



PREVALENCE OF OBESITY BASED ON WAIST:HIP RATIO AND ITS RELATION WITH THE LEVEL OF BLOOD PRESSURE AMONG HEALTHY YOUNG ADULTS.

Physiology

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ABSTRACT

Overweight and obesity are linked to more deaths worldwide than underweight. Like BMI, WHR is a useful measure of central obesity and can predict a wide range of risk factors and related health conditions. Abdominal obesity measured as waist:hip ratio, was associated with an increased risk of myocardial infarction, stroke and premature death. The study was carried out among 384 healthy young adults of the age group 18-24 yrs, to measure the prevalence of obesity based on waist:hip ratio and to ascertain the relation between waist:hip ratio and level of the blood pressure. WHR of male ≥ 0.9 and female ≥ 0.85 were considered to be obese. Blood pressure was categorized as per 7th JNC. Prevalence of obesity in male was 55.42% and in female 77.77%. Mean SBP and Mean DBP in both male and female showed an increasing trend with increasing WHR.

KEYWORDS

WHR, SBP, DBP

INTRODUCTION:

Obesity has been defined by World Health Organization as abnormal and excessive accumulation of fat and adipose tissue, that may impair health¹. Based on data from 2007 National Family Health Survey, 12.1% males and 16% females in India are overweight and obese. In Assam, 6.7% males and 7.8% females are overweight and obese.² Overweight and obesity are linked to more deaths worldwide than underweight. About 65% of the world's population live in countries where overweight and obesity kill more people than underweight.¹

Though BMI had been used more commonly as a measure of obesity, recent studies have found that WHR shows a graded and a significant association, stronger than that of BMI, with risk of myocardial infarction, also shown for Asian Indians.³ Researches have shown that waist:hip ratio is a useful measure of central obesity and a valid anthropometric index in predicting a wide range of risk factors and related health conditions.³

The suggestion for the use of waist:hip ratio as a measure of body fat distribution arose from a 12-year follow-up of middle-aged men, which showed that abdominal obesity measured as waist:hip ratio, was associated with an increased risk of myocardial infarction, stroke and premature death, whereas these diseases were not associated with measures of generalized obesity such as BMI.^{4,5}

Weight gain is often associated with increased level of LDL, VLDL, TG, cholesterol and decreased level of HDL that in the long run may give rise to increased peripheral resistance, increased cardiac output, increased sympathetic nervous system tone and high blood pressure.⁶

AIMS & OBJECTIVES:

1. To study the prevalence of obesity based on waist:hip ratio among healthy young adults.
2. To study the relation between obesity and the level of blood pressure.

METHODS:

The community based cross sectional and prospective study was conducted in the Department of Physiology, Assam Medical College, Dibrugarh from June 2013 to May 2014, among 384 healthy young adults of 18-24 years of both the sexes.

1. Waist Circumference: (WHO STEPS protocol) WC was measured at the approximate midpoint between the lower margin of the last palpable rib and the top of the iliac crest.⁷ The cut-offs of WC for male and female were ≥ 94 cm and ≥ 80 cm respectively.¹⁰

2. HIP Circumference:

HC was taken around widest portion of buttocks.⁸ The cut-offs of HC for male and female were ≥ 102 cm and ≥ 88 cm respectively.¹⁰

3. WAIST:HIP RATIO: Ratio of WC and HC was taken. The cut-offs of WHR for male and female were ≥ 0.9 and ≥ 0.85 .¹⁰

4. Blood Pressure recording: Three readings of blood pressure were taken at an interval of 5 minutes and the average of these three readings was considered as the blood pressure of the individual.⁹ Blood pressure was categorized as per 7th JNC.¹¹

Statistical analysis:

The data were organized in Microsoft excel and analysed by applying appropriate statistical tests by using Statistical Package of Social Sciences (SPSS version 20). Results were expressed in terms of mean $\pm$ SD, percentage and also in the form of diagrams.

One way ANOVA was used for multiple group comparisons followed by Post-hoc-Bonferroni test for group wise comparisons. Pearson's correlation coefficient was calculated.

RESULTS & OBSERVATIONS:

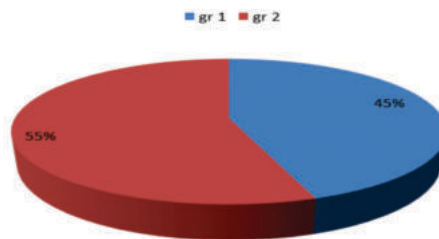


Figure I: Prevalence of obesity in male according WHR:

Total no of male was 240 of which obese (WHR > 0.9) were 133. Prevalence of obesity in male as per WHR was 55.42%.

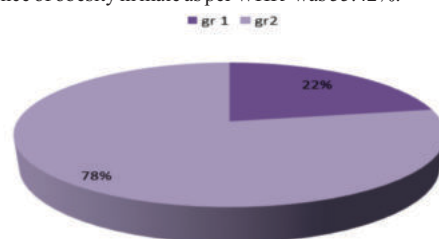


Figure II: Prevalence of obesity in female according to WHR:

Total no of female was 144 of which obese (WHR>.85) were 112. Prevalence of obesity in female as per WHR was 77.77%.

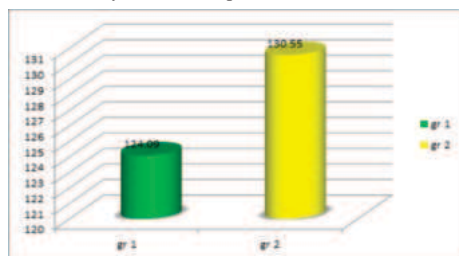


Figure III: Distribution of SBP in male according to WHR:

Mean SBP in male showed an increasing trend with increase in WHR.

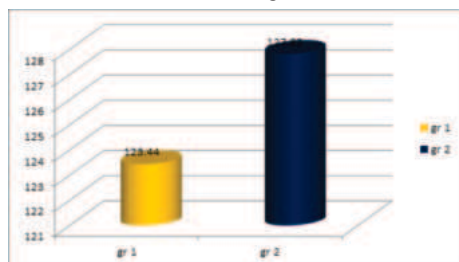


Figure IV: Distribution of SBP in female according to WHR:

Mean DBP in female was showed an increasing trend with increase in WHR.

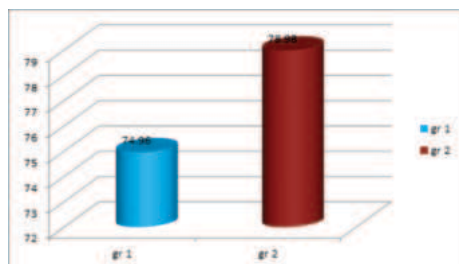


Figure V: Distribution of DBP in male according to WHR:

Mean DBP in male showed an increasing trend with increase in WHR.

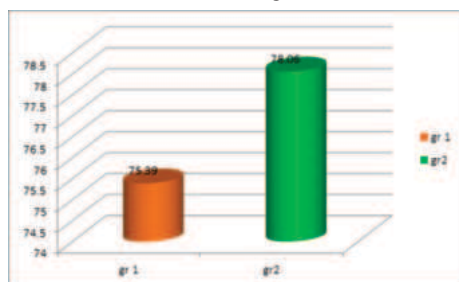


Figure VI: Distribution of DBP in female according to WHR:

Mean DBP in female showed an increasing with increase in WHR

Table I: Comparison of SBP and DBP in male as per WHR:

WHR group	(Mean±SD) SBP	P value	(Mean±SD) DBP	P value
Group1	(124.093±3.121)	<0.001	(74.960±2.892)	<0.001
Group 2	(130.551±3.537)		(78.987±4.936)	

On comparison of SBP & DBP between normal and obese male groups, statistically very highly significant increase in SBP and DBP with increase in WHR were observed.

Table II: Comparison of SBP and DBP in female as per WHR:

WHR groups	(Mean±SD) SBP	P value	(Mean±SD) DBP	P value
Group 1	(123.438±2.136)	<0.001	(75.396±3.451)	0.010
Group 2	(127.821±3.161)		(78.060±4.409)	

On comparison of SBP between normal and obese female groups, statistically very highly significant increase in SBP with WHR was observed.

On comparison of DBP between normal and obese female groups statistically highly significant increase in DBP with WHR was observed.

Table III: Correlation of SBP with WHR in male and female:

Correlation of SBP with WHR	Correlation coefficient r	P value
Male	.835	<.001
Female	.764	<.001

There was a significant positive correlation between SBP and WHR in both male and female.

Table IV: Correlation of DBP with WHR in male and female:

Correlation of DBP with WHR	Correlation coefficient r	P value
Male	.581	<.001
Female	.516	<.001

There was a significant positive correlation between DBP and WHR in both male and female.

DISCUSSION :

On the basis of Waist:Hip ratio, the study population was divided into Group1 (Normal) and Group2 (Obese) with cut off values of .9 and .85 for male and female respectively. Sample size was 384, male 240, female 144.

Prevalence of obesity according to WHR in male was 55.42% (133) and in female was 77.77% (112) with female preponderance.

According to WHR, mean SBP and mean DBP of obese male group was higher than normal male group, mean SBP and mean DBP of obese female group was higher than normal group, overall mean SBP and mean DBP of male was higher than mean SBP and mean DBP of female.

On comparison of SBP & DBP between normal and obese male groups, statistically very highly significant increase in SBP and DBP with increase in WHR were observed.

A significant positive correlation has been observed between systolic and diastolic blood pressure with waist:hip ratio in both male and female.

Similar findings were noted in study done by MT Guanganio et.al.¹³ and REGARDS study (Reasons for Geographic And Racial Differences in Stroke) study carried out by Deborah A Levine et.al.¹⁴; Dalton M et.al.¹⁵; Tatiana Y Wamen et.al.¹⁶; Gupta R et.al.¹⁷.

Obesity leads to an increase in peripheral vascular resistance, increased sympathetic nervous system activity. Long term sympathoactivation can raise the arterial pressure by increasing peripheral vasoconstriction and increased sodium reabsorption by kidneys. Activation of Renal Angiotensin Aldosterone system reabsorb water and sodium that too may increase the arterial pressure.

CONCLUSION:

Increased waist:hip ratio is a very important indicator of obesity and is directly associated with increase in both systolic and diastolic blood pressure and the increase is statistically very highly significant.

However further research is needed among diverse population in this regard to find out the actual causes of obesity and subsequent adverse effects over different organ systems of the body so that these can be modified before permanent irreversible imprints are left.

Acknowledgement:

Dr Rwitumsita Bharali, Assistant Professor, Physiology, Assam Medical College & Hospital

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