ORIGINAL ARTICLE

Waist Hip Ratio as the Predictor of Hypertension in Obese Males

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Abstract

***Background**: Obesity is a common problem in much of the world today and that is linked directly with several disease processes, notably, hypertension. It has been estimated to affect 5 to 10% of children and adolescent and 20 to 40% of adults in the developing countries like India. In India the number of overweight people has increased significantly over the last 20 years. **Aims**: The present study was conducted to identify which of the Anthropometric parameter better predictor of future hypertension development in this group of population. **Materials and Methods**: Human subjects male of age group 20 -40 years (n=50) were included in this study and Anthropometric indices of the individuals were recorded as per protocol. Blood Pressure readings were taken as per the standard protocol with a Mercury Sphygmomanometer. **Results**: The statistical analysis was done using Pearson correlation coefficient between SBP and other variables; the results show that Waist Hip Ratio (WHpR) was having strong positive correlation with SBP, followed by Waist Girth. Similarly the DBP was also correlated with other variables moderate positive correlation was shown with WHpR. The results clearly show that WHpR is a better anthropometric index in predicting the levels of SBP and DBP in this group of population. **Conclusion**: In conclusion we found Waist-Hip Ratio (WHpR) is important in prediction of elevated levels of SBP and DBP. Waist Girth of > 90cm and Waist-Hip Ratio (WHpR) of > 0.93 should be considered as at an increased risk for developing future Hypertension in this group of males.*

***Keywords:** Systolic Blood Pressure, Diastolic Blood Pressure, Waist-Hip Ratio.*

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Introduction

Obesity is a common problem in much of the world today and that is linked directly with several disease processes, notably, hypertension. Obesity is considered as disorder of energy balance where intake of calories is more then the expenditure, it affects wide range of people belonging to diverse ethnic groups, age and socio-economic status.[1] Direct associations between obesity and several diseases, including diabetes mellitus, hypertension, dyslipidaemia and ischemic heart disease are well recognized.[2] Hypertension is strongly linked to obesity. Hypertension is about 6 times more common in obese than it is in lean subjects.[3] Not only is hypertension more common in obese subjects, weight gain in young people is an important risk factor for the subsequent development of hypertension. The American Heart Association has recently added obesity to its list of Major risk factors for Heart disease.[4] Prevalence of hypertension increases in obesity as does the prevalence of hyperlipidemia and type II Diabetes Mellitus. The association between these conditions has been attributed to relative insulin resistance which may cause hypertension in some patients.[5] A relationship between the weight gain and increased blood pressure is well documented. Hypertension is about 6 times more common in obese than it is in lean subjects.[6] Not only is hypertension more common in obese subjects, weight gain in young people is an important risk factor for the subsequent development of hypertension. A 10 kg higher body weight is associated with

3mmHg increase in systolic pressure and a 2.3 mm Hg increase in diastolic pressure. This increase translates into an estimated 12% increase in risk for coronary heart disease and 24% increase in risk for stroke.[6]

It has been estimated from Framingham Health Study that excess body weight may account for up to 26% of cases of hypertension in men and 28% in women.[7] The distribution of body fat is considered important in the genesis of the obesity-hypertension syndrome, with a predominantly central distribution being particularly ominous.

The fall of blood pressure with weight reduction is associated with decreased blood volume, cardiac output and sympathetic activity. Thus the association between body weight and blood pressure and changes in weight and variation in blood pressure over time period indicates that weight reduction in over weight individuals and avoidance of obesity should be key strategies for both prevention and treatment of Hypertension.[8]

Materials and Methods

The study was conducted in the Prathima Institute of Medical Science Karimnagar, [A.P] in the General medicine OPD between 9 A.M to 12 A.M. About 50 obese male subjects were taken up randomly for the study. All subjects were selected randomly following the inclusion and exclusion criteria.

Inclusion Criteria

1. All patient's aged above 20 years and below 40 years
2. Male individuals
3. BMI > 25
4. OPD visitors of Gen Medicine Dept of PIMS Hospital Karimnagar A.P

Exclusion Criteria

1. patients less than 20 years of age
2. patients with clinically significant diseases such as
   (a) Cancer
   (b) Tuberculosis
   (c) Hyperthyroidism
   (d) Hypothyroidism
   (e) Cushing's syndrome
   (f) Secondary hypertension

Ethical Approval: The study was approved by Ethical committee of Prathima Institute of Medical sciences. All subjects were informed about the study to obtain maximum co-operation and a written consent was obtained.

Body Weight: This was measured in the erect position without footwear with the subject lightly clothed. Measurements were taken with the same instrument and were done in kilograms which were rounded off to the nearest half a kilogram.

Height: After removing the shoes subject was asked to stand upright on the flat floor keeping the feet parallel to heels, buttocks, and shoulder and back of the head touching a hard surface. The head was held comfortably erect with the lower border of the orbit in the same horizontal plane as the External Auditory Meatus. The arms were positioned by the side of the body. Measurements were taken to an accuracy of half centimeter.

Body Mass Index (BMI): This was calculated as Weight (in Kilograms) divided by (height in meters) ^{2}

Waist Girth: Waist circumference is measured at the midpoint between the Lower border of ribcage and iliac crest while the subject is in standing position and breathing normally nearest to half centimeter.

Hip Girth: The Hip Circumference was measured at the level of Greater Trochanter, by measuring to nearest half centimeter, at the point where the buttocks extended maximum, when viewed from side in standing position using a flexible non elastic tape.

Waist Hip Ratio (WHpR): The ratio of waist circumference to hip obtained from the above two physical parameters were calculated and were rounded of to the nearest two decimal.

$$\frac{\text{Waist Girth in cm}}{\text{Hip Girth in cm}}$$

Recording of Blood Pressure: Blood pressure measurements were done in the morning hours between 9.00 A.M and 12.00 A.M. The Standard Mercury Sphygmomanometer was used for all subjects and BP was measured using the Auscultatory Method (Littman stethoscope). The equipment was checked and calibrated for

its accuracy as per the recommendations by British Hypertension Society.[9] Measurements were taken in the sitting position. Tight fitting clothing was removed subjects were seated comfortably with back supported legs uncrossed and not talking. The cuff was applied on bare skin, firmly on the right arm, which was supported at the level of the heart. Readings were taken with precautions to avoid parallax error. Care was taken to give Ten minutes rest to the subject prior to first measurement and that time was utilized to take the case history of the patient.

Statistical Analysis: Collected data was entered in the Microsoft Word Excel Sheet 2007 version and the data obtained was analyzed using the SPSS (Statistical Package for the Social Sciences) 17 Version.

Results

The table 1 shows the record of mean parameters in adult males of this study group with standard deviation. All the individuals were between 20 – 40 years of age and had BMI > 25, although their mean SBP and DBP were 128.18 and 88.16 which is considered as high normal.[10]

Table- 1: Mean parameters recordings done in the study

Parameters	Obese Males Mean ± SD
Age	34.9 ± 5.7
SBP	128.18 ± 10.25
DBP	88.16 ± 5.32
Waist Girth	93.5 ± 6.49
BMI	26.7 ± 2.33
Waist Hip Ratio	0.97 ± 0.09

Table 2: summarizes the results of calculations and shows the Pearson correlation coefficient relation between SBP and other parameters. There was a positive correlation between Systolic Blood Pressure and age (r = 0.31) although it is a low correlation coefficient. Almost no correlation was found between SBP and BMI (r = 0.08). Whereas the Waist girth had a moderate correlation with (r = 0.6). The Waist Hip Ratio (WHpR) had a high correlation with SBP (r = 0.79). This shows what of all the parameter which predict SBP the Waist Hip Ratio had a better prediction levels because of its high correlation.

Table- 2: Pearson Coefficient correlation 'r' values of SBP with other variables

Variable	Systolic BP Mean ± SD	r-Value
Age	34.9 ± 5.7	0.31
Waist Girth	93.5 ± 6.49	0.60
BMI	26.7 ± 2.33	0.08
WHpR	0.97 ± 0.09	0.79

Table 3: shows the results the Pearson correlation coefficient calculation between DBP and other parameters. There was a positive correlation between Systolic Blood Pressure and age (r = 0.26) although it is a low correlation coefficient. Similarly a low correlation was found between DBP and BMI (r = 0.29). Whereas the Waist girth had a moderate correlation with (r = 0.39). The Waist Hip Ratio (WHpR) had a moderately high correlation with DBP (r = 0.44). Therefore of all the parameter for prediction for DBP Waist Hip Ratio (WHpR) is the one to depend upon.

Table- 3: Pearson Coefficient correlation 'r' values of DBP with other variables.

Variable	Diastolic BP Mean ± SD	r-Value
Age	34.9 ± 5.7	0.26
Waist Girth	93.5 ± 6.49	0.39
BMI	26.7 ± 2.33	0.29
WHpR	0.97 ± 0.09	0.44

Discussion

The present study was done with an aim to identify which of the anthropometric parameter is the best predictor of Hypertension. The subjects were inhabitants of Karimnagar District. Most of the subjects of the study were from the Middle class to Lower Middle class families. Although they were not diagnosed as hypertensives, their blood pressure seems to be upper limits of normal their average Systolic Blood Pressure calculated was 128 mmHg and diastolic pressure was 88 mmHg.

Chart- 1: Correlation of Waist Hip Ratio with SBP

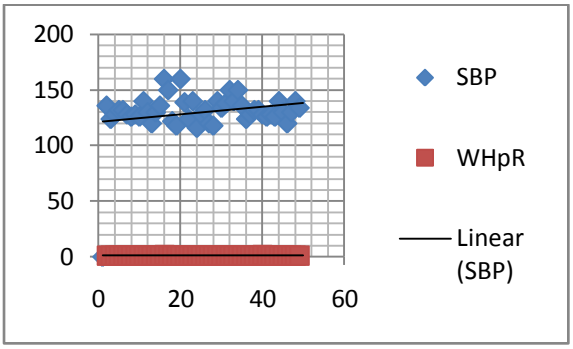
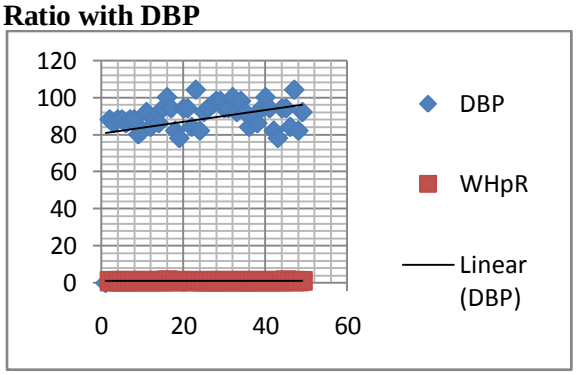


Chart- 2: Correlation values of Waist Hip Ratio with DBP



Data accrued during the past twenty years confirmed that SBP and DBP have a continuous, graded, strong, independent etiological relationship to Coronary Artery Disease (CAD). These relationships are documented for young, middle aged and older men. Most of the persons aged 35 years or more have SBP or DBP above optimal (<120/<80) mmHg); hence, they are at increased cardiovascular risk. What this means is that the blood pressure problem involves most of the population, not only the substantial minorities with clinical hypertension.

All the individuals were males who had BMI of > 25 which is classified as obese I category as IOTF-Proposed Classification of BMI Categories for Asia.[11]

When systolic blood pressure was correlated with anthropometric parameters of all parameters showed positive relation strongest correlation was shown by Waist Hip Ratio (WHpR) similarly the DBP showed positive correlation with all the parameters and waist Hip ratio was having moderate correlation.

Our findings were consistent to similar studies by Dalton M *et al* 2003[12], who showed that Waist Hip Ratio had strongest correlation with CVD risk factors and WHpR is the most useful measure of obesity to use to identify individuals with CVD risk factors. While Sayeed MA et al 2003,[13] who reported that Waist Height Ratio is the better predictor of diabetes and hypertension and lipidemia. In a similar study by Gupta R et al (2007)[14] they showed that there is a significant positive correlation of BMI, waist size and WHpR with systolic and diastolic BP in both men and women.

One similar study conducted by Benetou V *et al* (2004)[15] who compared affects among the variables and found among men, waist circumference appears more important than BMI in prediction of SBP which was similar to our findings where BMI showed almost no correlation with SBP (r= 0.08) and waist circumference appears to have a higher correlation.

Conclusion

Within the limitation of this study it has shown that Waist Girth and Waist-Hip Ratio (WHpR) in Males was found to be statistically significant indices in prediction of SBP and DBP. Waist Girth of >90cm and Waist-Hip Ratio (WHpR) of > 0.93 should be considered as at increased risk for developing future Hypertension. The IOTF (International Obesity Task Force)[11] proposed classification who proposed BMI > 25 as Obese as compared to WHO classification where BMI of 25 - 29.9 was classified as pre obese[16] was having better sensitivity in prediction of overweight and obesity and Hypertension development in this group of population.

Acknowledgement

Authors wish to thank all the participants who contributed in conducting this study successfully.

Source(s) of support: *Nil*
Conflict of Interest: *None declared*

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