Bone Mineral Density in Premenopausal and Postmenopausal Women

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ABSTRACT

Objective: To evaluate bone mineral density (BMD) in premenopausal and postmenopausal women and to find out osteopenia and osteoporosis in these women.

Study design: Cross-sectional study

Place and duration of study: Department of Physiology Services Institute of Medical Sciences Lahore from September, 2009 to April, 2010.

Subjects and methods: Bone mineral density of 34 premenopausal and 33 postmenopausal women was determined by the DXL calscan heel densitometer. Height and weight of each subject was taken to find out body mass index (BMI). Student 't' test was applied to see the significance of difference between the two groups. Pearsons correlation coefficient was determined to find out correlation.

Results: Bone mineral density (T-score) was highly significantly less (p= 0.000) in postmenopausal women than in premenopausal women. Osteopenia was present in 70.59% of premenopausal women and 63.64% of the postmenopausal women while 30.30% of postmenopausal women had osteoporosis. In postmenopausal women, there was a significant (p= 0.0016) negative correlation between age and bone mineral density.

Conclusion: Postmenopausal women had highly significantly decreased bone mineral density and this density decreased with increasing age. More than two third of both premenopausal and postmenopausal women had osteopenia while 30% of postmenopausal women were osteoporotic.

Key words: Bone mineral density (BMD), T-score, Osteopenia, Osteoporosis

INTRODUCTION

Bone is composed of a tough organic matrix that is greatly strengthened by bone minerals in the form of calcium salt[1]. Bone mineralization and rate of bone turnover are controlled by a number of hormones in the human body. Parathyroid hormone causes bone resorption and helps to maintain blood calcium levels. Estrogen exerts a major effect in women on bone remodeling by inhibiting interleukin-6 (IL-6) productions that reduces bone resorption and also controls the timing of osteoclast apoptosis. Estrogen deficiency, therefore results in a longer life span of osteoclasts[2]. In females, at the age of 40-50 years, the monthly sexual cycle becomes irregular, ovulation fails to occur during many of the cycles and ultimately there is cessation of the cycle which is called menopause. The female sex hormones diminish to almost none[1]. In women, the two major causes of bone loss are estrogen deficiency after the menopause and age related processes[3]. Bone turnover increases to high levels in women soon after menopause[4]. In addition, estrogen deficiency may induce calcium loss by indirect effects on

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extraskeletal calcium homeostasis[5]. Calcitonin reduces bone resorption and reduces bone loss. Like estrogens, calcitonin can cause a small increase in bone mass[6]. Bone density is one of the major predictors of osteoporotic fractures in the elderly[7]. Bone mineral density (BMD) is the most readily available measurement that correlates strongly with bone fragility[8]. Quantitative ultrasound (QUS) technique is a safe, painless, and non-invasive technique for the assessment of bone mineral density[9]. Low mineral density is a major risk factor for osteoporotic fracture[10]. This study was planned to evaluate bone mineral density in premenopausal and postmenopausal women and to find out osteopenia and osteoporosis in these women.

SUBJECTS AND METHODS

This cross sectional study was conducted in 34 premenopausal women and 33 postmenopausal women in Department of Physiology, Services Institute of Medical Sciences, Lahore. Subjects were selected from general population according to the inclusion criteria. Women having hypertension, diabetes mellitus, history of hormone replacement therapy, hysterectomy, and fractures were excluded.

Informed consent from each subject was taken Height (Cm) and weight (Kg) of each woman was determined by the standard scale to find out Body Mass Index (BMI). Bone mineral density was determined by the DXL Calscan heel densitometer.

Mean ± SD of all the variables was determined. Student 't' test was applied to see the significance of difference of parameters between two groups. Pearson's correlation coefficient was determined to evaluate correlation between different parameters.

RESULTS

There was non-significant difference (P>0.05) of height, weight and BMI between premenopausal and postmenopausal women. In premenopausal women, BMI was 30.17 ± 5.32 Kg/m^2 while in postmenopausal women, it was 27.85 ± 5.25 Kg/m^2 (Table 1)

Bone mineral density (T-score) was highly significantly (p= 0.000) decreased in postmenopausal women (-2.09±0.93) than in premenopausal women (-1.32±0.70) (Table 2), (Fig-I)

Osteopenia was present in 70.59% of premenopausal women and 63.64% of the postmenopausal women. Ten (30.30%) out of the 34 postmenopausal women had osteoporosis while only 01 (2.49%) out of the 33 premenopausal women had osteoporosis. (Table 3)

In postmenopausal women, there was a significant negative correlation (r= -0.416, p= 0.016) between age and bone mineral density (T-score), (Fig-2)

Table 1. Comparison of anthropometric features between premenopausal and postmenopausal women

Parameters	Premenopausal (n=34)	Postmeno-pausal (n=33)	p-value
Age (years)	36.53±3.90 (30-42)	54.85±6.25 (47-69)	-
Height (cm)	154.62±4.84	154.70±5.35	0.949*
Weight(Kg)	72.07±12.78	66.94±13.66	0.117*
BMI(Kg/m^2)	30.17±5.32	27.85±5.25	0.076*

Values are given as mean±SD
*Range of age is given in parenthesis   *Non-significant*

Table 2. Bone mineral density (T Score), in premenopausal and postmenopausal women

Parameters	Premeno-pausal (n=34)	Postmenopaus al (n=33)	p-value
Bone mineral density (T score)	-1.32±0.70	-2.09±0.93	0.000*

Values are given as Mean±SD   *statistically highly significant

Table 3. Number and percentage of premenopausal and postmenopausal women having normal bone mineral density, osteopenia and osteoporosis.

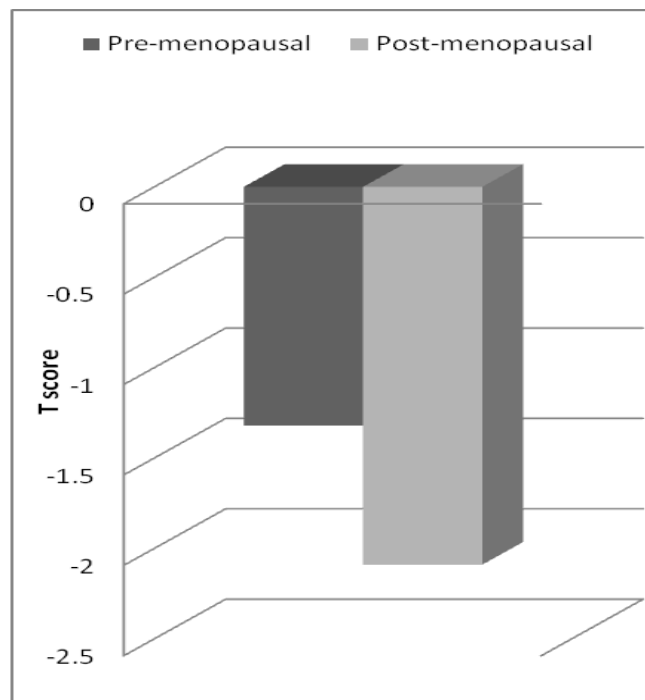| Bone mineral density (T-score)	Premenopausal women (n=34)		Postmenopausal women (n=33)	
	n=	%age	n=	%age
Normal (>-I)	09	26.47	02	06.06
Osteopenia (-1 to 2.4)	24	70.59	21	63.64
Osteoporosis (<-2.5)	01	2.94	10	30.30

Fig.-1. Comparison of bone mineral density (T-score) between premenopausal and postmenopausal women
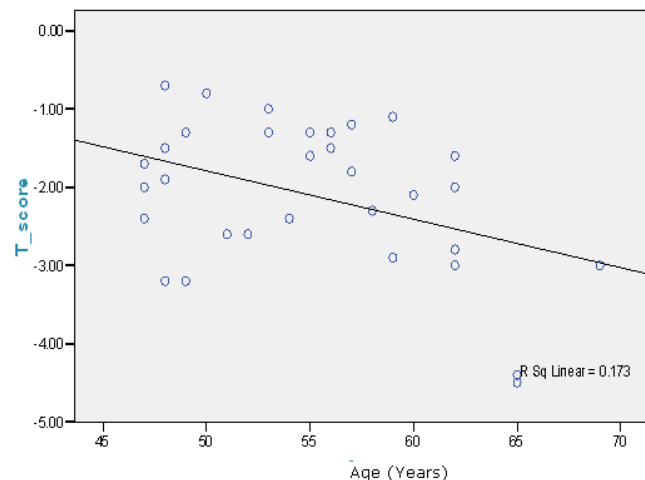

Fig. 2. Correlation between age and T-score in postmenopausal women

DISCUSSION

Bone mineral density was evaluated in premenopausal and postmenopausal women in the present study. According to the WHO criteria, premenopausal women were found to be obese (BMI>30kg/m^2) while postmenopausal women were overweight (BMI>25kg/m^2)[11].

Bone mineral density (BMD) in postmenopausal women was highly significantly (p= 0.000) lower as compared to that in premenopausal women. According to WHO criteria, BMD between –1 to –2.5 is considered as osteopenia and less than -2.5 is considered as osteoporosis[12]. It has been reported that postmenopausal women possess significantly lower bone mass than in premenopausal and perimenopausal women[13]. In the present study, osteopenia was present in 70.59% of premenopausal women and 63.64% of postmenopausal women. Ten (30.30%) out of 33 postmenopausal women had osteoporosis (BMD >-2.5) only 01 (2.94%) out of 34 premenopausal women had osteoporosis (BMD>-2.5). In postmenopausal women, BMD (T-score) had a significant negative correlation with increasing age. An increased risk for low BMD (osteopenia and osteoporosis) is associated with age and menopausal status[14]. Declining ovarian function before menopause is accompanied by reduction in bone mass and altered calcium metabolism[15]. In a study conducted in Quetta, in premenopausal women, osteopenia was present in 43.4% while osteoporosis was present in 12.9%[16]. Another study, conducted in Karachi, reported that 55% of premenopausal women had low BMD while 73.9% of postmenopausal women had low BMD[17].

CONCLUSION

Premenopausal women were obese while postmenopausal women were found to be overweight. More then two third of both premenopausal and postmenopausal women had osteopenia, moreover 30% postmenopausal women had osteoporosis. In postmenopausal women, bone mineral density significantly decreased with increasing age.

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