Original article:

A comparative study of blood glucose, lipid profile and thyroid function in obese subjects

Neha Saboo, P.Swaroop, Garima Bafna, Sumitra Kumari

Department of Physiology, J.L.N. Medical College, Ajmer (Raj), India
Corresponding author: Dr Neha Saboo
Date of submission: 12 June 2014 ; Date of Publication: 22 September 2014

ABSTRACT:

Background & Objectives: In view of life style disease like obesity, hypertension, ischemic heart disease becoming the major cause of mortality and morbidity in Indians it is thought pertinent to undertake this study to assess and compare glucose level, serum lipid profile and thyroid function in normal and obese subjects.

Material & Method : The present study had been conducted in the Department of Physiology and Biochemistry, J.L.N. Medical College and Hospital, Ajmer in a Group of 100 subjects with 50 healthy and 50 obese subjects BMI>30 of age group between 20 to 50 year.

Result: Result was showing as the BMI increases prevalence of raised blood glucose and dyslipidemia increased. Prevalence of raised blood glucose,raised total cholesterol, triglyceride,LDL,VLDL level in following order 32%,40%,42%,44%,28% and decreased HDL level was found in 54% subjects,most prevalent dyslipidemia was decreased HDL level.

Conclusion: This study also concludes that obesity increases the risk of hypothyroidism, which was more common in females than males. The low percentage of subjects with normal and controlled parameters suggests that there is a need for awareness programs and lifestyle interventions for the prevention and control of Obesity.

Key words: Blood glucose, dyslipidemia, obesity, thyroid stimulating hormone

Introduction:

Obesity is a medical condition in which excess body fat has accumulated to the extent that it may have an adverse effect on health, leading to reduced life expectancy and increased health problems.

WHO defines overweight and obesity based on the body mass index with BMI >25 denoting “overweight” and BMI>30 denoting obesity (H. Stichel et al. 2000).

Material and method:

The present study had been conducted in the Department of Physiology and Biochemistry, J.L.N. Medical College and Hospital, Ajmer in a Group of 100 subjects with 50 healthy (BMI between 20 to 25 in men; 19 and 24 in women) and 50 obese subjects BMI>30 of age group between 20 to 50 years. A detailed history followed by thorough general physical and systemic examination was done including anthropometry examination (height, weight)
for obesity along with following routine and special investigations.

**Investigations:**

A. **Routine Investigations:**

- Hb – gm/dl by Sahli’s Method
- TLC (Thousand / mm³) by using Turks Fluid and Neubauers Chamber
- DLC by using Leishmann’s Stain
- ESR (mm in 1hr) by Westergreen’s method
- PBF by Leishman’s method
- Blood Glucose (Fasting and PP) by enzymatic GOD – POD End point method

B. **Special Investigations:**

a. Serum Lipid Profile:
   - Total cholesterol by enzymatic CHOD – PAP, End point method
   - Triglyceride – by enzymatic GPO – PAP, End point method
   - HDL Cholesterol – by Phosphotungstic acid end point method
   - LDL Cholesterol – Calculated from the Friedewald’s formula
   - VLDL Cholesterol – Calculated from the Friedewald’s formula

b. Thyroid Function Test:
   - Serum T3, T4, TSH by Radioimmunoassay

c. Evaluation of obesity:
   - Body mass index (Quetelet’s Index) = weight (Kg)/(Height/m)²

**Result:**

In the present study total 100 subjects with 50 healthy (BMI between 20 to 25 in men and 19 and 24 in women) and 50 obese subject with BMI >30, age group between 20 to 50 years of either sex.

<table>
<thead>
<tr>
<th>Age Group (Years)</th>
<th>Group I Control (Normal)</th>
<th>Group II Obese Subjects</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Male</td>
<td>Female</td>
<td>Male</td>
</tr>
<tr>
<td>21 – 30</td>
<td>8 (8%)</td>
<td>10 (10%)</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>31 – 40</td>
<td>12 (12%)</td>
<td>9 (9%)</td>
<td>3 (3%)</td>
</tr>
<tr>
<td>41 – 50</td>
<td>5 (5%)</td>
<td>6 (6%)</td>
<td>5 (5%)</td>
</tr>
<tr>
<td>Total</td>
<td>25</td>
<td>25</td>
<td>11</td>
</tr>
</tbody>
</table>

On comparing individuals with control and obese subject the mean blood glucose fasting and postprandial in obese subjects were 100.34±16.96 and 130.00±35.37 as compared to control were 85.62±6.56 and 105.41±7.774 mg/dl., On comparing individuals with control and obese subject to lipid profile, mean total cholesterol, mean triglyceride, HDL cholesterol, LDL cholesterol, VLDL cholesterol levels in obese subjects were in following order 197.38±45.76 ,174.355±69.43, 36.56±10.59 ,135.43±34.167 ,33.716±14.46 and in normal subjects were 154.87±22.42 mg/dl, 114.25±20.73,52.42±14.99,87.94±19.45,23.38±3.34. In the present study, the mean TSH levels in control group were1.954±1.325 µIU/ml as compared to mean TSH levels of in the obese subjects were 7.411±16.16 µIU/ml the results are significant.
TABLE 2 Showing comparison in blood glucose level, lipid profile, thyroid function in 100 individual, 50 individuals of control and 50 individuals of obese subjects

<table>
<thead>
<tr>
<th>Parameter Blood Glucose (mg/dl)</th>
<th>Control (n=50)</th>
<th>Obese (n=50)</th>
<th>t</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean±S.D. (mg/dl)</td>
<td>Mean±S.D. (mg/dl)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fasting</td>
<td>85.62±6.56</td>
<td>100.34±16.96</td>
<td>1.997</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Postprandial</td>
<td>105.41±7.774</td>
<td>130.008±35.37</td>
<td>2.0048</td>
<td>&lt;0.001</td>
</tr>
</tbody>
</table>

LIPID PROFILE

| Total cholesterol               | 154.87±22.42     | 197.38±45.76 | 1.984| <0.001  |
| Triacylglycerol                 | 114.25±20.73     | 174.355±69.43| 1.984| <0.001  |
| HDL                             | 52.42±14.99      | 36.56±10.59  | 3.84 | <0.05   |
| LDL                             | 87.94±19.45      | 135.43±34.167| 1.985| <0.001  |
| VLDL                            | 23.38±3.94       | 33.716±14.46 | 2.0032| <0.01   |

TSH (µIU/ml)                     | 1.95±1.325       | 7.411±16.16  | 1.984| <0.05   |

Prevalence of raised blood glucose, raised total cholesterol, triglyceride, LDL, VLDL level in following order 32%, 40%, 42%, 44%, 28% and decreased HDL level was found in 54% subjects, most prevalent dyslipidemia was decreased HDL level.

TABLE 3 showing prevalence of blood glucose, lipid profile, thyroid function in obese subjects

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Obese Subjects(50)</th>
<th>Mean±S.D</th>
<th>Percentage</th>
<th>t</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blood Glucose Level(mg/dl)</td>
<td>Normal  34 Raised   16</td>
<td>111.82±10.65 164.84±44.64</td>
<td>32%</td>
<td>2.13145</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Lipid profile(mg/dl)</td>
<td>Normal  30 Raised   20</td>
<td>168.25±14.77 254.27±43.32</td>
<td>40%</td>
<td>2.11992</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Triglyceride</td>
<td>Normal  29 Raised   21</td>
<td>133.01±20.06 256.63±57.84</td>
<td>42%</td>
<td>2.09</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>HDL</td>
<td>Normal  23 Raised   27</td>
<td>47.77±7.95  26.117±3.85</td>
<td>54%</td>
<td>2.0141</td>
<td>&lt;0.05</td>
</tr>
<tr>
<td>LDL</td>
<td>Normal  28 Raised   22</td>
<td>90.176±17.50 158.64±30.54</td>
<td>44%</td>
<td>2.0482</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>VLDL</td>
<td>Normal  36 Raised   14</td>
<td>25.80±4.32  53.1±15.28</td>
<td>28%</td>
<td>2.144</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>TSH(µIU/ml)</td>
<td>Normal  40 Raised   10</td>
<td>2.85±1.023  25.08±29.76</td>
<td>20%</td>
<td>2.228</td>
<td>&lt;0.05</td>
</tr>
</tbody>
</table>
Discussion

On comparing individuals with control and obese subject the mean blood glucose fasting and postprandial in obese subjects were 100.34±16.96 and 130.008±35.37 as compared to control were 85.62±6.56 and 105.41±7.774 mg/dl.

These finding were in agreement with other studies by (Nielseen et al. 2000), (Okosun et al. 2001) and (Perry et al. 2002) and . On comparing individuals with control and obese subject to lipid profile, mean total cholesterol, mean triglyceride, HDL cholesterol, LDL cholesterol, VLDL cholesterol levels in obese subjects were in following order 197.38±45.76,174.355±69.43, 36.56±10.59, 135.43±34.167, 33.716±14.46 and in normal subjects were 154.87±22.42 mg/dl, 114.25±20.73, 32.42±14.99, 87.94±19.45, 52.38±3.34. Results were statistically significant. These finding were in agreement with other studies by (Huges et al. 1990), (Philip et al. 1991), (McKeigue et al. 1992), (Madhuri et al. 1996), (Sageer et al. 2002), (Celeste et al. 2003), (Nagila et al. 2008), (Maher Abdel et al. 2011), Thyroid hormone profile was found to be normal in 80% of the obese subjects. In these subjects the mean value for TSH was 2.85±1.023 µIU/ml. Only 20% obese subjects had thyroid hormone profile suggestive of hypothyroidism. In these patients mean value was 25.08±29.76 µIU/ml. Out of 50 obese subjects, 40 patients were euthyroid 10 patients were hypothyroidism.

Our results are consistent with the previous cross-sectional study conducted. These finding were in agreement with other studies by (Sudhir Mehta et al. 1996), (Yoshida et al. 1998), (H. Stichel et al. 2000), (Taglia Ferri M. et al. 2001), (Lacobellis et al. 2005), (Marzullo et al. 2010), (Kiran Chugh et al. 2012).

Conclusion:

Prevalence of raised blood glucose level, total cholesterol, triglyceride, LDL, VLDL level in following order 40%, 42%, 44%, 28% and decreased HDL level was found 54% subjects, most prevalent dyslipidemia was decreased HDL level. This study also concludes that obesity increases the risk of hypothyroidism. In this study 20% individuals were hypothyroidism and 80% were euthyroid. Further studies on larger group of individuals should be conducted.

References:

7. Kiran Chugh, Sandeep Goyal, Vijay Shankar, Shanti N Chugh: Thyroid function tests in metabolic