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"STUDY OF BODY MASS INDEX, WAIST HIP RATIO AND PERCENTAGE BODY FAT IN TYPE II DIABETES MELLITUS"

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ABSTRACT

Background: Obesity has been recognized as a major health problem, in the past two to three decades. Obesity, especially central obesity, is an important risk factor for the high prevalence of type II diabetes mellitus. **Aim:** The aim of this study is to investigate the Body Mass Index, Waist Hip Ratio and Percentage Body Fat in Type II Diabetes Mellitus. **Materials and Methods:** The study was conducted on 50 control and 50 type II diabetic subject between age group of 30-60 yrs. Body mass index (BMI) was calculated using the formula, *BMI = Wt (kilograms)/Ht 2 (meters)***,** Waist to Hip Ratio was calculated using formula = Waist circumference (cm) /Hip circumference (cm), The skin-fold thickness was measured from triceps, biceps, sub scapular and suprailiac skin folds, by using UNA skin fold caliper. Statistical analysis was done using Unpaired T - Test. **Results:** In the present study mean value of BMI in normal subjects is 25.1 Kg/m^2, and the mean value of BMI in diabetic patients is 23 Kg/m^2. The mean values of waist hip ratio and percentage body fat in normal subjects were0.9, 37.8 and mean values in diabetic subjects was 0.86, 27.8. The observed difference in the means of BMI, waist hip ratio and percentage body fat in normal and diabetic is 2.1, 0.04 and 10 are statistically significant ($P<0.05$). **Conclusion:** In type II diabetic patients, the

BMI and percentage body fat is reduced because of uncared, poorly controlled diabetic state which may lead to decrease in peripheral subcutaneous fat.

KEY WORDS: Body Mass Index (BMI), Waist hip ratio (WHP), % Body Fat (PBF), Skin Fold Thikness (SFT), Type II diabetes, obesity.

INTRODUCTION

"Diabetes Mellitus", is a chronic disease which requires long standing medical attention, is a leading cause of death in the developing countries. WHO estimates that by 2010 there will be nearly 221 million diabetics all over the world.[1]

Diabetes mellitus is a clinical syndrome characterized by hyperglycemia, caused by a complicated interplay of genes, obesity, environment, increased glucose production in liver, increased fat breakdown, and an absolute or relative deficiency of insulin.

Type II diabetes is the most common type of diabetes, and is usually associated with obesity. It usually develops after the age of 40 and is not associated with total loss of ability to secrete insulin. Type II diabetes was once called adult onset diabetes. Now, because of the 'epidemic' of obesity and inactivity in children, type II diabetes is occurring at younger ages. It is characterized by impaired insulin secretion, with progression towards insulin deficiency and insulin resistance.

Obesity is defined as a state of excessive adipose tissue mass. Obesity is a harbinger to coronary artery disease; stroke and increases risk of type II diabetes. In fact, the syntropy of obesity and type II diabetes is so obvious that a term "Diabesity" has been coined which suggests interrelationship between the two diseases.[2] Diabesity means obesity dependent diabetes mellitus.

BMI is a good indicator of obesity. According to WHO, a BMI value of 25-29.9 is considered to be overweight. But BMI does not give an idea about the type of obesity, whether Android or Gynoid. So estimation of waist hip ratio is done which gives a better viewpoint about the type of obesity. Taking into account we planned to study the Body Mass Index, Waist Hip Ratio and Percentage Body Fat in Type II Diabetes Mellitus.

MATERIAL AND METHODS

After the approval by institutional ethical committee, a case control study was carried out on 50 normal individuals taken from Bharti vidyapeeth dental college sangli and 50 diabetic patients were taken from Bharti vidyapeeth Medical college sangli. The diabetic patients taken were undiagnosed cases and were only diagnosed when fasting blood sugar levels (FBSL) were taken.

Anthropometric measurements: Height (in meters) - using a standiometer, weight (in kilograms) - using a digital weighing scale (precision of 100 grams), were measured. Body mass index (BMI) was calculated using the formula, ***BMI = Wt (kilograms)/Ht 2 (meters)***

Waist to Hip Ratio: Waist circumference was measured in centimeters, midway between the uppermost point on the iliac crest and the lowermost margin of the ribs with the measuring tape parallel to the ground and the subject in inspiration.[2] Hip Circumference was measured in centimeters, at the maximum circumference of the buttocks at the level of the greater trochanter.[2]

Waist hip ratio was calculated as,

Waist to Hip Ratio = Waist circumference (cm) /Hip circumference (cm).

Skin-fold thickness: The skin-fold thickness was measured from triceps, biceps, sub scapular and suprailiac skin folds, by using UNA skin fold caliper.

Calculation of percent body fat

Percent body fat is calculated as,

Then using Durnin and Womersley equation, percent body fat was calculated.[45]

$$\text{Percentage body fat} = \frac{495}{\textit{Body Density}} - 450$$

Body density equation determined by Jackson & Pollock,

1) Equation for males: Σ4SKF equals sum of biceps, triceps, sub scapular and suprailiac skin fold thickness.

Body density = 1.10938 – (0.0008267X Σ4SKF) + ([0.0000016 X Σ4SKF] ^{2}) – (0.0002574 X AGE)

Statistical Analysis: Results were presented as Mean ± SD. Unpaired t-test was used to find the significance of study parameters by using SPSS 16.0 version. P < 0.05 was considered as statistically significant.

OBESRVATIONS AND RESULTS

Table No.4 - Comparison of BMI, Waist Hip Ratio and % body Fat between Control and Type II diabetic Group.

Parameters	Mean ± S.D of Control (n=50)	Mean ± S.D of Type II Diabetic (n=50)	*SE*	Z Value	Observed difference	*p- Value*
BMI (Kg/m^2)	25.1 ± 5.55	23 ± 3.6	0.93	2.258	2.1	< 0.05
Waist Hip Ratio(cm)	0.9 ± 0.08	0.86 ± 0.08	0.016	2.5	0.04	< 0.05
Percentage Body Fat (%)	37.8±26.44	27.8±18.88	4.59	2.17	10.0	< 0.05

DISCUSSION

Obesity has been recognized as a major health problem, in the past two to three decades. Obesity, especially central obesity, is an important risk factor for the high prevalence of type II diabetes mellitus.

Anthropometry is a common field method, used to measure obesity.[3] in the present study measures the following anthropometric parameters namely BMI, Waist hip ratio and percentage body fat, which seem to be strongly associated with the early onset of type II diabetes mellitus.

Body mass Index: BMI is a good predictor of diabetes. In the present study mean value of BMI in normal subjects is 25.1 Kg/m^2, and the mean value of BMI in diabetic patients is 23 Kg/m^2. [Table No.1] The observed difference in the means of normal and diabetic is 2.1 and is statistically significant (P<0.05).

In the present study the BMI in diabetic patients, is low as compared to the BMI in normal individuals, which is exactly a reverse picture, seen in diabetes.

Our study coincides with studies of other authors, Wei M, et al.[4], Toufiq Rashid et al he stated that diabetes in India is related more to body fat than body mass index. Indians are likely to get the disease when they are thinner, compared to people in the West.[5] This low BMI in diabetes patients than the control group may be due to, Genetic predisposition may be the cause in Indians, who are likely to suffer from diabetes even when they are thinner. [6] It

is postulated that, uncared, poorly controlled diabetic state may lead to decrease in peripheral subcutaneous fat, because of which their BMI levels are low.[7]

Waist Hip Ratio & Percentage Body Fat

In the present study the percentage body fat in diabetic patients, is low as compared to the percentage body fat in normal individuals but waist hip ratio is increased in type II diabetic patients as compared to control. In present study mean values of waist hip ratio and percentage body fat in normal subjects were 0.9, 37.8 and mean values in diabetic subjects was 0.86, 27.8. The observed difference in the means of waist hip ratio and percentage body fat were 0.04 and 10 was found to be statistically significant with $P<0.05$.

Our study coincide with studies done by Marjaana Lahti-Koski et al, in Finland [8] also similar studies done in non-obese, South Indian population, showed android pattern of body fat, typified by more upper body adiposity (measured as waist hip ratio), was a greater risk factor for type II diabetes mellitus than general obesity.[9]

This may be due to, the central obesity was found to be a greater risk factor for type II diabetes mellitus than general obesity. Adipose tissue is metabolically relevant site of insulin action. Regulation of lipolysis with subsequent release of glycerol and free fatty acids in to the circulation, by insulin, has major implications for glucose homeostasis. It is said that increased availability and utilization of free fatty acids contribute to the development of skeletal muscle insulin resistance.[10, 11, 12]

Free fatty acids also increase endogenous glucose production by stimulating the key enzymes and by providing energy for gluconeogenesis.[13] Thus, resistance to the antilipolytic action of insulin in the adipose tissue, results in excessive release of free fatty acids and glycerol, having deleterious effects on glucose homeostasis. Since failure to turn off lipolysis directly affects liver and muscle metabolism, it is speculated that adipose tissue, might even be the primary site for defect, leading to insulin resistance and ultimately, to type II diabetes mellitus.

At cellular level, insulin signaling is mediated by binding of insulin to specific receptor. Insulin binding to the receptor simulates autophosphorylation of the intra cellular region of the receptor beta subunit.[10] Obesity is said to be a major contributory factor for the development of a reduced insulin receptor activity. This may suggest that, the defective

insulin receptor kinase activity is secondarily acquired due to obesity and metabolic changes like hyperinsulinemia and hyperglycemia. Another probable cause may be, saturation of subcutaneous fat depot, which is the primary event in pathophysiology of insulin resistance.

CONCLUSION

In present study it is concluded that in diabetic patients, the BMI and percentage body fat is reduced because of uncared, poorly controlled diabetic state which may lead to decrease in peripheral subcutaneous fat. The typical picture of central obesity seen as increased waist to hip ratio is seen in diabetic patients this is because Omental and mesenteric adipose tissue (visceral adiposity is associated with insulin resistance which results in development of type II diabetes mellitus.

REFERENCES

1. William F. Ganong, Review of Medical Physiology, 21st edition, 357-358.
2. K.D. Singh, J.K. Dhillon, Anupreet Arora and B.S. Gill, Receiver operating characteristic curve Analysis of BMI and percentage body fat in type II diabetics of Punjab. Indian J. Physiol Pharmacol, 2000; 44(4): 73-80.
3. Wilmore JH, Behnke AR. An anthropometric estimation of body density and lean body weight in young men. J Appl Physial 1969; 27: 25-31.
4. Wei M, Gaskill Sp, Haffuer SM, Stern MP: Waist circumference as the best predictor of NIDDM compared to BMI, waist/hip ratio and other anthropometric measurements in Mexican Americans: a 7year prospective study. Obes Res., 1997; 5: 16-23.
5. Toufiq Rashid. AIIMS asks US panel to draw up 'Indian' Xfactor. Indian Express, Jan 2005.
6. Ohlson l-O, Larsson B, Svardsudd K, Welin L, Eriksson H, Wilhelmsen L, Bjorntorp P, Tibblin G.The influence of body fat distribution on the incidence of diabetes mellitus: 13. 5 yrs of followup of the participants in the study of men born in 1913. Diabetes, 1985; 34: 1055-58.
7. PG Raman, Professor and Head, MGM Medical College, Indore Diabetes Mellitus 3rd edition. 201-202.
8. Marjaana Lahti-Koski:Pirjo Pietinem, Satu Mannisto and Erkki Vartiainen, Trends in waist/hip ratio and its determinants in adults in Finland from 1987-1997. Am J of Clin Nutr, Dec., 2000; 72(6): 1436-1444.

9. Mary Ann Banerji, Nuzhat Faridi, Rajsh Atturi, Rochelle L, Chaiken and Harold E Leboritz. Body Composition, Visceral Fat, Leptin and Insulin resistance in Asian Indian men. J. of Clin Endocrinology and Metab. 1999; 84(1): 137-144.
10. Son Nguyen Trung Le D, Kusama K, Yam amoto S. AComunity based picture of type II diabetes mellitus in Vietnam. J Atherscler Thromb. 2006; 13(1): 16-20.
11. Weyer C, Bogardus C, Mott DH and Pratly RE, The natural history of insulin secretory dysfunction and insulin resistance in the pathogenesis of type II diabetes mellitus. J. Clin. Inves. 1999; 104: 787-794.
12. De Fronzo, RA, Lilly Lecture 1987. The triumvirate:Beta cell, muscle, liver. Collusion responsible for type II diabetes mellitus. Diabetes, 1988; 37: 667-687.
13. Fajans SS, Bell GI, and Polonsky KS. 2001, Molecular mechanisms and clinical pathophysiology of maturity onset diabetes mellitus of the young.