Alterations in Lipid Profile in Old Age Hypothyroid Patients

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The current investigation was designed to study the changes of lipid profile in hypothyroid patients in local population and to investigate the importance of thyroid profile in old age dyslipidemia patients. Ninety five newly diagnosed and untreated hypothyroid patients (aged 49.21 ±12.47 years, BMI 30.36 ±5.8, 74 females and 21 males) were identified from thyroid OPD of INMOL, PGMI, Lahore. Patients were compared with 78 control subjects (aged 48.80 ±11.00 years, BMI 30.51 ±0.70, 54 females and 24 males) matched by age and body mass index (BMI). Serum TSH, FT4, FT3, Triacylglycerol (TAG), total cholesterol (TC), low-density lipoprotein cholesterol (LDL-C) and high density lipoprotein cholesterol (HDL-C) were measured. Significantly increased levels of TC and LDL-C in overt hypothyroid patients were observed. No significant differences were found in HDL-C and TAG in overt hypothyroid patients as compared to the control group. Elevated levels of TC and LDL-C in hypothyroid patients represent an increased risk of ischaemic heart disease that requires therapeutic intervention. The deranged lipid profiles in hypothyroidism can not be corrected without the treatment for hypothyroidism in these patients. Therefore, all older patients referred for diagnosis and treatment of dyslipidemia should also be screened for hypothyroidism.

Key words: Lipid profile, hypothyroid, old age

Disorders of the thyroid gland, including hypothyroidism, are most common of all endocrine diseases with the exception of diabetes mellitus. Overt hypothyroidism is associated with abnormalities of lipid metabolism, which may predispose to the development of atherosclerotic coronary artery disease (CAD). The dyslipidemia is characterized by elevated levels of total and LDL-cholesterol which may be a consequence of decreased uptake of LDL-Cholesterol by its receptors on liver cell surfaces. Because of marked prevalence of thyroid function abnormalities in the community, the effects of thyroid hormones on lipid metabolism and the well-defined role of circulating lipid concentrations in determining cardiovascular risk, it is important to investigate the alteration in circulating lipid levels in hypothyroid patients in our local population. It would also be pertinent to explore the significance of thyroid profile in dyslipidemic patients.

Subjects: All patients were newly diagnosed, untreated, and selected from thyroid OPD of INMOL. Ninety-five subjects (74 females and 21 males) aged 49.21 ±12.47 years with overt hypothyroidism were studied (TSH > 50 RIU/ml). The mean body mass index (BMI) of the patients was 30.36 ±5.80. Biochemical and clinical examinations were performed and a questionnaire was also filled in by all subjects. Out of the 74 overt hypothyroid female studied, 49 were postmenopausal but none was receiving hormone replacement therapy at the time of study. Seventy-eight age and BMI matched healthy individuals 54 females (35 postmenopausal) and 24 male were included as the control group. The mean age of the controls was 48.80 ±11.00 years and mean BMI was 30.51 ±4.7.

All participants were excluded for smoking, diabetes mellitus, cardiac, renal, liver disease or familial hypercholesterolemia. Subjects receiving cholesterol-lowering drugs were also excluded from the study.

Methods: Blood samples were collected after overnight fasting of 12-14 hours. Serum was separated and stored at -20°C until analysed.

Free T4 (normal range 0.89-1.79 ng/dl) and free T3 (normal range 1.63 - 3.77 pg/ml) and TSH (normal range 0.17 - 4.05 mIU/L) were measured by radioimmunoassay using kits provided by (Immunochem, France). Radioactivity was measured on Gamma counter (Capintec, USA). The sensitivities of the assay were calculated to be 0.03 ng/ml, 0.3 pg/ml and 0.025 mIU/L, for FT4, FT3 and TSH, respectively.

Serum total cholesterol (normal range <200 mg/dl) and HDL-cholesterol were measured by CHOD - PAP method. HDL-cholesterol was determined in the supernatant after precipitation with phosphotungstic acid and magnesium chloride (precipitating reagent). Triacylglycerol was measured by GPO enzymatic method (normal range <150 mg/dl). LDL-cholesterol was calculated using the Friedewald's formula (Friedewald et al., 1972). All kits for lipid profile were supplied by Merck (Germany).

Statistical analysis: The results are expressed as mean±SEM and statistical difference was determined by employing Student's t-test.

Results: The results of FT4, FT3, and TSH assays are shown in Table 1. Results are given as mean ± SEM. Serum TSH levels were >50 mIU/ml (50 mIU/ml was the end detection limit of the kit) in hypothyroid patients. The FT4 levels
were low in hypothyroid patients as compared to controls (p<0.005). Serum FT3 levels were within the reference range in hypothyroid patients.

The results of lipids and lipoprotein estimations in patients and controls are also shown in Table 1 and Figure 1. Alterations in parameters of lipid profile are expressed as % change from respective values of the normal subjects. Patients with overt hypothyroid had significantly higher serum levels of TC and LDL-C as compared to controls (p<0.005). No significant differences were observed in the serum levels of TAG and HDL-C, in hypothyroid patients and control subjects.

Table 1. Comparison of thyroid & lipid parameters in patients with overt hypothyroidism and control subjects

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Overt hypothyroid (n=59)</th>
<th>Control (n=78)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TSH (mlU/ml)</td>
<td>&gt; 50</td>
<td>2.83±1.31</td>
</tr>
<tr>
<td>FT4 (ng/dl)</td>
<td>0.21 ± 0.06*</td>
<td>1.45±0.22</td>
</tr>
<tr>
<td>FT3 (pg/dl)</td>
<td>1.9±0.15*</td>
<td>2.49±0.83</td>
</tr>
<tr>
<td>TC (mg/dl)</td>
<td>240±15.8±8</td>
<td>185±15.81</td>
</tr>
<tr>
<td>LDL-C (mg/dl)</td>
<td>160±10.3±4**</td>
<td>125±5.87</td>
</tr>
<tr>
<td>HDL-C (mg/dl)</td>
<td>35±3.64</td>
<td>39±4.31</td>
</tr>
<tr>
<td>TAG (mg/dl)</td>
<td>146±13.44</td>
<td>139±9.98</td>
</tr>
</tbody>
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* p < 0.001 ** p < 0.005, respectively, when hypothyroid patients compared with control subjects. N.S: Non-Significant.

![Graph](https://example.com/graph.png)

Fig.1: Comparison of serum lipid profile in control and patients with overt hypothyroidism

The values are expressed as percent change from the respective mean value of the same parameter for the controls. O-Hypo: Overt Hypothyroid Patients; T-Chol: Total Cholesterol; LDL-C; Low density lipoprotein cholesterol; HDL-C: high-density lipoprotein cholesterol; TAG: Triacylglycerol

Discussion:
It is well known that thyroid dysfunction leads to changes in lipoprotein metabolism. Low-density lipoprotein cholesterol (LDL-C) and high-density lipoprotein cholesterol (HDL-C) levels in blood are known to be increased hypothyroidism and decreased in hyperthyroidism5–16. The clearance of chylomicron remnants is decreased in hypothyroidism17. Changes in LDL-C are mainly attributable to altered clearance of LDL-C from plasma by changes in the number of LDL receptors on liver cell surfaces18–19. Because the promoter of the LDL receptor gene contains a thyroid hormone responsive element (TRE), T3 could modulate gene expression of the LDL receptor20. HDL-C metabolism is complex, and changes in plasma levels are due, in part, to remodeling of HDL-C particles by hepatic lipase and cholesterol ester transfer protein (CETP)=21. Activity of both enzymes decrease in hypothyroidism and increase in hyperthyroidism correlating with plasma HDL-C levels22–24. Many previous studies have found that individuals with overt hypothyroidism have elevated total cholesterol and LDL-C levels25–27.

Results of the current study showed significantly high levels of total cholesterol and LDL-C in hypothyroid patients as compared with normal control group. TAG and HDL-C levels, on the other hand, remained unaltered.

Conflicting results have been reported in several cross sectional studies of thyroid dysfunction and HDL-C levels. Compared with individuals with normal thyroid function, HDL-C has been reported to be high28–29 or low30–32 or unchanged33, 34. In a population based study it has been found that older women with elevated LDL-C were 80% more likely to have an elevated TSH, and those with abnormal levels of total cholesterol, LDL-C, and HDL-C were 90% more likely to have high TSH. Women with normal lipids levels were much less likely to have an elevated TSH35.

The incidence of hypothyroidism in the population is age and sex related being commoner in women and in older age group36, 37. On the basis of the results of the current investigation, along with others reported elsewhere, it is recommended that in patients with altered lipid profile, especially in older females, investigations of thyroid assay should be performed for proper diagnosis and treatment of hyperlipidemia.

References:


