

Evaluation of the Serum Lipid Profile in Female Patients with Hypothyroidism: A Rural Based Study

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Abstract

Background: 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. Objectives of the study: To estimate and compare the levels of serum lipid profile in cases of hypothyroidism and healthy controls. **Material and Methods:** A case control study was conducted on 60 cases of clinically diagnosed hypothyroidism and 60 matched healthy controls. Ethical clearance was obtained from Institute's ethical clearance committee. Informed consent was taken from both cases and controls after explaining the procedure. Statistical analysis was done using student's 't' test. **Results:** Serum TC, TGL, low density lipoprotein (LDL) and very low density lipoprotein (VLDL) levels were significantly increased in cases of hypothyroidism as compared to controls ($p < 0.001$). Serum HDL levels were significantly reduced in cases of hypothyroidism as compared to healthy controls. **Conclusion:** Our study showed a significantly elevated levels of serum lipids in cases, which may aggravate the risk of atherosclerosis and other cardiovascular disorders and associated complications.

Keywords: Hypothyroidism, TC, HDL, LDL, Atherosclerosis, lipid profile.

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Introduction

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.^[1]

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.^[2,3]

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.

The aim of present study was to measure the serum lipid profile of hypothyroid patients and to compare the mean value with the lipid profile of healthy controls after exclusion of other risk factors of hyperlipidaemia like increased smoking, hypertension, diabetes, alcoholics, hepatic or renal diseases and drugs causing hyperlipidaemia.

Material and Methods

This is a case control study. The study was conducted on 60 cases of clinically diagnosed hypothyroidism in the age group 20-50 years attending Out Patient Department (OPD) of Ear, Nose and Throat (ENT) and OPD of General surgery. Sixty age and sex matched healthy subjects were taken as controls. The study was conducted over a period of two years. Ethical clearance was obtained from the institute's ethical clearance committee.

Informed consent was taken from the cases and controls after explaining the procedure.

Inclusion Criteria

- Age group 20-50 years
- Hypothyroidism diagnosed by increased levels of TSH ($> 4 \mu\text{IU/ml}$) and Decreased serum T3 ($<1.48 \text{ ng/ml}$) and T4 ($<11.00 \mu\text{g/dl}$) levels

Exclusion criteria

- Pediatric age group
- Patients with renal disorders and hepatic disorders, Alcoholism
- Bone diseases
- Patients on medications such as diuretics, calcium, iron tablets, (anemics) antithyroid drugs and those who are on minerals supplementation which effect serum calcium, magnesium and phosphorus levels
- Diabetes Mellitus, Hypertension
- Pregnant and lactating women

Biochemical analysis: Venous blood sample of 3 ml was collected under aseptic precautions in a plain vial. It was allowed to clot and serum was separated by centrifugation.

- Serum T3(Triiodothyronine), T4(Thyroxine) and TSH(Thyroid Stimulating Hormone) levels were measured in serum by chemiluminescence immunoassay (CLIA) method using SnibeMaglumi 1000.

Lipid profile was analysed using automated analyser by following methods:

1. Triglycerides by enzymatic method using Glycerol-3-phosphate as substrate
2. Total cholesterol by Cholesterol oxidase -peroxidase method.
3. HDL cholesterol by Precipitation (with phosphotungstic acid) method.
4. LDL cholesterol using Friedwald formula

$$\text{LDL} = \text{TC} - (\text{HDL} + \text{TG}/5)$$

Statistical analysis

Data was expressed in terms of mean \pm SD. Chi- square test was applied to estimate the difference between the two groups of population. Unpaired 't'-test was used to study the changes in study parameters in between cases and controls. Pearson correlation was performed to establish the relationship between study variables. p value <0.05 was considered statistically significant.

Results

This was a comparative case control study conducted on 60 diagnosed cases of hypothyroidism ($n=60$) and 60 age and sex matched healthy controls ($n=60$). Serum lipid levels were estimated and analyzed in cases and controls. The results were expressed as mean \pm standard deviation. The age distribution of cases and controls is depicted in [Table 1]. The mean age (in years) of cases is 40.4 ± 10.4 years and that of controls is 41.4 ± 10.2 years and is not significant ($p>0.05$).

Table 1: Mean age of cases and controls

	Cases	Controls	P value
Mean age in years	40.4±10.4	41.4 ±10.2	p>0.05

The mean serum Cholesterol, serum HDL, serum LDL, serum VLDL and serum TGL levels in cases of hypothyroidism and control group are shown in [Table 2]. A statistically significant increased values of TGL, LDL, VLDL, total cholesterol ($p<0.001$) was noted in cases as compared to controls. The serum HDL levels were found to be decreased in cases as compared to controls.

Table 2: Comparison of serum lipid profile in between cases and controls

Parameters	Cases-hypothyroidism	Controls	Normal value	P value
TC	192.95±43.03	132.95±43.03	150-200	0.01
TGL	165.55±15.12	112.00±13.01	150	0.23
LDL	200.95±34.41	120.94±31.09	150	0.06
VLDL	62.15±13.22	15.65±14.11	15-40	0.08
LDL	22.85± 3.03	34.95±2.63	35	0.32

Discussion

This was a comparative case control study conducted on 60 diagnosed cases of hypothyroidism (n=60) and 60 age and sex matched healthy controls (n=60). Serum lipid levels were estimated and analyzed in cases and controls. The results were expressed as mean±standard deviation.

Our finding suggests that levels of serum total cholesterol, triglyceride, high density lipoprotein, low density lipoprotein were altered in hypothyroidism patients than in age-matched control subjects. Serum TC, TGL, LDL, VLDL levels were significantly increased in cases where as serum HDL levels were significantly reduced ($p<0.001$). Our findings were consistent with previous studies done by other investigators: Laway et al, Das et al, Saxena et al and Sharma et al.^[4-7]

Results of our study suggest the findings of dyslipidemia in hypothyroid patients. Correction of hypothyroidism rectifies the lipid abnormalities thereby decrease the cardiovascular complications.^[8-13] Levothyroxine sodium is the hormone of choice for thyroid hormone replacement therapy. The daily replacement dose is usually 1.5 µg/kg (typically 100-150 µg).

Conclusion

Our study shows that lipid levels were increased with the progression of disease. This rise in lipid levels and decreased High density lipoprotein fraction is an alarming sign. Therefore, controlling the lipid fractions and early management can save hypothyroidism patients from cardiovascular risk. Also supplementation with thyroxine will help in improving lipid parameters.

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