in a plain- tube (red top vacutainer) under sterile conditions and sent to the laboratory immediately for serum separation.

The serum Thyrotropin(TSH) levels (3rd Generation assay), FT4, FT3 were estimated in these subjects using vitros ECi by ortho clinical diagnostics. It is Non- competitive immunoassay- sandwich immunoassay.

Complete Lipid profile included the following estimations-

a. Total Serum Cholesterol was estimated by CHOD-PAP Method (Allain C.C.et al 1974).[(2)]
b. Serum Triglyceride was estimated by GPO-Trinder Method. (McGowan MW et al 1983).[(3)]
c. Serum High Density Cholesterol (HDL-C) was estimated by Phosphotungstic Acid Method (Gordon T. Et al 1977)[(4)]
d. Low Density Lipoprotein-Cholesterol (LDL-C) by Freidwald equation (Freidwald equation W.T.1974)

e. Very Low Density Lipoprotein-Cholesterol (VLDL-C) by Freidwald equation (Freidwald equation W.T.1974)

Exclusion criteria: The participants diagnosed with neoplasm, renal disease, liver disease, diabetes mellitus or familial hypercholesterolemia and subjects receiving drugs known to affect lipid metabolism were excluded from the study.

Ethical Consideration: The project was approved by the institutional Ethics Committee.

Results

The descriptive data was given as mean ± standard deviation. The statistical analysis was done by ANOVA and student t test. The mean difference was significant at the 0.05 level and statistically insignificant when the p value obtained was greater than 0.05. Table 1 depicts that mean levels of parameters of lipid profile amongst controls and in patients of subclinical hypothyroidism.

Mean total cholesterol levels amongst controls was 164.71 mg/dl while in patients of subclinical hypothyroidism were 169.83mg/dl. The mean serum levels of TC were high in subclinical hypothyroidism but when the results were compared with the controls, these were not significant statistically. The mean LDL amongst controls was 92.93 mg/dl while in patients was 108.35 mg/dl. The difference between the levels of control and patients was statistically insignificant. Mean HDL levels amongst patients of subclinical hypothyroidism was 34.62 mg/dl while in controls were 38.24 mg/dl .The difference between the levels of HDL in subclinical hypothyroidism and normal individuals was insignificant. Mean TG levels amongst controls was 154.81 mg/dl while in comparison the corresponding values amongst patients were 143.28mg/dl. The difference between the levels of controls and patients was statistically insignificant.

Table 2 depicts the mean levels of parameters of lipid profile amongst controls and in patients of overt hypothyroidism. Mean total cholesterol levels amongst controls was 164.71mg/dl while in comparison the corresponding values amongst patients of overt hypothyroidism were 203.80mg/dl. The difference between the levels of control and patients was statistically significant. The mean LDL amongst controls was 92.93 mg/dl while in comparison the corresponding values in patients was 132.45 mg/dl. The difference between the levels of control and patients was statistically significant. Mean HDL levels amongst patients of overt hypothyroidism was 39.00 mg/dl while in controls were 38.24 mg/dl. The difference between the mean levels of HDL was statistically insignificant in normal individuals and patients. Mean TG levels amongst controls was 154.81 mg/dl while in comparison the corresponding values amongst patients were 164.56 mg/dl. The difference between the levels of controls and patients was statistically insignificant.

Table 1: Comparison of various Biochemical Parameters in subclinical hypothyroidism(SH) and normal individuals(controls)

Parameters	Cases SH. N=119(Mean)	Control N=70(Mean)	P value
Serum Total Cholesterol(mg/dl)	169.83	164.71	0.990
Serum LDL(mg/dl)	108.35	92.93	0.412
Serum HDL(mg/dl)	34.62	38.24	0.508
Serum TG(mg/dl)	143.2857	154.81	0.957

Table 2: Comparison of various Biochemical Parameters in overt hypothyroidism and normal individuals (controls)

Parameter	Overt Hypothyroidism N=46 (mean)	Controls N=70(Mean)	P value
Serum Total Cholesterol (mg/dl)	203.80	164.71	0.031
Serum LDL(mg/dl)	132.45	92.93	0.003
Serum HDL(mg/dl)	39.00	38.24	0.999
Serum TG(mg/dl)	164.56	154.81	0.990

Discussion

Hypothyroidism is defined as when there is a decreased synthesis of thyroid hormones and low levels of circulating thyroid hormones. Clinically hypothyroidism is common in countries like India.[5,6,7] Dyslipidemia is reported to be more in patients who are not diagnosed in subclinical form and progress to overt symptoms of thyroid dysfunction. These patients are at high risk of cardiovascular diseases.[8] The possible reason behind this could be that the thyroid hormones induce 3-OH-3-methylglutaryl COA(HMG-COA) which is the first step in cholesterol biosynthesis. There is direct binding of T3 to specific thyroid hormone responsive elements (TREs) which lead to gene activation. It also controls the sterol regulatory element binding protein-2(SREBP) which regulates LDL receptor gene expression.[9,10,11] This cascade activates Hepatic lipase and triglyceride rich lipoproteins which hydrolyse HDL-2 to HDL-3.[12,13,14] Therefore there is a strong association between higher serum thyrotropin (TSH) levels and serum total cholesterol(TC) levels. In the light of these facts the present study was planned and in our study we found that:

1. In subclinical hypothyroidism there was higher levels of total cholesterol whereas levels of serum TG's, LDL and HDL did not differ significantly as compared to controls. Our results were also supported by other studies.[15,16]

2. Hypothyroidism is associated with hypercholesteremia. In our study we found that the mean serum levels of TC and LDL were higher in patients of overt hypothyroidism whereas mean serum levels of HDL and TG's were high but are not significant statistically. This was also supported by other studies.[17,18]

Conclusion

There is need for the routine assay of lipid profile in patients with subclinical and overt hypothyroidism. These patients are prone to atherosclerosis and cardiovascular problems and if we are screening these patients they can receive early treatment and delay the complications. The patient should also be advised about the lifestyle modifications of avoiding sedentary lifestyle and benefits of physical exercise.

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