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ASSESSMENT OF WAIST HIP RATIO (WHR) AND FASTING BLOOD GLUCOSE (FBG) LEVEL IN YOUNG OBESE SUBJECTS

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Abstract

Background: The primary factor contributing to diabetes-related sickness is frequently occurring insufficient blood glucose management, which makes it worser. Central obesity also plays a significant role in the pathogenesis of diabetes and its harmful consequences, which could anticipate such risks. It is necessary to identify overweight and obesity in young adults at the earliest as they are more likely to cause Insulin Resistance (IR) resulting in serious issues early in their lives. Although Body Mass Index (BMI) is most frequently used to reflect obesity, Waist Hip Ratio (WHR) and Waist Circumference (WC) are better indices in order to evaluate central obesity. Aim: Assessment of WHR and Fasting Blood Glucose (FBG) in young obese population. Material and methods: This cross-sectional study comprised of 100 obese subjects in the age range of 18 to 24 years. In accordance with WHO recommendations, a non-elastic measuring tape was used to measure the WC and WHR. FBG level was measured by semiauto analyzer. Result: WHR has significantly medium positive correlation with FBS level (p value = < 0.001). Conclusion: In obese individuals, the WHR and FBG level are positively correlated. Public awareness programs are therefore necessary to lower WHR by healthy lifestyle modifications like of change in eating habits and regular exercises. This would prevent the development of diabetes mellitus in long run.

Keywords: IR, Obesity, BMI, WHR, WC, FBG

INTRODUCTION

Diabetes mellitus (DM) is a chronic metabolic disorder with a hall mark of high blood glucose levelbrought on by insufficient insulin or Insulin Resistance (IR) (1). Globally, Over the past three decades, the prevalence of diabetes has surged to 422 million (2). DM is coming up with must pressing challenge with public health in the world. In India, the prevalence of DM is 15.6% for men and 13.5%for women, according to the National Family Health Survey (NFHM-5) conducted by the Ministry of Health and Family Welfare (MoHFW) in 2021 (3)**.** This disease has resulted in a tremendous strain on society and the economy. On the other hand, Obesity is a growing global health concern, especially among young people, as it may increase the risk of developing different metabolic disorders in later life. In India, obesity has increased among males from 21%to 24% and females from 19% to 23% (4,5). The prevalence of Abdominal Obesity(AO) is rising at an ominous rate, and variables such as Body Max Index (BMI),Waist Circumference (WC), and Waist Hip Ratio(WHR) can all be used to predict the possibility of developing IR and having poor glycemic control(6). It isimportant to identify overweight and obesity in young adults as early as possible as

they are more likely to develop IR, which can cause serious health problems in their early stages of life (7). Even though BMI is undoubtedly the most used and practical way to gauge general obesity, it is erroneous for usage with the elderly population, pregnant womenand extremely muscular athletes. WHR and WC were employed as an indicator of AO. Both IR and DM have a strong correlation with abdominal fat. Since, abdominal fat is particularly hormonally active and secretes cytokines such as interleukin-6, TNF-α, and resistin that may possibly reduce glucose tolerance (8, 9). Cytokines and low-grade chronic inflammation that occur in adipocytes are responsible for IR and pancreatic cell damage which leads to the onset of diabetes.

Apple-shaped obesity is regarded as being more serious than pear-shaped obesity due to the buildup of excessive fat in the deep abdominal region surrounding the visceral organs, which can result in the development of high blood pressure and IR, both of which may later result inheart diseases, dyslipidemia, and Type 2 Diabetes Mellitus (T2DM) (10,11). Therefore, marker of AO like WHR and WC are more accurate than BMI of general obesity like BMI to predict the possibility of DM (12).

MATERIAL AND METHODS

After receiving approval from the Institutional Ethical Committee, a study with a cross-sectional design was carried out on volunteers between the ages of 18 and 24 years who visitedSharda University in Greater Noida, Uttar Pradesh (U.P), India.

Inclusion Criteria: - Obese participants in the age range of 18 to 24 years and who were interested to volunteer in the research were included in the study.

Exclusion Criteria: - Non obese participants under 18 years of age or over 24 years, pregnant women, diabetic, individuals taking any medicine and suffering from chronic illness, etc were excluded from study.

Out of a total of 320 Volunteers, 100 obese subjects (54 females and 46 males) were selected for the study. Consent for study was obtained from all the subjects.

Anthropometric Measurements

Using standard methods, the participant's height (m) and weight (kg) were measured. For calculating BMI, measured weight was divided by height in m^2. WC and WHR were obtained using inextensible measuring tape as per the guidelines given by WHO (13).

Biochemical Measurements

After a minimum of eight-hours of overnight fasting, blood sample was drawn from the subjects. The plasma from the blood samples was separated. FBG was estimated through useof a semi-auto analyzer applying the GOD-POD method

Statistical Analysis

Statistical Package for Social Sciences (SPSS) of version 22 was used for statistical analysis. Pearson correlation between WHR and Fasting Blood Glucose (FBG) level of the subjects was assessed. P value <0.05 and <0.001 was regarded as significant and highly significant respectively.

RESULT

Demographic data for obese subjects

Table 1

Parameters	N	Mean	S.D
Fasting blood glucose(mg/dl)	100	88.6	8.95
Waist hip ratio (WHR)	100	0.9	0.06
For male subjects			
Fasting blood glucose(mg/dl)	46	88.0	9.41
Waist hip ratio (WHR)	46	0.89	0.07
For female subjects			
Fasting blood glucose(mg/dl)	54	89.3	8.33
Waist hip ratio (WHR)	54	0.92	0.05

A Pearson Correlation was calculated between FBG and WHR of 100 obese subjects with18 to 24 years of age.

Table 2: Correlation between FBG and WHR.

Parameter	Value
Pearson correlation coefficient (r)	**0.4529**
r^2	0.2051
P-value	0.000002229
Covariance	0.2636
Sample size (n)	100
Statistic	5.029

Results of the Pearson correlation (Table 2) indicated that there is a significant medium positive relationship between FBG and WHR, ($r(98) = .453$, $p < .001$).

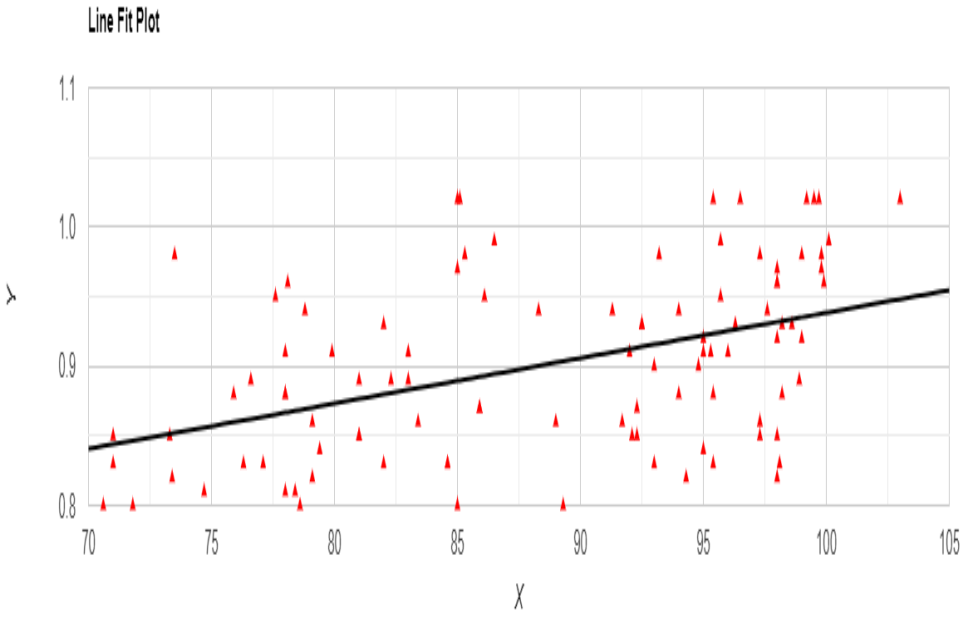
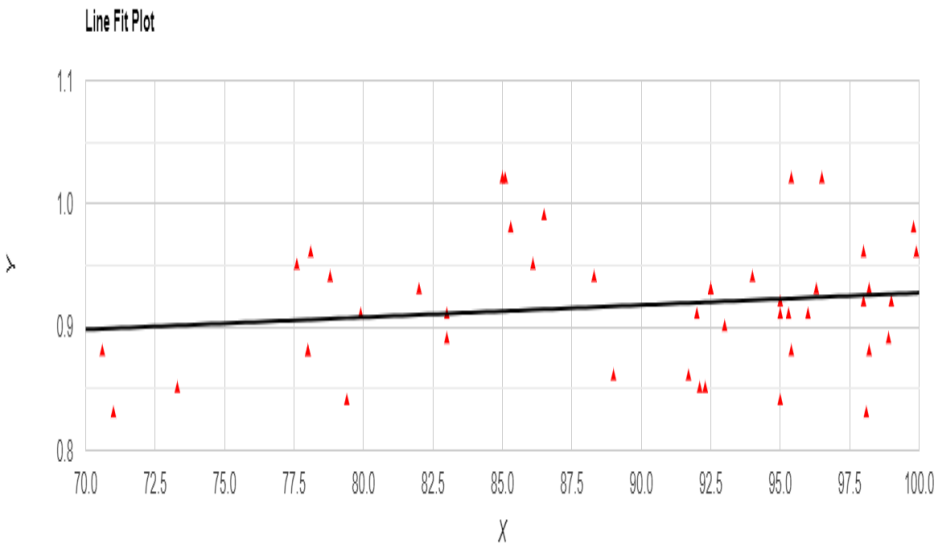


Table 3: Correlation between FBG and WHR among male obese subjects.

Parameter	Value
Pearson correlation coefficient (r)	**0.5815**
r^2	0.3381
P-value	0.000004014
Covariance	0.3891
Sample size (n)	54
Statistic	5.1537

Table 4: Pearson Correlation between FBG and WHR among female obese subjects.

Parameter	Value
Pearson correlation coefficient (r)	**0.1605**
r^2	0.02574
P-value	0.2868
Covariance	0.07032
Sample size (n)	46
Statistic	1.0783
Results of the Pearson correlation (Table 4) indicated that there is a non-significant small positive relationship between FBG and WHR, (r(44) = .16, p = .287).	



DISCUSSION

Obesity is linked to a number of chronic conditions, including T2DM, hypertension, dyslipidemia, and others. Obesity poses an imminent risk to India's health care system among young population. In the decade preceding, it has been noticed that young peoplein India were more vulnerable to experience early symptoms of diabetes and develop the diseaseat lower obesity levels.

Obese subjects in the age group ranging from 18 to 24 years were selected for this study. As a person grows from childhood to maturity, profound changes in their physiology, sexuality, psychology, and social development all take place at the same time. Such changes could posesa risk to their health and well-being (14).

This study shows the medium positive correlation between WHR and FBG level among obese individuals. It was seen that AO in male obese subjects was slightly

higher than female obese subjects. In female obese subjects there may be a resultof genetic and environmental factors. Restrictive diet is more required to stay slim in female subjects(11).

Oktariza RT., et. al in 2021 concluded in their study that WHR and high FBG (≥100 mg/dl) had significant positive correlation and this indicates impaired fasting blood glucose level, may result in prediabetes and later diabetes, if not handled effectively (11). Kharal PM., et.al in 2013 conducted a study where a paired sample correlation was done to correlate WHR with Random Blood Sugar (RBS) level in both the sexes (15). In a similar study by Hanley A., et.al in 2008 of AO and risk of diabetes, it was found that there is significant correlation between WHR and blood glucose level. It can be postulated that AO is one of the major contributors for progression of DM (16). Abiodun OA., et.al in 2014 concluded from their study that in Nigerian population RBS and blood pressure was positively correlated with BMI and WHR. Therefore, Nigerian population is at risk of developing DM and related complications with increasing in BMI and WHR. Promotion of a healthy lifestyle, regular exercise, and appropriate nutrition is necessary. (17). Zhao X., et al, in 2012 concluded that the interaction between the obesity markers and DM risk indicators are gender specific. The intensive predictors of DM were WHR for the female subgroup' and Waist-to-Height Ratio for the male subgroup (12).

Hence healthy lifestyle modifications, like regular physical exercises, consumptions of green vegetables and fruits, avoiding junk foods can be effective in reducing the incidence of DM and its consequences.

CONCLUSION

In the present study, FBS and WHR were assessed in young obese subjects and medium positive correlation found a correlation between them. A healthy life style modification and a change in eating habits can help in avoiding the obesity which might reduce the risk to suffer from various metabolic diseases like DM, Hypertension, Cardiovascular disease etc, in later life.

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