



## Original Article

# Relationship between obesity, sarcopenia, sarcopenic obesity, and bone mineral density in elderly subjects aged 80 years and over<sup>☆</sup>

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## ABSTRACT

**Objective:** This study sought to analyze the relationship between the components and aggravations of body composition (obesity, sarcopenia, and sarcopenic obesity) and bone mineral density in elderly subjects aged  $\geq 80$  years.

**Methods:** A cross-sectional study design was utilized to assess 128 subjects aged between 80 and 95 years. Body composition and bone mineral density were measured by dual energy X-ray absorptiometry. Gait speed was assessed by walking test. The statistical analyses included Spearman's correlation, one-way analysis of variance, the chi-squared test, and binary logistic regression analysis.

**Results:** The elderly subjects with sarcopenia had lower bone mineral density compared to the obesity group, with higher risk for presence of osteopenia/osteoporosis in the spine (OR: 2.81; CI: 1.11–7.11) and femur (OR: 2.75; CI: 1.02–7.44). Obesity was shown to be a protective factor for osteopenia/osteoporosis in the spine (OR: 0.43; CI: 0.20–0.93) and femur (OR: 0.27; CI: 0.12–0.62).

**Conclusion:** It was found that lean mass is more directly related to bone mineral density (total, femur, and spine) and sarcopenia is associated with osteopenia/osteoporosis. Obesity represents a possible protective factor for osteopenia/osteoporosis in elderly subjects aged 80 years and over.

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## Relação entre obesidade, sarcopenia, obesidade sarcopênica e densidade mineral óssea em idosos com 80 anos ou mais

### R E S U M O

#### Palavras-chave:

Composição corporal  
Osteoporose  
Idosos 80 anos ou mais

**Objetivo:** O objetivo do presente estudo foi analisar a relação entre os componentes e agravos da composição corporal (obesidade, sarcopenia e obesidade sarcopênica) com a densidade mineral óssea em idosos com idade  $\geq 80$  anos.

**Métodos:** Estudo com delineamento transversal que avaliou 128 sujeitos com idade entre 80 e 95 anos. A composição corporal e densidade mineral óssea foram mensuradas por meio da técnica de absorciometria de raios X de dupla energia. A velocidade de caminhada foi avaliada pelo teste de caminhada usual. Para análise estatística foram realizados os testes de correlação de Spearman, análise de variância com um fator, teste qui-quadrado e análise de regressão logística binária.

**Resultados:** Os idosos com sarcopenia apresentaram valores menores de DMO quando comparados com o grupo obesidade com maior chance de risco para a presença de osteopenia/osteoporose na coluna (OR: 2,81; IC: 1,11-7,11) e fêmur (OR: 2,75 IC: 1,02-7,44). Obesidade apresentou fator de proteção para osteopenia/osteoporose na coluna (OR: 0,43; IC: 0,20-0,93) e fêmur (OR: 0,27; IC: 0,12-0,62).

**Conclusão:** Observou-se que a massa magra está diretamente relacionada com a DMO (total, fêmur e coluna) e que a sarcopenia está associada à osteopenia/osteoporose em idosos com 80 anos ou mais.

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## Introduction

The prevalence of osteoporosis is high in the elderly. This disease damages functional capacity in this population,<sup>1</sup> since it may increase the prevalence of falls and fractures<sup>2</sup> and lead to dependency in performing activities of daily living (ADL), for example, standing up, sitting and climbing a flight of stairs, among others.

Bone mineral density (BMD) is determined by the amount of mineral content in the bone area, and may be influenced by several factors, among them, body composition.<sup>3</sup> Some studies have investigated the individual relationships between BMD and its components (body fat and lean mass). Genaro et al.<sup>4</sup> observed that lean mass is more associated with BMD in osteoporotic postmenopausal women than body fat, on the other hand Bleicher et al.<sup>5</sup> suggested that the loss of body fat is more associated with BMD in men aged over 70 years.

There is an assumption that both components (body fat and lean mass) could contribute to the maintenance of BMD, by generating a mechanical overload on the bones<sup>6,7</sup> favoring the absorption of calcium, however, recent evidence has shown that excess body fat is not a protective factor for BMD in older individuals.<sup>8,9</sup> In relation to lean mass, studies show that this variable is directly associated with bone mass<sup>10,11</sup> and a decrease in the quantity and quality of both is related to aging. This marked decrease in muscle mass that occurs with aging, associated with low muscle strength or low physical performance, is defined as sarcopenia<sup>12</sup> and, in the event that this condition coexists with excess body fat, it is called sarcopenic obesity.<sup>13</sup>

There is a gap in the literature with regard to the investigation of such aspects in elderly subjects aged 80 years and over. Thus, the aim of this study was to analyze the relationship between the components of body composition and aggravations (obesity, sarcopenia and sarcopenic obesity) with BMD in elderly subjects aged 80 years and over.

## Methods

### Sample characteristics

This was a cross-sectional study with a convenience sample, conducted between October 2009 and May 2010 in the city of Presidente Prudente (~210,000 inhabitants), located in the southeastern region of Brazil.

Elderly residents aged 80 years and over of both sexes, were invited to participate in the study. The Presidente Prudente municipal health department provided the names, addresses and telephone numbers of individuals who used the public health service of the city. The invitation was made by telephone and the survey was also publicized in the media. A total of 135 subjects responded to the invitations. Individuals who were unable to walk, bedridden, residents of rural areas, institutionalized, those with pacemakers and individuals with incomplete data in the database were excluded. Thus, the sample consisted of 128 subjects.

The objectives and methodology used for data collection were explained and the subjects were informed that they could withdraw from the study at any time. Only those who signed the "Informed Consent" were included in the sample. All protocols were reviewed and approved by the Research

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