ORIGINAL ARTICLE

WAIST HIP RATIO AND BODY MASS INDEX IN WOMEN OF DIFFERENT AGE GROUPS

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Background: Obesity in childhood and adolescence is increasing in developing countries around the world. It is defined as a condition of abnormal or excessive fat accumulation in adipose tissue, to the extent that health may be impaired. Our study primarily aimed at screening for obesity in females of different age groups by finding out the correlation between waist hip ratio (WHR) and body mass index (BMI) as a guidance for obesity related diseases. **Methods:** A cross-sectional analysis of 90 socio-economically matched women in age range of 20–55 years was conducted in Department of Physiology, Fatima Jinnah Medical College, and Shalamar Medical and Dental College, Lahore from July to December 2009. The students and staff of the department participated in the study. Subjects with history of diabetes, hypertension and cardiovascular disease were excluded. The subjects were grouped as G1 (21–29 years), G2 (30–39 years), and G3 (40–55 years). WHR and BMI of all the groups were determined. **Results:** In G1, WHR was 0.74±0.030 with BMI 21.59±3.07. G2 had WHR 0.78±0.055 and BMI 26.8±2.04, whereas in G3 WHR was 0.80±0.043 and BMI 32.4±4.23. Significant correlation (r=0.65), (r=0.79), (r=0.91) was found between WHR and BMI in all three groups respectively. Comparison also revealed a linear positive correlation graphically in all groups between WHR and BMI. **Conclusion:** There is a strong association between WHR and BMI for evaluation of obesity in different age groups and can serve as guidance for weight control to prevent complications of obesity

Keywords: Waist hip ratio, body mass index, obesity, women, health

INTRODUCTION

The prevalence of obesity is rising in both developed and developing nations.[1] Obesity has a strong association with causes of mortality, cardiovascular disease and diabetes. It is an important component of insulin resistance syndrome.[2–4] Body mass index has also been recommended by WHO as a simple, practical and epidemiological measure for identifying over weight and obese patients.[5] It is nevertheless a crude index and does not take into account the distribution of body fat.[5] Waist hip ratio can serve as an easy screening device used in conjunction with other proven measures to detect those at elevated risk of coronary heart disease (CHD).[6] Waist circumference and waist hip ratio have been used as measures of central obesity (where visceral adipose tissue is stored), and body mass index has been used as a measure of general obesity.[7]

The recognition of central obesity is clinically important, as life style intervention, which in turn, is a better predictor than body mass index.[8] However waist circumference cannot distinguish abdominal subcutaneous fat, total abdominal fat and total body fat and is strongly correlated with body mass index.[9] The distribution of body fat, especially abdominal localisation is a more important determinant than the total amount of body fat of the development of diabetes and other diseases.[10]

Women with waist hip ratios of >0.8, and body mass index >32 have an increased risk of heart disease, stroke and diabetes.[11]

Our study aimed to correlate WHR with BMI in different age groups in women of Lahore to detect obesity and provide guidance for its prevention in order to reduce the risk coronary heart disease, cardiovascular disease and type II diabetes in later years.

MATERIAL AND METHODS

Ninety female subjects in age range of 20–55 years matched socio-economically were selected by simple random sampling from the random number table belonging to the city of Lahore from July to December 2009. The subjects were divided into three groups, i.e., G1, G2 and G3. All groups comprised of 30 subjects. Group G1 comprised of subjects with age range 21–29 years, G2 with age range 30–39 years and G3 with age range 40–55 years.

Weight was measured in light clothing without shoes after emptying bladder. Height was measured as the distance from the top of the head to the bottom of the feet (no shoes) using a fixed stadiometer. BMI was calculated as the weight (Kg) divided by the square of the height (m). Waist circumference (Cm) was taken with a tape measure as the point midway between the costal margin and iliac crest in the midaxillary line, with the subject standing and breathing normally. Hip circumference

(Cm) was measured at the widest point around the greater trochanter. The waist-to-hip ratio was calculated as the waist measurement divided by the hip measurement. The physiometric variables included measurement of systolic blood pressure (SBP), diastolic blood pressure (DBP). Two consecutive readings were recorded for each of SBP and DBP and the averages were used. The measurements were taken with the help of mercury sphygmomanometer in a sitting position with the right forearm placed horizontal on the table.

All data were analysed using SPSS-16. Mean, standard deviation, linear regression analysis (curve estimation) and ANOVA were used to investigate the relationship between WHR and BMI.

RESULTS

In Table-1 obesity related parameters in different age groups are shown while Table-2 shows comparison between WHR and BMI in all the groups. In G1 WHR was 0.74±0.030 with BMI 21.59±3.07. G2 had WHR 0.78±0.055 and BMI 26.8±2.04 whereas in G3 WHR was 0.80±0.043 and BMI 32.4±4.23. Statistically significant relation at (r=0.65), (r=0.79), (r=0.91) was found between WHR and BMI in all three groups. Comparison also revealed a linear positive correlation graphically in all groups between WHR and BMI.

Table-1: Obesity related parameters in women with different age groups

Parameter	Group I	Group II	Group III
Height (Cm)	65±4.5	64±4.1	64±4.0
Weight (Kg)	118±5.8	148±5.8	165±8.8
WC (Cm)	27.2±2.9	37.2±3.1	38.8±3.5
Hip circumference (Cm)	37.2±2.5	43.2±2.0	43.9±3.1
WHR	0.74±0.030	0.78 ±0.055	0.80±0.043
Systolic BP (mmHg)	100–110	110–120	115–130
Diastolic BP (mm Hg)	66–75	75–80	80–90
BMI (Kg/m^2)	21.59±3.07	26.8±2.04	32.4±4.23

WC: waist circumference, WHR: waist hip ratio, BMI: body mass index

Table-2: Comparison between WHR and BMI in all three groups

Groups	WHR	BMI	Regression coefficient (r)
G1: 21–29 year (n=30)	0.74±0.030	21.59±3.07	0.65*
GII: 30–39 year (n=30)	0.78 ±0.055	26.8±2.04	0 .79*
GIII: 40–55 year (n=30)	0.80±0.043	32.4±4.23	0.91*

DISCUSSION

Obesity cannot be described solely as fat mass but the location of fat deposition is very important to determine the relation between obesity and disease. Abdominal type of obesity is linked to risk factors of atherosclerosis and to metabolic disease. Waist Hip Ratio is a practical, simple and non-invasive index of adipose tissue distribution.[14]

A number of obesity related variables are recognised risk factors of different diseases. Body weight, BMI, waist and hip circumference, WHR, triceps and subscapular are all positively predictor of obesity related diseases.[15] Waist measurement alone may be relevant when assessing severely obese subjects whose hip measurements are difficult and unreliable. However, waist hip ratio may be better predictor of cardiovascular risk than waist measurement, as it is less dependent on body size and height. Furthermore, hip circumference is an index of muscle mass and may reflect exercise status and insulin sensitivity.[15] BMI is the most commonly used indicator of obesity in population studies, although it is not a perfect one. It does not take into account body fat patterning as waist size, WHR and skin-fold measurements do.[17]

In our study there is a statistically significant correlation between WHR and BMI as shown by regression coefficients and linear graphical regression analysis. This is in accordance with other studies, which document that WHI and BMI have found equally important indicator to predict the risk of cardiovascular diseases. However, WHR has shown better prediction power for cardiovascular disease among women.[13,16] Many investigators advocated that WC as well as WHR have strongest relationship with the elevation of blood pressures especially in females although age and menopause have significant effect on cardiovascular parameters.[18]

The weakness of the present data is that the analysis does not include male data. However, this is a problem for female investigator in Pakistani society. There is a need for more such studies still remains on a vast scale especially in Pakistan.

CONCLUSION

That there is a good correlation between WHR and BMI for evaluation of obesity. It is suggested that the women with obesity in different ages should get their WHR measured and BMI calculated that may help to maintain better health and prevention of obesity related diseases.

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