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RESEARCH REPORT

# Musculoskeletal pain among postmenopausal women in Nigeria: Association with overall and central obesity

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**KEYWORDS**
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**Abstract** *Background:* Menopausal women experience musculoskeletal changes such as muscle atrophy, muscle weakness and osteoporosis—symptoms associated with advancing age coupled with depletion of the female sex hormone, estrogen. Estrogen is important in the maintenance of the integrity of the musculoskeletal system and its reduction in the circulation due to menopausal transition results in reduced resting metabolic rate, lowered energy expenditure, increase in fat mass, and central adipose tissue accumulation.
*Objective:* This study investigated the prevalence of musculoskeletal pain (MSP) in postmenopausal women (PMW) in Nigeria. We examined the association of overall and central obesity with complaints of MSP and the screening potential of obesity measures for risk of musculoskeletal problems among PMW in Nigeria.
*Methods:* This was a cross-sectional survey of MSP in 310 PMW in Ibadan, Nigeria. MSP was assessed using the Standardized Nordic Musculoskeletal Questionnaire, and overall and central obesity were assessed using body mass index (BMI), waist/height ratio (WHtR), waist circumference, and waist/hip ratio. Data were analysed using descriptive statistics, chi-square test, and logistic regression models with the probability level at $p = 0.05$.
*Results:* Participants were of the modal age group (51–60 years). The highest prevalence rates of MSP were in the lower extremity (189; 61.0%) and the back (164; 52.9%). A direct association was observed between the categories of BMI and lower extremity symptoms ($p < 0.05$), and the categories of WHtR and waist circumference were associated with back and lower extremity symptoms ($p < 0.05$). Postmenopausal women had greater odds of reporting MSP across various classes of BMI. WHtR revealed the greatest odds for back (odds ratio = 1.70, 95% confidence interval 1.07–2.75) and lower extremity symptoms (odds ratio = 2.33, 95% confidence interval 1.44–3.78).

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*Conclusion:* Lower extremity and back pain symptoms were the most prevalent. For overall and central obesity directly associated with MSP, WHtR seemed the best obesity screening tool for MSP in postmenopausal women.


## Introduction

Musculoskeletal pain results from musculoskeletal disorders (MSDs)—a general term for several types of disorders affecting various body parts such as the neck, back, upper limbs, or lower limbs. These disorders affect tissues such as tendons, muscles, ligaments, nerves, and other supporting joint structures [1], and they produce symptoms of pain, ache, or discomfort in the affected body part. These symptoms of pain or discomfort may be acute or chronic, focal or diffuse. Several previous studies have attributed musculoskeletal pain from MSDs as being work related [1,2]. It is also well known that musculoskeletal pain can be multifactorial in origin [3]. Indeed, a very pertinent cause is that associated with ageing, and Felson [4] had opined that MSDs are likely to become more prevalent as the population ages throughout the world.

At menopause, women are known to experience a number of physiological and psychological changes [5]. These include musculoskeletal changes such as osteoporosis, muscle atrophy, and muscle weakness [6]—symptoms that are more or less associated with advancing age [7]. Oestrogen, the female sex hormone, plays a prominent role in maintaining the integrity of the musculoskeletal system; hence, a decrease in this hormone as associated with the menopause transition may lead to impaired muscle function [8], particularly in the postmenopausal years. There are also body composition changes at menopause; some studies suggested increases in body mass index (BMI) or total fat mass with menopause [7,9]. Loss of ovarian function induces a reduction in resting metabolic rate, physical energy expenditure, and an increase in fat mass and abdominal adipose tissue accumulation [7] oftentimes resulting in overweight or obesity. However, to the best of our knowledge, studies that directly investigated the association of overall and central obesity with musculoskeletal pain in postmenopausal women are scarce.

The objectives of this study were to investigate the prevalence of musculoskeletal pain in a population of postmenopausal women; examine if overall obesity (BMI) and central obesity [waist/height ratio (WHtR)], waist circumference (WC), and waist/hip ratio (WHpR) are associated with complaints of musculoskeletal pain in postmenopausal women in Nigeria; and possibly determine which of the obesity measures has the best screening potential for musculoskeletal symptoms in these women.

## Methods

### Participants and setting

This is a cross-sectional survey of urban postmenopausal women in Ibadan North local government area of Oyo State in Nigeria. Ethical approval was obtained from the research ethics committee of University of Ibadan and University College Hospital, Ibadan, Nigeria. Informed consent was obtained from all participants, and all procedures were conducted in accordance with the Declaration of Helsinki. Postmenopausal women who participated in this study were workers in government secretariats, schools, and hospitals in Ibadan North local government area of Oyo State, Nigeria. A nonprobability sampling technique was used in this study such that women who appeared to be in the menopausal age category were approached in these venues, and the purpose of the study was explained to them. Self-administered questionnaires were distributed by hand to volunteers. Their menstrual cycle status was ascertained through a question in the questionnaire that asked participants to indicate if their menstrual bleeding was regular, irregular, or was no longer present. Women who reported no menses at least in the past 12 months previous to the study and had no surgical menopause were identified as postmenopausal women and recruited into the study.

### Assessment of musculoskeletal symptoms

Assessment of musculoskeletal symptoms was done with the aid of the Standardized Nordic Musculoskeletal Questionnaire by Kuorinka et al [10]. The Standardized Nordic Musculoskeletal Questionnaire assesses 7-day and 12-month prevalence and patterns of MSDs such as pain, discomfort, and numbness in nine areas of the body including the neck, shoulders elbows, wrists, upper back, lower back, hips/thighs/buttocks, knees, and ankles/feet [10]. For the purpose of this study, symptoms were categorised into four major body areas—neck/shoulder, upper extremity, the back, and lower extremity [11]—and a 12-month prevalence of musculoskeletal symptoms in the postmenopausal women was considered.

### Assessment of obesity

Assessment of obesity was done by rating the BMI as an index of overall obesity, whereas WHtR, WC, and WHpR were used to rate central obesity. BMI was defined as the ratio of weight in kilograms and square of height in metres ($kg/m^2$). Weight and height were measured using standardised means. WC was taken as the largest circumference around the abdomen about the level of the umbilicus [12], whereas WHtR is WC divided by height in centimetres. BMI was categorised as underweight ($<18.5$ $kg/m^2$), normal weight (18.5—24.99 $kg/m^2$), overweight (25.0—29.99 $kg/m^2$), and obese ($\geq 30.0$ $kg/m^2$) [12]. WC was categorised as normal ($<88$ cm) and obese ($>88$ cm), whereas WHtR is classified as normal ($<0.5$) and obese

(>0.5). Categorisation of WHpR is in the order of normal (<0.85) and obese (>0.85) [12].

### Statistical analysis

Descriptive statistics of means and standard deviations were calculated for continuous variables, and categorical variables were calculated as percentages in order to summarise the demographic characteristics of participants. Educational level was classified as follows: those who had secondary/postsecondary education were described as <tertiary, whereas those with a higher educational level were described as tertiary. Personal income was classified as low, middle, moderate, and high according to the minimum wage (18,000 naira/m, or approximately US$112) stratification of the Federal Government of Nigeria. Firstly, bivariate analysis using chi-square test was used to examine the associations of musculoskeletal symptoms with overall and central obesity across standard classes of obesity measures. Secondly, multivariable logistic regression model was used to establish the odds ratios (ORs) and 95% confidence interval (CI) of complaints of musculoskeletal symptoms with obesity. Data processing was carried out using STATA version 10 (STATA Corp., College Station, TX, USA), and the significance level was set at $p = 0.05$.

**Table 1** Characteristics of postmenopausal women in the study.

| Variable | *n* | % |
|---|---|---|
| Age group (y) | | |
| 41–50 | 94 | 30.3 |
| 51–60 | 201 | 64.8 |
| 60–65 | 15 | 4.8 |
| Marital status | | |
| Not married | 48 | 84.5 |
| Married | 262 | 15.5 |
| Educational level | | |
| <Tertiary | 57 | 18.4 |
| Tertiary | 253 | 81.6 |
| Employment | | |
| Government paid | 245 | 79.0 |
| Self-employed/private | 65 | 21.0 |
| Personal income | | |
| Low/middle | 220 | 71.0 |
| Moderate/high | 90 | 29.0 |
| Musculoskeletal symptoms | | |
| Neck/shoulder | | |
| Yes | 143 | 46.1 |
| No | 167 | 53.9 |
| Upper extremity | | |
| Yes | 86 | 27.7 |
| No | 224 | 72.3 |
| Back | | |
| Yes | 164 | 52.9 |
| No | 146 | 47.1 |
| Lower extremity | | |
| Yes | 189 | 61.0 |
| No | 121 | 39.0 |

## Results

Out of the 500 questionnaires distributed by hand, 310 were properly and completely filled by postmenopausal women who met the inclusion criteria for the study. This represented a response rate of 62%. These questionnaires were then coded and subjected to analysis. The modal age group for the postmenopausal women was 51–60 years with a mean last menstrual period of 5.5 ± 3.1 years. They were mostly married 262 (84.5%), predominantly government employed 245 (79.0%), and were of the low/middle income category 220 (71.0%). These data are shown in Table 1. When classified according to BMI, 68 (21.9%) were in the normal weight category, whereas others were either overweight (117; 37.8%) or obese (125; 40.3%). Classifications using standard categorisations according to other central or abdominal obesity measures are as shown in Table 2.

### Prevalence of musculoskeletal pain and association with obesity measures

A 12-month prevalence of musuloskeletal pain in postmenopausal women in this study revealed the highest prevalence in the lower extremity followed by the back—189 (60.97%) and 164 (52.9%), respectively, whereas upper extremity was the least reported (Table 1). A bivariate analysis of associations of musculoskeletal symptoms with overall and central obesity across different classes of obesity measures with the aid of chi-square test showed that only lower extremity pain in postmenopausal women was associated with categories of BMI ($p < 0.05$). Moreover, WHtR and WC were associated with complaints of pain in the back and lower extremity in the participants ($p < 0.05$). By contrast, WHpR was not associated with any of the musculoskeletal symptoms ($p > 0.05$; Table 3). A multivariable analysis through logistic regression models, after adjusting for the effect of age, revealed that obese postmenopausal women were more likely to report musculoskeletal complaints across various classes of obesity measures. A significant association was observed between BMI and the 12-month prevalence of musculoskeletal

**Table 2** Categorisation of postmenopausal women according to overall and central obesity variables.

| Obesity measure | *n* | % |
|---|---|---|
| Body mass index (kg/m$^2$) | | |
| 18.5–24.99 | 68 | 21.9 |
| 25–29.99 | 117 | 37.8 |
| ≥30.00 | 125 | 40.3 |
| Waist/height ratio | | |
| ≤0.5 | 112 | 36.1 |
| >0.5 | 98 | 63.9 |
| Waist/hip ratio | | |
| ≤0.85 | 154 | 52.6 |
| >0.85 | 139 | 47.4 |
| Waist circumference (cm) | | |
| ≤88 | 122 | 39.4 |
| >88 | 188 | 60.6 |

**Table 3** Bivariate analysis showing association of musculoskeletal symptoms with obesity measures in participants.

| Obesity measure | Musculoskeletal symptoms | | | |
|---|---|---|---|---|
| | Neck/shoulder | Upper extremity | Back | Lower extremity |
| Body mass index (kg/m$^2$) | | | | |
| 18.5–24.99 | 0.052 | 0.319 | 0.144 | 0.011* |
| 25–29.99 | | | | |
| ≥30.00 | | | | |
| Waist/height ratio | | | | |
| ≤0.5 | 0.069 | 0.985 | 0.015* | 0.001* |
| >0.5 | | | | |
| Waist/hip ratio | | | | |
| ≤0.85 | 0.153 | 0.419 | 0.884 | 0.894 |
| >0.85 | | | | |
| Waist circumference (cm) | | | | |
| ≤88 | 0.090 | 0.968 | 0.047* | 0.001* |
| >88 | | | | |

*$p < 0.05$, indicating the musculoskeletal symptoms were significantly associated with obesity measures in postmenopausal women.

symptoms in the neck/shoulder for obese participants (OR = 2.02; 95% CI, 1.09–3.75), but not for overweight participants (OR = 1.66; 95% CI, 0.89–3.09). However, a significant association was observed in both overweight and obese participants between BMI and lower extremity symptoms. Analysis of the WHtR data revealed that obese postmenopausal women had twice the number of musculoskeletal complaints of lower extremity pain (OR = 2.33; 95% CI, 1.44–3.78) and 70% more back pain complaints (OR = 1.70; 95% CI, 1.07–2.75) compared with their nonobese counterparts. These associations remained significant for both body regions. A similar trend was observed with WC as an obesity measure (OR = 2.32; 95% CI, 1.44–3.76) for lower extremity symptoms and the association was significant, whereas (OR = 1.51; 95% CI, 0.94–2.40) for back pain the association was not significant (Table 4). Among the various obesity measures, WHtR revealed the greatest odds and significant associations with musculoskeletal symptoms in identified body regions. Therefore, WHtR seemed to be the best obesity screening

**Table 4** Logistic regression analysis of obesity measures and musculoskeletal symptoms in postmenopausal women (adjusted for age).

| Obesity measure | Musculoskeletal symptoms | | | |
|---|---|---|---|---|
| | Neck/shoulder<br>OR (95% CI)<br>*p* | Upper extremity<br>OR (95% CI)<br>*p* | Back<br>OR (95% CI)<br>*p* | Lower extremity<br>OR (95% CI)<br>*p* |
| Body mass index (kg/m$^2$) | | | | |
| 18.5–24.99 | 1 | 1 | 1 | 1 |
| 25.0–29.99 | 1.66 (0.89–3.09)<br>0.113 | 0.89 (0.46–1.68)<br>0.700 | 1.72 (0.93–3.16)<br>0.082 | 2.08 (1.12–3.84)<br>0.020* |
| ≥30.0 | 2.02 (1.09–3.75)<br>0.003* | 0.62 (0.32–1.20)<br>0.159 | 1.52 (0.83–2.78)<br>0.17 | 2.48 (1.34–4.57)<br>0.004* |
| Waist circumference (cm) | | | | |
| ≤88 | 1 | 1 | 1 | 1 |
| >88 | 1.41 (0.88–2.25)<br>0.150 | 0.98 (0.58–1.64)<br>0.900 | 1.51 (0.94–2.40)<br>0.090 | 2.32 (1.44–3.76)<br>0.001* |
| Waist/height ratio | | | | |
| ≤0.5 | 1 | 1 | 1 | 1 |
| >0.5 | 1.47 (0.92–2.38)<br>0.110 | 0.99 (0.59–1.68)<br>0.900 | 1.70 (1.07–2.75)<br>0.030* | 2.33 (1.44–3.78)<br>0.001* |
| Waist/hip ratio | | | | |
| ≤0.85 | 1 | 1 | 1 | 1 |
| >0.85 | 1.42 (0.89–2.26)<br>0.140 | 1.23 (0.74–2.06)<br>0.420 | 1.04 (0.66–1.67)<br>0.840 | 1.03 (0.65–1.65)<br>0.890 |

*Significant *p* value.
CI = confidence interval; OR = odds ratio (adjusted for age).

tool for risk of musculoskeletal problems in postmenopausal women compared with BMI, WC, and WHpR.

## Discussion

This study revealed that musculoskeletal pain is prevalent in varied anatomic body locations of postmenopausal women in Nigeria. A number of previous studies have shown that compared with men, women have a higher prevalence of musculoskeletal pain [3,13,14]. The present study, however, focused only on postmenopausal women—hence, there was no basis for comparison with men. The most prevalent painful sites were the lower extremities and the back. A study conducted by Wijnhoven et al [14] in a Dutch population indicated the hip part of the lower extremity and wrist/hand in the upper extremity as the most painful sites; hence, the result of this study is somewhat similar to that observed for the Dutch population. In addition, Kohlman [13] reported a prevalence of musculoskeletal pain in an adult women population that was age dependent, with the maximum prevalence occurring in the age group of 50—60 years. In this study, the modal age group was 51—60 years, somewhat similar to the observation of Kohlman [13]. In their study, Wijnhoven et al [14] also observed that overweight is directly associated with musculoskeletal pain in all anatomic locations of the participants whereas older age is associated with lower extremity pain in women.

The postmenopausal women in this study were predominantly overweight or obese, and this is a great cause for concern because the menopausal transition has been known to be a period of change in which loss of ovarian function induces a reduction in resting metabolic rate, physical energy expenditure, and an increase in fat mass and abdominal adipose tissue accumulation [7]. Additionally, it was observed that there was a direct association of musculoskeletal symptoms with varied categories of overall and central abdominal obesity.

In actual fact, the mechanism by which obesity is associated with musculoskeletal symptoms and disorders has not been clearly defined [3]. However, it was opined that obesity imposes structural and functional limitations owing to additional loading of the locomotor system leading to aberrant mechanics during locomotor tasks [3]—thus increasing stress within connective tissue structures and the potential for musculoskeletal injury. According to the National Heart, Lung, and Blood Institute [15], excess weight places mechanical and metabolic strains on bones, muscles, and joints, thus increasing the risk of back pain, lower limb pain, and disability owing to musculoskeletal conditions.

This study shows that postmenopausal women with higher obesity indices are at greater risk of having musculoskeletal symptoms particularly in the neck/shoulder, back, and lower extremities. However, strongest associations of overall and central abdominal measures with lower extremity symptoms were observed. This is consistent with findings from previous studies [11,16,17].

The overall obesity measure (BMI) showed discriminative ability for musculoskeletal symptoms in the lower extremity, whereas measures of central abdominal obesity (WHtR and WC) showed greater discriminative ability for musculoskeletal symptoms in the back and lower extremities. By contrast, WHpR did not show any discriminative ability for musculoskeletal symptoms. The limitation of WHpR has been attributed to the fact that it may over- or underevaluate the risk for tall and short individuals with similar WC [18]. This may be one explanation why WHpR could not screen for musculoskeletal symptoms in this study. WHtR, by contrast, has been regarded by some researchers as a useful tool for assessing central abdominal obesity because it corrects WC for the height of the individual [19—21]. In this study, only WHtR showed consistent significant associations with musculoskeletal symptoms in both the back and lower extremities. Hence, it appears to be the best screening tool for musculoskeletal symptoms in postmenopausal women.

### Study limitations

A greater percentage of postmenopausal women participating in this study had a tertiary educational level and were mostly government employees in urban areas. This could have resulted in a homogenous sample of individuals of almost the same lifestyle and socioeconomic class. The effect of this is such that the result obtained in this study may not be generalisable to all postmenopausal women in Nigeria, particularly the uneducated and those of the rural populace. The strength of this study, however, lies in the fact that obesity assessments were done by trained research assistants using standardised methods and were not estimated by participants.

### Conclusion

Postmenopausal women with greater obesity indices are at greater risk of having musculoskeletal symptoms particularly in the neck/shoulder, back, and lower extremities. Strongest associations of overall and central obesity measures with lower extremity symptoms were observed. WHtR is the best obesity screening tool for musculoskeletal symptoms in postmenopausal women.

## Conflicts of interest

The authors have no competing interests to declare.

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## References

[1] Stock S, Baril R, Dion-Hubert C, Lapointe C, Paquette S, Sauvage J, et al. Work-related musculoskeletal disorders—Guide and tools for modified work. Montréal, Québec: Guide OMRT-Fr, Montréal, IRSST — Montréal, Direction de la santé publique; 2005, p. 15.

[2] Putz-Anderson V, Bernard BP, Burt SE, Cole LL, Fairfield-Estill C, Fine LJ, et al. Musculoskeletal disorders and workplace factors: A critical review of epidemiologic evidence for work-related musculoskeletal disorders of the neck, upper extremity, and low back. Cincinnati, OH: U.S. Department of

Health and Human Services, Public Health Service, Centers for Disease Control and Prevention, National Institute for Occupational Safety and Health; 1997.
[3] Wearing SC, Hennig EW, Byrne NM, Steele JR, Hills AP. Musculoskeletal disorders associated with obesity: a biomechanical perspective. Obes Rev 2006;7:239—50.
[4] Felson DT. Epidemiology of rheumatic diseases. In: Koopman W, editor. Arthritis and allied conditions. Philadelphia, PA: Lippincott, Williams and Wilkins; 2000. p. 532.
[5] Bachman GA, Leiblum SR. The impact of hormones on menopausal sexuality. Menopause 2004;11:120—30.
[6] Lautenbach GL, Petri M. Women's health. Rheumatic Dis Clin North Am 1999;5:539—65.
[7] Poehlman ET, Tchernoff A. Traversing the menopause: changes in energy expenditure and body composition. Coron Artery Dis 1998;9:799—803.
[8] Sipila S, Poutamo J. Muscle performance, sex hormones and training in perimenopausal and postmenopausal women. Scand J Med Sci Sports 2003;13:19—25.
[9] Poehlman ET, Toth MJ, Garder AW. Changes in energy balance and body composition at menopause: a controlled longitudinal study. Ann Intern Med 2005;123:673—5.
[10] Kuorinka I, Jonsson B, Kilbom A, Vinterberg H, Biering-Sørensen F, Andersson G, et al. Standardised Nordic questionnaires for the analysis of musculoskeletal symptoms. Appl Ergon 1987;18:233—7.
[11] Viester L, Verhagen Evert ALM, Oude Hengel KM, Koppes Lando LJ, van der Beek Allard J, Bongers PM. The relation between body mass index and musculoskeletal symptoms in the working population. BMC Musculoskelet Disord 2013;14:238. http://dx.doi.org/10.1186/1471-2474-14-238.
[12] World Health Organization. Obesity: preventing and managing the global epidemic: report of a WHO consultations. Geneva, Switzerland: WHO; 2000. p. 9—11.
[13] Kohlmann T. Musculoskeletal pain in the population. Schmerz 2003;17:405—11.
[14] Wijnhoven HA, de Vet HC, Picavet HS. Explaining sex differences in chronic musculoskeletal pain in a general population. Pain 2006;124:158—66.
[15] National Institutes of Health/National Heart, Lung and Blood Institute. Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: The evidence report. Bethesda, MD: National Institutes of Health; 1998.
[16] Andersen JH, Haahr JP, Frost P. Risk factors for more severe regional musculoskeletal symptoms: a two year-prospective study of a general working population. Arthritis Rheum 2007;56:1355—64.
[17] Tukker A, Visscher TLS, Picavet HSJ. Overweight and health problems of the lower extremities: osteoarthritis, pain and disability. Public Health Nutr 2009;12:359—68.
[18] Browning LM, Hsieh SD, Ashwell M. A systematic review of waist-to-height ratio as a screening tool for the predicting of cardiovascular disease and diabetes: 0.5 could be a suitable global boundary value. Nutr Res Rev 2010;23:247—69.
[19] Ashwell M, Hsieh SD. Six reasons why the waist-to-height ratio is a rapid and effective indicator for health risks of obesity and how its use could simplify the international public health message on obesity. Int J Food SciNutr 2005;56:303—7.
[20] Schneider HJ, Glaesmer H, Klotsche J, Bohler S, Lehnert H, Zeihert AM, et al. Accuracy of anthropometric indicators of obesity to predict cardiovascular risk. J Clin Endocrinol Metab 2007;92:589—94.
[21] Schneider HJ, Klotsche J, Silber S, Stalla GK, Wittchen HU. Measuring abdominal obesity: effects of height on distribution of cardio-metabolic risk factors risk using waist circumference and waist-to-height ratio. Diabetes Care 2011;34:e7.