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ASSOCIATION BETWEEN CENTRAL OBESITY PARAMETERS AND BLOOD PRESSURE PHENOTYPES: STUDY AMONG WOMEN.

PALLAVI S. KANTHE*[1], BHEEMSHETTY S PATIL[2] AND GOUHAR BANU SHAIKH[1]

[1]Dept of Physiology, Shri B M Patil Medical College, BLDE University, Bijapur, 586103, Karnataka.
[2] Dept of Anatomy, Shri B M Patil Medical College, BLDE University, Bijapur, 586103, Karnataka.

ABSTRACT

A cross sectional study of 138 women in the age group of 26- 35 years was conducted to study the relationship between central obesity and blood pressure phenotypes. According to BMI measurements, subjects were divided into three groups namely: Normal weight (Group1) –BMI 18.5-24.9 kg / m^2, Overweight (Group2) - 25 kg / m^2 - 29.9 kg / m^2, Obese (Group3) - BMI≥ 30 kg / m^2). BMI, WHR, WHtR, BP phenotypes like SBP, DBP, PP and MAP were recorded. Results showed insignificant increase in blood pressure phenotypes with increasing BMI, WHR and WHtR in groups II and III compared to group I. BMI and WHR showed significant positive correlations with both SBP and PP. WHtR had showed significant positive correlation with SBP. BMI, WHR and WHtR have some independent effect on the risk of elevated blood pressures among females. WHR and BMI were found to be equally important indicator to predict the risk of cardiovascular diseases.

KEY WORDS: BMI, Overweight, Obese, SBP, MAP, PP

*Corresponding author

PALLAVI S. KANTHE
Dept of Physiology, Shri B M Patil Medical College, BLDE University, Bijapur, 586103, Karnataka.

INTRODUCTION

Obesity is an epidemic that threatens global well being. The obesity epidemic has had a major medical and public health impact[1]. It is the result of imbalance between food intake and energy expenditure[2]. Overweight and Obesity are associated with cluster of cardiovascular risk factors such as arterial stiffening, increased vascular tone, hypertension and atherogenic vascular phenotypes[3]. Generally, CT and MRI these methods are used to measure directly the intra abdominal fat volume, but these methods are not convenient (practical) for population based cross sectional studies[4]. Therefore, in the present study, we used anthropometric parameters like BMI, WHR and WHtR to show correlation between central obesity and BP phenotypes. WHR, BMI and WHtR are the important variables of obesity. Among these parameters, BMI reasonably estimates adiposity as well as allowing classification of overweight and obesity[5]. A recent pilot study indicates that cut-off point derived from waist to height ratio (WHtR) is a more accurate measurement of central obesity than WC[6]. BP phenotypes include SBP, DBP, PP and MAP. They are considered as the parameters to evaluate hypertension. We limited our study population to women as obesity affects women more than men and the relative risk of cardiovascular diseases is more in obese women than in obese men. This is because women are naturally fatter with higher levels essential fats and less lean tissue than men[7]. Traditionally hypertension is known to be associated with obesity in both genders. However, whether this relationship between hypertension & obesity is linear for all the blood pressure phenotypes not yet investigated especially in middle aged women. This study was implemented to know the correlation between central obesity and BP phenotypes in an attempt to contrive cardiac risk factors in obese women and to compare the same with non obese women. By knowing this, we can advise dietary interventions and regular physical activity to obese women.

MATERIALS & METHODS

This is a comparative and cross sectional study assessing the relation between central obesity and BP phenotypes in middle aged women. The study was conducted in the Department of Physiology, Shri B M Patil Medical College, from March to July 2014. Ethical clearance was obtained from the institution. After explainingthe details of the study, Informed consent was obtained from each of the subjects. The study was conducted on 138 (Normal weight = 59, study group= 79) volunteer women aged 26-35 years, attending the OPD of Shri BM Patil Medical College, Bijapur. Subjects were randomly selected for the study. Depending upon BMI, these subjects were divided into three groups: Normal weight (Group1) –BMI 18.5-24.9 kg / m^2, Overweight (Group2) - 25 kg / m^2 - 29.9 kg / m^2, Obese (Group3) - BMI≥ 30 kg / m^2) [8]

Inclusion criteria

Women with BMI between18.5 kg / m^2- ≥ 40 kg/m^2 aged between 26-35 years were included in the study.

Exclusion criteria

subjects with Diabetes mellitus any cardiovascular diseases or endocrine disorders, taking medications interfering with vascular reactivity were excluded from the study. All the parameters were recorded in the departmental laboratory between 8 to 10 am. Anthropometric parameters like height (cm), weight (Kg), waist & hip circumferences were recorded. BMI (Kg/m^2), WHR & WHtR were calculated. The BMI (Quetelet Index) was conventionally calculated as weight in kg/height (in meters^2) for each subject. WC was measured with a tape midway between the lowest rib & the iliac crest in the upright position. Hip circumference was measured in standing erect, feet together at the level of the greater trochanters[9]. WHR was calculated as waist circumference divided by hip

circumference. WHtR was calculated as the waist circumference divided by height.

Evaluation of BP phenotypes

Blood pressure of all women was recorded with a mercury sphygmomanometer (DIAMOND) and a stethoscope in a sitting position. Mean arterial blood pressure (MAP) is the average blood pressure level during the cardiac cycle. MAP was simply estimated as DBP + (SBP-DBP)/3. PP was calculated as SBP-DBP[10].

STATISTICAL ANALYSIS

Statistical analysis was done using SPSS Software. The results were expressed as Mean ± SD. Comparisons between Normal weight, overweight and Obese groups were carried out using One-Way ANOVA and Hochberg post Hoc tests. $P \leq 0.05$ was considered as statistically significant. Correlation was done between BMI, WHR, WHtR and BP phenotypes by Pearson's correlation using SPSS software.

RESULTS

Table I

Central Obesity Parameters and BP Phenotypes of different study groups.

Parameters	Group 1	Group2	Group 3	'p' value
BMI Kg/m^2	22.08 ± 2.14	28.24±1.08*	33.6±3.17*#	0.000
WHR	0.77± 2.6x 10^{-2}	0.82±5.1x10^{-2}*	0.86± 5.7x10^{-2}*#	0.000
WHtR	0.39± 4.9x10^{-2}	0.57±3x10^{-2}*	0.64±0.66x10^{-2}*#	0.000
SBP mmHg	122.4± 8.05	123± 13.7	127± 13.5	0.070
DBP mmHg	79± 5.9	80± 8	80± 9.2	0.837
PP mmHg	43 ± 6.01	43±11.4	45± 8.4	0.220
MAP mmHg	94 ± 6.7	94±8.4	95± 9.7	0.535

Data presented are Mean±SD. Analysis of data was done by one-way ANOVA and post-hoc by Hochberg test. The * depicts comparison with Group 1and the # depicts comparison with Group 2. * P < 0.05; # P < 0.05. Group 1 (Normal weight), Group 2 (Overweight), Group 3 (Obese)

Table II

Correlation between Central Obesity parameters and BP Phenotypes.

Parameters	SBP	DBP	PP	MAP
BMI	r =0.251**	r =0.071	r =0.193*	r = 0.133
WHR	r =0.246**	r =0.076	r =0.210*	r= 0.133
WHtR	r= 0.195*	r= -0.074	r= 0.107	r = 0.108

**** P < 0.05***

Anthropometric parameters

Mean ± SD of BMI, WHR and WHtR have been shown in table1. BMI, WHR and WHtR were significantly higher in group 2 compared to group 1. BMI, WHR and WHtR showed significantly higher values in group 3 compared to group 1 and group 2 (p=0.00).

BP Phenotypes Measures

Mean ± SD of SBP, DBP, PP and MAP have been shown in table 1. SBP and DBP have shown statistically non significant values in group 2 and group 3 compared to group 1.SBP was insignificantly higher in Group 3 compared to Group 1 & 2. There was no significant difference in DBP observed between the three groups. Insignificant higher values of PP in group 3 compared to group 2 and group 1. MAP was insignificantly higher in group 3 compared group 2 & group 3.

Correlation between Central Obesity parameters and BP Phenotypes

The respective correlations between central obesity parameters and SBP, DBP, PP and MAP have been given in table 2. BMI and WHR have shown significant positive correlations with both SBP and PP. WHtR has shown significant positive correlation with SBP.

Figure 1
Correlation between SBP and BMI

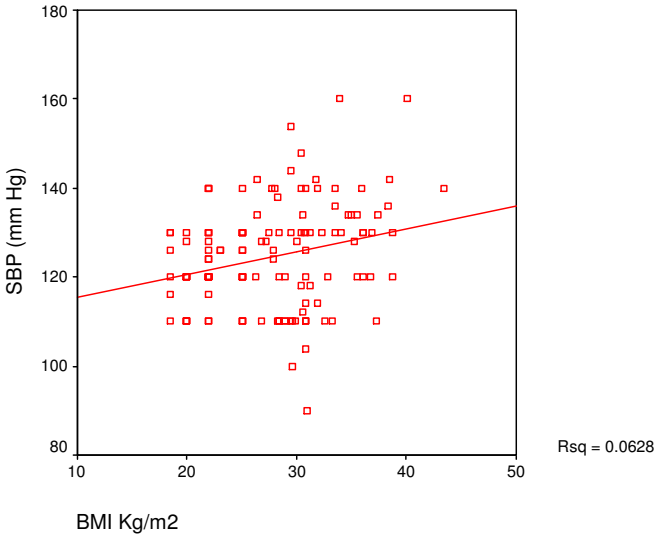


Figure 2
Correlation between SBP and WHR

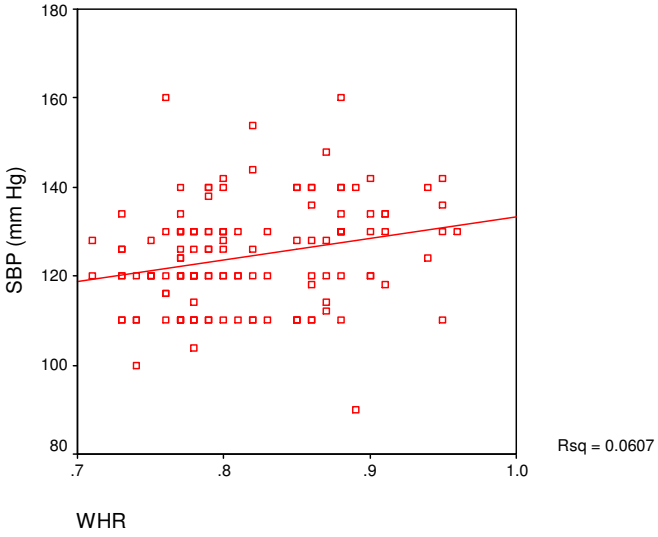
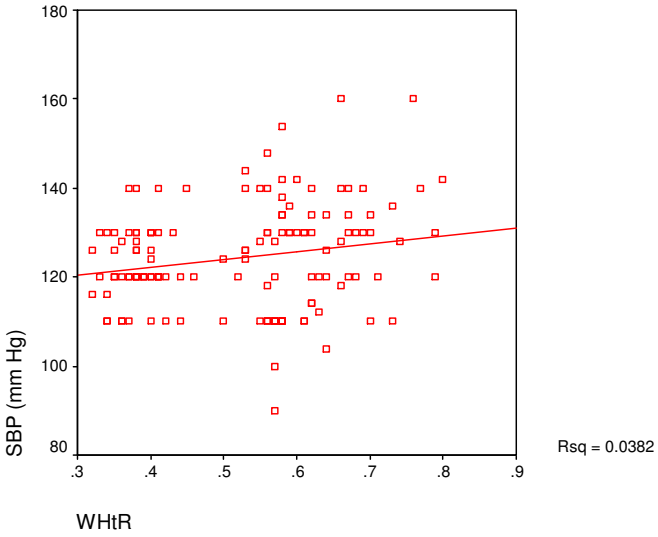


Figure 3
Correlation between SBP and WHtR



DISCUSSION

In the present study, we found non- significant increase in blood pressure phenotypes with increasing BMI, WHR and WHtR in group 3 compared with group1 and group 2. BMI and WHR have shown the strongest associations with PP for middle aged overweight and obese women in our study. Nanaware et al reported that intra abdominal pressure is directly related to the degree of abdominal adiposity & elevated intra-abdominal fat could act to compress the kidney, increase Sodium & water retention & elevate BP. Ectopic deposition of fat within the rigid renal capsule could also elevate intra-renal pressure result in sodium & water retention & in BP[11]. Ejike et al reported that though age is a major risk for hypertension, increasing BMI is thought to increase salt retention, physical inactivity & lead to the development of metabolic abnormalities like Dyslipidemia, insulin resistance etc they are known to result in increased blood pressure & risk of cardiovascular diseases[12]. According to Kopelman, total blood volume in obesity is increased in proportion to body weight. This increase in blood volume contributes to an increase in the left ventricular preload & an increase in resting cardiac output. Blood pressure is the function of cardiac output and systemic vascular resistance. Despite an elevation of cardiac output, obese individual have been shown to have depressed myocardial contractility[13]. Badaruddoza et al showed BMI, WHR have significant correlation with SBP, DBP and MAP. However BMI has been found highly correlated with DBP only which is contrast to our study result. In our study we observed BMI and WHR have significant positive correlations with both SBP and PP[10]. P R Deshmukh et al suggested that BMI and WC as a significant predictors of both increase in Systolic and diastolic blood pressure in middle aged men and women[14]. Sayeed et al reported that WHtR is a better obesity index than BMI and WHR for predicting hypertension; but in our study WHtR was shown to have significant positive correlation with SBP only[15]. Lin et al also reported that WHtR may be better indicator for screening obesity related cardiovascular diseases risk factors than BMI, WC and WHR, similar findings were observed in our study [16]. Tesfaye et al showed a positive correlation between BMI and SBP, DBP, in three population sub groups in men and women which is similarly observed in our study; we

have reported positive significant correlation between BMI, WHR and WHtR with SBP, PP in obese women[17]. Bose et al, reported that the presence of central obesity is a risk factor for hypertension among Bengalee men. Central obesity status had significant positive effects on SBP, DBP and MAP[4]. In our study, we found that, increasing BMI, WHR and WHtR are associated with increase in blood pressure phenotypes are important predictors of cardiovascular diseases.

CONCLUSION

The present study supports the hypothesis that BMI, WHR and WHtR have any independent effect on the risk of elevated blood pressures among females. WHR and BMI have been found equally important indicator to predict the risk of cardiovascular diseases. It is also simple and significant indicator for the management of moderate or high risk of cardiovascular disease and regular health care system in women. Hence, dietary interventions and regular physical activity should be encouraged in obese women.

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