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Correlation of Fasting Plasma Glucose with Waist Circumference in Perimenopausal Women.

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ABSTRACT

The association between type 2 Diabetes Mellitus and Obesity is very close. Impaired Fasting Glucose (IFG) reflects an intermediate condition between normality and diabetes. Obesity is more common in middle aged women. Waist Circumference (WC) indicates both general as well as central obesity & both are prone for development of type 2 D.M. Early detection of obesity may delay or prevent the onset of type 2 D.M. The aim of this is to study the correlation of Fasting plasma Glucose (FPG) levels with WC in middle aged women that includes pre and post menopausal women. FPG levels and WC were estimated in 100 asymptomatic middle aged women with no family history of type 2 Diabetes Mellitus.(D.M.) in pre and postmenopausal women. The results were analyzed statistically using ANOVA test. In the entire subject population (n=100) difference in mean age and FPG levels are found statistically significant in postmenopausal groups but no statistically significant difference for WC was noted in pre and post menopausal women Mean values or age , FPG levels & WC were found higher in postmenopausal women . Obesity is present in both postmenopausal and premenopausal group and all value are higher in postmenopausal women so preventive measure should start at early to prevent the diabetes in both groups. WC should use as a important parameter for obesity which is simple, self monitored & easy to interpret for early diagnosis of obesity and prevention of obesity & diabetes.

Keywords: Fasting Plasma Glucose, Obesity, Waist Circumference.

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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 due to rapid epidemiological transition with increased urbanization and socio-economic development which has resulted in a dramatic change in lifestyle, consisting of physical inactivity, diet rich in fat, sugar and salt coupled with a high level of mental stress. WHO projects that diabetes deaths will double between 2005 and 2030 [1].

Diabetes mellitus (D.M) comprises of a group of common metabolic disorders & is characterized by a state of chronic hyperglycaemia due to defective production of insulin or increased resistance of body to its action [2].

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].

The connection between obesity and type 2 Diabetes Mellitus (D.M.) is so strong that attempting to treat diabetes properly without managing any coexisting obesity is almost futile so that many experts consider obesity and type 2 diabetes to be different ends of the same spectrum therefore together called as 'diabesity' [4]. For this reason obesity can be viewed as a prediabetic condition**.**

There is growing evidence of Impaired Fasting Glucose (IFG) or prediabetes which is defined as fasting plasma glucose level between 100-125 mg/dl that reflects an intermediate condition between normality and diabetes [5].

Obesity is more common among women than men especially in the age group of 45 – 49 years i.e at perimenopausal women [6]. Prevalence of IFG also seems to be higher in women than men in the Indian population [7]**.**

There are different parameters for measurement of obesity like Body Mass Index (BMI), Waist to Hip Ratio (WHR), WC etc. BMI indicates general obesity , WHR indicating central obesity & WC indicating general as well as central (abdominal) obesity [8].

Many epidemiologic studies have shown that both general as well as central obesity are powerful predictor of type 2 diabetes & only few studies have explored the correlation between WC with the risk of type 2 D.M.

Hence in this study, we have tried to ascertain if WC can be used as a risk predictor for type 2 D.M.

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 have taken the patients 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.

100 subjects were recruited in the study on the basis of inclusion and exclusion criteria. 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 measuring tape. A measurement of the waist circumference (in cms) was taken at the midpoint between the iliac crest and the lower border of the ribs after a normal expiration. A third measurement was taken if the difference of the two measurements was greater than the tolerance limit. The average of the two closest measurements was used in the current analysis. Waist circumference of < 80 cm was considered as normal [9].

Fasting Plasma Glucose levels were estimated in 100 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.

Women were classified as premenopausal if they reported changes in frequency of their menses & reported amenorrhea of at least 3, but less than 12 months, and naturally postmenopausal if there was amenorrhea for 12 or more consecutive months [10].

The results were analyzed statistically by using ANOVA test .

OBSERVATION AND RESULTS

Study shows statistically significant difference between age & Fasting Plasma Glucose of pre and postmenopausal women (Table 1&2). But no statistically significant difference between Waist circumference of pre and postmenopausal women was seen (Table 3). Mean values for age, FPG levels and WC were found higher in postmenopausal group than premenopausal group.

Table 1: Comparison of age in pre and postmenopausal groups

Parameters	Pre menopause	Post menopause	Z Value	P Value
	Mean ± SD (n=50)	Mean ± SD (n=50)		
Age (Yrs)	46.53 ± 1.41	47.28 ± 1.47	2.72	<0.01*

* statistically significant

Table shows statistically significant difference between age of pre and postmenopausal women

Table 2: Comparison of BSL fasting in pre and postmenopausal groups

Parameters	Pre menopause	Post menopause	Z Value	P Value
	Mean ± SD (n=50)	Mean ± SD (n=50)		
BSL- fasting	81.85 ± 9.67	85.88 ± 10.93	2.04	<0.05*

* statistically significant

Table shows statistically significant difference between Fasting Plasma Glucose of pre and postmenopausal women .

Table 3: Comparison of WC in pre and postmenopausal groups

Parameters	Pre menopause	Post menopause	Z Value	P Value
	Mean ± SD (n=50)	Mean ± SD (n=50)		
WC	82.55 ± 6.56	83.69 ± 9.20	0.73	>0.05**

** Not statistically significant

Table shows no statistically significant difference between Waist circumference of pre and postmenopausal women.

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DISCUSSION

In a nutshell all mean values for age, FPG levels and WC were found higher in postmenopausal group than premenopausal group. Many studies showed WC as a important predictor of obesity [11,12].

Obesity is a morbid phenotype of excess body fat resulting from an excess energy balance in the form of fat accumulation. 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. Fat depots are viewed as endocrine tissues that secrete various chemicals collectively known as adipokines i.e.leptin, resistin, and tumor necrotic factor α, adiponectin, ghrelin, angiotensinogen, plasminogen activator inhibitor & many others. Most of these chemicals must be responsible to develop Insulin resistance [13,14].

Some observations suggest that fat produces chemical signals that act on muscles and liver to increase insulin resistance [15,16]. 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. 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 central or abdominal play an important role in the development of type 2 D.M. in men and women. Central obesity is commonly associated with menopause [17-20].

Natural menopause was associated with reduced energy expenditure during rest as well as during physical activity and this was responsible for obesity in post menopausal women but it is a non-modifiable. Estrogen deficiency resulted in accelerated loss of fat-free mass with increased central adiposity leading to obesity [17].

For significant increase in FPG levels in postmenopausal women many studies [21-25] found that there could be psychosocial factors responsible such as depressive symptoms and stressful life events associated with the dysregulation of the hypothalamo-pituitary-adrenal axis resulting in an increased release of cortisol, decreased glucose uptake, and elevated glucose levels. It was also found that in depressed mood and anxiety were major correlates of weight gain in late reproductive periods. Serotonin is not only responsible for mood but also for regulation of food intake. With no control on food intake due to low serotonin levels associated with, may probably account for this weight gain [25].

It is observed that age-related insulin secretary dysfunction may have a role in the alterations in glucose metabolism [26]. Age may be accepted as factor of small magnitude in increasing the Blood Glucose Level. 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 [27].

As WC indicates both general as well as central obesity . WC alone could be used as an indicator of obesity as a health risk and that other measures like BMI & WHR would not be required because they have certain limitations as most members of the population cannot readily calculate it due to two measurements and calculations. For BMI this difficulty is compounded by the inaccuracy of self-reported height and weight measurements. Approximately 20% of adults are classified in the incorrect BMI category on the basis of self-reported height and weight [28]. In comparison WC could be easily measured by general populations as only 2% of men and women recorded incorrect WC on the basis of self-measured WC [29].

In our study we have found that WC is present in pre & postmenopausal group with no statistical significance but higher values in postmenopausal women which means that obesity is present irrespective of menopause. 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 , this might be the reason for obesity in premenopausal women which can be prevented due to lifestyle modifications such as diet and exercise so early detection of obesity & diabetes using WC and FPG may prove beneficial for preventions.

It is very important to note that people with impaired fasting glycaemia can change their life style to stare off to delay the onset of diabetes [17]. Weight control would be the most effective way to reduce the risk of type 2 D.M. So only menopause per se may not associated with weight gain and increase in glucose concentrations and 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.

In conclusion we suggest that WC simple, self monitored measure for obesity & could be better tool to predict risk of type 2 D.M.in aged 45- 49 yrs where obesity is common so that early detection of obesity can prevent incidence of type 2 D.M General public does not recognize the connection between overweight or obesity with diabetes so greater efforts for educating them. Unfortunately obesity is difficult to treat & requires a high order of motivation on patient's part.

However it is only a preliminary study and further the study will be continued in a large number of women with parameters like serum insulin, serotonin level to draw any meaningful conclusion.

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REFERENCES

[1] World Health Organization. Media centre , Diabetes, Fact sheet ; N°312 January 2011.
[2] K Park. Park's textbook of Preventive & Social Medicine. Banarasidas Bhanot publications, 18 th Edition; 2005:311- 316**.**
[3] Alfred AR , Linda HW, Barbara VY, Ronald AB. Public Health Rep 1975; 90: 44-51.
[4] Campbell IW, Haslam DW. What is Obesity? Obesity. 1st ed. India: Churchill Livingstone Elsevier Publishers. 2006; 34-63.
[5] Diabetes Care 2003 ;26(11): 3160-3164.
[6] K Park. Park's textbook of Preventive & Social Medicine. Banarasidas Bhanot publications.18 th Edition; 2005:317- 319.
[7] Diabetes care, 2003; Vol. 26:1770 – 1780.
[8] Suminori Kono. March 2009; 4(2): 99-101.
[9] Shan K Z, Zi M W, Stanley H, Moonseong H, Myles SF , Steven BH . American J Clin Nutr 2002;76:743–749.
[10] Dudley EC, Hopper JL, Taffe J, Guthrie JR, Burger HG, Dennerstein L. Climacteric 1998; 1: 1-8.
[11] Ian Janssen, Peter T K, Robert R. American J Clin Nutr 2004; 79: 379–84.
[12] L-Y Chien, Y-M Liou, and J-J Chen. Int J Obesity 2004;28:690-696.
[13] Mikako D Y, Jason E. B, Beth E J, William W ,Kimberly K, Rosemarie J et al. The J Clin Endocrinol Metabol 2003;88(11):5452–5455
[14] .Joan V, Montserrat B, Nuria V, Ana M, Jose M Go. Obesity Res 2004 ;12(6) : 962-971.
[15] William F Ganong. Endocrine Function of the Pancreas & Regulation of Carbohydrate metabolism. Review of Medical Physiology 22nd Edition, Mc Graw Hill Publishers , 2005: 333 - 355.
[16] Jaffrey SF, Eleftheria MF. Obesity. In Kasper, Braunwald, Fausi, Hauser, Longo, Jameson. Harrison's Principles of Internal Medicine 16 th Edition, 2005; 1: 422 – 429
[17] Eric TP, Michael JT, and Andrew WG. Ann Int Med 1995; 123 (9): 673-675.
[18] M J Toth, A Tchernof, C K Sites and E T Poehlman. Int J Obesity 2000; 24(2): 226-231.
[19] G Panotopoulos, J Raison, JC Ruiz, B Guy-Grand & A Basdevant. European Soc Human Reprod Embryol 1997;12 (1): 126-133.
[20] C-J Chang, C-H Wu1, W-J Yao, Y-C Yang, J-S Wu &F-H Lu. Int J Obesity 2000; 24: 1699-1704.
[21] Katri R, Karen A. Matthews, and Lewis H. Kuller. Diabetes Care 2007; 30 (4): 872-877.

[22] Cassandra A, Frank BH , Louise MR, Ichiro K, Graham AC, Frank ES, Joan M. Diabetes Care 2004; Vol.27:129-133
[23] Tarani C, Eric B, Michael M. British Med J 2006;Vol.332: 521-525.
[24] Mary D S, Jeane A G, Ellen W F, Lori H, Li Liub, Shinlan Liub, Deborah B N and Michelle B. 2003; 20:401-409.
[25] Wurtman JJ. J Affective Dis 1993;29:183-192.
[26] Annette MC, Jaferey BH. American J Physiol Endocrinol Metabol2003;284: 7 -12.
[27] Cyril A.K, Eric Neil and Norman J. Samson Wright's Applied Physiology. Nutrition .13th Edition, Oxford Medical Publication, 1982; 482 -496.
[28] Spencer EA, Appleby PN, Davey GK, Key TJ. Public Health Nutr 2002; 5:561-565.
[29] Han TS, Lean ME. British J Nutr 1998;80:81-88.