

**ORIGINAL ARTICLE****PHYSICAL ACTIVITY AND PATTERN OF BLOOD PRESSURE IN POSTMENOPAUSAL WOMEN WITH HYPERTENSION IN NIGERIA****Omoyemi O. Ogwumike<sup>1</sup>, Ade F. Adeniyi<sup>1</sup>, Bukayo T<sup>1</sup>. Dosa, Arinola O. Sanya<sup>1</sup>, Kehinde O. Awolola<sup>2</sup>****ABSTRACT**

**BACKGROUND:** *Hormonal changes during menopause have been attributed to hypertension-a common public health concern. This study investigated physical activity (PA) and pattern of blood pressure (BP) in postmenopausal women newly diagnosed with hypertension and referred for treatment at the medicine outpatient clinic of a tertiary health facility in Ibadan, Oyo State, Nigeria. It compared BP pattern and adiposity variables [body mass index (BMI) and waist-hip ratio (WHR)] between two PA groups.*

**METHODS:** *Purposive sampling technique was used to recruit 220 participants in this cross-sectional survey after obtaining their informed consent. International Physical Activity Questionnaire was used to assess PA level, while a 16-item questionnaire was used to assess socio-demographic and clinical profiles of the women. BP, BMI and WHR were assessed using standard measurement procedures. Descriptive statistics of mean  $\pm$  standard deviation were used for data summarization and independent t-test was used to compare variables between low level and moderate to vigorous level PA groups.*

**RESULTS:** *Participants' mean values include: age  $61.6 \pm 8.5$  years, years since menopause  $12.75 \pm 8.15$ , BMI  $28.63 \pm 4.99 \text{ kg/m}^2$ , WHR  $1.11 \pm 0.08$ , SBP and DBP  $145.9 \pm 17.9$ ;  $93.7 \pm 11.4$  mmHg respectively. Mean values of SBP, DBP, BMI and WHR were higher among participants with low PA compared to those with moderate to vigorous even though the difference was not statistically significant ( $P > 0.05$ ).*

**CONCLUSION:** *Involvement in moderate to vigorous physical activities among menopausal women in Nigeria should be encouraged. This may reduce hypertension and adiposity with a possible control of cardiovascular disease risk.*

**KEYWORDS:** *Postmenopausal, Hypertension, Physical Activity, Blood Pressure, Adiposity*

**DOI:** <http://dx.doi.org/10.4314/ejhs.v24i2.8>

**INTRODUCTION**

Hypertension is one of the chronic non-communicable diseases that have been recognized as a public health problem in developing countries (1). In Nigeria, hypertension is a widespread problem and it is of immense social and economic importance due to its high prevalence and the severity of its complications (2).

Menopause signifies a phase of a woman's life during which there is cessation of the

menstrual cycle for at least twelve months. This period marks the end of a woman's childbearing years (3). In menopause, the loss in ovarian hormones result in marked biochemical, physiological and structural changes that alter the overall health status of the woman (4), and postmenopause is the phase of a woman's life after menopause. Hypertension is by far, the most important risk factor for coronary heart disease (CHD) that affects women in the early postmenopausal years (5).

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Several studies have indicated that behavioral modifications such as maintaining an improved regular physical activity schedule are recommended as first-line or adjunctive therapy for hypertension (6, 7). In spite of several studies which have been carried out on hypertension in the Nigerian populace (8, 9, 10, 11), there is a dearth of published studies on hypertension with specific reference to menopausal women. Few studies also exist concerning physical activity and menopausal women in Nigeria (12, 13, 14). This study was therefore carried out to compare PA level, adiposity and pattern of blood pressure in postmenopausal women with hypertension in Nigeria.

## MATERIALS AND METHODS

This study took place at the University College Hospital Ibadan, a specialist tertiary health institution located in the southwest region of Nigeria. The hospital is a major referral centre for the management of individuals with chronic conditions. The study was a cross-sectional survey of postmenopausal women newly diagnosed with hypertension and referred for treatment at the medicine outpatient department of the hospital. Participants aged 45 to 85 years and were recruited between May and July 2011. Ethical approval for the study was obtained from the Research Ethics Committee of the University of Ibadan/University College Hospital. Written informed consent was obtained each participant.

**Measures/Instruments:** Socio-demographic information such as age, marital status, level of education, occupation and personal income were obtained from participants through a 16-item bio-data form. This was also used to retrieve clinical information concerning menstrual cycle status, years since menopause and menopausal symptoms from participants. Anthropometric measurements such as weight, height, waist and hip circumferences were taken using standardized measures (15). Body mass index (BMI) was calculated using the formula  $\text{height}/\text{weight}^2$ . Waist hip ratio (WHR) was obtained by dividing waist circumference by hip circumference.

Blood pressure was measured, with the participant sitting, using the auscultatory method with the aid of the mercury in glass sphygmomanometer (Accoson, England) and a

Littman stethoscope. The average of two BP measurements of a participant was used in this study and then classified according to the World Health Organization and the International Society for Hypertension criteria in which (SBP and DBP in mm/Hg) of < 130 and < 85 is normal; 130-139 and 85-89 is high-normal; 140-159 and 90-99 is mild; 160-179 and 100-109 is moderate; while  $\geq 180$  and  $\geq 110$  is severe.

Physical activity (PA) was assessed using the International Physical Activity Questionnaire (IPAQ)-short version, by Pate et al, 1995 (16). The IPAQ is a 7-day recall 7-item questionnaire which seeks information on the level of physical activities which the participant undertook over the previous 7-day period. It assesses total PA in terms of energy requirements in metabolic equivalents of tasks per minute (MET-minutes). PA was categorized into vigorous with a minimum of 1,500 MET-min/wk, moderate with 600 MET-min/wk, and low when lower than 600 MET-min/wk. Computation of PA was done by multiplying the number of minutes and the frequency in days by a specific code for each activity that represents the MET value of each activity. These included frequency in days of walking, moderate and vigorous intensity activities. Total PA score in METS min/week was then calculated by summation of the MET intensities.

Personal income was classified as low, middle, moderate and high based on the federal government of Nigeria's former minimum wage of 6,500 naira (41 US dollars) per month. Participants with low income earned less than the minimum wage, those in middle earned about four times the minimum wage and those from moderate to high income earned from about five to twelve times minimum wage per month.

**Participants:** The participants consisted of 220 postmenopausal women aged 45 to 85 years newly diagnosed with hypertension and referred for treatment at the medicine Outpatient Department of the University College Hospital, a specialist tertiary healthcare facility in Ibadan, Oyo State, Nigeria. A purposive sampling technique was used to select postmenopausal women who attended this clinic between May and July 2011. In this study, recruiting a sample of 220 postmenopausal women from a clinic of about 300 women with hypertension was believed to give a

precision of less than  $\pm 5$  at a 95% confidence interval. The purpose and procedure of the study was explained to would-be participants after which, those who consented to participate signed a written informed consent form and were included in the study.

**Statistical analysis:** During the analysis, participants were classified into two groups. One group contained postmenopausal women with hypertension who presented with low PA, while the other group was made up of the participants who presented with moderate to vigorous PA levels. Based on these groupings, the variables including SBP, DBP, BMI and WHR were

compared between the PA groups. Statistical analysis was conducted using descriptive statistics of means and percentages, inferential statistics of independent t-tests and alpha was set at  $p < 0.05$ .

## RESULTS

Participants consisted of 220 postmenopausal women with a mean age of  $61 \pm 8.5$  years. Their mean number of years since menopause was  $12.75 \pm 8.15$ . The majority (67.3%) of the participants, were married, while (59.5%) were self-employed and about half (50.5%) were in the middle income category (See Table 1).

**Table 1:** Socio-demographic characteristics and physical activity level of postmenopausal women with hypertension in the Study N= 220

Variables	n	(%)
<b>Age (years)</b>		
45-54	49	22.3
55-64	86	39.1
65-74	63	28.6
75-85	22	10.0
<b>Marital Status</b>		
Married	148	67.3
Not Married	72	32.7
<b>Level of Education</b>		
Primary	83	37.7
Secondary	56	25.5
Tertiary	81	36.8
<b>Occupation</b>		
Self Employed	131	59.5
Paid Employment	89	40.5
<b>Personal Income</b>		
Low	78	35.4
Middle	111	50.5
Moderate- High	31	14.1
<b>Physical Activity Level</b>		
Low	83	37.7
Moderate to Vigorous	137	62.3

*N = Total number of participants in the study, n = frequency of occurrence, %= percentage*

**Adiposity variables of participants:** These are as shown in Table 2. The mean BMI of  $28.63 \pm 4.99\text{kg/m}^2$  indicates that the participants were largely overweight and the mean WHR was  $1.11 \pm$

0.08. One hundred and seventy (77.3%) of the participants had BMI above 25 while 210 (95.6%) had WHR greater than 0.9.

**Table 2:** Adiposity variables of postmenopausal women

Variables	Mean	± SD	95% CI
Weight (kg)	74.62	8.5	60.43 - 62.68
Height (m)	1.61	0.07	1.60 - 1.62
BMI	28.63	4.99	27.97- 29.29
WC	47.29	5.19	46.43 - 48.12
HC	42.6	6.49	41.74 - 43.47
WHR	1.11	0.08	1.10 - 1.13

CI= Confidence interval, BMI= Body Mass Index, WC= Waist Circumference, HC=Hip Circumference, WHR= Waist Hip Ratio

**Physical activity level and pattern of blood pressure:** Figure 1 shows that 81 participants (36.8%) who were moderately hypertensive formed the largest group followed by those with mild hypertension 77 (35%). Participants with moderate and high PA levels were merged in a group and compared with those who had low PA level (Table 3). A comparison of the mean age, number of years since menopause, SBP, DBP,

BMI and WHR of the two groups was conducted. It was observed that participants who reported low PA levels were significantly older than those in the group of moderate to high PA ( $P=0.001$ ). The low PA group also had higher mean values of years since menopause, greater body weight, BMI and WHR as well as higher mean values for SBP and DBP.

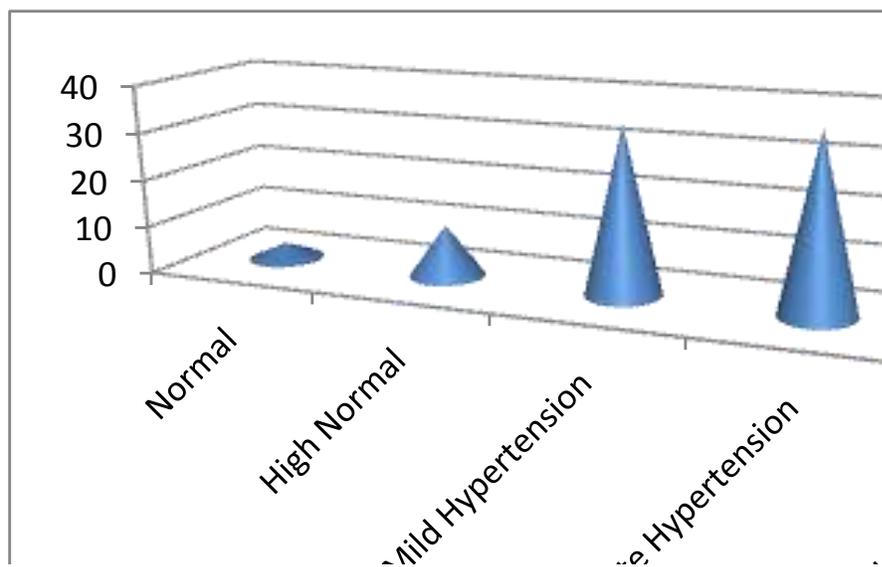


Figure 1: Pattern of blood pressure in postmenopausal women, N=220

**Table 3:** Physical activity level, blood pressure variables and adiposity measures of participants

Variable	Physical Activity Level		t	P
	Low	Moderate to Vigorous		
	n=83 Mean ± SD	n=137 Mean ± SD		
Age (years)	63.92 ± 9.30	60.12 ± 7.67	3.28	0.001*
Years since Menopause	14.94 ± 9.12	11.42 ± 7.20	3.17	0.001*
Weight (kg)	76.54 ± 14.02	73.45 ± 12.36	1.71	0.08
SBP	147.61 ± 19.59	144.82 ± 16.73	1.13	0.26
DBP	94.31 ± 12.08	93.26 ± 10.97	0.66	0.51
BMI	29.30 ± 5.12	28.23 ± 4.88	1.54	0.12
WHR	1.12 ± 0.08	1.11 ± 0.07	0.54	0.08

SBP= Systolic Blood Pressure, DBP= Diastolic Blood Pressure, BMI= Body Mass Index, WC= Waist Circumference, HC=Hip Circumference, WHR= Waist Hip Ratio, n= number of participants in each PAL group, SD= Standard deviation, P= Probability, t=test statistic, \*=significant P values

## DISCUSSION

The mean age of postmenopausal women in this study is in line with that in most previous studies, which reported that most women have become menopausal above the age of 55 years (17, 18). The mean BMI of the postmenopausal women, however, is an important cause for concern because the majority of the participants were in the overweight category. According to various health institutions—National Institute of Health, National Heart Lung and Blood Institute, National Institute of Diabetes and Digestive and Kidney Diseases—it has been established that BMI is a good predictor of body fat and disease risk. When BMI exceeds 27.3kg/m<sup>2</sup> for women, they are predisposed to increased incidence of high blood pressure, diabetes and coronary heart disease (18, 19). Many previous studies have reported that weight gain is a common occurrence at menopause (20, 21, 22); therefore, the high mean BMI in this study participants (28.63kg/m<sup>2</sup>) could be due to a higher mean body weight in the older postmenopausal women. This finding is similar with that of Achie et al, (23). It is therefore of paramount importance that women in the premenopausal years are encouraged to imbibe a lifestyle of improved physical activity as well as dietary patterns that would discourage weight gain.

Waist-hip ratio has been a well-known index for the assessment of obesity health risk profile. The mean WHR of participants in this study is another serious reason for concern as a greater percentage had values greater than 0.9. According to the National Heart, Lung and Blood Institute, women with WHR greater than 0.9 are in the upper limit of the categories for very high relative disease risk (19). It is also noteworthy that greater percentages of participants (95.6%) were identified by WHR within a relative disease risk compared to 77.3% that were identified by BMI. This also substantiates the fact reported by previous authors that WHR is a more accurate index of identifying individuals with cardiovascular disease risk than BMI (24, 23).

The blood pressure pattern in this study showed that greatest percentage of the women were in the moderate category of hypertension, followed closely by those with mild hypertension. The rise in SBP with aging has been mainly attributed to an increase in vascular stiffness of the great arteries in combination with atherosclerotic changes in the vessel walls (5). The hormonal changes in menopause also have an additive effect on the increase in blood pressure during menopausal transition (25, 26). There is usually a decline in the estrogen/androgen ratio and this dilutes the vaso-relaxant effects of estrogen on the vessel wall and promotes the production of vasoconstriction factors such as endothelin (27). The increase in peripheral resistance of the blood vessel walls may be responsible for larger increase

in blood pressure in postmenopausal years. In addition, estrogen has a regulatory effect on the renin-angiotensin system and affects angiotensinogen production and sodium metabolism. In postmenopausal women, especially those who are overweight, the higher sympathetic activity positively potentiates blood pressure rise (28, 29). In turn, over-activity of the sympathetic nervous system is associated with abdominal visceral fat which is strongly related to increased inflammatory markers and oxidative stress. Increased insulin resistance has also been reported to occur at menopause causing unfavorable changes in blood pressure, lipid metabolism, body weight and the development of metabolic syndrome (30).

Postmenopausal women in the low PA level group were older than those in the moderate + high PA level groups. Previous studies have shown that PA declines during early old age (31) and precipitously later in life (32). Participants with lower PA levels reported higher systolic and diastolic blood pressure compared to those with moderate to vigorous PA levels. This observation obviously underscores the importance of PA in menopausal women. According to Poehlman and Tchernoff, (21) the loss of ovarian function induces a reduction in resting metabolic rate, physical activity energy expenditure, fat free mass and an increase in abdominal adipose tissue accumulation. Participants who reported low PA level were observed to have higher values for both central and abdominal obesity indices—BMI and WHR respectively—compared with those who were more physically active. This observation is in line with reports from previous studies that suggest increases in body mass index or total fat mass with menopause (33) and that body composition and abdominal fat distribution are related to the occurrence of disease conditions such as hyperlipidemia, diabetes, hypertension and atherosclerosis (34). Lifestyle modifications of improved physical activity have been recommended as adjunctive therapy for hypertension (8, 7). The result of this study corroborates with this fact even though there were no statistically significant differences when participants who reported low PA levels were compared with the group of participants who reported moderate to vigorous PA levels. However the obvious minimal differences in the blood

pressure and obesity variables between the two groups are of a very relevant clinical significance. In addition, a possible confounding factor associated with the result in this study could be that the participants involved were recruited over a relatively short period (three months). It may be possible that a longer duration of the study of the postmenopausal women would have involved a larger sample size which would have possibly yielded a stronger direction of the effect of overweight and obesity associated with blood pressure patterns of the participants.

Moderate hypertension and overweight are mostly observed in postmenopausal women with hypertension in this study. Higher mean values of blood pressure and adiposity variables were observed in postmenopausal women with hypertension who reported low physical activity level. It is advisable that menopausal women in Nigeria engage more in moderate to vigorous physical activities.

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