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Research Article

PREMENOPAUSAL AND POSTMENOPAUSAL EFFECTS ON BONE MINERAL DENSITY

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Abstract:

Objective: To determine the premenopausal and postmenopausal effects on bone mineral density in women to detect osteopenia and osteoporosis in these women.

Study design: A Cross-sectional study.

Place and duration of the study: In the Physiology Department of Holy Family Hospital Rawalpindi for a duration of one year, from May 2018 to May 2019.

Methods: 34 premenopausal and 33 postmenopausal women were sampled and their bone mineral densities were determined using the DXL calscan heel densitometer. The weight and height of each individual were determined to gauge the body mass index (BMI). To determine the variation between the two groups, a t-test was performed, and Pearson's correlation coefficient was used to determine the correlation between the two groups.

Results: In postmenopausal women, Bone mineral density (T score) was significantly lower than in premenopausal women ($p = 0.000$). Osteopenia was present in 70.59% of premenopausal women and 63.64% of postmenopausal women and osteoporosis was present in 30.30% of postmenopausal women. There was a static negative correlation ($p = 0.0016$) between bone mineral density and age in postmenopausal women.

Conclusion: Bone mineral density decreased significantly in postmenopausal women and this density decreased with age. More than two thirds of premenopausal and postmenopausal women were found to demonstrate osteopenia, while 30% of postmenopausal women were osteoporotic.

Key words: T score, bone mineral density (BMD), osteoporosis, osteopenia.

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INTRODUCTION:

The bone consists of a hard-organic matrix, which is strongly fortified by bone minerals in the form of a calcium salt¹. The rate of bone turnover and bone mineralization are under control of some hormones in the human body. Parathyroid hormone helps to maintain calcium levels in blood and causes bone resorption². Estrogen has a significant effect on bone remodeling in women by inhibiting the production of interleukin-6 (IL-6), which controls the timing of osteoclast apoptosis and reduces bone resorption. Estrogen deficiency, therefore, causes the prolongation of osteoclast life. In females, at 40-50 years of age, sexual cycle becomes irregular monthly, ovulation does not occur in many cycles and, consequently, the cycle called menopause stops³. The female sex hormones are hardly reduced. In females, two main causes of bone loss are age-related processes and lack of estrogen after menopause. Immediately after menopause, bone turnover in women rises to peak levels. In addition, estrogen deficiency can cause calcium loss due to indirect effects on extra-cortical calcium homeostasis. Calcitonin reduces bone loss and bone resorption. Like estrogen, calcitonin result in slight increase in bone mass⁴. Bone density is one of the main determinants of osteoporotic fractures in the elderly. Bone mineral density (BMD) is the most readily available measure that is strongly associated with bone fragility. The quantitative ultrasound (QUS) technique is a safe, painless and non-invasive

technique to evaluate bone mineral density. For osteoporotic fracture, an important risk factor is Low mineral density⁵. This study was planned to determine the bone mineral density in premenopausal and postmenopausal women and to detect osteoporosis and osteopenia in these women.

MATERIALS AND METHODS:

According to the selection criteria, the subjects were selected from the general population. The women selected excluded those suffering from diabetes mellitus, hypertension, those who had undergone hysterectomy, and those who had a history of hormone replacement therapy or a history of fractures. Informed consent was taken from each subject. The bone mineral density was determined by a DXL Calscan heel densitometer. The mean values \pm SD of all the variables were determined. To determine the importance of the difference of parameters between the two groups, Student's t test was applied. To determine the correlation between different parameters, the Pearson correlation coefficient was determined.

RESULTS:

There were no significant variations in weight, BMI and height between premenopausal and postmenopausal women ($P > 0.05$). In premenopausal women, the BMI was 30.17 ± 5.32 Kg / m² and 27.85 ± 5.25 Kg / m² in menopausal women (Table 1).

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

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

Values are given as mean \pm SD

Range of age is given in parenthesis

**Non-significant*

Bone mineral density (T score) decreased significantly in postmenopausal women ($p = 0.000$) compared to premenopausal women -2.09 ± 0.93 (-1.32 ± 0.70) (Table 2), 70.59% of premenopausal women and 63.64 % of postmenopausal women had osteopenia.

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

Parameters	Premeno-pausal (n=34)	Postmenopausal (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

Eight of the 34 (30.30%) postmenopausal women had osteoporosis, while only 01 (2.49%) of the 33 women had osteoporosis before menopause. (Table 3) There was no significant relation between bone mineral density (T score) and age in postmenopausal women ($r = -0.416$, $p = 0.016$).

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 (>-1)	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

DISCUSSION:

In this study, bone mineral density was evaluated in postmenopausal and premenopausal women. According to the WHO criteria, premenopausal women were obese (BMI> 30 kg / m²) and postmenopausal women were overweight (BMI> 25 kg / m²)⁶⁻⁸. Bone mineral density (BMD) was lower significantly in postmenopausal women than in premenopausal women ($p = 0.000$). According to the criteria of the World Health Organization, BMD osteopenia from -1 to -2.5 is considered to be less than -2.5 osteoporosis⁹⁻¹¹. It has been reported that postmenopausal women have a lower bone mass than premenopausal and perimenopausal women. In this study, 70.59% of premenopausal women and 63.64% of postmenopausal women had osteopenia¹². Of the 33 postmenopausal women, 10 (30.30%) had osteoporosis (BMD< -2.5) and only 01 (2.94%) of the 34 premenopausal women had osteoporosis (BMD< -2.5). In postmenopausal women, BMD (T score) showed a significant negative correlation with increasing age¹³. The low risk of BMD (osteopenia and osteoporosis) is linked with menopausal status and age. Decreased ovarian function before menopause is accompanied by an altered calcium

metabolism and a decrease in bone mass. In a Quetta study, osteopenia was found in 43.4% and osteoporosis in 12.9% of premenopausal women¹⁴. Another study in Karachi reported that 55% of premenopausal women had low BMD and 73.9% of postmenopausal women had low BMD¹⁵.

CONCLUSION:

While premenopausal women were obese, it was found that postmenopausal women were overweight. Two third of the premenopausal and postmenopausal women had osteopenia and 30% of the postmenopausal women had osteoporosis. In postmenopausal women, bone mineral density decreased markedly with age.

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