

The Magnitude of Low Bone Marrow Density in Middle and Old Age Women

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Abstract

Objective: To describe the frequency of low Bone Mineral Density (BMD) in perimenopausal and postmenopausal women.

Methods: Middle to old aged women from two teaching hospitals of Peshawar were included in the study. They were divided into four age groups, 40-49 years, 50-59 years, 60-69 years and 70 years and above. There was no history of any drug use for bone loss. BMD was measured at the heel by ultrasonography and main outcome measures were in the form of baseline T-Scores.

Results: Of the 608 women studied, 35.03% were in the age group 40-49 years, 34.87% in 50-59 years, 22.7% in 60-69 years and 7.4% were 70 years or older. Using WHO criteria, 35.36% of women had osteopenia (T-Score -1 to -2.49) and 12.01% had osteoporosis (T-Score < -2.5). The frequency of decreased BMD increased significantly with increasing age ($P < 0.000$). Osteoporosis was present in 9.59% in the age group of 40-49 years, and it increased to 36.99% in patients aged 60-69 years and 23.29% in age group of 70 years and above. Within a single age group the number of women with osteopenia and osteoporosis was significantly high e.g. in age group of 70 years and above only 20% of subjects had normal BMD whereas 80% had low BMD.

Conclusion: Almost half of the sample population had decreased BMD. Peri and postmenopausal women constitute a high-risk group for osteoporosis and future fractures (JPMA 55:500;2005).

Introduction

Osteoporosis is a major public health problem facing the older people of both sexes. It is defined as bone disease characterized by low bone mass and microarchitectural deterioration of bone tissue leading to bone fragility and increased susceptibility to fractures.^{1,2} The most frequent sites of fracture are hip, spine and wrist.³ Osteoporotic fractures have a considerable impact on mortality, morbidity and medical expense worldwide. As the life expectancy is increasing the number of men and women with osteoporosis and low bone mineral density is expected to rise. It is estimated that it will reach 61 million by 2020.⁴

Eighty percent osteoporosis occurs in women and 20% in men.^{2,4} It is most common in postmenopausal women, due to deficiency of estrogens. Such women can present with back pain, loss of height and stooped posture before the actual fracture occurs.

Osteoporosis is a preventable and treatable disease, especially if diagnosed early. The preferable method of diagnosis is measurement of Bone Mineral Density (BMD). Low bone mineral density is the single best predictor of the fracture risk in the asymptomatic postmenopausal women.^{2,5,6} T-Score measurement is used to determine the BMD level and the presence or risk of osteoporosis. A T-Score is the standard deviation variance of patient's BMD compared to a healthy young

reference population. According to WHO, persons with a T-Score below -2.5 have osteoporosis and those with a T-Score between -1 and -2.5 have a low bone density and are at risk of osteoporosis.^{2,4,7}

Dual X-Ray absorptiometry (DXA) of hip and spine are currently the 'gold standard' for measuring BMD.^{4,6,8} However the central DXA equipment is large, expensive and is not available in all settings. Access to testing has improved after the introduction of BMD measurements at peripheral skeletal sites. It has been found that BMD at appendicular skeletal sites as distal radius, phalanx and calcaneus correlates reasonably well with density at the axial skeleton (hip and spine). Peripheral BMD measurements can be used to assess fracture risk at both peripheral and central sites and performs as well as central BMD except for hip fractures.^{5,6,9,10} The presence of such devices provide an opportunity for early identification of low BMD especially in middle and old age women who constitute a high risk group for the development of osteoporosis.

This study was carried out in order to define the magnitude of osteoporosis and osteopenia in peri and postmenopausal women, to increase awareness among the physicians and to develop consensus regarding the prevention and treatment of this disease in this high-risk group.

Subjects and Methods

This was a prospective exploratory study done by convenient sampling. The frequency of osteoporosis and osteopenia with reference to sex and age was measured. Subjects were selected from the out patient department of Khyber Teaching Hospital and Hayatabad Medical Complex, Peshawar.

The inclusion criteria were, females above 40 years of age, ambulatory and not HRT or any drug having effect on bone mass. Verbal informed consent was obtained from each participant before prior to the study, and those who refused were not included.

Each selected sample person was allotted a study number and information was recorded on a prescribed Performa. Each participant was provided with the test results.

In the out patient department of both teaching hospitals each participant had BMD measurement free of cost. BMD was measured at the heel using ultrasonography (Hologic, set on normal Asian BMD values as reference). Technicians trained by the manufacturers of the equipment, performed the test.

WHO Criteria for low BMD was used for analysis:

Normal: BMD > -1.0 of the young adult reference range

Osteopenia: BMD -1.0 to -2.49 of the young adult reference range

Osteoporosis: BMD < -2.5 of the young adult reference range

Data analysis was done by using SPSS Version 12 software. Frequency of Bone Mineral density in total sample was calculated. Pearson Chi Square test was applied as test of significance.

Results

Of the 608 women included in the study, the largest group (69%) was in the age range of 50 to 59 years. The age distribution is shown in table 1.

Table 1. Distribution of Study Sample by Age Group.

Age Group	Frequency	Percentage	Cumulative
40-49 Years	213	35.03	35.03
50-59 Years	212	34.87	69.90
60-69 Years	138	22.70	92.60
70 Years and Above	45	7.40	100.00
Total	608	100.00	

Table 2 shows the frequency of Bone Mineral Density of the total study sample. According to the calcaneal ultrasound, 12% women had osteoporosis whereas 35.36% had osteopenia. The cumulative frequency of low BMD reaching upto 47.37% in the study sample indicates that 288 women out of 608 sample population had either osteoporosis or osteopenia.

Table 2. Frequency of BMD in Total Sample.

T-Scores	Frequency	Percent	Cum. Percent
Osteoporosis (-2.5 and below)	73	12.01	12.01
Osteopenia (-1 to -2.49)	215	35.36	47.37
Normal (-1 and above)	320	52.63	100.00
Total	608	100.00	

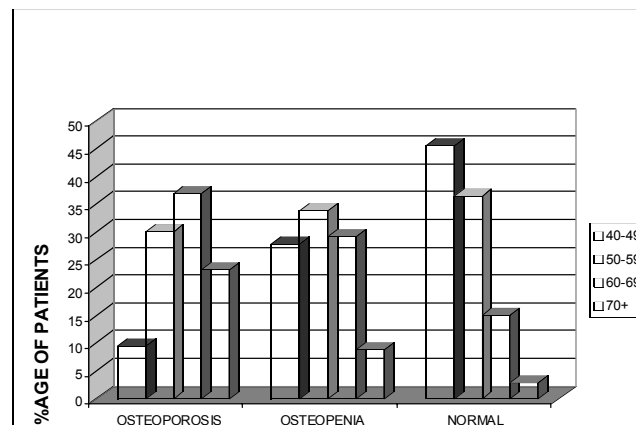


Figure. Frequency of Osteoporosis and Osteopenia w.r.t. age group.

The frequency of osteoporosis and osteopenia related to different age groups is shown in figure. It was observed that increasing age had a higher frequency of both conditions.

Discussion

Low bone mineral density is a significant risk factor for fracture in estrogen deficient postmenopausal women. Such bone loss has been shown to occur prior to menopause also.¹¹

In this study almost half of the participants (47%) had low BMD, including 12% who had osteoporosis according to the WHO criteria. These results are in consistence with the 50-60% prevalence of low BMD in women aged 50 years or older in United States.⁶ However most of the studies have reported a higher frequency in Asian women as compared to African American women.^{6,7} Age is the most important risk factor for predicting low BMD and it has been observed in this study that the frequency of low BMD increases with increasing age. Many studies have evaluated age as an independent risk factor for predicting low BMD, after controlling for other variables as history of prior fractures, BMI etc.^{1,6} Despite high prevalence of osteoporosis in this particular group of women (i.e. Peri and post menopausal), there is no clear consensus on the screening of such women. Most of the recent systematic reviews and guidelines disagree about which women to be screened and when, and there is no clear evidence that screening improves outcome.^{2,5} However BMD is recommended for screening individuals at risk, which includes menopausal women, diagnosing patients with suspected disease or clinical symptoms and guiding

treatment initiation.^{2,12,13} Some of the studies have suggested that clinical risk factors for osteoporosis can be used in selecting the patients for BMD testing, however they cannot be the substitute for bone density measurements. Risk factors for the disease are advancing age, being female, thin small frame and family history of osteoporosis.^{2,4,13}

Our study has several limitations. We have emphasized only on the age of the participants whereas other clinical risk factors have not been taken into account. They include low body mass index, maternal history of osteoporosis, and personal history of fractures, cigarette smoking and lack of exercise. As has been previously discussed these factors have a positive association with decreased bone density.^{1,2,4,6} In our study BMD was measured at the calcaneus using ultrasonography. Different sites and devices yield different estimates of low BMD and osteoporosis prevalence. Results from the National Osteoporosis Risk Assessment (NORA) USA have shown that heel ultrasonography yielded decreased odd ratios for osteoporosis when compared to single and dual photon X-Ray absorptiometry of other peripheral skeletal sites.⁶ A study by S. Grampp et al showed that detection rate for osteoporosis was higher with calcaneal ultrasound as compared with DXA of spine and femur.⁸ Whereas D.C. Bauer et al have concluded in their study that low bone ultrasound of calcaneus predicts the occurrence of fractures quite accurately in older women.⁹

Similarly T-Score is calculated from the mean and standard deviation of the BMD in a young, healthy reference population database for each device. Different healthy reference populations from different manufacturers may lead to different T-Scores even in the same patient when using different equipment.^{6,8} In our study the reference population was young healthy Asian females and same equipment (Hologic) was used for every participant.

The study concluded that peri and post-menopausal women in our population are at high risk for osteoporosis. A consensus should be drawn on the modalities of treatments.

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