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Waist-To-Hip Ratio is the Better Predictor of Abdominal Adiposity than BMI in Type 2 Diabetics

Dr.K.Rajendran

Assistant Professor, Department of Physical Education and Sports Sciences, Annamalai University, Chidambaram, Tamilnadu, India.

Abstract

The purpose of the study was to observe the relationship among waist-to-hip ratio, BMI and abdominal adiposity in male type 2 diabetic Punjabi population. A total of 120 Type 2 diabetic men with an age ranged from 30 to 70 years volunteered to participate in this study. The body mass index (BMI), fasting blood sugar (FBS), waist circumference (WC), hip circumference (HC) & waist to hip ratio (WHR) were recorded with standard procedure. The data was analyzed using Mean ±SD. Results: The mean age, BMI and FBS was 50.3 ± 11.8 years, 27.3 ± 3.7 kg/m² and 135.1 ± 27.4 mg/dl respectively. The mean waist circumference, hip circumference & waist to hip ratio was 102.2 ± 8.3cm, 98.40 ± 7.3cm & $1.03 \pm .02$, respectively. Waist-to-hip ratio showed that all Type 2 diabetics had abdominal obesity whereas the BMI values shown 30% normal, 50% overweight and 20% type I obese. Conclusion: It is concluded from the results of the present study that waist-to-hip ratio is the better way to come to knowthe level of obesity i.e. abdominal obesity in Type 2 diabetics than BMI. As abdominal obesity would further leads to excessive morbidity and mortality in Type 2 diabetics by increasing the incidence of cardiovascular diseases and insulin resistance.

Keywords: Obesity, Insulin resistance, CVD.

Introduction

Diabetes Mellitus (DM) is a syndrome characterized by a state of chronic hyperglycemias causing disturbance of carbohydrate or fat metabolism, associated with absolute or relative deficiency in insulin secretion or insulin action (Lea and Febiger, 1994). The increased fatty tissue is exclusively related to risk factors, such as the altered insulin and lipid profile, which can contribute to the development of the insulin resistance syndrome, which further comprises several risk factors for the emergence of cardiovascular complications (Gower, 1999). Prevalence of diabetes is higher in Indian subcontinent & It is estimated that 20% of global burden resides in South East Asia Region (SEAR) area, which will be tripled to 228 million by the year 2025 from the current 84 million(Park,2007). Type 2 diabetes mellitus is a disorder that disrupts the way your body uses glucose (sugar).All the cells in your body need sugar to work normally. Sugar gets into the cells with the help of a hormone called insulin. If there is not enough insulin, or if the body stops responding to insulin, sugar builds up in the blood. This is what happens to people with diabetes mellitus.

There are two different types of diabetes mellitus. In type 1 diabetes mellitus, the problem is that

Correspondence

Dr.K.Rajendran,
E-mail:drkr978@gmail.com, Ph. +9194433 28490

the pancreas (an organ in the abdomen) does not make enough insulin. In type 2 diabetes mellitus, the pancreas does not make enough insulin, the body becomes resistant to normal or even high levels of insulin, or both. This causes high blood glucose (blood sugar) levels, which can cause problems if untreated. In the United States, Canada, and Europe, about 90 percent of all people with diabetes have type 2 diabetes. Type 2 diabetes is a chronic medical condition that requires regular monitoring and treatment throughout your life. Treatment includes lifestyle changes, self-care measures, and sometimes medications. Fortunately, these treatments can keep blood sugar levels close to normal and minimize the risk of developing complications. Being diagnosed with type 2 diabetes can be a frightening and overwhelming experience, and you likely have questions about why it developed, what it means for your long-term health, and how it will affect your everyday life. For most people, the first few months after being diagnosed are filled with emotional highs and lows. If you have just been diagnosed with diabetes, you and your family should use this time to learn as much as possible so that caring for your diabetes (including testing your blood sugar, going to medical appointments, and taking your medications) becomes a part of your daily routine.

Despite the risks associated with type 2 diabetes, most people can lead active lives and continue to enjoy the foods and activities that they previously enjoyed. Diabetes does not mean an end to "special

occasion" foods like birthday cake, and most people with diabetes can enjoy exercise in almost any form. Type 2 diabetes is thought to be caused by a combination of genetic and environmental factors. Genetic causes — Many people with type 2 diabetes have a family member with either type 2 diabetes or other medical problems associated with diabetes, such as high cholesterol levels, high blood pressure, or obesity. The lifetime risk of developing type 2 diabetes is 5 to 10 times higher in first-degree relatives (sister, brother, son, daughter) of a person with diabetes compared with a person with no family history of diabetes. The likelihood of developing type 2 diabetes is greater in certain ethnic groups, such as people of Hispanic, African, and Asian descent. Environmental conditions Environmental factors such as what you eat and how active you are, combined with genetic causes, affect the risk of developing type 2 diabetes. Pregnancy — a small number (about 3 to 5 percent) of pregnant women develop diabetes during pregnancy, called "gestational diabetes." Gestational diabetes is similar to type 2 diabetes, but usually resolves after the woman delivers her baby. Women who have gestational diabetes are at increased risk for developing type 2 diabetes later in life.

Obesity and diabetes mellitus shares an intimate relationship. It was found that risk for diabetes is almost double in the mildly obese, 5 times in moderately obese and 10 times in morbidly obese persons(AACE/ACE, 1998).Obesity in type 2 diabetes occurs commonly due to changes in diet and life style. As fat mass & fat cell size increases, the regulation of free fatty acid (FFA) metabolism becomes abnormal. These changes lead to an increase in FFA production. The increased FFA concentrations compete with glucose for oxygen in insulin-sensitive tissues and stimulate endogenous glucose production, causing insulin resistance, which is the earliest detectable abnormality in obese type 2 diabetics (Evans,1996).

Methodology

The 120 Type 2 diabetic male patients belonging to Patiala district of Punjab were selected as subjects after obtaining their informed written consent and their age ranged from 30-70 years. The following exclusion criteria were used- taken any steroid therapy in past 3 months, any liver, kidney or cardiac failure, and patients who were on any type of anti-lipidemic therapy. The study protocol was reviewed and approved by the Ethics Committee of Punjabi University, Patiala. The serum was separated immediately after obtaining the blood sample (overnight fasting). Fasting blood glucose concentration was measured using Blood Analyzer by the qualified laboratory technician. The appropriate chemical testing kits were used. The Body Mass Index (BMI) was calculated using weight and height (kg/m²) waist-to-hip ratio was also calculated with the help of waist and hip circumference. The statistical analysis was done by using SPSS version 16. The level of significance was <.05.

Analysis of Data

Table - I shows the general information of the study population. As given by ICMR, study of data revealed that mean weight of male patients was 76.19 kg, which is higher than the reference Indian male. BMI of the study population revealed that only 30% subjects were normal as per the categories of BMI, where 50% were overweight (i.e. 25 to 30 kg/m²) and 20% of them were type I obese (> 30 kg/m²). Mean fasting blood glucose level of the patients was 135.18 ± 27.42 mg/dl indicates elevated or poor control on diabetes.

Results

Table I. Mean ±SD of Age, Height, Weight , BMI & FBS of Type 2 diabetics

Variables	
Age (years)	50.3 ± 11.8
Height (cms)	166.88 ± 7.2
Weight (kgs)	76.19 ± 11.9
BMI (kg/m²)	27.3 ± 3.7
FBS (mg/dl)	135.1 ± 27.4

BMI-body mass index, FBS-fasting blood sugar

Table II shows that all the Type 2 diabetics had circumference values of hip and waist more than the normal reported values thus indicates an abdominal obesity in them. The waist-to- hip ratio also suggests the abdominal obesity in type 2 diabetics.

Table II. Mean ±SD of Circumference variables of Type 2 diabetics

Variables	Observed Values	Normal Values
Waist Circumference (cms)	102.2 ± 8.3	86
Hip Circumference (cms)	98.40 ± 7.3	81
Waist-to-Hip Ratio (WHR)	1.03 ± .02	>0.96

Discussion

The anthropometric measurements like waist circumference (WC), hip circumference (HC) (Okosun et al.,2000), and body mass index (BMI) (Vikram et al.,2003) were considered measurements of obesity and diagnostic components of the metabolic syndrome in Type 2 diabetics (Jeong et al.,2004). However, waist-to-hip ratio (WHR) is considered as an appropriate marker of abdominal obesity (Snehalatha et al., 2003).The results of the present study were in agreement with the previous research reports that there is direct relationship among abdominal obesity and WHR in type 2 diabetics. As per BMI values 30% Type 2 diabetics in this study were normal and 50% were overweight but the values of waist circumference, hip circumference and waist-to-hip ratio showed that all Type 2 diabetics had abdominal obesity. Total body fat is not the sole source of the adverse health complications of obesity; rather the fat distribution or the relative proportion of lipids in various potential lipid deposition compartments is what determines the metabolic risk of the individual. Upper body obesity, manifested clinically by increased waist circumference, is known to be associated with cardiovascular disease. The findings of the present study clearly showed that Type2 diabetics were with elevated abdominal adiposity (indexed by WHR) which were in direct agreement with the studies of Seidell et al., 1989. These results clearly indicate that waist-t-hip ratio is the more reliable method to predict the prevalence of abdominal obesity in type 2 diabetic patients than BMI. Further, the excessive adiposity induces a certain degree of insulin resistance in Type 2 diabetics as adipose tissue in them do not utilize glucose as effectively as normal weight individuals. This leads to decreased number of plasma membrane insulin receptors but that is in part reversible with weight reduction.

Conclusion

It is concluded from the results of the present

study that waist-to-hip ratio is the better way to come to know the level of obesity i.e. abdominal obesity in Type 2 diabetics than BMI. As abdominal obesity would further leads to excessive morbidity and mortality in Type 2 diabetics by increasing the incidence of cardiovascular diseases and insulin resistance.

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