Original Research

Correlation of menopausal status with fasting blood glucose in preobese & obese women in the age group 45 - 49 yrs.

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Abstract

Background:- The association between type 2 Diabetes Mellitus and Obesity is very close. Obesity is common in women aged between 45-49 yrs. Prevalence of prediabetes i.e Impaired Fasting Glucose also seems to be higher in women than men in the Indian population. The present work is planned to study the prediabetic status in preobese and obese in pre & post menopausal women with the help of estimation of Fasting Blood Glucose (FBG) levels

Objectives:- To study correlation of menopausal status with fasting blood glucose levels of the Normal weight, Obese & Preobese women to assess the Prediabetic status.

Materials & Method:-Fasting Fasting Blood Glucose levels and BMI were estimated in 300 asymptomatic women with no family history of Type 2 Diabetes Mellitus.(D.M.) .Pre & Post menopausal subjects are divided in Control (I),Preobese (IIa) & Obese group (IIb).The results is analyzed statistically by ANOVA test.

Result & Conclusion:- Mean FBG levels in preobese and obese group are higher than control group in both pre & post menopausal women . There is significant difference between BMI & Fasting Blood glucose levels in Pre & post menopausal women. In nutshell obesity with & without menopause both act as a important predictor for type 2 D.M. Thus in premenopausal women lifestyle modifications may prove as important means for prevention of obesity & type 2 D.M to reduce the complication in post menopausal status.

Introduction:

More than 220 million people worldwide have diabetes. In 2004, an estimated 3.4 million people died from consequences of high blood sugar. More than 80% of diabetes deaths occur in low- and middle-income countries. WHO projects that diabetes deaths will double between 2005 and 2030.¹
The incidence of Diabetes Mellitus increases with age. So, American Diabetes Association (ADA) recommends screening of all individuals more than 45 yrs, every 3 years as early detection of the disease which may help to improve its outcome.² Expert Committee of American Diabetes Association continues to recommend the Fasting Blood Glucose as the preferred diagnostic tool because it is more convenient, less expensive and still more reliable.

Obesity may be considered as dynamic process of accumulating and ‘filling’ of fat cells, resulting in an additional tax on essential organs such as the heart, liver, and kidneys. This process of ‘supporting and carting’ of weight for many years apparently takes its toll on the vascular system and when the crude relative risks of obesity for each disease condition are calculated, diabetes mellitus is found to be the highest ³. It is also projected that in India out of 41 million diabetic people, 20 millions are obese.⁴

The connection between obesity and type 2 D.M is so strong that attempting to treat diabetes properly without managing any coexisting obesity is almost futile. The association between these conditions is so close that many experts consider obesity and type 2 D.M to be different ends of the same spectrum therefore together called as ‘diabesity’.⁵ For this reason obesity can be viewed as a prediabetic condition. There is growing evidence of prediabetes or Impaired Fasting Glucose (IFG) which is defined as fasting plasma glucose level between 100-125 mg/dl ⁶ that reflects an intermediate condition between normality and diabetes.

Obesity is more common among women than men especially in the age group of 45 – 49 years i.e at perimenopausal age ⁷ Prevalence of IFG also seems to be higher in women than men in the Indian population.⁸

The present work is planned to study the prediabetic status in pre & post menopausal women with the help of estimation of Fasting Blood Glucose (FBG) levels where early lifestyle modifications are possible & can prevent more weight gain in postmenopausal stage which worsen the condition furthermore.

**Materials and Methods**

The study was a cross sectional study. It was conducted in Private dispensaries & Department of Physiology & Biochemistry of Bharati Vidyapeeth University Medical College Pune 43. We first catch the subject visiting at private dispensaries for acute symptoms without any chronic disease then follow up was taken with their consent & we asked them to tell this project to their relative and friends of the said age group & sex, took their information with address and visited them for further procedure. The study Period is Feb.2008- Jan 2010. The research protocol was approved by local ethical committee and informed written consent was obtained from each subject prior to inclusion in the study.
194 women volunteers aged between 45-49 with no changes in frequency of their menses with intact uterus and at least one ovary and were not currently taking oral contraceptives or hormone therapy recruited as premenopausal in the study. 106 women volunteers recruited as natural postmenopausal as a 12-month long amenorrhea.\(^9\)

Volunteers suffering from any chronic aliment, volunteers with family history of Diabetes Mellitus and having Diabetes Mellitus, history of taking any kind of long term medication were excluded from the study. The purpose of the study was explained to all the volunteers. Detailed medical history & thorough physical examination was performed on all volunteers.

The anthropometric measurements of the women were carried out using standard instrument. Body height was measured to the nearest 0.1 cm with subjects in the erect position without shoes; body weight, measured to the nearest 0.1 kg with subjects wearing indoor clothes but no shoes; body mass index (BMI), calculated as weight (kg)\(\div\)height (m\(^2\)).\(^{10}\) The subjects are divided in Normal weight (Control group), Preobese & Obese group (Study group) using following classification. (Table 1)

Fasting Plasma Glucose levels were estimated in 300 asymptomatic middle aged women for that participants were asked to take regular meal before 10 PM on the previous night to ensure the 8-10 hrs fasting period. The fasting blood sample of 2 ml was drawn with appropriate aseptic precautions early morning between 7 – 8 am after a minimum of 8-10 hrs fasting. For transportation, blood sample is collected in a fluoride bulb. Plasma was separated by centrifugation and fasting plasma glucose was estimated by Glucose Oxidase Peroxidase (GOD/POD) method using Han’s 0392 filter Colorimeter for estimation of blood glucose levels in Biochemistry Laboratory of Dept. of Biochemistry.

**Table 1: Classification of Obesity on the basis of BMI\(^{12}\)**

<table>
<thead>
<tr>
<th>BMI (Kg / m(^2))</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.50 – 24.99</td>
<td>Normal weight</td>
</tr>
<tr>
<td>25.00 – 29.99</td>
<td>Pre obese</td>
</tr>
<tr>
<td>≥ 30.00</td>
<td>Obese</td>
</tr>
</tbody>
</table>

**Analysis of data:** The results were analyzed statistically by using ANOVA test.
Observations & Results

Table 2: Association between menopause and BMI in study group

<table>
<thead>
<tr>
<th>Menopause</th>
<th>BMI</th>
<th>Total (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Preobese</td>
</tr>
<tr>
<td>Pre</td>
<td>73</td>
<td>67</td>
</tr>
<tr>
<td>Post</td>
<td>27</td>
<td>33</td>
</tr>
<tr>
<td>Total</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

\( \chi^2 = 8.26, \ P<0.05 \)

There is significant association between Menopause & BMI

Table 3: Comparison of FBG and BMI in pre menopausal group

<table>
<thead>
<tr>
<th>Parameter</th>
<th>BMI</th>
<th>F Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Preobese</td>
<td>Obese</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD (n=73)</td>
<td>Mean ± SD (n=67)</td>
<td>Mean ± SD (n=54)</td>
</tr>
<tr>
<td>FBG</td>
<td>80.99 ± 6.17</td>
<td>84.21 ± 8.41</td>
<td>85.18 ± 9.13</td>
</tr>
</tbody>
</table>

Pre menopausal women shows significant difference of FBG in all three groups

Table 4: Comparison of FBG and BMI in post menopausal group

<table>
<thead>
<tr>
<th>Parameter</th>
<th>BMI</th>
<th>F Value</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Control</td>
<td>Preobese</td>
<td>Obese</td>
</tr>
<tr>
<td></td>
<td>Mean ± SD (n=27)</td>
<td>Mean ± SD (n=33)</td>
<td>Mean ± SD (n=46)</td>
</tr>
<tr>
<td>FBG</td>
<td>81.48 ± 6.86</td>
<td>84.48 ± 8.93</td>
<td>87.87 ± 9.86</td>
</tr>
</tbody>
</table>

Post menopausal women shows significant difference in FBG in all three groups

Discussion

In a nutshell we found that there is significant increase in Fasting blood glucose in preobese & obese group compared to control group. Similar finding have found in various studies. As age range is small we may not get significant difference in particular age. (Table 2)

Correlation between type 2 D.M & obesity was done by many researchers by using parameters of obesity like BMI. According to the Diabetes Epidemiology Collaborative Analysis of Diagnostic Criteria in Asia (DECODA) Study Group, the prevalence of Impaired Fasting Glucose (IFG) seemed to be higher in women than men in Indian population. Therefore obesity and previously identified IFG both are considered as independent risk factors for development of type 2 D.M.

Obesity is a morbid phenotype of excess body fat resulting from an excess energy balance in the form of fat accumulation. BMI indicates general obesity. It is certain that obesity is a important risk factor in the etiology of type 2 DM & central obesity.
also plays a key role in its development. Insulin resistance is a characteristic feature of type 2 D.M. & central obesity plays a key role in its development. Fat depots are viewed as endocrine tissues that secrete various chemicals collectively known as adipokines i.e. leptin, resistin, tumor necrotic factor α, adiponectin, ghrelin, angiotensinogen, plasminogen activator inhibitor & many others. It was found that alteration in the levels of most of these chemicals levels is responsible for development Insulin resistance 14,15

Experimental evidence supports the above observations; when glucose transporters are selectively knocked out in adipose tissue of animals, glucose transport in muscle in vitro is normal but when those animals are tested in vivo, there is an associated decrease in glucose transport in muscle. 16 This is probably due to release of chemical signals from the adipose tissue which act on the glucose transporters in the muscle. This means that fat depots are not inert lumps but are actually endocrine tissues that secrete various chemicals which modulate insulin secretion and insulin action which may contribute to insulin resistance.

Obesity, both general and abdominal play an important role in the development of type 2 D.M. in men and women. 17,18 BMI displayed the greater relative risk in women; especially in premenopausal women.

In this age group i.e. in mid-life period in women are associated with weight gain due to one of the important reason i.e menopause transition which is non-modifiable. Obesity is commonly associated with menopause Some studies 19, 20, 21 tried to render an explanation for weight gain after menopause. They reported that natural menopause was associated with reduced energy expenditure, during rest as well as during physical activity and this was responsible for obesity. Estrogen deficiency resulted in accelerated loss of fat-free mass with increased central adiposity leading to obesity 22, 23

But now a days due to urbanization & industrialization there is a dramatic change in lifestyle, consisting of physical inactivity, diet rich in fat, sugar and salt coupled with a high level of mental stress weight gain and lifestyle diseases associated with it which can be prevented due to lifestyle modifications such as diet and exercise. Our study group includes both premenopausal women not postmenopausal women with no change in menopause cycles so no disturbance of endocrine changes were present

It is observed that age-related insulin secretory dysfunction may have a role in the alterations in glucose metabolism. 24 Age may be accepted as factor of small magnitude in increasing the Blood Glucose Level as this effect of age is nullified in the present study by including all age matched groups.

In Type 2 D.M with obesity, a low energy, low carbohydrate diet by itself effective in controlling the disease in most of the patients. Reduction in amount of body fat increases the sensitivity to endogenous insulin, diminishes the need for excessive secretion of insulin by beta cells and prevents beta cell exhaustion. 25
It is very important to note that people with impaired fasting glucose can change their life style to stare off to delay the onset of diabetes. Weight control would be the most effective way to reduce the risk of Type 2 D.M. Unfortunately obesity is difficult to treat & requires a high order of motivation on patient’s part.

Thus weight gain and increased BMI correlates well and supports our study of higher percentage of IFG incidence with increased BMI. General public does not recognize the connection between overweight or obesity with diabetes so greater efforts for educating the obese and preobese are needed. Effective interventions in the prevention of IFG are to be encouraged, particularly avoiding the increase in body weight that generally occurs in the mid-life years. Thus in premenopausal women lifestyle modifications may prove as important means for prevention of obesity & type 2 D.M to reduce the complications in post menopausal status.

References:
11. Graham A. Colditz; Walter C. Willett; Andrea Rotnitzky; and JoAnn E. Manson. Weight Gain as a Risk Factor for Clinical Diabetes Mellitus in Women. Annals of Internal Medicine, 1995; Vol.122 (7):481-486.


