

## Evaluation of serum lipid profile in patients with hyperthyroidism

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### Abstract

**Introduction:** Thyroid dysfunctions are known to influence lipid metabolism significantly, affects lipoprotein metabolism. Hyperthyroidism is associated with lipid alterations mainly concerning total and LDL cholesterol.

**Materials and Method:** It was a case control study. The cases and controls were screened for serum thyroid profile and complete lipid profile, the values were compared with that of normal healthy subjects. The cases were divided into two groups after studying the thyroid profile i.e. subclinical hyperthyroidism (characterized by low serum TSH with normal T4) and overt hyperthyroidism (characterized by low TSH and with elevated FT4).

**Results:** The descriptive data was given as mean  $\pm$  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. The mean serum total cholesterol & LDL levels were decreased in patients of overt hyperthyroidism as compared to controls and the difference between the levels was statistically insignificant. But the mean serum TG remain unchanged in patients and the difference was statistically insignificant. In the cases of subclinical hyperthyroidism the mean serum levels of total cholesterol, LDL & TG were decreased in patients as compared to controls & the difference was statistically insignificant. But the mean serum HDL levels was significantly decreased in patients as compared to controls.

**Conclusion:** Thyroid function test for screening of thyroid dysfunction is great importance in all dyslipidemic patients. It is also of cardinal importance in all patients with unexpected improvement or worsening of their lipid profile. So underlying thyroid disorders should be recognized and treated in patients with dyslipidemia especially when the results are unforeseen.

**Keywords:** Thyroid dysfunction, Hyperthyroidism, Lipid profile, Dyslipidemia.

### Introduction

Thyroid diseases are the commonest endocrine disorders in India. It has been estimated that about 42 million people in India suffer from thyroid diseases. Other epidemiological studies showed subclinical and overt hyperthyroidism to be present in 1.6% and 1.3% of subjects participating in a community survey. More than a third of community detected hyperthyroid cases have positive anti-TPO and about 39% of these subjects have a goiter<sup>(1,2)</sup>

Thyroid function tests now a days are most commonly requested laboratory investigation to diagnose autoimmune thyroid disorders. Thyroid hormones have ubiquitous effects on growth and development and also regulate calorogenesis and metabolic rate throughout life. Thyroid dysfunction is a disorder of thyroid gland which manifests either as hyper or hypothyroidism and is reflected in the levels of thyroid stimulating hormone (TSH).<sup>(3)</sup>

Hyperthyroidism is a clinical syndrome that results from increased levels of free thyroid hormones in plasma associated with clinical evidence of hyper metabolism.<sup>(4,5,6)</sup> The incidence of Hyperthyroidism is lower as compared to hypothyroidism.<sup>(7)</sup> Thyroid dysfunctions are known to influence lipid metabolism and significantly affects lipoprotein metabolism. Hyperthyroidism is associated with lipid alterations mainly concerning total and LDL cholesterol.<sup>(8,9)</sup> Despite the increased activity of the HMG-CoA reductase, levels

of total cholesterol and LDL cholesterol tend to decrease in patients with clinical or subclinical hyperthyroidism.

### Methods

This study was undertaken in the department of Biochemistry and was a case control study carried out on total 100 subjects who were willing to participate. Proper ethical consideration was taken from the ethical committee. The patient's informed consent was taken and assured that it will be confidential. 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 semiauto analyzer. The cases were divided into two groups after studying the thyroid profile i.e. subclinical hyperthyroidism (characterized by low serum TSH with normal T4) and overt hyperthyroidism (characterized by low TSH and with elevated FT4).

**Sample Collection:** 5 ml of venous blood was taken after an overnight fast i.e. approximately 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 TSH levels (3<sup>rd</sup> 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-

- Total Serum Cholesterol was estimated by CHOD-PAP Method (Allain C.C.et al 1974).<sup>(10)</sup>
- Serum Triglyceride was estimated by GPO-Trinder Method. (McGowan MW et al 1983).<sup>(11)</sup>
- Serum High Density Cholesterol (HDL-C) was estimated by Phosphotungstic acid Method (Gordon T. Et al 1977).<sup>(12)</sup>
- Low Density Lipoprotein-Cholesterol (LDL-C) by Freidwald equation (Freidwald equation W.T.1974).
- Very Low Density Lipoprotein-Cholesterol (VLDL-C) by Freidwald equation (Freidwald equation W.T.1974).

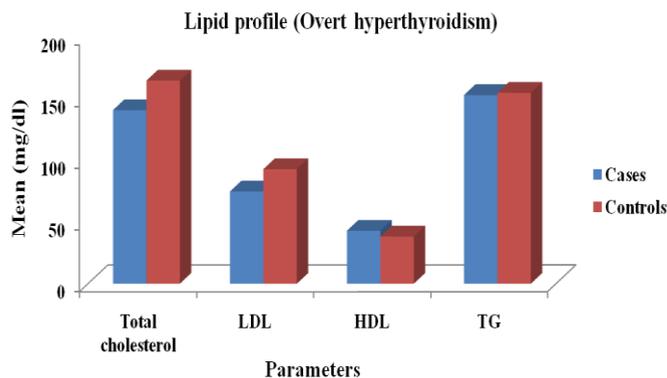
**Exclusion criteria:** The participants diagnosed with neoplasm, renal disease, liver disease, diabetes mellitus or familial hypercholesterolemia and subjects receiving drugs known to affect lipid metabolism were excluded from the study.

The statistical analysis was done by ANOVA and student 't' test.

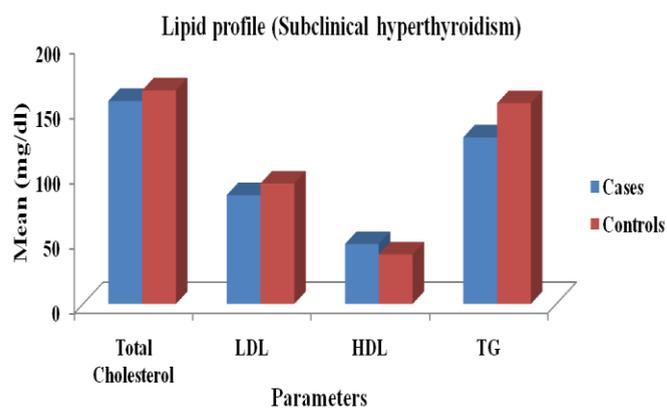
## Results

The descriptive data was given as mean  $\pm$  standard deviation by using 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 overt hyperthyroidism. In cases the mean serum total cholesterol & LDL levels were decreased in patients as compared to controls and the difference between the serum levels was statistically insignificant. The mean serum HDL levels in patients were higher than controls and the difference was statistically insignificant. But the mean serum TG remain unchanged in patients when compared with controls.

Table 2 depicts the mean levels of parameters of lipid profile amongst controls and in patients of subclinical hyperthyroidism. In the cases the mean serum levels of total cholesterol, LDL & TG were decreased in patients as compared to controls & the difference was statistically insignificant. But the mean serum HDL levels was significantly decreased in patients as compared to controls.



**Fig. 1: Comparison of lipid profile in subjects with overt hyperthyroidism and controls**



**Fig. 2: Comparison of lipid profile in subjects with subclinical hyperthyroidism and controls**

## Discussion

Endocrine diseases are increasing worldwide and among those of thyroid dysfunction is more common.<sup>(13)</sup> Thyroid dysfunction has a great impact on lipids and it is also associated with number of other clinical risk factors. The incidence of hyperthyroidism is lower as compared to hypothyroidism in the general population. Generally hyperthyroidism is characterized by decrease in serum levels of total cholesterol, LDL and HDL-C. These changes are explained by regulatory effect of thyroid hormone on key enzyme of lipoprotein metabolism. Thyroid hormones stimulates CETP which transports cholesteryl esters from HDL2 to VLDL and TG's in opposite direction. Finally thyroid hormones stimulates LPL and HL which hydrolyzes HDL2 to HDL3 which ultimately enhances LDL oxidability. Largost et al, Kauusi et al and Santamarina et al also supported the same explanation behind dyslipidemia.<sup>(14,15,16)</sup>

In our study we found decreased level of total cholesterol, LDL and TG's in subclinical hyperthyroid patients. There is also seen marked decrease in serum HDL-C. The lipid profile tend to be decreased in patients with subclinical hyperthyroidism, reason may be due to increased bile excretion of cholesterol and increased LDL receptor gene expression leading to increased LDL receptor- mediated catabolism of LDL particles.<sup>(17)</sup> Moreover hyperthyroidism results in enhanced LDL oxidability which is related to FT4 levels. A decrease in HDL-C levels also observed due to increase in CETP-mediated transfer of cholesteryl esters from HDL to VLDL and increased catabolism of HDL2. TG levels remain unchanged. In our study we observed small increase in serum HDL levels and the reason behind this could be due to decreased activity of CETP and HL which may interfere the catabolism of HDL2.<sup>(18)</sup>

## Conclusion

Thyroid function test for screening of thyroid dysfunction is of great importance in all dyslipidemic patients. It is also of cardinal importance in all patients with unexpected improvement or worsening of their lipid profile. So underlying thyroid disorders should be recognized and treated in patients with dyslipidemia especially when the results are unforeseen.

It is also important to address the association of thyroid abnormalities with increased risk for CAD and whether therapy of these disorders could influence cardiovascular mortality.

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