ORIGINAL RESEARCH PAPER

Volume-7 | Issue-3 | March-2018 | PRINT ISSN No 2277 - 8179

INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

IMPACT OF BODY MASS INDEX ON FASTING BLOOD GLUCOSE IN POSTMENOPAUSAL WOMEN

PHYSIOLOGY

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ABSTRACT

Objectives: To assess the relationship of body mass index with fasting blood glucose in postmenopausal women.
Methods: The study was conducted on 100 postmenopausal women in the age group of 45-55 years. Subjects were divided into 3 subgroups normal, overweight and obese on the basis of BMI.
Body weight and height was taken and BMI was calculated using Quetlet index. Blood samples were taken in the early morning after a minimum 8 hours of fasting and were investigated for fasting blood glucose. Data obtained was compiled and statistical analysis was done. All parameters were reported as mean and standard deviation. The statistical differences in mean values were tested using Levene' test for equality of variances followed by t-test for equality of means. ANOVA was used to do comparison with in the subgroups. Pearson correlation was used to calculate the correlation between various variables. A p-value <0.05 was considered statistically significant and p-value >0.05 was considered non-significant.
Conclusion: A highly significant correlation was seen between fasting blood glucose and BMI in normal, overweight as well as obese postmenopausal women.

KEYWORDS

Body Mass Index, Postmenopausal, Fasting blood glucose.

INTRODUCTION

Correlation of BMI with blood glucose in women is an important aspect for viewing the impact of changing hormonal levels on the advancing age of women, as menopause sets in. Menopause, a normal biological event marked for most women by the end of menstrual period, signifies the depletion of functional ovarian follicles, that are responsible for estradiol production[1]. Menopause is the permanent cessation of menstruation resulting from the loss of ovarian follicular activity. It is heralded by the menopausal transition, a period when the endocrine, biological and clinical features of approaching menopause begin. A common initial marker is the onset of menstrual irregularity. The biology underlying the transition to menopause includes central neuroendocrine changes as well as changes with in the ovary, the most striking of which is a profound decline in follicle no.'s [2]

Menopause is associated with energy expenditure during rest and physical activity, an accelerated loss of fat-free mass and alteration of adipose tissue metabolism and fat oxidation. This deregulation of energy metabolism could induce an increase in total adiposity and redistribution of fat in the abdominal region in postmenopausal women[3,4].

As BMI and central obesity pose a risk for diabetes mellitus, assessment of correlation of BMI with blood glucose and postmenopausal women is essential as obesity is the most common disorder associated with women in their menopausal stage and occurs in approximately 65% of women[5].

Obesity is associated with risk of hypertension, atherosclerosis, dyslipidemia, cancer, osteoarthritis and respiratory problems[6,7,8].

So, the present study is planned to assess the effects of increase in bodyweight on fasting blood glucose in women who have attained menopause. It can help the women of advancing age to pay heed to the modifiable risk factors so that overall morbidity due to diabetes can be decreased in these women.

MATERIAL AND METHODS:

SELECTION PROCEDURE OF THE SUBJECTS:

Subjects were selected from different outpatient departments of Government Medical College, Jammu. Subjects included healthy postmenopausal women in the age group of 45 to 55 years. All those women with H/0 diabetes mellitus, hypertension, neurological disorders, any other illness known to affect fasting blood glucose, were excluded from the study, as were smokers and alcoholics. For body mass index, body weight was measured in kilograms, on a weighing scale[9]. Height in meter was also measured. Body mass index was calculated using Quetelet's Index[10].

SPECIMEN COLLECTION AND HANDLING FOR ESTIMATION OF BLOOD GLUCOSE: A fasting blood sample of 2 ml was drawn with appropriate aseptic precautions in the early morning after a minimum of 8 hours fasting. The glucose method is an adaption of the hexokinase-glucose-6-phosphate dehydogenase method.

Subjects were further divided into 3 subgroups namely normal, overweight and obese.

STATISTICAL ANALYSIS:

The statistical differences in mean values were tested using Levene's test for equality of variances followed by t-test for equality of means. ANOVA was used to do comparison with in the subgroups. Pearson correlation was used to calculate correlation between various variables.

RESULTS:

POSTMENOPAUSAL WOMEN

Table1 shows mean BMI of subgroups of postmenopausal women. The BMI range in normal weight females is 18.9 to 24.03 Kg/m^2, with a mean of 21.97 (SD ± 1.12) Kg/m^2. Overweight females have BMI range of 25.14 to 29.74 Kg/m^2,with a mean of 27.61 (SD ± 1.42) Kg/m^2. Obese females have BMI range of 30.04 to 37.78 Kg/m^2,with a mean of 32.55 (SD ± 2.41) Kg/m^2.

Table 2 shows fasting blood glucose range in normal weight females is 70-130mg/dl ,with a mean of 94.64 (SD+ 13.7)mg/dl .Overweight females have fasting blood glucose range of 86 to 121 mg/dl, with a mean of 97.38 (SD +9.98)mg/dl .Obese females have fasting blood glucose range of 72 to 150 mg/dl ,with a mean of 108.75 (SD+18.74)mg/dl. There is a positive correlation in all 3 subgroups and p- value is highly significant in all the 3 subgroups.

Table 3 shows post menopausal women show significant difference of fasting blood glucose (FBG) in all three subgroups and p-value is highly significant. There is increase in blood glucose in correspondence with increase in BMI in postmenopausal women.

Table 1 Mean BMI in subgroups of postmenopausal women

BMI (Kg/m^2)	Classification	Postmenopausal (no.) Group II	Mean BMI ± SD (Range) (in Kg/m^2)
18.50 – 24.99	Normal weight	37	21.97 ± 1.12 (18.9 – 24.03)
25.00 – 29.99	Overweight	34	27.61 ± 1.42 (25.14 – 29.74)
≥ 30.00	Obese	29	32.55 ± 2.41 (30.04 – 37.78)

Table 2 Correlation of BMI with fasting blood glucose (FBG) in postmenopausal women

BMI (Kg / m^2)	Classification	Postmenopausal Women (no.) Group II	Mean fasting Blood glucose ± SD (Range) (in mg/dl)	Pearson correlation with p value
18.50 24.99	Normal weight	37	99.64+13.7 (70-130)	0.432 P=0.008 Highly significant
25.00 29.99	Overweight	34	97.38+9.98 (86-121)	0.818 P=0.000 Highly significant
> 30.00	Obese	29	108.75+18.74 (72—150)	0.866 p =0.00 Highly significant

Table 3 Comparison of fasting blood glucose (FBG) and BMI in postmenopausal

Parameter	BMI			F Value	p Value
	Normal weight	Overweight	Obese		
	Mean ± SD (n=37)	Mean ± SD (n=34)	Mean ± SD (n=29)		
FBG	94.64±13.70	97.38±9.98	108.75±18.74	8.532	0.000

DISCUSSION

The abrupt endocrine changes during menopausal transition have important impacts on the physiology of female body which exacerbates risks for many diseases and disabilities during postmenopausal life [11], mainly estrogen deficiency.

Postmenopausal status is associated with a 60% increased risk for metabolic syndrome. It is thought to be associated with decreased estrogens and increased abdominal obesity in postmenopausal women with metabolic syndrome [12].

Increase in BMI lead to increased levels of blood glucose, hypertension, dyslipidemia, metabolic syndrome.

Our study showed that BMI has high impact on the fasting blood glucose in postmenopausal women.

Need et al. (13) also observed in their study that fasting serum glucose was positively and significantly correlated with BMI. The findings support our observations that BMI as well as central obesity pose a risk factor for diabetes.

BMI was greater for women who had just undergone menopause [14].

Mean blood glucose level in the menopausal women increased slightly than that of the non-menopausal women[15].

Koskova et al. (16) observed in their study that fasting serum glucose increased with age, increasing slightly upto menopause and the postmenopausal group showed a significant increase with frequent pathological values. C- peptide increased slightly with age. Increase in insulin was evident upto menopause.

Increase in fasting glucose level is greater in postmenopausal women[17].

Many postmenopausal women gain weight, which leads to greater incidence of type 2 diabetes[18] .

Obesity is related to ectopic accumulation of lipids in the muscles ,liver and beta- pancreatic cells, leading to insulin resistance in the muscles and liver and impairment of beta- cells function. Free fatty acids are in competition with glucose for oxidation, suggesting that increased lipid oxidation worsens insulin resistance in obesity [19].

This study was also in agreement with the fact that menopause results in a decrease in both pancreatic insulin secretion and insulin elimination.

A larger percentage of type 2 diabetics have central obesity as compared to general obesity and both types of obesity was greater in females as was observed by Kamath et al.(20).

Assessment of body weight composition in postmenopausal women and determination of correlations with metabolic and hormonal parameters was done. The authors found that body mass index values positively correlated with age, time since menopause, parity and glucose, thereby displaying significant correlations with hormonal and metabolic parameters[21].

CONCLUSION:

We conclude that highly significant correlation was seen between fasting blood glucose and BMI in normal, overweight as well as obese postmenopausal women.

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