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Factors associated with osteopenia and osteoporosis in women undergoing bone mineral density test☆

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ABSTRACT

The aim of this study was to determine the prevalence of osteopenia and osteoporosis in a female population, that had bone mineral density (BMD) measured by dual-energy X-ray absorptiometry (DXA) in a specialized clinic in the south of Brazil. We conducted a cross-sectional study including 1871 women that performed scans between January and December 2012. We conducted a logistic regression analysis with all independent variables and outcomes (osteopenia, osteoporosis and fracture risk). According to DXA results, 36.5% of women had normal BMD, 49.8% were diagnosed with osteopenia and 13.7% with osteoporosis. Menopause and age over 50 years old were risk factors for osteopenia and osteoporosis while prior hysterectomy and BMI greater than 25 were protective factors. For the outcome of fracture at any site the risk factors were age over 50 years old, osteopenia and osteoporosis (OR = 2.09, 95% CI: 1.28–3.40) and (OR = 2.49, 95% CI: 1.65–3.74), respectively.

Fatores associados à osteopenia e osteoporose em mulheres submetidas à densitometria óssea

Palavras-chave:
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RESUMO

O objetivo deste estudo foi determinar a prevalência de osteopenia e osteoporose em uma população de mulheres que fizeram exames de densitometria em uma clínica especializada no sul do Brasil. Nós conduzimos um estudo transversal, incluindo 1.871 mulheres que se submeteram à densitometria óssea entre janeiro e dezembro de 2012. Foi feita uma análise de regressão logística com todas as variáveis independentes e os desfechos (osteopenia, osteoporose e risco de fraturas). A densitometria óssea foi diagnosticada como normal em 36,5% das mulheres, 49,8% com osteopenia e 13,7% com osteoporose. Estar na menopausa

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e ter mais de 50 anos foram fatores de risco para osteopenia e osteoporose, enquanto ter feito histerectomia e apresentar índice de massa corporal (IMC) maior do que 25 foram fatores de proteção. Para o desfecho fratura em qualquer sítio, os fatores associados foram idade acima de 50 anos e osteopenia ou osteoporose, (OR = 2,09, intervalo de confiança [IC]: 1,28-3, 95%, 40) e (OR = 2,49, 95% CI: 1,65-3, 74), respectivamente.

Introduction

Osteoporosis is a systemic skeletal disease characterized by low bone mass and micro architectural deterioration of the bone tissue, resulting in increased risk of fracture due to bone fragility.[1] It was recently acknowledged as one of the main public health issues of developed countries.[2]

Osteoporosis is diagnosed by measuring the bone mineral density (BMD); a bone density that is 2.5 standard deviations (SD) or more below the young adult mean value (*t*-score <−2.5) indicates osteoporosis. Patients with bone density between 1 and 2.5 SD below average (*t*-score −1 to −2.5) are said to have osteopenia.[3]

In women, BMD decreases with age, presenting sharp drop during menopause. It is estimated that one in every two women in the UK from the age of 50 will suffer some kind of fracture during the remainder of her life.[4]

With increasing life expectancy and an aging population, it is anticipated that the impact of osteoporosis in the coming years will have a significant increase.[5] We should expect an economic burden for current and future public health system due to the high prevalence of osteoporosis and resulting fractures.[6]

The aim of this study was to determine the prevalence and factors associated with osteopenia and osteoporosis in women who have undergone bone mineral density test in a specialized service.

Methods

A cross-sectional study was made with 1871 women undergoing bone mineral density test in a specialized clinic from January 2012 to December 2012. The project was approved by the Research Ethics Committee of Universidade Extremo Sul Catarinense under Protocol No. 829 392 012.

Osteopenia and osteoporosis were diagnosed by *Dual-energy X-ray absorptiometry* (DXA), allowing the BMD to be measured with the GE Lunar Prodigy Primo equipment with software Encore version 13.20. The Lunar Prodigy series showed clinical accuracy even 40% higher compared to other systems. A study suggests that BMD measurement error is between 5% and 8%.[7]

DXA is considered the gold standard for measuring BMD and diagnosing osteopenia/osteoporosis. DXA results are presented by (1) absolute BMD values (g/cm^2): absolute values are important because they are used to monitor changes in BMD over time; (2) *t*-score, calculated in SD, taking as reference the mean BMD of peak bone mass in young adults. The diagnostic criteria proposed by the World Health Organization (WHO) in 1994, based on the following data: up to −1.0 SD, normal, from −1.1 to −2.49 SD, osteopenia, and below −2.5 SD, osteoporosis[8]; (3) Z-score, calculated on SD, taking as reference the mean BMD expected for individuals of same age, ethnicity and gender.

It is important to recognize that the DXA results described here are only valid when strict criteria for the exam, quality control and analysis of the images are observed. The professionals responsible for the acquisition of images, as well as for analyzing and interpreting them must act in accordance with recognized professional qualification programs in the country. The incorrect application of the method limits its use, as in all imaging tests.

General data were taken from the densitometry report and included measurement of weight and height, age, BMI, previous fractures, calcium intake, thyroid medication, menopause, hormone replacement therapy, symptoms of menopause, hysterectomy and oophorectomy. Age was categorized into percentiles: (1) 25th percentile: aged 51 years or less, (2) between 25th and 50th percentile: aged 52–57 years, (3) between 50th and 75th percentile: aged 58–65 years and (4) above the 75th percentile: aged 66 years or older. Other qualitative variables were dichotomized.

BMI was calculated using the formula weight (kg)/height^2 (m). The DXA data collected included BMD values (g/cm^2) of the femur neck, preferably the right one, the total femur and the mean value of the lumbar vertebrae (L1-L4).

Descriptive analysis of all variables was performed. A bivariate analysis was performed using the Pearson's chi-square test.

In the model building process, we observed the importance of each component through the likelihood ratio test. The −2log likelihood (*deviance*) value, which is a measure to determine how well the model fits the data, was used. Estimates per interval were calculated using 95% confidence level. All variables with $p < 0.25$ (univariate analysis) were candidates to enter the model, according to the method of Hosmer and Lemeshow. Only $p < 0.05$ variables remained in the model. In case any biologically important change was observed in the coefficient of estimated risk factor, comparing models with and without the risk factor, it was considered that the covariate would be a confounding factor, and if so, should remain in the model, even if its own coefficient was not significant. The method used to build the multivariable logistic regression model was the backward method, in which all the variables selected by the researchers enter the model, and selection is made by removing the least significant variable, one at a time, in an automatic sequence mode, based on statistical criteria. The estimates per interval were calculated using 95% confidence