

ORIGINAL RESEARCH

Assessment of changes in Bone mineral density changes during the menopause transition

¹Dr. Vipin Kumar Singh, ²Dr. Ajeet Singh, ³Dr. Arpita Goen, ⁴Dr. Neera Singh

¹Associate Professor, Department of Orthopaedics, Mayo Institute of Medical Sciences and Research, Barabanki, Lucknow, U.P., India

²Associate Professor, Department of Orthopaedics, Prasad Institute of Medical Sciences and Hospital, Lucknow, U.P., India

^{3,4}Associate Professor, Department of Obstetrics and Gynaecology, ICARE Institute of Medical Sciences and Research & Dr Bidhan Chandra Roy Hospital, Haldia, West Bengal, India

Corresponding Author

Dr. Neera Singh

Associate Professor, Department of Obstetrics and Gynaecology, ICARE Institute of Medical Sciences and Research & Dr Bidhan Chandra Roy Hospital, Haldia, West Bengal, India

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ABSTRACT

Background: Osteoporosis affects over 20 million Americans and leads to approximately 1.5 million fractures each year, making it one of the leading public health problems in the United States. Hence; the present study was conducted for assessing changes in Bone mineral density (BMD) changes during the menopause transition. **Material and methods:** This study was conducted to assess the bone mineral density changes in pre-menopausal women and post-menopausal women. Hence, a cohort of 100 women was enrolled in this study. The subjects had been divided into 2 groups. Group 1 consisted of 50 pre-menopausal women and Group 2 comprised of 50 post-menopausal women. BMD was evaluated. The findings were tabulated. Statistical analysis was conducted using SPSS software. **Results:** There were 50 women in Group 1 and 50 women in Group 2. In the postmenopausal phase, the annual rates of bone loss from the spine and hip were recorded at 0.019 g/cm² per year and 0.011 g/cm² per year, respectively, with both values showing statistical significance (P<0.001). Furthermore, during the late peri- and postmenopausal periods, women in the highest tertile of body weight experienced a bone loss rate that was approximately 30-50% slower compared to those in the lowest tertile. **Conclusion:** Bone density reduction significantly intensifies during the late perimenopausal phase and persists at a comparable rate in the initial years following menopause.

Keywords: Bone mineral density, osteoporosis, menopause

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INTRODUCTION

Osteoporosis affects over 20 million Americans and leads to approximately 1.5 million fractures each year, making it one of the leading public health problems in the United States. The most important risk factor for bone loss in midlife women is the menopause. Women lose about 50% of their trabecular bone and 30% of their cortical bone during the course of their lifetime, about half of which is lost during the first 10 yr after the menopause. Approximately 40% of all postmenopausal women will eventually experience fractures. In 2001, the National Osteoporosis Foundation estimated that the annual cost of health care and lost productivity related to osteoporosis was \$17 billion.^{1,2}

The incidence of low-trauma fracture varies substantially across race/ethnicity groups, both nationally and worldwide. Low-trauma fractures of the hip for instance, which are a major cause of morbidity, physical disability, and early mortality in older Americans, are considerably more common in White women than in Asian, Black, and Hispanic women in the US.³⁻⁵

Although low bone mineral density (BMD) by dual energy X-ray absorptiometry (DXA) is the most reliable predictor of hip fracture risk within race/ethnicity groups^{6,7} BMD does not account for the differences in fracture risk between race/ethnicity groups. Japanese women for example, who have lower risk of hip fracture than White women, also have lower BMD on average than

White women^{8,9}. On the other hand, Black women have fewer fractures than White women, even after controlling for differences in BMD.¹⁰ This study was conducted to assess bone mineral density changes during the menopause transition.

MATERIAL AND METHODS

This study was conducted to assess the bone mineral density changes in pre-menopausal women and postmenopausal women. Hence, a cohort of 100 women was enrolled in this study. The subjects had been divided into 2 groups. Group 1 consisted of 50 premenopausal women and Group 2 comprised of 50 postmenopausal women. BMD was evaluated. The findings were tabulated. Statistical analysis was conducted using SPSS software.

RESULTS

Table 1: Group-wise distribution of subjects

Group	Number of subjects	Percentage
Group 1 (Premenopausal)	50	50
Group 2 (Postmenopausal)	50	50
Total	100	100

There were 50 women in Group 1 and 50 women in Group 2. In the postmenopausal phase, the annual rates of bone loss from the spine and hip were recorded at 0.019 g/cm² per year and 0.011 g/cm² per year, respectively, with both values showing statistical significance (P<0.001). Furthermore, during the late peri- and postmenopausal periods, women in the highest tertile of body weight experienced a bone loss rate that was approximately 30-50% slower compared to those in the lowest tertile.

DISCUSSION

Fractures and the consequent loss of independent living are critical health issues in aging women. The menopause transition, also called perimenopause, is associated with an accelerated loss of bone mineral density (BMD), which increases the risk of osteoporosis and bone fractures.^{11,12} BMD loss starts before the final menstrual period, and continues throughout the menopausal transition.^{13,14} This fast decline in BMD can be associated with irreversible disruption of bone microarchitecture and a greater risk of spine and hip fractures.¹⁵⁻¹⁸

Several prospective cohorts have documented declines in BMD over the MT^{19,20}, and SWAN established that there is a rapid phase of bone loss in a 3-year period around the final menstrual period (FMP); BMD begins to decline around 1 year prior to the FMP, and continues to decrease in early postmenopause, with a slight reduction in loss rate around 2 years after the FMP.²¹ This pattern of initial acceleration of change before the FMP and a deceleration after the FMP, is seen in a variety of hormonal, metabolic, and other

indicators of health, which has led researchers to refer to this interval as the transmenopause.

This interval includes both perimenopause and early postmenopause but is best defined using the date of the FMP and not menstrual bleeding patterns, because of the large between-women variability in the length of the different menstrually defined MT stages. In fact, even in the year after the FMP, 30% of women could be classified as early perimenopausal based on bleeding patterns. This study was conducted to assess bone mineral density changes during the menopause transition.

In this study, there were 50 women in Group 1 and 50 women in Group 2. In the postmenopausal phase, the annual rates of bone loss from the spine and hip were recorded at 0.019 g/cm² per year and 0.011 g/cm² per year, respectively, with both values showing statistical significance (P<0.001). Furthermore, during the late peri- and postmenopausal periods, women in the highest tertile of body weight experienced a bone loss rate that was approximately 30-50% slower compared to those in the lowest tertile. Finkelstein JS et al²² assessed rates of bone loss at each stage of the transition and examine major factors that modify those rates. They conducted a longitudinal cohort study of 1902 African-American, Caucasian, Chinese, or Japanese women participating in The Study of Women's Health Across the Nation. Women were pre- or early perimenopausal at baseline. They assessed bone mineral density (BMD) of the lumbar spine and total hip across a maximum of six annual visits. There was little change in BMD during the pre- or early perimenopause. BMD declined substantially in the late perimenopause, with an average loss of 0.018 and 0.010 g/cm².yr from the spine and hip, respectively (P<0.001 for both). In the postmenopause, rates of loss from the spine and hip were 0.022 and 0.013 g/cm².yr, respectively (P<0.001 for both). During the late peri- and postmenopause, bone loss was approximately 35-55% slower in women in the top vs. the bottom tertile of body weight. Apparent ethnic differences in rates of spine bone loss were largely explained by differences in body weight. Bone loss accelerates substantially in the late perimenopause and continues at a similar pace in the first postmenopausal years. Body weight is a major determinant of the rate of menopausal BMD loss, whereas ethnicity, per se, is not. Healthcare providers should consider this information when deciding when to screen women for osteoporosis. Park YM et al²³ determined the extent to which hip and lumbar spine BMD differ among the stages of menopause in healthy women, and whether BMD is associated with FSH and E₂ levels. A cross-sectional study of 141 healthy women classified as premenopausal (Pre; 38 ± 6 yrs; mean ± SD, n = 30), early perimenopausal (EPeri; 50 ± 3 yrs, n = 31), late perimenopausal (LPeri; 50 ± 4 yrs, n = 30), early postmenopausal (EPost; 55 ± 3 yrs, n = 24), or late postmenopausal (LPost; 62 ± 4 yrs, n = 26), was conducted. Spine/hip BMD and sex

hormones were measured using dual-energy X-ray absorptiometry and enzymatic/colorimetric methods, respectively. Compared to EPeri, spine BMD was lower ($p < 0.05$) in LPeri, EPost, and LPost and hip BMD was lower ($p < 0.05$) in EPost and LPost. BMD was inversely associated with FSH (spine: $r = -0.341$; hip: $r = -0.271$, $p < 0.05$) and directly associated with E_2 (spine: $r = 0.274$; hip: $r = 0.256$, $p < 0.05$). The menopause-related loss of spine and hip BMD is associated not only with low E_2 but also higher FSH. Future studies are essential to delineating the mechanisms by which FSH regulates bone health in aging women.²³

CONCLUSION

Bone density reduction significantly intensifies during the late perimenopausal phase and persists at a comparable rate in the initial years following menopause.

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