

## To Study the Effect of the Body Mass Index on Blood Pressure in Pre- and Post-Menopausal Women

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### Abstract

Menopause is the transitory period of decrease ovarian activity and decreased oestrogen level associated with increased chances of obesity and increased comorbidities like hypertension, hypercholesterolemia, impaired cognitive function and cardiovascular dysfunction. Hypertension is one of the major cardiovascular risk factors for the excess mortality and morbidity in postmenopausal females. Aim of our study was to evaluate association between BMI and Blood Pressure in pre- and post-menopausal women. Study was conducted in 30 Post Menopausal women in age group of 50 – 55 years and 30 pre-menopausal women in age group of 40 – 45 years. Standardised measurement of weight, Height and blood pressure were done. Statistical analysis was done by Student T- test. In Present study we found that post-menopausal women had higher BMI, ( $p < 0.05$ ) as compared with the pre-menopausal women;  $p < 0.05$ . Blood pressure was elevated in postmenopausal women when compared with Pre -menopausal women  $p < 0.01$ . Results of present study suggest that post-menopausal women were obese and had increased Blood Pressure, when compared with pre-menopausal Women.

**Key words:** Menopause, BMI, Blood pressure.

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### Introduction

Hypertension is chronic non-communicable diseases that have been recognized as a public health problem in developing countries. Women who have tendency to gain weight are prone to develop hypertension with advancing age [1]. Menopause signifies a phase of a woman's life during which there is cessation of menstrual cycle for at least one year. This period marks the end of woman's childbearing age. Estrogen act as shield of protection so 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. In menopause, the loss in ovarian activity and decreased oestrogen level associated with increased chances of obesity and increased comorbidities like hypertension, hypercholesterolemia, impaired cognitive function and cardiovascular dysfunction. [2] Hypertension is the most important risk factor for coronary heart disease (CHD) that affects women in the early post-menopausal years. The decreasing ovarian function starts as early as 40 years of age but it is insidious and asymptomatic often but abrupt and

symptomatic mostly [3]. The measurement of BMI and BP is easy, 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 and BP and to identify their effectiveness to screen the postmenopausal women.

### Material and Methods

This cross-sectional study was conducted in Department of Physiology, Govt. Medical College & Civil Hospital. Study involved 30 pre-menopausal women in the age group of 40-45 years and 30 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. For BMI measurement weight in (kg) was measured with the calibrated weighing scale and height in meters was determined with the Stadio Meter. The BMI was calculated using the Quetelet's formula  $BMI =$

weight in kg /height in m<sup>2</sup>. All anthropometric were taken using standard techniques.

Physio Metric Measurements includes measurement of systolic and diastolic blood pressure. Before taking the blood pressure all participants allowed to take minimum 10–15-minute rest with the right forearm were placed horizontally on a table [4]. Blood pressure measurements were taken using mercury sphygmomanometer. Two consecutive values were recorded and averages were used. The results were

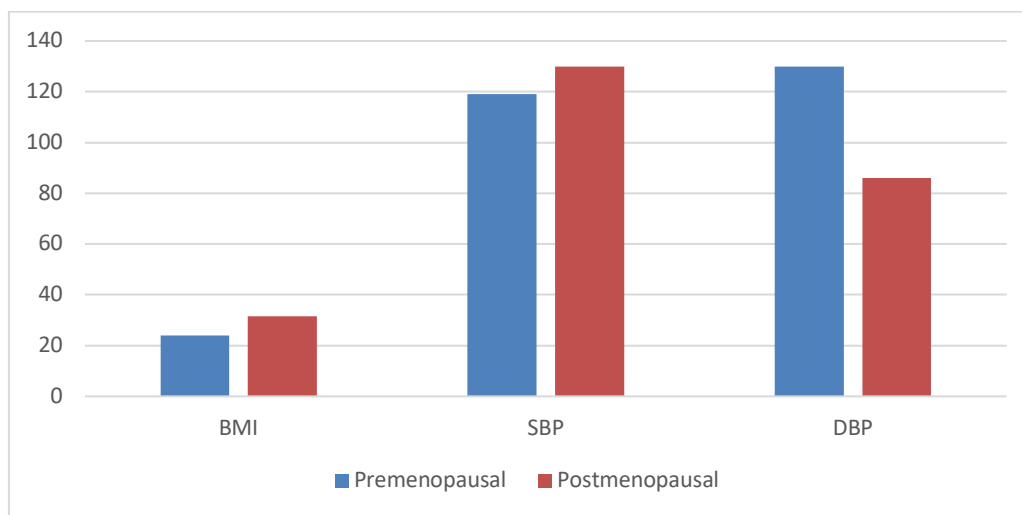
tabulated and T-test statistical analyses were performed to find the association between blood pressure, BMI in pre-menopausal and post-menopausal women.

**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 postmenopausal women.

**Results**

**Table.1: Anthropometric data of pre- and post-menopausal women (n=30)**

| Parameter           | Premenopausal |      | Postmenopausal |      | P value |
|---------------------|---------------|------|----------------|------|---------|
|                     | Mean          | ±SD  | Mean           | ±SD  |         |
| Mean Age            | 42.3          | 1.55 | 52.76          | 1.45 | -       |
| BMI                 | 24.97         | 1.67 | 31.42          | 2.63 | P<0.05  |
| Systolic BP (mmHg)  | 119.96        | 4.44 | 129.76         | 9.45 | P<0.01  |
| Diastolic BP (mmHg) | 81.8          | 3.59 | 85.4           | 5.15 | P<0.01  |



**Chart 1: Comparison of data between pre- and post-menopausal women**  
 BMI: Body Mass Index; SBP: Systolic BP ; DBP: Diastolic BP

During the transitory period from pre menopause to post menopause, most of the women experience loss of lean mass, weight gain, fat mass and central obesity. Table 1 displays comparison between main characteristic of premenopausal and postmenopausal women. There was approximately 10-year difference in mean age of pre- and post-menopausal women. The BMI of the postmenopausal women in this study was within the obese range (31.42±2.63) & also higher than BMI of the pre-menopausal women (24.97±1.67). Similar findings were observed in a previous study of post-menopausal women where BMI of 25.96 were determined. In this present sample elevated blood pressure in post-menopausal women suggested that BP rise appear to be more due to increased BMI. Chart 1 displays frequency distribution of BMI, SBP, DBP in pre- and post-

menopausal women. Post-menopausal women had above normal BMI and increased blood pressure.

**Discussion**

The BMI of the postmenopausal women was higher and in the overweight range (Mean BMI 31.42) p <0.05. In this present study most of post-menopausal women are obese. In previous study of post-menopausal women in Zaria, Nigeria where BMI of 25.96 were determined [5]. In this present sample, 93.25% (p<0.01) of post-menopausal women were with elevated blood pressure. This result suggest that BP rises after menopause appear to be more due to increased BMI [6]. Gaveller and Rosenblum (2003), reported an increase in BMI with menopause and identified smoking, moderate drinking, fat as percent of total calories, neuro-endocrine factors, and being Black or Asian as significant predictors for increased BMI [7]. The

weight gain was different from the age-related difference. Biological changes after menopause as a result of cessation of oestrogen 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 oestradiol as compared to pre-menopausal women and suggested careful management at right time like healthy habits and regular exercise can make this phase comfortable [8]. The BMI and BP had a positive correlation with each other [9] and suggest that the decreased oestrogen secretion among post-menopausal women resulting in an assemblage of abdominal fat [10].

### Conclusion

The results of this study demonstrate there is a linear association between BP and Obesity and post-menopausal women are at risk of weight gain. Visceral obesity precipitates atherosclerotic changes and increases the risk of Hypertension and cardiovascular dysfunction. In this study we observed a Positive association between Body Mass Index and Blood pressure. Weight gain in menopausal period can be prevented by lifestyle modification.

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