

## Study of Lipid Profile in Hypothyroidism

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### Abstract:

Hypothyroidism is one of the most common forms of thyroid dysfunction resulting from the deficiency of thyroid hormones. Hypothyroidism is the most common of thyroid disorders in India affecting one in ten adults and more so in women than men by 6 to 8 times. Hypothyroidism also affects the lipid metabolism in a significant way. This cross sectional study was conducted in the department of General medicine, to evaluate the lipid profile of hypothyroid patients. 30 Clinically and biochemically newly diagnosed hypothyroid patients of both sexes, age 20 to 60 years and 30 normal healthy controls were include in study. Serum lipid profile was estimated in both groups. Total Cholesterol, Triglycerides, LDL Cholesterol, VLDL was higher in hypothyroid subjects as compared to controls and it was statistically highly significant. HDL Cholesterol was lower as compared to controls and it was statistically highly significant.

**Key words :** Hypothyroidism , Lipid profile

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### Introduction

Thyroid diseases are among the most common endocrine disorders worldwide. India too is no exception. According to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid disease. [1] Thyroid diseases are different from other diseases in terms of their ease of diagnosis, accessibility of medical treatment, and the relative visibility that even a small swelling of the thyroid offers to the treating physician. Early diagnosis and treatment remain the cornerstone of management. [1,2] The thyroid gland secretes two important hormones thyroxine (T4) and triiodothyronine(T3), which are commonly known as T4 and T3 respectively. T3 is biologically more active form of thyroid hormone and is produced by local deiodination of T4 by the enzyme 5' deiodinase in the peripheral tissues including kidneys. [3] These thyroid hormones have important biological effects such as regulation of body hemodynamics, thermoregulation, and various metabolisms. It influences almost all metabolisms in the body including carbohydrate, proteins, lipids and maintenance of water and electrolyte homeostasis, which are well-established. [4,5] Hypothyroidism is

one of the most common endocrine diseases resulting from deficiency of thyroid hormones, with a wide clinical manifestation ranging from metabolic disorders to cardiovascular disease, electrolyte and mineral disturbances. Commonly encountered endocrine abnormalities are hypothyroidism and hyperthyroidism. They might occur as subclinical or overt clinical form. Prevalence of hypothyroidism is 4.6% as per NHANES 3 study [6]. Basal energy expenditure is directly or indirectly regulated by thyroid hormones through their effect on protein, carbohydrate and lipid metabolism. [7]. Thyroid hormones have multiple effects on the regulation of lipid digestion, absorption, synthesis and catabolism. Thyroid hormones regulate the expression of enzymes involved in all steps of lipid metabolism leading to the development of qualitative and quantitative changes of lipids in thyroid dysfunction. [8]. Most patients with dyslipidemia are due to primary cause or genetic cause and some are due to secondary causes. [9]. As per the recommendations of American thyroid association adults must be screened for thyroid dysfunction by measurement of serum TSH, beginning at the age of 35 and every 5

years thereafter. [10]. Subclinical hypothyroidism is characterised by biochemical evidence of thyroid hormone deficiency in patients who may or may not have clinical features of hypothyroidism [11]. It comprises of high serum TSH concentration and normal serum total or free T4 and T3 concentrations associated with a few or no symptoms and signs of hypothyroidism. It is a state of mild thyroid failure. [12,13]. It is more common than overt clinical hypothyroidism. [14,15]. Classical symptoms and signs of hypothyroidism are fatigue, weight gain, cold intolerance, constipation, dry skin, hoarseness of voice, mental abnormalities, decrease in appetite and arthralgia. Many studies were done to assess the lipid profile status of hypothyroid patients. But controversies still prevail and that needs to attain consensus. So, we have designed this study in our population for evaluation of lipid profile in hypothyroid patients that might be helpful for clinical management of hypothyroid patients with dyslipidemia.

### Material and Methods

This cross sectional study was conducted in the Department of General medicine, to evaluate the lipid profile of hypothyroid patients. 30 Clinically and biochemically newly diagnosed hypothyroid patients of both sexes, age 20 to 60 years, with no history of thyroxine and hypolipidemic drugs in the last 3 (three) months were included in the study. Patients with chronic renal failure, diabetes mellitus,

liver diseases, chronic diseases, pregnancy and age less than 20 and more than 60 years were excluded. Hypothyroidism was diagnosed by clinical history, physical examinations and relevant laboratory investigations. Both overt and subclinical hypothyroid patients were included in study. 30 control subjects were taken whose thyroid profile was normal. Confirm diagnosis of hypothyroidism has been made on the basis of serum TSH, T3, T4 level. Morning samples of serum were obtained after 12 hours of overnight fasting. The blood samples were collected into plain tubes after which the samples were centrifuged at 4°C for 15 minutes after incubation of 20 minutes for extraction of serum. With the help of enzymatic colorimetric method using chemistry auto-analyzer, the sera were analyzed for serum lipid profile that included total cholesterol, triglyceride, LDL-cholesterol, HDL-cholesterol and VLDL-cholesterol respectively. All the data was collected and statistical analysis was done. Data was expressed in terms of mean  $\pm$  SD. Changes in study parameters in between Hypothyroid cases and controls was compared. Pearson correlation was performed to establish the relationship between study variables. p value <0.01 was considered statistically significant and p value <0.001 was considered statistically highly significant

### Results

**Table 1: Symptoms in hypothyroid patients**

Symptoms	Hypothyroid Patients n=30	Percentage
Dry skin	14	46.6 %
Constipation	21	70 %
Weight gain	26	86 %
Cold intolerance	08	26.6 %
Fatigue	22	73.3 %
Hoarse voice	18	60 %
Puffiness of face	15	50 %

**Table 2: Lipid profile parameters in hypothyroid patients**

Lipid profile parameters(mg/dl)	Hypothyroid n=30 Mean $\pm$ SD	Control n=30 Mean $\pm$ SD	P value
Total Cholesterol	275.24 $\pm$ 40.24	160.82 $\pm$ 17.34	<0.001
Triglycerides	148.70 $\pm$ 30.12	90.34 $\pm$ 12.16	<0.001
HDL- Cholesterol	24.70 $\pm$ 4.2	42.48 $\pm$ 7.2	<0.001
LDL- Cholesterol	201.62 $\pm$ 38.24	110.48 $\pm$ 18.24	<0.001
VLDL	30.31 $\pm$ 4.2	16.84 $\pm$ 1.98	<0.001

Table 1 shows most common symptom in hypothyroid patients was weight gain, followed by fatigue, constipation, hoarseness of voice, puffiness of face, dry skin, intolerance to cold temperature. Table 2 shows lipid profile parameters in hypothyroid subjects and normal control subjects. Total Cholesterol, Triglycerides, LDL- Cholesterol, VLDL was higher in hypothyroid subjects as compared to controls and it was statistically highly

significant p<0.001. HDL- Cholesterol was lower as compared to controls and it was statistically highly significant p<0.001.

### Discussion

Hypothyroidism, a common endocrine disorder affecting adults of all ages, is due to relative deficiency in thyroid hormones. It is the most common pathologic hormone deficiency among the

endocrine disorders. Thyroid hormones (T4 and T3) regulate the rate of metabolism, affect growth, and modulate energy utilization by increasing the basal metabolic rate, increasing oxygen consumption, and facilitating heat production. Thyroid hormones have significant effects on synthesis, mobilization and metabolism of lipids. This study was carried out to understand the effect of hypothyroidism on lipid profile. In our study most common symptom in hypothyroid patients was weight gain, followed by fatigue, constipation, hoarseness of voice, puffiness of face, dry skin, intolerance to cold temperature. Lipid profile parameters in hypothyroid subjects and normal control subjects. Total Cholesterol, Triglycerides, LDL- Cholesterol, VLDL was higher in hypothyroid subjects as compared to controls and it was statistically highly significant  $p < 0.001$ . HDL- Cholesterol was lower as compared to controls and it was statistically highly significant  $p < 0.001$ . Archana et al. in her study concluded that hypothyroidism results in a small increase in serum LDL, totals. cholesterol. Thompson and Abrams & Grundy [16] have stated decreased activity of LDL receptors as the main cause of hypercholesterolemia in hypothyroidism. Serum concentrations of high density lipoprotein cholesterol was reported to be higher among hypothyroid patients (subclinical or clinical) [17] Studies done by Michalopoulou, [18] Diekman, [19] Tsmihodimos [20] and Olukoga [21] showed average serum concentration of HDL higher in subclinical or clinical hypothyroidism. Increase in HDL cholesterol concentration is mainly due to increased concentration of HDL2 particles. Dullaart have stated that decreased activity of CETP (cholesteryl ester transport protein) results in reduced transfer of cholesteryl esters from HDL to VLDL, thus increasing HDL cholesterol levels. Lam have stated that in hypothyroid patients decreased activity of hepatic lipase leads to the decreased catabolism of HDL2 particles leading to increased HDL. So, decrease in HDL cholesterol level in our study might be due to increased activity of CETP and lipoprotein lipase in hypothyroid patients. Decreased thyroid secretion and decreased activity of lipoprotein lipase, decreased rate of cholesterol secretion in the bile and consequent diminished loss in the faeces due to decreased number of LDL receptors on liver cells lead to hypercholesterolemia. Hypothyroidism affects the cardiovascular, pulmonary, renal, neuromuscular, nervous and the reproductive systems. Most of the cardiovascular signs and symptoms are associated with a lipid profile abnormality.

Results of our study suggest the findings of dyslipidemia in hypothyroid patients. Correction of hypothyroidism rectifies the lipid abnormalities thereby decrease the cardiovascular complications. [22,23] Levothyroxine sodium is the hormone of choice for thyroid hormone replacement therapy.

The daily replacement dose is usually 1.5  $\mu\text{g}/\text{kg}$  (typically 100-150  $\mu\text{g}$ ).

### Conclusion

Thyroid dysfunction can have an important effect on lipid profile. Biochemical screening for thyroid dysfunction is critical in all dyslipidemic patients, as well as in all patients with unexpected improvement or worsening of their lipid profile. Underlying thyroid disorders should be recognized and treated in this setting. Results of our study suggest the findings of dyslipidemia in hypothyroid patients. Thus, patients with dyslipidemia should be investigated for hypothyroidism.

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