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Bone density measured by dual energy X-ray absorptiometry in Qatari women

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Abstract

Background: Over the past 10 years, osteoporosis has emerged as a major public health problem. It is characterized by low bone mass with micro architectural deterioration of bone tissue resulting in increase bone fragility and susceptibility to fractures. Bone mineral density measurements are widely used to diagnose osteoporosis and to assess its severity. Commercial dual-energy X-rays absorptiometry (DXA) scanners used to determine bone mineral density (BMD) contains reference data for different populations.

Aim: The aim of this study was to determine reference values for Qatari female population and to compare them with values from western and other Arab countries.

Methods: A cross-sectional study of 574 Qatari women aged between 20 and 69 years was carried out using DXA scan to establish reference values of bone mineral density. Measurements were taken at the lumbar spine and proximal femur. The data were compared with normative taken by Caucasians, Kuwaiti, Lebanese and Saudi women over five decades of age.

Results: Our results showed that the Qatari subjects showed the expected decline in BMD at spinal sites with age after peaking at 30–39 years age group, and for femoral site at 40–49 years. The BMD values of the spine of Qatari women were lower than Caucasian and Kuwaiti women but higher than the Lebanese and similar to Saudi women. The BMD values of the total femur were higher in Qatari females than Caucasians, Kuwaitis, Lebanese and Saudis in the age group of 40–59, but lower in the age group 60–69 years.

Of the 147 studied Qatari women in the age group (50–69) years, the T-score was normal (>−1S.D.) in 79 subjects (53.7%), in the osteopenic range (−1 to −2.5S.D.) in 51 subjects (34.7%) and in the osteoporotic range (<−2.5S.D.) in 17 subjects (11.6%).

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Conclusion: BMD value of Qatari females are lower than Caucasians and Kuwaitis at the spine, and at the total femur in the age group 60–69 years, but higher values of total femur in the age group 40–59 years. Osteoporosis is common among menopausal Qatari women and should be considered a matter of public concern.

Keywords: Bone densitometry; Dual energy absorptiometry; Normative data; Osteoporosis

1. Introduction

Osteoporosis is a chronic disease that involves a reduction in bone strength and an increased risk of fracture. Bone mineral density (BMD) is highly correlated with bone strength, accounting for 75–85% of the variances in the bone tissue strength [1]. Clinically, BMD measurements are widely used to diagnose osteoporosis and to assess its severity, and changes in bone mass are commonly used as a surrogate for fracture risk [2,3].

In clinical practice, raw BMD values (in g/cm^2) are not normally used for assessing skeletal status and fracture risk. Instead, they are expressed in terms of the number of standard deviations above or below the young (20–39) years normal value (commonly referred to as T-score) for a normative population of the same ethnicity. The World Health Organization (WHO) has established diagnostic criteria for osteoporosis based on T-scores and not raw BMD values [3]. These criteria define osteoporosis in terms of a T-score below −2.5, i.e. BMD at a skeletal site more than 2.5 standard deviations (S.D.) below the young adult mean for that population. This definition depends on having a set of BMD reference data (mean ± S.D.) for each skeletal site for the particular reference population. T-score can be easily adjusted upwards or downwards if an inappropriate reference population is chosen. Indeed, it has been suggested that the improper use of T-scores has probably resulted in the misdiagnosis of over 1 million patients in the period 1989–1997 in USA alone [4].

Commercial dual-energy X-rays absorptiometry (DXA) systems contains sets of BMD reference data for different populations, although these databases may not be consistent due to the relatively small numbers of measurements taken on women in the young normal range [5]. These reference data allow a patient's BMD measurement to be compared with the expected peak bone mass of a young normal of the same sex and ethnicity (to deliver a T-score) and to the mean age-matched value for the normative population (the so called Z-score) [6,7].

The aim of this study was to determine a reference values for the Qatari female population and to compare them with those for Caucasians and with the available data for females from other Arab countries.

2. Subjects and methods

The BMD of the lumbar spine and proximal left femur of 574 Qatari female volunteers with no previous history of bone diseases were measured after they gave informed consent. All subjects were fully ambulatory. Advertisement was made through the newspapers and by posters, educational leaflets and educational sessions at the primary health centers and the outpatient clinics of the hospital. The study received approval from the Ethics Committee of Hamad Medical Corporation. Screening was done by interviewing the patients and the list of questionnaire was completed by the interviewer before scanning.

2.1. Exclusion criteria

The following individuals were excluded from the study:

- women using any of the following medication (steroids, anticonvulsants, estrogen, heparin, thyroxine, Vitamin D metabolites);
- women having any of the following diseases (renal, parathyroid, thyroid, adrenal, hypogonadism malignancy, chronic liver or chronic gastrointestinal disease, diabetes, early oophorectoy, osteomalacia, rheumatoid arthritis);
- women with history of fracture of the hips, spine or wrists were also excluded.

Data were recorded which include age, weight, height and date of menopause. Postmenopausal women were defined as those who had their menstrual period at least one year before the date of scanning,