



PREVALENCE OF OSTEOPOROSIS IN OLDER POSTMENOPAUSAL WOMEN

Prevalência de osteoporose em mulheres idosas na pós-menopausa

Prevalencia de osteoporosis en mujeres mayores en la postmenopausia

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ABSTRACT

Objective: To identify the prevalence of osteoporosis in postmenopausal women and its association with risk factors. **Methods:** Cross-sectional study with 115 older postmenopausal women who participated in the extension project of the Federal District University Center lasting one year, starting in 2017. Bone mineral density was measured using Dual-energy X-ray absorptiometry technique on lumbar spine (L1-L4) and femoral neck. Risk factors for low density were evaluated through interviews. Statistical analysis was performed using the Chi-squared test ($p < 0.05$). **Results:** The mean age was 67.8 ± 8.4 years and mean time since menopause was 16.7 ± 6.2 years. Mean bone mineral density was -0.96 ± 1.42 in the femoral neck and -1.25 ± 1.75 in the lumbar spine (L1-L4). The prevalence of low density was 66.9% for the lumbar spine and 52.1% for the femoral neck. We found a significant difference in age (50.5% between 51 and 55 years and low density), physical inactivity (82.9%), personal history of fracture in the last 5 years (31.2% with low density) and body mass index - overweight among women with normal bone mineral density (44.7%) when compared with those with low density ($p < 0.001$). **Conclusion:** Postmenopausal women had a high prevalence of low bone mineral density and associated risk factors.

Descriptors: Bone Density; Aging; Health Promotion.

RESUMO

Objetivo: Identificar a prevalência de osteoporose em mulheres na pós-menopausa e sua associação com fatores de risco. **Métodos:** Estudo transversal realizado com 115 idosas na pós-menopausa que participavam do projeto de extensão do Centro Universitário do Distrito Federal, com duração de um ano, com início em 2017. Mensurou-se a densidade mineral óssea pelo Dual-energy X-ray absorptiometry em coluna lombar (lombar 1 a lombar 4) e colo do fêmur. Por meio de entrevista, avaliaram-se fatores de risco para baixa densidade. Na análise estatística, utilizou-se o teste qui-quadrado de Pearson ($p < 0,05$). **Resultados:** A média de idade encontrada é de $67,8 \pm 8,4$ anos e o tempo de menopausa de $16,7 \pm 6,2$ anos. A média de densidade mineral óssea é de $-0,96 \pm 1,42$ no colo do fêmur e de $-1,25 \pm 1,75$ na coluna lombar (L1-L4). A prevalência de baixa densidade é de 66,9% para coluna lombar e de 52,1% para colo de fêmur. Encontrou-se diferença significativa na idade (50,5% tinham entre 51 a 55 anos e baixa densidade), inatividade física (82,9%), história pessoal de fratura nos últimos 5 anos (31,2% com baixa densidade) e observou-se o índice de massa corpórea - sobrepeso entre mulheres com densidade mineral óssea normal (44,7%) quando comparadas àquelas com baixa densidade ($p < 0,001$). **Conclusão:** As mulheres na pós-menopausa apresentaram elevada prevalência de baixa densidade mineral óssea e fatores de risco associados.

Descritores: Densidade Óssea; Envelhecimento; Promoção da Saúde.



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RESUMEN

Objetivo: Identificar la prevalencia de osteoporosis en mujeres en la postmenopausia y su asociación con factores de riesgo. **Métodos:** Estudio transversal realizado con 115 mujeres mayores en la postmenopausia que participaron del proyecto de extensión del Centro Universitario del Distrito Federal con duración de un año e inicio en 2017. Se ha mensurado la densidad mineral ósea por el Dual-energy X-ray absorptiometry en la columna lumbar (primera vértebra lumbar hasta la cuarta) y el cuello femoral. Se evaluaron los factores de riesgo para la densidad baja a través de entrevista. Se utilizó la prueba de chi-cuadrado de Pearson ($p < 0,05$) para el análisis estadístico. **Resultados:** La media de edad encontrada ha sido de $67,8 \pm 8,4$ años y el tiempo de menopausia de $16,7 \pm 6,2$ años. La media de la densidad mineral ósea ha sido de $-0,96 \pm 1,42$ para el cuello femoral y de $-1,25 \pm 1,75$ para la columna lumbar (L1-L4). La prevalencia de densidad baja es del 66,9% para la columna lumbar y del 52,1% para el cuello femoral. Se encontró diferencia significativa para la edad (50,5% tenían entre 51 y 55 años y baja densidad), la inactividad física (82,9%), la historia personal de fractura en los últimos 5 años (31,2% con densidad baja) y se observó el índice de masa corporal – sobrepeso entre mujeres de densidad mineral ósea normal (44,7%) comparadas con aquellas de densidad baja ($p < 0,001$). **Conclusión:** Las mujeres en la postmenopausia presentaron elevada prevalencia de densidad mineral ósea baja y los factores de riesgo asociados.

Descriptor: Densidad Ósea; Envejecimiento; Promoción de la Salud.

INTRODUCTION

Osteoporosis is a systemic bone disease characterized by loss of bone mass and deterioration of bone microarchitecture and bone quality leading to an increased risk of fragility fractures. Since there are no obvious symptoms of osteoporosis, this condition is often diagnosed after the occurrence of a fragility fracture. Thus, osteoporotic fractures highly burden the healthcare system in terms of increased hospitalizations, surgeries, and prolonged home care and rehabilitation requirements⁽¹⁾. For example, a large study conducted in the United States over a 12-year period (2000–2011) in postmenopausal women ≥ 55 years of age found that the hospitalization costs for osteoporotic fractures were greater than those for other serious conditions such as stroke, myocardial infarction and breast cancer⁽²⁾.

In the Latin America (LA) region, osteoporosis and osteoporotic fractures continue to be a major healthcare concern⁽¹⁾. The Latin American Vertebral Osteoporosis Study (LAVOS) conducted in five countries across LA with women ≥ 50 years old found that the standardized prevalence of radiographic vertebral fractures was 11.18 (95% confidence interval [CI] 9.23-13.4)⁽³⁾.

Chronic degenerative diseases appear with aging and there is delayed rehabilitation and signs of disease at advanced stages, which generally compromises older adults' functionality and quality of life⁽⁴⁾. Within this process, there is also a reduction in muscle mass and muscle strength, fatigue, alterations of gait and balance, loss of appetite and a consequent reduction in weight⁽⁵⁾.

According to the Brazilian Guidelines for the diagnosis and treatment of osteoporosis in postmenopausal women, the most important risk factors related to osteoporosis and postmenopausal fractures are: female gender, White or Asian ethnicity, family history, early menopause, reduced ovarian function before menopause (athlete's amenorrhea, hyperprolactinemia, anorexia nervosa), poor diet (high caffeine intake, low calcium intake), poor life style (sedentary lifestyle, alcohol abuse, smoking) and fractures⁽⁴⁾.

Menopause is a period in which women's health status is significantly fluctuating. Its average onset is at the age of 50. The global average life expectancy for women is 74 years⁽⁶⁾, so the time after menopause accounts for nearly one-third of women's lives. The secretion of estrogen rapidly declines after menopause and leaves postmenopausal women (PMW) at a higher risk of various physical and mental illnesses compared with men⁽⁷⁾.

Thus, osteoporosis ends up being a common disease in postmenopausal women due to age and hypoestrogenism, with an increased prevalence and incidence of fractures and hence a negative effect on the quality of life of such women⁽⁸⁾.

Every postmenopausal woman should be assessed for risk of fractures resulting from osteoporosis as women in this phase of life with a diagnosis of osteoporosis – but without having experienced fractures – may have a quality of life similar to postmenopausal women without osteoporosis⁽⁹⁾.

There is enough evidence to state that bone densitometry (BD) is currently the most effective method to estimate fracture risk in postmenopausal women⁽¹⁰⁾. Preventative measures are especially important given that the available

treatments may conserve bone mass but cannot restore the osteoporotic bone to normality⁽¹¹⁾. Therefore, the objective of this study was to identify the prevalence of osteoporosis in postmenopausal women and its association with risk factors.

METHODS

This quantitative cross-sectional study was conducted with 115 older women (out of 155) who participated in the extension project titled "Health Promotion and Healthy Aging" of the Federal District University Center (*Centro Universitário do Distrito Federal - UDF*) located in the Central region in western Brazil.

Inclusion criteria for the present study were: people aged 60 or over with or without hysterectomy who were part of the extension project and whose last menstrual period occurred at least 12 months prior to recruitment. Postmenopause was characterized as absence of the menstrual cycle for the last 12 months⁽⁴⁾.

Volunteers presenting other conditions or diseases associated with alterations in bone mass were excluded from the study: patients who had undergone oophorectomy, had a history of kidney disease, history of endocrinal disorders or diseases (hyperthyroidism, hypothyroidism, diabetes, Cushing Syndrome, Addison's Disease), history of heart or lung diseases, Paget's Disease, auto-immune diseases (Graves' Disease or Hashimoto's Disease), history of use of medication associated with alterations in bone metabolism (Hormone Replacement Therapy, corticoids, thyroid hormones, heparin, warfarin, phenobarbital, phenytoin, carbamazepine, lithium or methotrexate, supplementation with calcium or vitamin D).

The older women were first approached during meetings of the Health Promotion and Healthy Aging project, which were carried out twice a week for 2 hours/day and included lectures on health promotion and disease prevention. During the meetings, the older women were informed about the objective of the study and invited to participate. Data were collected between September 2017 and February 2018 after signature of the Consent Form.

Data were collected through interviews in which the researcher applied a questionnaire with questions addressing the following variables: age, race, gynecological history (ages of menarche and menopause, time since menopause in years, presence of and time since hysterectomy in years), practice of physical activity, current smoking habits, osteoporosis and fractures (history of nontraumatic fractures in the last 5 years, 1st degree relative with osteoporosis). Women that did moderate aerobic exercise for at least 30 minutes five times a week (150 min/week) or did strength training three days a week were considered active⁽¹²⁾.

After completing the questionnaires, the older women were asked to come to the Physiology Laboratory of the Federal District University Center to carry out BD tests on the proximal femur and lumbar spine (L1-L4) using the Dual-energy X-ray absorptiometry technique (DEXA) and a Hologic QDR-2000 scanner. The criteria were computed in a single exam (the first exam performed) during the data collection period.

The participants were classified according to the T-score and the criteria described in the Brazilian Guidelines for the diagnosis and treatment of osteoporosis in postmenopausal women⁽⁴⁾: normal when ≥ -1.0 SD, osteopenia when the value was between -1.0 and -2.4 SD, and osteoporosis when ≤ -2.5 SD. The participants with total T-score values for spine and/or femoral neck < -1.0 SD (osteopenia and osteoporosis) were considered to have low bone mineral density (BMD).

Weight measurement was taken using Filizola scales and height was measured using a stadiometer coupled to the scales. These anthropometric measurements were taken from all the participants – who wore light clothes and were barefoot during measurements – and were used to calculate Body Mass Index (BMI), which is the product of the division of body weight by the square of the height ($W(\text{Kg})/H(\text{m})^2$). The data were classified according to the World Health Organization (WHO)⁽¹⁵⁾ criteria, which classifies adult individuals with BMI $< 18.5\text{Kg}/\text{m}^2$ as underweight, BMI between 18.5 and $24.9\text{Kg}/\text{m}^2$ as normal weight, BMI between 25 and $29.9\text{Kg}/\text{m}^2$ as overweight, and BMI $> 29.9\text{Kg}/\text{m}^2$ as obese.

The data were analyzed using the Stata software version 12.0 and underwent descriptive statistical analysis using measures of frequency and central tendency in addition to the Chi-squared test. The level of significance adopted was $p < 0.05$.

The project was approved by the Research Ethics Committee of the Federal District University Center (*Centro Universitário do Distrito Federal - UDF*) under Approval No. 1.931.184.

RESULTS

The sample consisted of 115 older postmenopausal women who underwent bone densitometry. The mean age was 67.8 ± 8.4 years and the mean time since menopause was 16.7 ± 6.2 years. The mean BMD (in SD of T-score) was -0.96 ± 1.42 for the femoral neck and -1.25 ± 1.75 for the lumbar spine (L1-L4).

Table I shows the distribution of risk factors for osteoporosis. Most of the women in the sample were White (76.5%), sedentary (63.5%) and had normal BMI (50.4%). A few participants reported smoking (27.9%).

Table I - Distribution of risk factors for osteoporosis in older postmenopausal women. Brasília, Federal District, Brazil, 2018.

Risk factor	n	%	p value*
Age (years)			
60 to 65	34	29.5	0.05
66 to 70	57	49.6	
71 to 75	24	20.9	
Race			
White	88	76.5	<0.001
Mixed	19	16.5	
Black	8	7.0	
Body mass index			
Underweight	11	9.6	<0.001
Normal	58	50.4	
Overweight	36	31.3	
Obese	10	8.7	
Age at Menopause (years)			
≤ 45	12	10.4	<0.01
46 a 50	45	39.1	
51 a 55	58	50.5	
Physical activity			
Yes	42	36.5	0.03
No	73	63.5	
Smoking			
Yes	32	27.9	0.02
No	83	72.1	
Nontraumatic fractures (last 5 years)			
Yes	18	15.6	<0.001
No	97	84.4	
1st degree relative with osteoporosis			
Yes	24	20.9	<0.001
No	91	79.1	
Hysterectomy			
Yes	28	24.3	<0.001
No	87	75.7	

* Chi-squared Test

The prevalence rate of low BMD (osteopenia and/or osteoporosis) was 66.9% for the lumbar spine (L1-L4) and 52.1% for the femoral neck (Table II). The classification of the data collected from the T-score was made considering the Brazilian Guidelines for the diagnosis and treatment of osteoporosis in postmenopausal women⁽⁴⁾.

Table II - Prevalence of low bone mineral density in older postmenopausal women. Brasília, Federal District, Brazil, 2018.

DEXA	Number of patients (%)			
	Normal BMD	Osteopenia	Osteoporosis	Low BMD*
Lumbar spine (L1-L4)	38	57	20	77 (66.9)
Femoral neck	55	50	10	60 (52.1)

*T-score < -1 SD (osteopenia + osteoporosis). DEXA: Dual-energy X-ray Absorptiometry; BMD: Bone Mineral Density

The clinical characteristics of the older postmenopausal women classified into normal or low BMD were subjected to statistical comparison and the data are shown in Table III. It There was an association of low BMD with age ($p=0.04$), White ethnicity ($p=0.05$), normal BMI ($p<0.001$), physical inactivity ($p<0.001$), smoking ($p=0.03$), nontraumatic fractures in the last five years ($p<0.001$), and having a first degree relative with osteoporosis ($p=0.05$).

Table III - Association between risk factors and the profile of bone mineral density of older postmenopausal women (n=115). Brasília, Distrito Federal, Brazil, 2018.

Risk Factor	Low BMD n (%)	Normal BMD n (%)	p-value
Age (years)			
60 to 65	10 (15.1)	24 (48.9)	0.04*
66 to 70	39 (59.1)	18 (36.7)	
71 to 75	17 (25.8)	7 (14.4)	
Race			
White	64 (82.1)	24 (64.9)	0.05*
Mixed	11 (14.1)	8 (21.6)	
Black	3 (3.8)	5 (13.5)	
Body mass index			
Underweight	7 (10.3)	4 (8.5)	<0.001*
Normal	42 (61.8)	16 (34.1)	
Overweight	15 (22.1)	21 (44.7)	
Obese	4 (5.8)	6 (12.7)	
Age at menopause (years)			
≤ 45	8 (10.9)	4 (9.5)	0.82
46 to 50	28 (38.3)	17 (40.4)	
51 to 55	37 (50.8)	21 (50.1)	
Physical activity			
Yes	12 (17.1)	30 (66.7)	<0.001*
No	58 (82.9)	15 (33.3)	
Smoking			
Yes	21 (24.7)	11 (36.7)	0.03*
No	64 (75.3)	19 (63.3)	
Nontraumatic fractures (last 5 years)			
Yes	10 (31.2)	8 (9.6)	<0.001*
No	22 (68.8)	75 (90.4)	
1st degree relative with osteoporosis			
Yes	14 (40)	10 (12.5)	0.05*
No	21 (60)	70 (87.5)	
Hysterectomy			
Yes	16 (37.2)	12 (16.7)	0.06
No	27 (62.8)	60 (83.3)	

* Chi-squared Test. BMD: Bone Mineral Density

DISCUSSION

Actions concerning the care for older adults taken by the healthcare team are necessary to outline the sociodemographic profile of this population group so as to promote health and prevent and treat diseases in this period of life and facilitate older adults' access to public services that allow quality treatment and prevention⁽¹⁴⁾.

In the present study, there was a high prevalence of osteopenia and osteoporosis among the older postmenopausal women. Densitometric diagnosis of osteopenia and/or osteoporosis in the lumbar spine and/or femoral neck was found in more than half of the women assessed.

The prevalence of osteoporosis in postmenopausal women assessed in Indian studies ranged from 12% to 60% and it has been shown to increase with advancing age^(15,16). Overall prevalence of osteoporosis in India is found to be higher than that reported in other countries, although studies have not been conducted in rural settings⁽¹⁷⁾.

As demonstrated by these studies, the prevalence of osteoporosis in Brazil varies significantly according to the study methodology. Some studies based the diagnosis of osteoporosis on bone densitometry data and others relied on participants self-reporting. In 2010, researchers conducted a cross-sectional study that included 4,332 women aged > 40 years in São Paulo (São Paulo Osteoporosis Study [SAPOS]). The diagnosis of osteoporosis was made by DEXA and the prevalence rate of postmenopausal osteoporosis was 33%⁽¹⁸⁾.

Women's aging entails a decline in the functional capacity of various systems, including the bone system⁽⁵⁾. Hormonal alterations in the menopause, especially estrogen deficiency, cause more bone resorption than bone formation, thereby leading to a reduction in bone mass and, consequently, osteoporosis⁽⁹⁾.

A study of 378 postmenopausal women found that 74% of them presented osteopenia and/or osteoporosis in the lumbar spine and/or femoral neck⁽¹⁹⁾. A Brazilian study conducted in 2012 to evaluate the bone mass of 70 women aged 45-65 years found low BMD in the femoral neck (28.6%) and in the lumbar spine (45.7%)⁽²⁰⁾.

Research shows that with advancing age there is a loss of balance between bone formation and resorption and that although age-related bone loss begins soon after peak bone mass it is more pronounced after the age of 65⁽²¹⁾. The study conducted by the Women's Health Initiative (WHI)⁽²³⁾ evaluated osteoporosis treatment and identified participant characteristics associated with treatment utilization after fracture or diagnosis of osteoporosis in the WHI. Of the 17,803 women who reported a new diagnosis of osteoporosis or fracture in the interval between enrollment and their final WHI visit, 3,457 reported both fracture and new diagnosis of osteoporosis, 7,926 reported only fracture and 6,420 reported only new diagnosis of osteoporosis⁽²³⁾.

A study that assessed the prevalence of osteoporosis in Brazilian women over 50 years of age through bone density measurement found a prevalence rate of 40%⁽²⁴⁾. In the United States, a study of 600 patients assessed at the Wayne State University in Detroit found a prevalence rate of 52%⁽²⁾.

Recently, a community-based study in Saudi Arabia revealed that 57% of the women presented low BMD (29.8% of them presented osteopenia and 27.2% presented osteoporosis)⁽²⁵⁾. Another study in South Korea reported a 32.3 prevalence rate of osteoporosis and a 49.9% prevalence rate of osteopenia in the female population⁽²⁶⁾. A more recent study of postmenopausal women found that 42.5% of them were osteoporotic and 44.9% were osteopenic⁽²⁷⁾.

Several cohort studies have been conducted to assess the family history of osteoporosis and osteoporotic fractures. Researchers have reported that the risk of hip and wrist fracture increased by 50% and 64%, respectively, in the presence of parental history of osteoporotic fracture of the hip or wrist. A family history seems to increase the risk of fracture independently of BMD⁽²⁸⁾. Other researchers found a negative correlation between a fracture history in a sister and 10-year fracture-free survival in perimenopausal women⁽²⁹⁾. A cohort study found osteopenia in 51% of the Caucasian women aged 60 to 89 years with a family history of osteoporosis⁽³⁰⁾.

Studies have shown the importance of ethnicity as a factor related to osteoporosis, thus indicating that Black women are at a lower risk of osteoporosis, unlike White and Asian women⁽³¹⁾. Researchers have also demonstrated that the prevalence of osteoporosis and osteopenia is higher in White race or White skin individuals⁽³²⁾. In the present study, the individuals with White skin showed greater bone loss (osteopenia and osteoporosis).

There is evidence that exercise can prevent some of the complications associated with menopause, such as bone loss, loss of physical fitness and increased risk of osteoporosis⁽³³⁾. Physical exercise effectively decreases risk factors for falling and improves balance⁽³³⁾.

Few cross-sectional studies have investigated associations between physical activity and osteoporosis. However, these studies focused on occupational physical activity and other lifestyle factors rather than recreational sports or physical activity⁽³⁴⁾. A study analyzed women aged ≥50 years and found that women whose work involved heavy physical labor had a lower prevalence of osteoporosis than women who had more sedentary jobs⁽³⁵⁾.

Studies have reported that the areas most affected by osteoporosis are the femoral neck, lumbar spine, hip and trochanter and these areas also respond best to the results of the training program⁽³³⁾. Research with women with osteoporosis compared strength training, stretching and control group programs and showed the benefits of strength training interventions in improving posture and balance⁽³⁶⁾.

A study that analyzed the presence of hysterectomy found that women who had undergone hysterectomy presented artificial menopause despite the preservation of ovary functions. In the present study, there was no significant association between hysterectomy and osteoporosis⁽³⁷⁾.

Some limitations of the present study should be mentioned. First, the cross-sectional design of this study made it difficult to establish cause and effect relationships. Moreover, the study suffered losses that could lead to biases in the results.

CONCLUSION

A high prevalence of low bone mineral density was observed in the lumbar spine and femoral neck among older postmenopausal women. Knowledge of risk factors for low bone mass identified may assist professionals in identifying patients at risk of osteoporosis since evidence demonstrates that clinical history data, physical exams and specific complementary exams combined are key to preventing osteoporotic fractures.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest regarding this research.

CONTRIBUTIONS

Milene da Silva Spinola and **Maria de Lourdes Alves Carneiro** contributed to the study design and conception; the acquisition, analysis and interpretation of data. **José Maria Thiago Bonardi** contributed to the writing and/or revision of the manuscript. **Bárbara Katherine Ataíde Barros Rodrigues** and **Luciana Zaranza Monteiro** contributed to the study design and conception.

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