

ORIGINAL RESEARCH

STUDY OF BONE MINERAL DENSITY IN POSTMENOPAUSAL WOMEN AT A DISTRICT HOSPITAL

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Abstract

Background: Bone mineral density (BMD) is a quantitative measure of bone mass and represents the total mineral in a selected volume of bone in the hip or in the spine. Dual-energy x-ray absorptiometry (DEXA) is currently the gold standard in the measurement of bone mineral density (BMD). Present study was aimed to study bone mineral density in postmenopausal women at a district hospital.

Material and Methods: Present study was single-center, descriptive, observational study, conducted women who were post-menopausal for at least one year.

Results: 220 postmenopausal women were studied. Mean age was 50.93 ± 5.19 years, mean height was 154.44 ± 8.20 cm, mean weight was 64.39 ± 14.25 kgs & mean BMI was 24.44 ± 3.51 kg/m², mean age at menopause was 48.24 ± 4.14 years & mean menopausal duration was 3.17 ± 1.91 years. Bone mineral density at lumbar spine was normal in majority of cases (44.55 %), while 32.27 % cases had osteopenia & 23.18 % cases had osteoporosis. While, bone mineral density at femoral neck was normal in majority of cases (46.82 %), while 30.91 % cases had osteopenia & 22.27 % cases had osteoporosis.

Conclusion: Estimation of bone mineral density is the key to early diagnose osteoporosis among postmenopausal women.

Keywords: bone mineral density, osteoporosis, postmenopausal women, DEXA scan

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INTRODUCTION

Bone mineral density (BMD) is a quantitative measure of bone mass and represents the total mineral in a selected volume of bone in the hip or in the spine. BMD is an important clinical measure of bone strength and health.¹ Loss of bone mineral density (BMD) is related to hormonal imbalance, ageing, environmental factors, life style and genetic predisposition.^{2,3}

Osteoporosis-related fractures are associated with substantial pain, suffering, disability, and possibly even death for the affected patients. The greatest bone loss occurs in women during perimenopause and is associated with estrogen insufficiency, a condition of menopause. Low calcium intakes with extensive prevalence of vitamin D deficiency, increasing longevity, sex inequality, early menopause, genetic predisposition, lack of diagnostic facilities, and poor knowledge of bone health have contributed toward the high prevalence of osteoporosis.⁴

Dual-energy x-ray absorptiometry (DEXA) is currently the gold standard in the measurement of bone mineral density (BMD). It reports the subject's bone mineral density as a T-score

which is a measure of the subject's BMD compared to healthy controls who are at the peak of their bone mass. Any score upward of -1 is considered normal. Scores between -1 and -2.5 denote osteopenia. Results less than -2.5 suggest osteoporosis.^{5,6} Present study was aimed to study bone mineral density in postmenopausal women at a district hospital.

MATERIAL AND METHODS

Present study was single-center, descriptive, observational study, conducted in department of orthopedics, with help from department of obstetrics & gynaecology, at District hospital, Udhampur, India. Study duration was of 6 months years (January 2022 to June 2022). Study was approved by institutional ethical committee.

Inclusion criteria

- Women who were post-menopausal for at least one year, attending gynaecology OPD, willing to participate

Exclusion criteria

- Deranged renal function, abnormal thyroid function, significant liver disease, history of cancer, regular therapy with a phosphate binding antacid,
- Oestrogen replacement therapy within the previous 9 -12 months,
- Therapy with any other drug that affect skeleton like steroids, anti convulsant and anticoagulants.

Informed consent was obtained from all subjects involved in the study. After enrolment, every case underwent a detailed history and physical examination was carried out, findings were entered in the predesigned performa. Bone Mineral Density was estimated by GE Lunar Densitometer.at three sites, lumbar spine (L1- L2 level) & femoral neck.

Data was collected and compiled using Microsoft Excel, analysed using SPSS 23.0 version. Statistical analysis was done using descriptive statistics.

RESULTS

220 postmenopausal women were studied. Mean age was 50.93 ± 5.19 years, mean height was 154.44 ± 8.20 cm, mean weight was 64.39 ± 14.25 kgs & mean BMI was 24.44 ± 3.51 kg/m², mean age at menopause was 48.24 ± 4.14 years & mean menopausal duration was 3.17 ± 1.91 years.

Table 1: Patient characteristic

Patient characteristic	Mean \pm SD
Age (years)	50.93 ± 5.19
Height (cm)	154.44 ± 8.20
Weight (kg)	64.39 ± 14.25
BMI (kg/m ²)	24.44 ± 3.51
Age at menopause (years)	48.24 ± 4.14
Menopausal duration (years)	3.17 ± 1.91

In present study, bone mineral density at lumbar spine was normal in majority of cases (44.55 %), while 32.27 % cases had osteopenia & 23.18 % cases had osteoporosis. While, bone mineral density at femoral neck was normal in majority of cases (46.82 %), while 30.91 % cases had osteopenia & 22.27 % cases had osteoporosis.

Table 2: Bone mineral density

Bone mineral density	T score	At lumbar spine {No. of cases/ (Percentage)}	At femoral neck {No. of cases/ (Percentage)}

Normal	(≥ -1.0)	98 (44.55 %)	103 (46.82 %)
Osteopenia	(-1.0 to -2.5)	71 (32.27 %)	68 (30.91 %)
Osteoporosis	(≤ -2.5)	51 (23.18 %)	49 (22.27 %)

DISCUSSION

Although India is a sun-rich country, deficiency of vitamin D has been reported at all age groups. Avoidance of sunlight exposure due to sociocultural reasons, poor intakes of dietary calcium, environmental pollution, and higher 25(OH)-d-24-hydroxylase enzyme in Asian Indians are some of the reasons for hypovitaminosis D.⁷

Osteoporosis renders significant morbidity among the geriatric population, especially in postmenopausal females. The management of osteoporotic complications may consume a significant part of a nation's health-care resources in future as the number of geriatric patients is bound to increase with an increase in the average longevity.⁸ Osteoporosis is classified clinically to be either primary or secondary osteoporosis. Primary osteoporosis refers to both bone loss occurring in post-menopausal women and bone loss owing to the normal ageing process. Secondary osteoporosis refers to bone loss that ensues as a secondary effect of other diseases or drug treatment.^{2,3}

It is reported that 42.5% women and 24.6% men above the age of 50 years suffer from osteoporosis in India.⁹ In India peak bone mineral density (BMD) at hip, forearm and spine is significantly lower than corresponding western counterparts.¹⁰ Osteoporosis is becoming a public health problem in India with lower normative index of BMD as compared to western countries.¹¹

Babhulkar S,¹² retrospectively analysed 31238 participants, mean age was 47.8±14.2 years and 47.6% were females. Among females, 38.8% were postmenopausal women (age >50 years). Overall prevalence of osteopenia and osteoporosis was 49.9 and 18.3% respectively. Across East, West, North and South India, the prevalence of osteopenia was 51.3, 47.9, 55.6 and 47.4% respectively whereas prevalence of osteoporosis was 18.4, 16.3, 16.4 and 20.7% respectively. Among postmenopausal women, overall osteoporosis prevalence was 33.1% and ranged from 16.9% in North region to 21.8% South region. Prevalence of osteoporosis (37.0 vs 12.5%) was higher in elderly (≥ 60 years) than adults (<60 years).

Khinda, R et al.,¹³ studied 1628 postmenopausal women, prevalence of osteoporosis and osteopenia was observed to be 30.50% and 44.20%, respectively. In univariable and multivariable regression analysis, variables independently influencing the risk of osteoporosis and osteopenia were: higher systolic blood pressure, triglyceride levels, poor sleep quality and C-reactive protein levels. Years since menopause >10 years was observed to be an independent predictor for the risk of osteopenia but not for osteoporosis. Higher body mass index (>30 kg/m²) was observed to be a significant protective factor against the risk of osteoporosis and osteopenia.

Sridevi A¹⁴ noted that, the prevalence of osteopenia was 26% and osteoporosis 14% along with 60% of normal among women. As the age increased the prevalence of osteoporosis also increased. The prevalence of osteopenia and osteoporosis (low BMD) was found to be high (73%) among women in the age group of 51-60 years compared with that of 41- 50 years (27%).

In study by Mishra S et al.,¹⁵ around 80% of the post-menopausal women were osteoporotic. BMD scores were significantly low in postmenopausal women according to T-score along with significantly decreased Serum mineral levels when compared to premenopausal women.

There was significant positive correlation between T-score and serum calcium and magnesium levels in postmenopausal women.

Aggarwal N et al.,¹⁶ noted that the prevalence of low BMD was found in more than half of this population (53%). The mean age in group I (normal BMD) was found to be 50.56 ± 5.74 years as compared to 52.50 ± 5.94 in group II with low BMD ($P=0.02$). The two groups were similar with respect to parity, education, socioeconomic status, family history of osteoporosis, hormone replacement therapy, and thyroid disorders. 46.8% of the women in group I and 33% of the women in group II had low physical activity and there was no statistically significant difference in sunlight exposure between the groups. Parity or the number of children and type of menopause was not seen to have much association with low BMD in our study. Lack of exercise and low calcium diet were significantly associated with low BMD. Multiple logistic regression analysis showed that age, exercise, menopause, and low calcium diet acted as significant predictors of low bone density.

BMI and body weight are important factors affecting BMD. Postmenopausal females with low BMI are more likely to have osteopenia and osteoporosis and are thus at an increased risk of pathological fractures. Goyal A,¹⁷ noted that bone mineral density was significantly higher in the obese group as compared to normal BMI group at both lumbar spine ($p=0.001$) and femoral neck ($p=0.001$). BMD at lumbar spine was lower than that at femoral neck across all the three groups of BMI.

BMD: (Bone Mineral Density) detects osteoporosis before fracture occurs, predicts fracture chances in future, detects rate of bone loss, and monitors effect of treatment. A low bone density value in a very elderly woman is likely due to progressive bone loss over many years since menopause. In this process bone mass is reduced, and bone quality or architecture also deteriorates, adding further to skeletal fragility.¹⁸

Considering the very complex character of osteoporosis, determined by genetic factors and broadly understood environmental factors, and the slow progress of this disease, further research and in-depth analyses should be conducted to explain which of the factors connected with the dynamically changing environment, including lifestyle, are the primary determinants of osteoporosis. Bone health may be optimized by creating an environment to achieve peak bone mass during adolescence, maintenance of healthy bone throughout the life cycle, and prevention of bone loss postmenopausal.

CONCLUSION

Estimation of bone mineral density is the key to early diagnose osteoporosis among postmenopausal women. There is a need to improve awareness among the postmenopausal women and healthcare provider for maintaining bone mineral density and variety of intervention ranging from lifestyle modifications to pharmacological interventions to improve bone mineral density.

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