



To Study the Relationship of Waist Circumference and Waist Hip Ratio with Blood Pressure in Medical Students

Authors

Dr Suman Rai¹, Dr Shubhangi Mahashabde²

¹Associate Professor, Physiology Department, Amaltas Institute of Medical Sciences, Dewas (M.P.)

Address:- 510-B, Shehnai 2 Residency, Kanadia Road, Bengali Square, Indore, Pin 452016

Email: Sumanrai2609@gmail.com, Mobile – 9977670507

²Assistant Professor, Physiology Department, Amaltas Institute of Medical Sciences, Dewas (M.P.)

Address:- 6 Indira Gandhi Nagar, Kesar Bagh Road, Indore, Pin 452009

Email: shubhangi.mahashabde@gmail.com, Mobile - 9981627770

ABSTRACT

As a result of various research and developments in the medical field in 20th century, many health problems that were common a century ago do not exist today. But they have been replaced by disease like high blood pressure, obesity, and coronary heart disease attributed to faulty and sedentary life style associated with industrialization, urbanization, economic development and market globalization. This combination of unhealthy diet and lifestyle is having a significant impact on the health and nutritional status of population, particularly in developing countries and countries in transition.

Methodology: *The present study was carried out in the department of physiology, Amaltas institute of medical sciences Dewas (M.P.). We have selected the 250 individuals of age groups 14 to 25 years. A randomized cross sectional non interventional study was performed. Data thus obtained were analyzed by Chi square test with the help of SPSS-20 (software Package used for Statistical Analysis) software for statistical analysis.*

Results: *The results of the present study showed that there was a significant association of Waist circumference with Systolic Blood pressure on both male as well as female students. Significant linear association of Waist Hip Ratio with blood pressure in males only, while in females Waist Hip Ratio failed to show association with blood pressure.*

Keywords: *blood pressure, waist circumference, waist hip ratio.*

Introduction

Prevalence of high blood pressure and obesity are increasing in India in recent years even-though under nutrition contrition to be an important public health issue even in the 21st century⁽⁶⁾. Despite the availability of a few therapeutic agents, the management of obesity is still mainly by change in lifestyle and dietary modification. Physical activity and dietary modification are the

cornerstones for management of high blood pressure and obesity.

The association between waist hip ratio and blood pressure has been extensively documented, usually with body mass index (kg/m) as the measure of relative weight. Despite the consistency with which this correlation is observed, mechanistic explanations for the phenomenon are still being debated, and no

biological model of the process has been established. The association, however consistent, is rather modest in magnitude, and large sample sizes are therefore required in order to make estimates with any degree of certainty. More recently, there has been a rapid change in living and eating patterns along with accelerated urbanization. These observations present both an opportunity and a challenge for biological inference. The objective of this study was to determine any correlation of waist circumference and waist hip ratio with blood pressure in medical students.

Material and Methods

The present study was carried out in the department of physiology, Amaltas institute of medical sciences Dewas (M.P.)

We have selected the 250 individuals of age groups 14 to 25 years from Amaltas institute of medical sciences Dewas (M.P.). A randomized cross sectional non interventional study was performed after taking permission from the Ethics and Scientific Review Committee Amaltas institute of medical sciences Dewas (M.P.) an informed consent had been taken from these subjects after explaining the study procedure and written consent was obtained from. And then after taking detailed history, the physical examination including general as well as systemic examination particularly the Cardio-vascular system was done. All the participants were subjected to a self-made questionnaire to get information regarding their personal, present past, family, socioeconomic and medical history in detail. Special information about their exercise schedule was also obtained through the questionnaire regarding type, duration and length of time of exercise.

These subjects were assessed for various physiological parameters mentioned below and a standardized protocol was followed while taking the measurements:

- Height
- Weight
- Blood pressure

- Waist circumference
- Hip circumference

Instrumentation

This section describes the instruments used in the process of data collection;

Blood Pressure Apparatus: Mercurial sphygmomanometer calibrated in mm Hg.

Weighing Scale: Bathroom weighing scale (Hanson: Model H89DK) for the measurement of subjects in kilograms. The device had a reliability coefficient $r=0.80$.

Stadiometer: The instrument was used for the measurement of height in meters (m) to the nearest 0.1cm. The device had a reliability coefficient $r=0.90$.

Measuring Tape: A flexible measuring tape with a capacity of 150 centimeters, made in China was used for measuring the waist and hip circumferences of the subjects. The device had a reliability coefficient $r=0.70$.

The waist and hip circumferences were measured with a flexible measuring tape following the guidelines recommended in the Anthropometric Standardization Reference Manual and according to the procedure of Norton and Olds, 1996.

Waist circumference (WC)

Waist circumference was measured with tailors inelastic tape midway between lowest palpable rib and top of line crest of individuals with light normal clothing in standing position to the nearest 1 cm. Waist circumference: $WC > 90\text{cm}$ in males and $WC > 80\text{ cm}$ in females were taken as markers of abdominal obesity.

Hip circumference (HC)

Hip circumference was measured with Tailors inelastic tape at the fullest part girth of hip or every individuals with light normal clothing in standing position to nearest of 1 cm

Waist Hip Ratio (WHR)

Waist and Hip circumference were measured to determine the waist-to-hip ratio. While the waist circumference was measured at the level of the narrowest point between the lowest coastal borders and the iliac crest after expiration, the hip circumference was taken at the greatest posterior

protuberance of the buttocks. The waist to-hip ratio was determined by dividing the waist circumference by the hip circumference: mathematically calculated as:

Formula for waist hip ratio = waist circumference (cm)/hip circumference (cm).

It is calculated by dividing the waist circumference (WC) by the hip circumference (HC) correct to two places of decimal. A WHR > 1.0 in males and WHR > 0.9 in females was taken as abnormal.

The average values of waist-to-hip ratio 0.80-0.90 and 0.90-0.90 for both females and males respectively are considered safe. However, Values above these averages (for instance, WHR > 1.0) raise the health risks for individuals of both sexes.

Measurement of Blood pressure

Our purpose was to get correlation of blood pressure with body type so, to avoid circadian variation in the blood pressure recording, we measured the blood pressure during before lunch period in all the subjects uniformly at 12.30 pm. In each session of blood pressure recordings, the procedure was demonstrated. The students were given sufficient rest before starting the blood pressure recording. (auscultatory method). The subjects were given a 10 minutes rest and no intake of tea, coffee, food, water in last half an hour was allowed. After taking oral consent the blood pressure (auscultatory method) was measured in sitting posture with proper back support with cubital fossa at the level of heart.

Classification of blood pressure for adults

Classification according to the Seventh Report of the Joint National Committee (25).

Blood Pressure Classification	Systolic blood pressure (SBP) mmHg	Diastolic blood pressure (DBP) mmHg
Normal	<120	And <80
Pre hypertension	120-139	Or 80-89
Stage 1 Hypertension	140-159	Or 90-99
Stage 2 Hypertension	>160	Or >100

Statistical Analysis

Data thus obtained were analyzed by Chi square test with the help of SPSS-20 (software Package used for Statistical Analysis) software for statistical analysis.

Significant Figures

Decision to retain or reject the null hypothesis was made at P≤0.05 alfa level of significance.

Significant when p value P≤0.05

Strongly significant when p value P≤0.05

Observation

The present study was carried out in the Department of Physiology Amaltas institute of medical sciences Dewas. Total 250 medical students were selected to do the study. And finally all 250 participants completed the study and data thus collected were tabulated and analyzed statistically.

Table-1 Correlation between waist circumference and systolic blood pressure (for males)

Waist circumference	Systolic blood pressure,		Chisquare test	P value
	≤ 120 mmHg	>120 mmHg		
1 (≤ 90cm)	114	21	10.075	0.0015
>90cm	25	15		
Total (n=175)	139	36		

Chi squared equals 10.075 with 1 degree of freedom.

The two-tailed p value equals 0.0015

The association between rows (groups) and columns (outcomes) is considered to be extremely statistically significant.

The above table shows that out of 175 male medical students, 114 students having blood pressure <120 mmHg and waist circumference <90cm.

The 25 students having blood pressure <120 mmHg i.e. normal and waist circumference is high i.e. >90cm.

The 21 students having blood pressure >120 mmHg i.e. high and waist circumference is higher side i.e. ≤ 90 cm.

15 male students shown both blood pressure and waist circumference on higher side.

Table-2 Correlation between waist circumference and systolic blood pressure (for females)

Waist circumference	Systolic blood pressure,		Chisquare test	P value
	≤ 120 mmHg	>120 mmHg		
(≤ 80cm)	43	8	6.329	0.0119
>80cm	13	11		
Total (n=75)	56	19		

Chi squared equals 6.329 with 1 degree of freedom.

The two-tailed p value equals 0.0119

The association between rows (groups) and columns (outcomes) is considered to be extremely statistically significant.

The above table shows that out of 75 female medical students, 43 students having blood pressure <120 mmHg and waist circumference <80cm.

The 13 students having blood pressure <120 mmHg i.e. normal and waist circumference is >80cm i.e. high.

The 8 female students having blood pressure >120 mmHg but waist circumference is ≤ 80 cm. i.e. in normal range.

11 female students shown both blood pressure and waist circumference on higher side.

Table-3 Correlation between waist Hip ratio and systolic blood pressure (for males)

Waist Hip Ratio	Systolic blood pressure,		Chi squaretest	P value
	\leq 120 mmHg	>120 mmHg		
(≤ 1)	119	29	8.701	0.0032
(>1)	14	13		
Total (n=175)	133	42		

Chi squared equals 8.701 with 1 degree of freedom.

The two-tailed p value equals 0.0032.

The association between rows (groups) and columns (outcomes) is considered to be extremely statistically significant.

The above table shows that out of 175 male medical students, 119 students having blood pressure ≤ 120 mmHg and waist hip ratio is <1

The 14 students having blood pressure ≤ 120 mmHg i.e. normal and waist hip ratio is >1 i.e. on higher side.

The 29 students having blood pressure >120 mmHg and waist hip ratio is ≤ 1 .

13 male students shown both blood pressure and waist hip ratio on higher side.

Table-4 Correlation between waist Hip ratio and systolic blood pressure (for females)

Waist Hip Ratio	Systolic blood pressure,		Chisquaretest	P value
	\leq 120 mmHg	>120 mmHg		
(≤ 0.9)	43	14	0.075	\0.7844
(>0.9)	13	5		
Total (n=75)	56	19		

Chi squared equals 0.075 with 1 degree of freedom.

The two-tailed p value equals 0.7844.

The association between rows (groups) and columns (outcomes) is considered to be extremely statistically significant.

The above table shows that out of 75 female medical students, 43 students having blood pressure ≤ 120 mmHg and waist hip ratio is <0.9

The 13 students having blood pressure ≤ 120 mmHg i.e. normal and waist hip ratio is >0.9 i.e. on higher side.

The 14 students having blood pressure >120 mmHg i.e. normal and waist hip ratio is ≤ 0.9 i.e. higher side.

Total 13 students shown both blood pressure and waist hip ratio on higher side.

Results

The purpose of this study was to investigate the relationship between waist circumference, waist hip ratio and systolic Blood Pressure of 250 medical students of 18 to 25 years of age group of Amaltas Institute of Medical Sciences, Dewas

Result of the study shows that:

Prevalence of high systolic Blood Pressure among the males and female was not of high significant difference.

Obesity was more prevalent in female students.

Waist circumference was significantly associated with Systolic Blood pressure on both male as well as female students.

Since high blood pressure is a silent killer, adults should be encouraged to participate in at least moderate intensity physical activities three to five times per week throughout life.

Discussion

The purpose of this study was to investigate the relationship between blood pressure and body composition of medical students of 18 to 25 years of Amaltes institute of medical sciences, Dewas (m.p.)

Present study between waist circumference and systolic Blood Pressure for the male students the TABLE-1 shows that Chi squared equals 6.329 with one degree of freedom and the two tailed P value equals 0.0119, which is <0.05 , thus the association between waist circumference and systolic blood pressure for young male medical students is considered to be strongly statistically significant.

Why is centrally located body fat a more important of blood pressure elevation than peripherally located fat. There are three independent, but complementary mechanisms: 1. There is increased renal blood flow in obesity. Renin angiotensin system is activated. Surrounding fat and fat infiltrating into medullary sinuses raises intra renal pressure. The intra-abdominal pressure is also elevated in the obese. All these factors together cause altered pressure natriuresis by the kidney and raise the sympathetic tone. This causes arterial blood pressure to rise in obesity.

Adipose tissue expresses leptin and angiotensin which also cause sympathetic stimulation and Obesity causes glomerulosclerosis that further exacerbates the resultant hypertension by causing volume expansion.

There is some evidence that the mechanism of obesity associated hypertension is related to inadequate vasodilatation of blood vessels in response to increased intravascular volume and cardiac output, an effect related with an increased sympathetic nervous system tone and insulin resistance. So, in a group of overweight individuals, higher values of blood pressure are expected. Few studies have explored the relationship between a large set of anthropometric measurements and blood pressure in the Brazilian adult population, as well as in other parts of the world. A positive association between WC and

BMI, similar to other studies, and blood pressure was noted.

Present study between waist circumference and systolic Blood Pressure for the female students the TABLE-2 shows that Chi squared equals 10.075 with one degree of freedom and the two tailed P value equals 0.0015, which is <0.05 , thus the association between waist circumference and systolic blood pressure for young female medical students is considered to be strongly statistically significant. Thus there is strong correlation between waist circumference and systolic blood pressure for female students i.e. those individuals whom blood pressure. Female in their reproductive years tend to accumulate fat as they age, but still retain the gynoid pattern and in rounding it is pertinent to note that the absolute working capacity of the active female has been established to be approximately 20% less than that of the active male. Fat being metabolically inactive tissue, has detrimental effect on most sports performances. The primary purpose of cells is to store lipid. Consequently, the greater percentage of fat is detrimental (performance wise) in two ways – the cells do not contribute towards energy production, and it costs energy to move the fat. It is a physiological fact that higher body density, which is an index of greater quantity of metabolically active tissue, like muscle and bones, favor performance because of the muscular hypertrophy, which serves an adaptive alteration capable of enhancing muscular strength and endurance.

Present study of relationship between Waist Hip Ratio and systolic blood pressure for male students the TABLE-3 shows that chi squared equals 8.701 with one degree of freedom and the two tailed P value equals 0.0032 which is <0.05 , thus the association between waist hip ratio and systolic blood pressure for young male medical students is considered to be statistically significant. There were 13 students whom WHR was >1 and their systolic blood pressure was also >120 mmHg i.e. they are having risk to develop hypertension in future.

Obese individuals with excess intra-abdominal fat are at particular risk of negative health consequences, with certain ethnic populations like migrant Indians carrying different levels of risk. Total body fat appears to be a less important indicator of metabolic complications than the fat distribution pattern. Although there is no universally agreed way of measuring central adiposity, WHR has been found to be the best predictor of cardiovascular disease.

Present study of relationship between Waist Hip Ratio and systolic blood pressure for female students the TABLE 4 shows that chi squared equals 0.075 with one degree of freedom and the two tailed P value equals 0.7844 which is <0.05 , thus the association between waist hip ratio and systolic blood pressure for young female medical students is considered to be statistically significant.

In this study, we examined the consistency and the relationship of hypertension with overall and abdominal adiposity in a population from developing country, and the results show an unpretentious, but significant linear association of WHR with blood pressure in males only, while in females WHR failed to show association with blood pressure.

This study depicted significant positive between all the anthropometric indicators and systolic blood pressure except for WHR. Many investigators have earlier reported significant positive correlation of WHR with systolic and diastolic blood pressure.

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