Evaluation of Serum Lipid Profile in Pre and Post-Menopausal Women suffering from Type 2 Diabetes

Iohborlang Rymbai¹, Laishram Cindy², Vijita Ningombam³, Ningombam Sashikanta Singh⁴, Bishu Debbame⁵, M Anita Devi⁶.

INTRODUCTION

The physiological changes during menopause include changes in metabolism of glucose and insulin, body fat distribution, coagulation, fibrinolysis, and vascular endothelial dysfunction. However, several other changes which develop during menopause may also influence the risk of cardiovascular disease such as increased obesity or android pattern of body fat distribution, decreasing resting metabolic rate and physical activity [1]. With age, women become more likely to develop type 2 Diabetes Mellitus (DM): approximately 12.5% of women have a known type 2 DM at the age of 50–59 years. Moreover, type 2 DM remains undiagnosed in more than one-third of these women [2]. Lipid abnormalities are commonly found in both Type2 DM patients and post-menopausal women. Though, the pathophysiology of lipid abnormalities in type 2 DM is not yet totally explained, insulin resistance is mainly involved in the process. Abnormalities in lipid profile of patients with diabetes are likely to play an important role in the development of atherosclerosis. Currently post-menopausal women account for more than 30% of the female population at risk for Coronary Arterial Disease (CAD) in India [3]. Hence, this study was taken up to evaluate the serum lipid profile in pre and post-menopausal women suffering from type 2 DM.

MATERIALS AND METHODS

This is a cross sectional study, conducted between October, 2015 and April, 2016 in Imphal, Manipur, India, after getting approval from the Institutional Ethics committee, Regional Institute of Medical Sciences(RIMS), Imphal. A total of 80 known type 2 diabetic women (40 pre-menopausal and 40 post-menopausal women) were included in the study.

Serum Total Cholesterol (TC) was determined by enzymatic (CHOD-PAP) calorimetric method, Triglycerides (TG) by enzymatic (GPO-PAP) method, HDL-C by precipitant method and LDL –C by Friedewald formula: LDL-C = TC − (HDL-C + TG/5) and VLDL= TG/5. This study showed that Serum TG, VLDL-C increased significantly in post-menopausal diabetic women when compared with pre-menopausal diabetic women (P<0.05). TC and LDL-C level was also found to increase in post-menopausal women but not statistically significant. HDL-C was found to decrease significantly in post-menopausal women when compared with pre-menopausal women (P < 0.05). Therefore, the study has shown that dyslipidaemia in post-menopausal diabetic women had higher prevalence of high TG, TC, LDL-C and VLDL-C than the pre-menopausal women, indicating that they were more prone to cardiovascular diseases. Increased TG, reduced HDL-C, and increased VLDL-C levels were the lipid abnormalities found in post-menopausal diabetic women. Early detection and modification of specific factor may improve women's health.
obtained after explaining thoroughly the purpose of the study. Detailed history of the subjects was taken and anthropometric measurements were recorded. Weight was recorded to the nearest kg. Height was measured in cm. BMI was calculated by using formula \( \frac{\text{wt in kg}}{\text{ht in m}^2} \).

**Exclusion criteria**

i) Pregnant women.

ii) Patients on drugs for abnormal lipids.

iii) Patients with history of hysterectomy, oophorectomy, and those on hormone therapy.

iv) Patients with any concurrent illness like chronic liver disease, hypothyroidism, coronary heart disease or any other metabolic disorders.

**Samples and investigation**

After an overnight fasting of 12-14 hrs, 3ml of venous blood was drawn under aseptic precaution in a sterile plain vial from selected subjects. Serum was then separated by centrifuging the blood sample at 3000 rpm for 15 min. The serum obtained was pipetted and analyzed for lipid profiles using commercially available reagent kit on Digital photoelectric Colorimeter. Serum total cholesterol (TC) was determined by enzymatic (CHOD-PAP) calorimetric methods [4]. Triglycerides (TG) by enzymatic (GPO-PAP) method [5]. HDL-C was estimated using precipitant method [6] and LDL-C by Friedewald formula [7]: \( \text{LDL-C} = \text{TC} - (\text{HDL-C} + \text{TG}/5) \). VLDL-C was then calculated using the formula: \( \text{VLDL-C} = \text{TG}/5 \).

**Data analysis**

All values were expressed as mean + Standard Deviation. Comparison of mean was done by independent samples t-test. The statistical analysis was performed using SPSS 21 version computer software for windows. Statistical significance was considered at \( P < 0.05 \).

**RESULTS**

1. The mean age and the BMI of pre-menopausal diabetic women were 41.55±2.87 years and 24.67±2.05kg/m\(^2\) respectively and the mean age, BMI of the post-menopausal diabetic women were 62.35±6.66 years and 24.87±2.13kg/m\(^2\) respectively (Table 1).

2. The mean waist circumference of pre-menopausal diabetic women was 87.85+7.45cms and post-menopausal diabetic women were 91.28+7.45cms.

3. Serum TG, VLDL-C were found to increase in post-menopausal diabetic women when compared with pre-menopausal diabetic women which were statistically significant (\( P<0.05 \)).

4. Serum HDL-C was found to decrease significantly in post-menopausal women (Table 2).

<table>
<thead>
<tr>
<th>Table 1: Age and anthropometric characteristic of the study population</th>
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<tbody>
<tr>
<td><strong>Pre menopausal</strong> Mean ± SD</td>
</tr>
<tr>
<td>Age</td>
</tr>
<tr>
<td>Weight in kg</td>
</tr>
<tr>
<td>Height in cm</td>
</tr>
<tr>
<td>BMI in kg/m(^2)</td>
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<tr>
<td>Waist circumference in cm</td>
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</tbody>
</table>

Table 2: Blood sugar level and lipid profile of patients in the study population.

<table>
<thead>
<tr>
<th></th>
<th><strong>Pre menopausal</strong> Mean ± SD</th>
<th><strong>Post menopausal</strong> Mean ± SD</th>
<th><strong>P value</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>FBS</td>
<td>115.2±37.1</td>
<td>123.6±27.64</td>
<td>.004</td>
</tr>
<tr>
<td>PPBS</td>
<td>291.3±49.61</td>
<td>247.9±42.57</td>
<td>.587</td>
</tr>
<tr>
<td>Triglycerides</td>
<td>164.35±50.22</td>
<td>169.15±68.37</td>
<td>.030</td>
</tr>
<tr>
<td>Total Cholesterol</td>
<td>194.25±41.63</td>
<td>211.00±60.67</td>
<td>.075</td>
</tr>
<tr>
<td>HDL Cholesterol</td>
<td>37.6±5.23</td>
<td>36.0±6.9</td>
<td>.628</td>
</tr>
<tr>
<td>LDL Cholesterol</td>
<td>129.04±24.07</td>
<td>137.48±24.48</td>
<td>.117</td>
</tr>
<tr>
<td>VLDL Cholesterol</td>
<td>32.87±10.64</td>
<td>33.83±13.67</td>
<td>.038</td>
</tr>
</tbody>
</table>

*P value is significant

a) Serum TG, VLDL-C was found to increase significantly in post-menopausal diabetic women when compared with pre-menopausal women (\( P<0.05 \)).

b) TC, LDL-C level were found to increase in post-menopausal diabetic women when compared with pre-menopausal but not statistically significant.

c) HDL-C was found significantly decrease in post-menopausal.

d) The blood sugar level both FBS and PPBS was also found to increase in case of pre-menopausal women when compared with that of post-menopausal diabetic women.

Fig 1: Comparative status of blood glucose level and serum lipid profile (mg/dl) in pre and post-menopausal diabetic women.

a. Out of 80 patients, 50% (40) had TG> 150mg/dl, 51.25% (41) had TC> 200mg/dl and 68.75% (55) had LDL>100mg/dl
DISCUSSION

Filipa Mascarenhas-Melo et al [8] reported that TG increased significantly in post-menopausal diabetic women when compared to pre-menopausal diabetic women (P<0.05). The finding of present study is in accordance with their finding. The increased TG level in the post-menopausal women is probably due to, insulin resistance in DM, increase hepatic synthesis of triglyceride (TG) rich lipoproteins, and a faster clearance of high-density lipoproteins cholesterol (HDLC). Hypertriglyceridaemia can lead to the development of atherosclerosis by a number of mechanisms, resulting to change in HDLmetabolism [7].

In this study, there was significantly decrease HDL-C level in post-menopausal (P<0.05). The findings of Vishalika Mahajan et al [9] are similar with the findings of the present study. The decrease HDL-C in post-menopausal women may be mainly due to the insulin resistance state and the duration of diabetes in post-menopausal women resulting as a high risk factor of Coronary Heart Disease and premature atherosclerosis [10] independent of serum LDL-C and triglyceride level.

In the study, increased VLDL was statistically significant in post-menopausal diabetic women (P < 0.05), and this finding was in accordance with Swapnali et al [11]. Insulin resistance leads to increased assembly and secretion of VLDL, and the resulting hypertriglyceridermia leads to lower HDL-cholesterol levels and smaller, cholesterol ester (CE) depleted LDL. The basis for the interaction between insulin resistance and VLDL secretion is the complex post-translational regulation of apo B. These small VLDL particles are highly atherogenic as they contain more CE molecules per particle [12]. The VLDL remnants have a high capacity for interacting with arterial smooth muscle cells and all these have significant contribution for development of atherosclerosis.

CONCLUSION:

This study has shown that dyslipidemia in post-menopausal diabetic women had higher prevalence of high TG, TC, LDL-C and VLDL-C than the pre-menopausal women, indicating that they were more prone to cardiovascular diseases. Elevated plasma TG, reduced HDL-C, and elevated VLDL-C levels were the lipid abnormalities found in post-menopausal diabetic women. Early detection and modification of specific factor may improve women’s health.

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