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# THYROID DYSFUNCTION AND ITS RELATION TO DYSLIPIDEMIA

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**ABSTRACT**

Thyroid hormones are known to affect energy pathways. Hypothyroidism is relatively common and is associated with an unfavorable effect on lipids. So the aim was to study the correlation of thyroid profile and serum lipid profile in hypothyroid patients and controls. We studied thyroid functions test and serum lipid profile in 30 hypothyroid patients and a similar number of age, gender matched healthy controls. It was observed that serum total cholesterol,triglyceride and LDL levels were raised in cases, while HDL levels were lower as compared to control. It was concluded that patients with hypothyroidism exhibited elevated atherogenic parameters and high risk of cardiovascular diseases.

**Introduction:**

Hypothyroidism is a common metabolic disorder in the general population. The most common cause of hypothyroidism worldwide is considered as too little iodine in the diet. Decreased thyroid hormone synthesis and low levels of circulating thyroid hormones result in biochemical and/or clinical hypothyroidism. Thyroid hormones up-regulate metabolic pathways relevant to resting energy expenditure, hence, dyslipidemia and thyroid functions are often correlated.[1]

Hypothyroidism is one of the most common causes of secondary dyslipidemia. Therefore, before starting hypolipidemic therapy, the evaluation of thyroid function is needed. Hence, hypothyroid patients are at high risk of cardiovascular diseases.[2] Levothyroxine replacement therapy significantly improved the lipid profile in hypothyroid patients indicating the possible relation between thyroid hormones and lipid levels in the blood of hypothyroid patients.[3]

The present study was conducted with an objective to evaluate the serum lipid profile levels in hypothyroidism patients & to correlate them with the disease process.

**Material and methods:**

The study was conducted on 60 subjects of age groups 30- 60 years comprising of 30 age and sex matched healthy control and 30 cases of hypothyroidism. Patients were selected after obtaining clearance from ethical committe and informed consent were taken from all participants. The patients with elevated TSH levels with free T3 & free T4 within normal range were considered as hypothyroid patients. Patients with diseases like renal disease, acute metabolic complications, cardiovascular diseases and patients on antithyroid/ thyroxine drugs were excluded.

Serum total Cholesterol ,Serum HDL & LDL Cholesterol ,Serum Triglyceride were done by Vitros 5600 autoanalyser. Statistical analysis was done using student t test.

**Result**:

**Table 1: Thyroid profile in cases and controls**

| Thyroid profile | Cases | Control | P value |
|---|---|---|---|
| TSH (0.35-4.94 mIU/L) | 6.57±0.92 | 3.65±0.63 | <0.05 |
| FT3(1.71-3.71pg/ml) | 2.88±0.68 | 1.57±0.13 | <0.01 |
| FT4(0.70-1.48ng/dl) | 1.01±0.21 | 0.99±0.08 | 0.001 |

**Table 2: Lipid profile in cases and controls**

| Lipid profile | Cases | Control | P value |
|---|---|---|---|
| Total cholesterol | 186.74±26.23 | 163.29±18.75 | <0.05 |
| Triglyceride | 188.99±27.33 | 143.56±17.88 | <0.001 |
| HDL | 41.18±9.21 | 54.02±7.02 | 0.001 |
| LDL | 103.94±21.11 | 82.46±18.07 | <0.001 |

Table 1 shows comparison of subjects according to thyroid profile parameters: Serum FT3 and FT4 levels of cases that of controls were found to be within normal range. But TSH levels were significantly raised in the cases, which is suggestive of hypothyroidism.

Table 2 shows lipid profile of cases and control. It was also found that serum LDL, Triglyceride levels and total cholesterol were significantly higher ($p < 0.001$) in cases than controls; while HDL levels were significantly lower in cases as compared to control.

**Discussion:**

The significant higher serum total cholesterol, LDLc and triglyceride observed among the hypothyroid patients in the current study compared with healthy controls are in agreement with the literature reports that hypothyroidism is one of the risk factor for the onset of coronary heart disease.[4,5] Thyroid hormone regulates metabolic processes essential for normal growth and development. Thyroid hormones induce the 3-hydroxy-3-methylglutaryl-coenzyme A (HMG-CoA) reductase, which is the first step in cholesterol biosynthesis. triiodothyronine ($T_3$) upregulates LDL receptors by controlling the LDL receptor gene activation. [6] Thyroid hormones can influence HDL metabolism by increasing cholesteryl ester transfer protein (CETP) activity.

Hyperthyroidism, excess thyroid hormone, promotes a hypermetabolic state characterized by increased resting energy expenditure, weight loss, reduced cholesterol levels, increased lipolysis, and gluconeogenesis. Whereas, hypothyroidism, is associated with hypometabolism characterized by reduced resting energy expenditure, weight gain, increased cholesterol levels, reduced lipolysis, and reduced gluconeogenesis .[7]

By affecting the metabolism of lipids, hypothyroidism accelerates the process of atherogenesis and elevates cardiovascular risk.[8,9] Although LDL is widely accepted as the major atherogenic lipoprotein, TG-rich lipoproteins such as chylomicron remnants, whose clearance is reduced in hypothyroidism and very LDL remnants still play an important role in atherogenesis. These remnants are taken up by macrophages in the arterial walls to produce foam cells and thus may be a risk factor for causing atherosclerosis.[10]

**Conclusion:**

Patients with hypothyroidism exhibited elevated atherogenic parameters and are at high risk of cardiovascular diseases is almost confirmed. Hence, screening for lipid profile can help in overall management of hypothyroidism and can help in prevention of cardiovascular disorders and other complications.

**References:**

1. Michalaki MA, Vagenakis AG, Leonardou AS, Argentou MN, Habeos IG, Makri MG, et al. Thyroid function in humans with morbid obesity. Thyroid 2006;16:73e8.
2. Caseelli WP. 1996. Lipid risk factors and ischemic heart disese. Atherosclerosis, 124; s1- s9,

3. Teixeira Pde F, Reuters VS, Ferreira MM, Almeida CP, Reis FA, Buescu A, et al. Lipid profile in different degrees of hypothyroidism and effects of levothyroxine replacement in mild thyroid failure. Transl Res. 2008;151:224–31.
4. Halliwell B, Gutteridge JMC. 1990. Role of free radicals and catalytic metal ions in human disease; an overview. Methods Enzymol, 186; 1-85.
5. Yilmaz S, Ozan S, Benzer F, Canatan H.2003. oxidative damage and antioxidant enzyme activities in experimental hypothyroidism. Cell Biochem Funct, 21(4); 325-30.
6. Faure P, Oziol L, Artur Y, Chomard P. Thyroid hormone (T3) and its acetic derivative (TA3) protect low-density lipoproteins from oxidation by different mechanisms. Biochimie. 2004;86:411–8.
7. Brent GA. 2012. Hypothyroidism and thyroiditis. In: Williams Textbook of Endocrinology, edited by Melmed SP, Larsen PR, Kronenberg HM, editors. Philadelphia, PA: Elsevier.
8. Ito M, Takamatsu J, Matsuo T, Kameoka K, Kubota S, Fukata S, et al. Serum concentrations of remnant-like particles in hypothyroid patients before and after thyroxine replacement. Clin Endocrinol (Oxf) 2003;58:621–6.
9. Riis AL, Gravholt CH, Djurhuus CB, Nřrrelund H, Jřrgensen JO, Weeke J, et al. Elevated regional lipolysis in hyperthyroidism. J Clin Endocr Metab. 2002;87:4747–53.
10. Klein I, Ojamaa K. Thyroid hormone and the cardiovascular system. N Engl J Med. 2001;344:501–9.