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SCREENING OF TYPE 2 DIABETICS FOR OBESITY AND GLYCEMIC CONTROL

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ABSTRACT

The association of obesity and poor glycemic control in diabetics has been linked to many cardio metabolic diseases risk resulting in increased morbidity and mortality. The present study evaluated obesity in type 2 diabetics using waist hip ratio (WHR) and Body Mass index (BMI) as indices. Glycemic control was assessed by measuring fasting blood glucose (FBG) and postprandial blood glucose (PPBG) in 400 type 2 diabetics (males 200 & females 200). The subjects were selected by purposive sampling from DCRC, Nagpur. The waist (WC) and hip circumference (HC) FBG and PPBG were assessed by standard techniques. Mean age of males was 49.98+_10.74 and females 54.09+_5.44. A significantly high (P=0.0004) FBG was noted in males (169+-60.12) as compared to females (146+_47.4).Mean PPBG also reflected highly significant (p=0.0003) differences between the sexes(male 261.4+_92.33 & females 226.39+_70.46).BMI wise classification showed 13.50% males and 31% females in obesity grade II category (BMI >30). WHR classification however reflected 93.5% of females and 47.5% males in the high risk category. Poor glycemic control in both sexes irrespective of differences in obesity category using different tools was a significant observation.

Keywords: BMI, WHR, FBG, PMBG, Glycemic Control

INTRODUCTION

Obesity is known to be predisposing factor for diabetes especially in individuals with a genetic history of diabetes. Most individuals who develop diabetes are overweight. Excess fat makes it harder for the cells to respond to insulin. Being inactive further reduces the body's ability to respond to insulin **(Hanas R., 2007).**

Obesity is a major potentially modifiable risk factor for Type 2 Diabetes. It is associated with a poor control of blood glucose levels, blood pressure and cholesterol, placing persons with

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diabetes at higher risk for cardiovascular diseases. While studies have well established the strong epidemiological association between obesity and the development of diabetes **(Daousi C., et al 2006)**, little attention has been paid to the significance of obesity in clinical population with diabetes.

Diabetes epidemic can be attributed to the increasing incidence of obesity, especially in India. This co-morbid condition of Obesity in type 2 diabetes is very common and is often termed as 'Diabesity' **(Kalra S., et al 2012).**

Clinical evidence suggests that the association of diabetes with 'Central Obesity' or 'Android Distribution' is stronger than the association with peripheral fat or 'Gynoid Distribution'. **(Guh D.P., et al 2009)**

Central obesity has been associated with decreased glucose tolerance and alterations in glucose insulin homeostasis. Studies have indicated that central obesity might be more important in the Indian population **(Kumar S., et al 2008).** With the rapidly increasing diabetic population in our country it is of paramount importance to determine the prevalence of obesity in Type 2 Diabetics.

Body Mass Index (BMI) is widely used to assess overweight and obesity. However, it does not distinguish fat from muscle or different fat distributions **(Frankfield D.C., et al 2001).**

Waist to Hip Ratio (WHR) is yet another useful tool for detecting central obesity. Nevertheless, it may over or under evaluate risk for tall and short individuals with similar waist circumference.

The objective of the present study was to screen type 2 diabetics for obesity and glycemic control.

METHODOLOGY

400 diabetics comprising of 200 males and females each were selected by purposive sampling from Diabetes Care & Research Centre, Nagpur. Fasting and post meal blood glucose was analysed in an auto analyser. Height,

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weight, waist and hip circumference were measures by standard techniques.

A relatively easy way to determine the extent of overweight and obesity is to use a person's body weight and height measurements to determine Body Mass Index (BMI), which is a ratio of weight to height.

The BMI status of the subjects was assessed and categorized according to the classification of International Obesity Task Force **(IOTF).**

The Weight Height Ratio (WHR) was calculated as the circumference of waist over hip circumference. WHR above 0.9 for and 0.85 for women identify the high individual risk for CAD **(AHA Guidelines 2000).**

Central obesity is considered to be present when waist circumference is >90cms in males and >80cms in females. WHR of >1.00 for men and >0.85 for women is defined as truncal obesity (WHO 2000). WHR of the subjects was calculated and compared with the standards.

The study data was compiled, tabulated and analyzed statistically using 't' test of significance.

RESULTS AND DISCUSSION

The study results have been discussed with respect to differences observed in the parameters viz: FBG, PPBG, WC, HC and WHR in male and female subjects. Comparisons have been drawn with standard values and interpreted.

The mean age of males was 49.98+_10.74 and females 54.09+_10.82. The mean values of glycemic profile and body measurements of male and female subjects are presented with statistical interpretation in **Table1.**

The mean FBG levels were significantly higher (p=0.0004) in males (169± 60.12) as compared to female subjects (146.4± 47.4).The maximum range of FBG was extremely high in both sexes (males 438mg/dl & females 371mg/dl) reflecting uncontrolled diabetes. High PPBG was observed in both males (261.4± 60.12) and females (226.39± 70.46). The

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difference in the PPBG values of male and females was highly significant (p=0.0003). Both FBG and PPBG were higher in males as compared to female diabetics.

The male subjects (167.9± 6.49) were taller than the females (153.1± 6.35).

The difference in height was insignificant (p= 6.6275). The mean weight of males was 72.84± 13.86 which differed significantly (p=0.0005) from the mean weight of females (65.65± 12.42).

The mean BMI of males (25.76± 4.20) and females (28.06± 4.6) was indicative of obesity grade II.

The mean WC of the subjects in both groups (males 97.07± 10.52, females 100± 10.7) exceeded the standard thresholds of >90cms in males and >80cms in females. The mean hip circumference of female subjects was significantly higher than male subjects (P=0.0009).

WHR is the most useful measure of obesity to identify individuals with CVD risk factors **(Dalton M., et al. 2003).**

The mean values of WHR were 1.00± 0.05 in males and 0.98± 0.07 in females. WHR of females was higher than males. The difference in WHR of the sexes was significant (p= 0.0017).

An attempt was made to classify the subjects according to the BMI status to assess the percentage of males and females falling in each category. The data is presented in **Table 2.**

Table data reveals that a high percentage of subjects in both the sexes fall in the obesity grade I category (Males 41.50 % Females 43.50%). Female subjects showed a higher percentage in obesity grade II category (30%) as compared to males (15.50%). A negligible percentage of subjects in both the groups were in the underweight category. 22% male subjects were in normal category while a lesser percentage (10.5%) was observed in females.

The subjects have been classified based on threshold levels of WHR. The data is presented in **Table 3 (a)** for males and **Table 3(b)** for female subjects.

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WHR of >1.00 for men and >0.85 for women is defined as truncal obesity. Observations from the table data reveal that 47.5% of male subjects and 93.5% of female subjects fall above the standards indicating obesity and a high risk for related diseases.

The increase of BMI, WC, WHR and WHtR could predict a higher risk causing the development of hyperglycemia **(Hong X., et al. 2009).**

According to well established cut off values BMI was stated to be a more sensitive indicator for Hypertension in both men and women while WC and WHtR were found to be better indicators of diabetes and dyslipidemia **(Zeng Q., et al 2014).**

Results of the study significantly show that both tools of obesity measurement reflect the prevalence of obesity in a large percentage of male and female subjects. WHR points to a greater percentage of subjects at high risk as compared to BMI. Obese diabetic subjects reflect high levels of FBG and PPBG suggestive of uncontrolled diabetes.

CONCLUSION

The high prevalence of obesity in diabetics suggests a structured weight reduction to achieve glycemic control. Increasing physical activity and maintaining 'Ideal Weight' can lower the chances of developing diabetes.

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Table1: Mean Glycemic Profile and Anthropometric Measurements

S.No	Parameters	Males (n=200)	Females (n=200)	p value	Summary
1.	**FBG**			0.0004	***
	Mean	169	146.4		
	SD	± 60.12	± 47.4		
	Range	78-448	78-371		
2.	**PMBG**			0.0003	***
	Mean	261.4	226.39		

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	SD	± 92.33	± 70.46		
	Range	107-650	111-470		
3.	**Height**			6.6275	
	Mean	167.9	153.1		
	SD	± 6.49	± 6.35		
	Range	148-186	132-166		
4.	**Weight**			0.0005	***
	Mean	72.84	65.65		
	SD	± 13.86	± 12.42		
	Range	44-117	37-107.3		
5.	**BMI**			2.964	
	Mean	25.76	28.06		
	SD	± 4.20	± 4.6		
	Range	16.95-41.77	16.6-42.4		
6.	**WC**			0.006	***
	Mean	97.07	100		
	SD	± 10.52	± 10.7		
	Range	68-134	77-134		
7.	**HC**			0.0009	***
	Mean	97.50	102		
	SD	± 13.2	± 10.7		
	Range	68-134	70-130		
8.	**WHR**				
	Mean	1.00	0.98		
	SD	± 0.05	± 0.07		
	Range	0.77-1.18	0.79-1.48		

Table 2: Male and Female subjects according to BMI Standards

S.No.	BMI	Males (n=200)	%	Females (n=200)	%
1.	Below 18.5 Underweight	7	3.50	4	2
2.	18.5-22.9 Normal	45	22.50	21	10.5
3.	23-24.9 at risk of obesity	36	18.00	24	12
4.	25-29.9 Obesity Grade I	83	41.50	87	43.5
5.	≥30 Obesity Grade II	27	13.50	62	31
6.	>40 Morbid obesity	2	1	2	1

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Table 3(a) Classification of Male subjects according to WHR Standards

S.No.	WHR	Males(n=200)	%
1.	<0.95	44	22
2.	0.96-1.0	61	30.5
3.	>1	95	47.5

Table 3(b) Classification of Female subjects according to WHR Standards

S.No.	WHR	Females (n=200)	%
1.	<0.80	3	1.5
2.	0.81-0.85	10	5
3.	>0.86	187	93.5

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