To study of serum lipid profile alteration in subclinical hypothyroidism patients: A prospective case control hospital based study

Author
Dr Anil Kumar Gupta
Assistant Professor, Dept. of General Medicine, MSY Medical College & Hospital, Lalpur, Meerut (U.P), India

Abstract
Background: Thyroid hormones have significant effects on the synthesis, mobilization and metabolism of lipids. Hence the present study was planned to determine lipid abnormalities in patients with subclinical hypothyroidism and its interpretation.

Material & Methods: A total of 50 that is, 25 cases of subclinical hypothyroidism and 25 euthyroid controls were selected for the study. Demographic data such as age and sex were recorded. Lipid profile was assessed, which based on NCEP (National Cholesterol Education Program) guidelines and thyroid profile was assessed.

Results: In our study the mean age of cases was 36.54 years and in controls was 24.45 years (p<0.001). BMI was statistical not significant in between groups. It was also observed that among the cases the mean TSH level was significantly high. However no significant difference was noted among cases and controls when fT3 and fT4 were compared. The significant rise was noted in cases with regard to serum cholesterol and triglycerides but no difference between cases and controls when mean HDL and LDL were compared.

Conclusion: We concluded that subjects with laboratory report of hypercholesterolemia and hypertriglyceridemia should be also further examined and tested for serum thyroid hormones measurements.

Keywords: Thyroid hormones, Subclinical hypothyroidism, Lipid profile, TSH level.

Introduction
Hypothyroidism is defined as a deficiency of thyroid activity. It results from reduced secretion of total thyroxine (T4) and triiodothyronine (T3). Subclinical hypothyroidism (SCH) can be best defined as a high serum thyroid stimulating hormone (TSH) and normal serum total/free thyroxine (T4), triiodothyronine (T3) concentrations associated with few or no symptoms/signs of hypothyroidism. It is referred to as a state of mild thyroid failure and is essentially a laboratory diagnosis.\(^1\)\(^2\) Subclinical hypothyroidism is much more common than overt hypothyroidism.\(^3\)\(^4\) Therefore, early diagnosis and treatment may prevent the onset of overt hypothyroidism and its associated effects. In India according to a projection from various studies on thyroid disease, it has been estimated that about 42 million people in India suffer from thyroid diseases.\(^5\) Recent population-based study reported prevalence of hypothyroidism as 3.9% and prevalence of subclinical hypothyroidism was...
also high (9.4%). In women, the prevalence was higher 11.4%, when compared with men, in whom the prevalence was 6.2%. The prevalence of subclinical hypothyroidism increased with age. Thyroid hormones have significant effects on the synthesis, mobilization and metabolism of lipids. They affect serum cholesterol mainly by altering lipoprotein metabolism. Subclinical hypothyroidism may be associated with increased risk of coronary artery disease (CAD), peripheral vascular disease, and various biochemical abnormalities including increased LDL-C levels, increased total cholesterol and serum triglyceride values. It is uncertain whether subclinical hypothyroidism (increased serum TSH, normal serum T4 and T3) is also associated with hyperlipidemia. Some case-control studies, have reported increased concentration of serum total cholesterol and LDL cholesterol in subjects with subclinical hypothyroidism compared with euthyroid controls. Several large cross-sectional studies found no significant difference in total cholesterol or LDL-C between subjects with subclinical hypothyroidism and euthyroidism. However, the results of lipid profile alterations in subclinical hypothyroidism are controversial in different studies; some of those showing positive correlation and prompt reversal of changes following treatment and while other refuting any correlation between the two. Further, there are very few Indian studies about lipid profile changes in subclinical hypothyroidism. Hence the present study was planned to determine lipid abnormalities in patients with subclinical hypothyroidism and its interpretation.

**Material & Methods**

Patients with subclinical hypothyroidism attending OPD of Department of General Medicine, MSY Medical College & Hospital, Lalpur, Meerut. A total of 50 that is, 25 cases of subclinical hypothyroidism and 25 euthyroid controls were selected for the study.

**Inclusion Criteria**

- Patients with
  - Elevated TSH levels (> 5.00 µ IU/mL)
  - Normal Free T3 (FT3) levels that is, FT3 from 1.45 to 3.48 pg/mL.
  - Normal Free T4 (FT4) levels that is, FT4 from 0.7 to 1.85 ng/mL.
- Patients aged above 18 years.

**Exclusion Criteria**

- Patients with overt hypothyroidism and on treatment with thyroxine and antithyroid drugs.
- Patients on antilipidemic drugs.
- Pregnant women and those on oral contraceptives.
- Patients with acute medical illness.
- Patients with familial hypercholesteremia.

**Method of collection of data**

Demographic data such as age and sex were recorded. A thorough physical examination such as anthropometry, vitals and systemic examination was conducted.

**Lipid profile**

Based on NCEP (National Cholesterol Education Program) guidelines normal values of lipid parameters were;

- Low density lipoprotein < 100 mg/dL.
- High density lipoprotein;
  - Female > 50 mg/dL.
  - Males > 40 mg/dL.
- Total Cholesterol < 200 mg/dL.
- Triglycerides < 150 mg/dL.

**Thyroid profile**

The thyroid profile was assessed by withdrawing venous blood under aseptic precautions and estimation of TSH, FT3 and FT4 was done using a fully automated immunoflorescence immunoassay analyser was used to estimate TSH, FT3 and FT4. The results obtained were interpreted as below;  

Thyroid stimulating hormone

- Normal range – 0.49 to 4.67 µ IU/mL.
Abnormal - < 0.49 or > 4.67 µ IU/mL.  
*Free Triiodothyronine*

Normal range – 1.45 to 3.48 pg/mL.  
Abnormal - < 1.45 or > 3.48 pg/mL.  
*Free thyroxine*

Normal range – 0.70 to 1.85 ng/dL.  
Abnormal - < 0.7 or > 1.85 ng/dL.

**Statistical analysis**
The continuous data was expressed as mean ± standard deviation (SD) and the comparison was done using unpaired 't' test. A probability value ('p' value) of less than or equal to 0.05 was considered as statistically significant.

**Results**
In our study the mean age of cases was 36.54 years and in controls was 24.45 years (p<0.001). BMI was statistical not significant in between groups (table 1).

In the present study it was observed that among the cases the mean TSH level was significantly high. However no significant difference was noted among cases and controls when fT3 and fT4 were compared (table 2).

The significant rise was noted in cases with regard to serum cholesterol and triglycerides but no difference between cases and controls when mean HDL and LDL were compared (table 3).

**Table 1: Parameters in both groups**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Cases (n=25)</th>
<th>Controls (n=25)</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
</tr>
<tr>
<td>Age</td>
<td>36.54</td>
<td>12.76</td>
<td>24.45</td>
</tr>
<tr>
<td>BMI</td>
<td>20.24</td>
<td>1.34</td>
<td>21.45</td>
</tr>
</tbody>
</table>

**Table 2: Mean Thyroid level**

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Cases (n=25)</th>
<th>Controls (n=25)</th>
<th></th>
<th></th>
<th>DF</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>TSH (µ IU/mL)</td>
<td>7.86</td>
<td>2.41</td>
<td>2.34</td>
<td>1.09</td>
<td>15.17</td>
<td>48</td>
</tr>
<tr>
<td>fT3 (pg/mL)</td>
<td>2.06</td>
<td>0.37</td>
<td>2.01</td>
<td>0.50</td>
<td>0.04</td>
<td>48</td>
</tr>
<tr>
<td>fT4 (ng/dL)</td>
<td>1.00</td>
<td>0.26</td>
<td>1.01</td>
<td>0.32</td>
<td>0.44</td>
<td>48</td>
</tr>
</tbody>
</table>

**Table 3: Mean lipid profile**

<table>
<thead>
<tr>
<th>Lipid parameters(mg/dL.)</th>
<th>Cases (n=25)</th>
<th>Controls (n=25)</th>
<th></th>
<th></th>
<th>t</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>SD</td>
<td>Mean</td>
<td>SD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Serum cholesterol</td>
<td>166.03</td>
<td>37.30</td>
<td>142.62</td>
<td>35.17</td>
<td>2.106</td>
<td>0.034</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>167.4</td>
<td>69.88</td>
<td>120.53</td>
<td>33.51</td>
<td>2.115</td>
<td>0.014</td>
</tr>
<tr>
<td>Low density lipoprotein</td>
<td>101.45</td>
<td>40.16</td>
<td>92.11</td>
<td>21.46</td>
<td>1.331</td>
<td>0.177</td>
</tr>
<tr>
<td>High density lipoprotein</td>
<td>40.18</td>
<td>9.66</td>
<td>38.23</td>
<td>5.66</td>
<td>1.678</td>
<td>0.084</td>
</tr>
</tbody>
</table>

**Discussion**
Thyroid disorders are the most common endocrinal disorders. Thyroid diseases are among the common endocrinal disorders worldwide. The symptoms of subclinical hypothyroidism are vague and non specific.

In our study the mean age of cases was 36.54 years and in controls was 24.45 years (p<0.001), which was similar to a study done at Calcutta where it was 38.56 years and 31.55± 2.1 years in another study done in New Delhi and in controls mean age was 20.46 years (p<0.001). BMI was statistical not significant in between groups in our study. This finding was in sharp contrast to a study where mean BMI was 25.5kg/m².

In the present study it was observed that among the cases the mean TSH level was significantly high. This finding was similar to a study done in New Delhi where mean TSH was 7.615±0.11 µ IU/mL.

No significant difference was noted among cases and controls when fT3 and fT4 were compared. Free T3 levels between cases and controls were similar. This is an expected finding because...
peripheral deiodination of T4 to T3 is unaffected in subclinical hypothyroidism. A study from Italy\textsuperscript{20} yielded similar results. The significant rise was noted in cases with regard to serum cholesterol and triglycerides but no difference between cases and controls when mean HDL and LDL were compared. This result was in accordance with the study conducted in Punjab\textsuperscript{21} (181.58 ±35.16 mg/dL) However many other studies have reported higher mean total cholesterol as compared to present study like a study done in New Delhi\textsuperscript{18} shows a mean cholesterol levels of 236.724 ± 9.472 mg/dL, similarly a study done at Gorgan\textsuperscript{22} shows a mean cholesterol of 262.66 ± 67.94 mg/dL.

Conclusion
We concluded that subjects with laboratory report of hypercholesterolemia and hypertriglyceridemia should be also further examined and tested for serum thyroid hormones measurements and particularly the evaluation of thyroid stimulating hormone (TSH) should be reassessed carefully.

References


