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Original Research Article

Comparison of body composition, nutritional status, functional status, and quality of life between osteoporotic and osteopenic postmenopausal women

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ARTICLE INFO

Article history:
Received 25 April 2014
Accepted 8 May 2015
Available online 5 July 2015

Keywords:
Body composition
Functional status
Nutrition
Osteoporosis
Quality of life

ABSTRACT

Background and objective: Osteoporosis is a condition that affects body composition, physical activity, and psychological state. We aimed to examine the differences between osteoporotic and osteopenic postmenopausal women with respect to body composition, nutrition, functional status, and quality of life.

Materials and methods: A total of 102 osteopenic (Group 1) and 100 osteoporotic (Group 2) patients were enrolled in the study. Bone mineral density (BMD), fat tissue mass (FTM), lean tissue mass (LTM), and bone mineral content (BMC) were evaluated using dual-energy X-ray absorbtiometry. Nutritional status of the patients was assessed with the Mini Nutritional Assessment (MNA), functional status with the Nottingham Extended Activities of Daily Living (NEADL) scale, and quality of life with the assessment of health-related quality of life in osteoporosis (ECOS-16).

Results: Group 2 had significantly lower FTM, LTM, and MNA scores than Group 1 ($P < 0.05$). NEADL and ECOS-16 scores did not differ between the groups ($P > 0.05$). A significant correlation was found between MNA and FTM, LTM, BMC, and BMD ($P < 0.05$). Whereas the assessment of functional status showed a significant positive correlation with BMD and a significant negative correlation with age ($P < 0.05$), no significant correlation was found between functional status and body composition ($P > 0.05$).

Conclusions: We found lower FTM and LTM values and a poorer nutritional status in osteoporotic patients than in osteopenic ones. Nutritional status was correlated with body composition and BMD, and functional status was correlated with age and BMD.

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Peer review under the responsibility of the Lithuanian University of Health Sciences.

Production and hosting by Elsevier

http://dx.doi.org/10.1016/j.medici.2015.05.003

1. Introduction

Osteoporosis is a disease characterized by a decrease in bone mineral density (BMD), skeletal weakening, and increased fracture risk [1–3]. Due to an aging population worldwide, it constitutes a major public health problem, leading to increased mortality and morbidity rates [2,4].

As osteoporosis may lead to a limitation of daily activities by causing restricted mobility and pain, women who think they carry the risk of osteoporosis strive to reduce the risk of bone injury by limiting their physical activities [1,4]. This restriction leads to other conditions, such as loss of social roles, social isolation, loneliness, depression, anxiety, despair, loss of values, and psychological consequences [1].

Lean, fat, and bone mass are components of body weight. Lean tissue mass (LTM) and fat tissue mass (FTM) account for more than 95% of body weight [5]. Body composition is affected by many factors, the most important of which are aging and menopausal state [4,6,7]. FTM usually increases in healthy women; LTM and bone tissue mass are reduced after menopause. Information can be gathered about muscle strength by measuring LTM. This point is important because muscle strength affects bone mass and structure [7]. FTM is the metabolically active part that exerts a non-weight-bearing effect through the hormonal metabolism of adipocytes [5]. Studies examining how these factors affect bone structure reported controversial results. Some studies reported that LTM is a major determinant of BMD, whereas others found that FTM is the main determinant. Other studies suggested an equal effect of these two parameters [8,9]. These changes lead to the onset or progression of disability in advanced ages [10].

Nutrition is a significant factor related to health status in elderly people, and malnutrition is an important risk factor for the development of osteoporosis [11,12]. In addition, low body weight appears to be related to osteoporosis risk [11]. The assessment of nutritional status and the correction of personal nutritional errors may lead to reduction in bone fragility and an increase in quality of life [12].

In this study, we examined the differences between osteoporotic and osteopenic postmenopausal women with respect to body composition measured with dual-energy X-ray absorptiometry (DXA), nutritional status, functional status, and quality of life. Moreover, the relationship among these variables was investigated.

2. Materials and methods

2.1. Study participants

In our osteoporosis unit, patients in need of treatment due to osteoporosis or osteopenia were followed up on an outpatient basis twice a week by a team of physicians. In this unit, an assessment form containing detailed information about the demographic characteristics, health status, menopausal state, and medical disorders was initially filled out by patients, who were put under follow-up thereafter.

Our prospective cross-sectional study included those patients who were referred to our osteoporosis unit with the following characteristics: diagnosed with osteopenia or osteoporosis according to BMD scores within 3 months of L1–L4 and/or femur (femoral neck and/or total femur), aged 45–80 years, in a good health status and are physically active, and without metal prostheses. A total of 202 nonhospitalized postmenopausal Caucasian women volunteers were included. Patients who fulfilled these criteria were all investigated, respectively. Those with the following conditions were excluded: renal failure; rheumatologic, oncologic, and cardiac disease; cerebrovascular disease; chronic glucocorticoid usage; mild or severe cognitive impairment; metabolic bone disease; and patients who could not be mobilized alone. None of these patients had previously received any form of osteoporosis therapy. The assessment of the presence of fracture was not examined.

The patients were divided into the osteopenic (Group 1, $n = 102$) and osteoporotic (Group 2, $n = 100$) groups. Age, menopause duration, height, and weight of all of the patients were recorded.

This study was approved by our local ethics committee.

2.2. Bone mineral density and body composition measurements

BMD (g/cm^2), bone mineral content (BMC, g), LTM (kg), and FTM (kg) measurements were performed using the DXA technique (Lunar Prodigy Advance; GE, Madison, WI, USA).

BMD measurement was taken from three regions in the lumbar spine (L1–L4 anterioposterior) and femur (femoral neck and total femur). Diagnoses of osteoporosis and osteopenia were made according to the World Health Organization criteria (osteopenia, a *T*-score between −1 and −2.5 standard deviations [SD] below; osteoporosis, a *T*-score −2.5 SD or more below).

Body mass index (BMI, kg/m^2) was calculated as weight (kg) divided by the square of height (m).

2.3. Nutrition

The Mini Nutritional Assessment (MNA) was used to assess nutritional status. Scored between 0 and 30, this tool consists of four parts: anthropometric measurements, global evaluation, dietetic assessment, and subjective assessment. A score less than 17 indicates malnutrition; a score between 17 and 23.5 indicates malnutrition risk; and a score greater than 23.5 is indicative of adequate nutrition [11,12].

2.4. Functional status

The Nottingham Extended Activities of Daily Living (NEADL) scale was used to assess the patients' activity levels. This scale is composed of 22 questions and 4 subscales: mobility, kitchen, domestic, and leisure activities. The answers are scored between 1 and 4 (not at all = 0, with help = 1, on my own difficulty = 2, on my own = 3) [13].

2.5. Quality of life

Quality of life of the patients was evaluated by the assessment of health-related quality of life in osteoporosis (ECOS 16)