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Research article

TO STUDY THE EFFECT OF THE BODY MASS INDEX AND WAIST HIP RATIO ON BLOOD PRESSURE IN PRE- AND POST-MENOPAUSAL WOMEN

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ABSTRACT

Background: Menopause is the transient period of declined ovarian activity and decreased oestrogen level associated with increased chances of obesity and increased comorbidities like hypertension, hypercholesterolemia, impaired cognitive function and cardio vascular dysfunction. Hypertension is one of the major cardiovascular risk factor for the excess mortality and morbidity in postmenopausal females. **Aim & Objective:** To study the effect of Body Mass Index and Waist Hip Ratio on Blood Pressure in Pre- and Post-Menopausal Women. **Participants:** Fifty premenopausal women in the age group of 40 to 45 years and fifty post- menopausal women in the age group of 50 to 55 years. **Methodology:** Standardised measurements of weight, height, waist circumference, hip circumference and Blood Pressure were done. Results were analysed by student t' –test. Statistical analysis was performed to find the association between Blood Pressure, BMI and WHR of premenopausal and post-menopausal women. **Results:** Post-menopausal women had higher BMI, ($p < 0.05$), had a higher waist and hip circumference ($p < 0.05$) as compared with the pre-menopausal women; $p < 0.05$. When compared with WHR, the result shows that there is no significance difference between pre- menopausal and post-menopausal; $p > 0.05$. Blood pressure is elevated among postmenopausal women when compared with Pre -menopausal women $p < 0.01$. **Conclusion:** These findings suggest that obesity has significant impact on Blood Pressure and obese post menopausal women are at increased risk of developing Cardio vascular complications when compared with pre-menopausal women.

Keywords: Menopause, Body Mass Index, Waist Hip Ratio, Blood Pressure.

INTRODUCTION

Cardio vascular disease is the leading cause of mortality and morbidity in the post-menopausal woman. Women tend to gain weight and prone to develop hypertension as age advances and the importance of high blood pressure as a

risk factor in cardio vascular diseases is well established⁶.

Menopause is the transient period of declining ovarian function and hormones as a part of ageing and it has an impact on health and sense of wellbeing. Menopause is unique in mammals

and only human beings have a longer life span after menopause. The declining ovarian function starts as early as 40 years of age but it is insidious and asymptomatic often but abrupt and symptomatic mostly. As estrogen acts as a shield of protection, women are protected from cardiovascular dysfunction during reproductive phase and the chances are equal after menopause due to structural and functional changes involving cardiac muscles and valves.

Prevalence of obesity in women rises in each decade but 20% weight gain occurs within 3 years of menopause. Obesity in Post menopausal women are multi factorial like reduced physical activity, resting metabolic rate, stress etc. The pattern of weight distribution like more on abdominal girth or more on hips and buttocks is also a predictor of coronary events. The altered hormonal status precipitate central adiposity which in turn leads to non-communicable diseases like diabetes, dyslipidemia, hypertension, cardiovascular dysfunction and decline in cognitive function.

The body mass index is commonly used as an index to assess the degree of body fat and various studies shown that with normal body BMI with increased waist hip ratio have two fold increases in cardiovascular dysfunction. WHR is a better predictor to assess the risk of development of CVD in women compared to BMI². The measurement of WHR, BP is easy and aid as non-invasive and effective tool to assess the health status of women. Hence the purpose of this study is to establish the relationship of BMI, WHR and BP and to identify their effectiveness to screen the postmenopausal women.

MATERIALS AND METHODOLOGY

This Cross sectional study was conducted in Research Laboratory, Department of Physiology, Coimbatore Medical College after the between June 2012 to October 2012. Study involved 50 pre-menopausal women in the age group of 40-45 years and 50 post menopausal women in the

age group of 50-55 years. The study was explained to the subjects and written consent was obtained. Institutional Ethical Committee Clearance also obtained. Women who were diabetics, hypertensive, and smokers, alcoholic, amenorrhoeic due to surgical removal of uterus were excluded from the study.

Anthropometric Measurements: Weight in (kg) was measured with the calibrated weighing scale and height in meters was determined with the stadiometer. The BMI was calculated using the Quetelet's formula $BMI = \text{weight in kg} / \text{height in m}^2$ as a measure of relative weight. Using the flexible meter tape the waist circumference was measured at a point midway between lowest rib and iliac crest¹. Hip circumference was measured at the widest level on the greater trochanter⁴. The Waist to hip ratio was calculated using the formula $WHR = \text{waist circumference (cm)} / \text{hip circumference (cm)}$. All anthropometric were taken using standard techniques.

Physiometric Measurements: This includes measurement of systolic and diastolic blood pressure. Two consecutive values were recorded and averages were used. The measurements were taken using mercury sphygmomanometer in a sitting position after a minimum of 10-15 minutes rest with the right fore arm were placed horizontally on a table⁵. Three consecutive BP were recorded and the mean value was used for analysis

Statistical Analysis: The results were tabulated and T-test statistical analyses were performed to find the association between blood pressure, BMI and WHR in pre-menopausal and post-menopausal women.

RESULTS

Post- menopausal women are obese (Mean BMI 26.34 ± 0.40) when compared with the pre-menopausal women (24.39 ± 0.12); $p < 0.05$. The post-menopausal women had a higher waist (91.14) and hip circumference (84.64); $p < 0.05$ as compared with the pre-menopausal women

(84.64 and 98.06 respectively); $p < 0.05$. When compared with WHR, there is no significance difference between pre- menopausal (0.8618) and post-menopausal (0.8724); $p > 0.05$. Post-menopausal women had increased Blood Pressure, when compared with pre-menopausal women $p < 0.01$.

Table.1: Anthropometric data of pre and post menopausal women

Parameter	Pre menopausal	Post Menopausal	P value.
Mean Age (years)	42.51±0.60	49.38±0.65	-
BMI	24.39±0.12	26.34±0.40	$P < 0.05$
Waist circumference (cm)	84.36±0.14	91.14±0.22	$P < 0.05$
Hip circumference (cm)	78.16±0.18	84.64±0.24	$P < 0.05$
Systolic BP (mmHg)	108.42±1.32	124.10±1.62	$P < 0.01$
Diastolic BP (mmHg)	74.62±1.10	82.46±1.12	$P < 0.01$
W H R (%)	0.86	0.87	$P < 0.05$

BMI: Body mass index; BP: Blood pressure; WHR: Waist Hip ratio

DISCUSSION

During the transition period from pre menopause to post menopause, most of the women experience loss of lean mass, gain in weight, fat mass and central obesity. The BMI of the postmenopausal women was higher and in the overweight range (Mean BMI 26.4) $p < 0.05$. Only 11.37% of the post menopausal women were normal BMI, 89.63% were overweight. Similar findings were observed in a study of post menopausal women in Zaria, Nigeria where BMI of 25.96 were determined¹. The waist circumference and hip circumference of the study group (91.14±1.20cm) was higher than that of the control (84.63±1.10cm) $p < 0.05$. More fat deposition around the abdomen in the reproductive age present as greater WHR⁽³⁾. The identification of menopausal women at risk of hypertension based on

WHR supports the study on three population groups of Punjab by Divya Bishnol et al² and and Tesfaye F et al¹¹. In this present sample, 93.25% ($p < 0.01$) of post menopausal women were with elevated blood pressure suggested that BP rises after menopause appear to be more due to increased BMI⁵. The results of the present study shows that the BMI, WHR and BP were elevated among post-menopausal women and the association between BMI, WHR and BP were studied. Biological changes as a result of cessation of estrogen secretion and aging leads to obesity.

Obesity in post menopausal women is multifactorial like reduced resting metabolic Rate, reduced physical activity, increased appetite and eating habits, emotional stress. The significant increase in body parameters and BP in post menopausal women due to lesser amount of estradiol as compared to pre menopausal women and suggested careful management at right time like healthy habits and regular exercise can make this phase comfortable⁷. The BMI, WHR and BP had a positive correlation with each other¹¹ and stressed that the decreased estrogen secretion among post menopausal women resulting in agglomeration of abdominal fat¹².

CONCLUSION

The results of this study demonstrates there is a linear association between BP and central adiposity and post menopausal women are at risk of weight gain . Obesity, more of visceral obesity precipitates atherosclerotic changes and increases the risk of Hypertension and cardio vascular dysfunction. In this study we observed an association between Body Mass Index and Blood pressure . Weight gain and increased WHR in menopausal period can be prevented by Life style modification.

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