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Original Research Article

Assessment of Risk Associated with the Development of Osteoporosis in Menopausal Women

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ABSTRACT

Background: Osteoporosis is one of the major health problems affecting a significant proportion of women above 45 years of age. In contrast to postmenopausal bone loss, which is associated with excessive osteoclast activity, the bone loss that accompanies aging is associated with a progressive decline in the supply of osteoblasts in proportion to the demand. Although osteoporosis can occur in both sexes but it is most common in women older than age 65. Hence, we planned this study to assess the risk associated with the development of psteoporosis in women after menopause.

Materials & Methods: The present study included assessment of risk factors for the development of osteoporosis in women after menopause. A total of 350 women were included in the study, out of which 100 women were controls (30 year of age) and 250 women aged 45 years and above were considered as cases. A standardized Performa was filled which included age, family history, yearsince menopause, smoking, alcohol and socioeconomic status by a general questionnaire. After that all subjects were referred for bone mineral density test. BMD was determined by Pronosco X-posure system of hand radiograph to diagnose the osteoporosis and osteopenia in cases. BMD values were measured in terms of T-score and Z-score. All the results were analyzed by SPSS software.

Results: A linear increase of osteopenia and osteoporosis with advancing age. Negative correlation of menopausal duration with BMD was observed. Among postmenopausal women, history of fracture, and parity were negatively associated with BMD, whereas obesity, metabolic syndrome, physical activity, education, high serum ferritin, and polypharmacy were positively associated with BMD.

Conclusion: Postmenopausal women who had more reproductive years and a late menopause were came out at reduced risk for low bone mineral density, and thus may be less prone to the development of osteoporosis.

Key words: BMD, BMI, Osteoporosis, Women.

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INTRODUCTION

Osteoporosis is one of the major health problems affecting a significant proportion of women above 45 years of age.[1] Bone is in a constant state of flux, being constantly renewed throughout life. It is further affected, both internally and externally, by altered stresses and strains, by lifestyle influences such as diet and smoking and is also subject to seasonal variation of thickness, particularly in northern latitudes.[2,3] The long bones of the skeleton are made up of a dense outer cortex of which 90% by volume is calcified.[4] Breakdown of old bone occurs much faster than the formation of new bone in subjects' over 30 yrs of age. In contrast to postmenopausal bone loss, which is associated with excessive osteoclast activity, the bone loss that accompanies aging is associated with a progressive decline in the supply of osteoblasts in proportion to the demand.[5,6] This demand is ultimately determined by the frequency with which new multicellular units are created and new cycles of remodeling are initiated.[7,8]

With ageing bone lose its mass and become thinner (called osteopenia) because existing bone is broken down faster than new bone is made.[9,10] As this occurs, bones lose calcium and other minerals and become lighter, less dense, and more porous. This makes the bones weaker and increases the chance that they might break (fracture). With further bone loss, osteopenia leads to osteoporosis. Although osteoporosis can occur in both sexes but it is most common in women older than age 65.[11]

Hence, we planned this study to assess the risk associated with the development of osteoporosis in women after menopause.

MATERIAL AND METHODS

The present study was conducted in the department of human anatomy and medicine of the medical institute and included assessment of risk factors for the development of osteoporosis in women after menopause. A total of 350 women were included in the study, out of which 100 women were controls (30 year of age) and 250 women aged 45 years and above were considered as cases. Ethical approval was taken from the institutional ethical committee and written consent was obtained after explaining in detail the entire research protocol. Inclusion criteria for the present study included patients who suffered from bone and joint pain and came to medical hospital for investigation and patients with aged from 45 years and above. Exclusion criteria for the present study included patients with history of fracture and previously diagnosed osteoporosis, history of diseases such as diabetes, hypertension and cardiovascular diseases and patients with medication which may affect the BMD values. A standardized Performa was filled which included age, family history, year since menopause, smoking, alcohol and socioeconomic status by a general questionnaire. After that all subjects were referred for bone mineral density test. BMD was determined by Pronosco X-posure system of hand radiograph to diagnose the osteoporosis and osteopenia in cases. BMD values were measured in terms of T-score and Z-score. T-score is the difference between the individual patients bone mineral density and the mean results obtained in young adult population expressed in units of young population standard deviation. Z-score is the difference between the individual patient's results and the mean results obtained in an age matched population expressed in units of the age matched population standard deviation. All the results were analyzed by SPSS software. Chi-square test and student t test were used for the assessment of level of significance.

Table 1: Distribution of cases according to diagnosis category and age groups

Patients	Variable	Group	Number	Percentage
Osteopenia	**Age**	45-50	25	35.72
		51-55	21	53.84
		56-60	15	37.50
		61-65	13	43.33
		66-70	20	50.0
		>70	15	48.38
Osteoporosis	**Age**	45-50	6	8.57
		51-55	3	7.69
		56-60	6	10.0
		61-65	9	30.0
		66-70	17	42.50
		>70	14	45.16

Graph 1: Distribution of cases according to diagnosis category and age groups

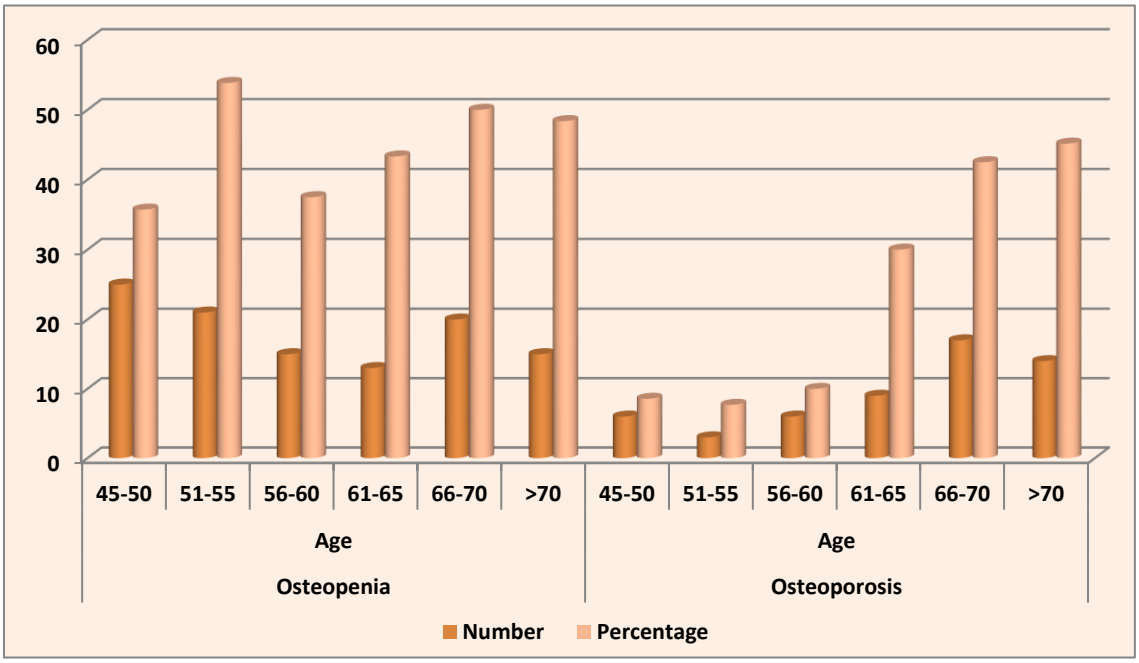

Table 2: Distribution of cases according to diagnosis category and BMI (kg/m²)

Patients	Variable	Group	Number	Percentage
Osteopenia	**BMI**	≤18	0	0
		18.1-24.9	42	35.0
		>25	67	51.53
Osteoporosis	**BMI**	≤18	0	0
		18.1-24.9	18	15.0
		>25	35	26.92

Graph 2: Distribution of cases according to diagnosis category and BMI(kg/m²)

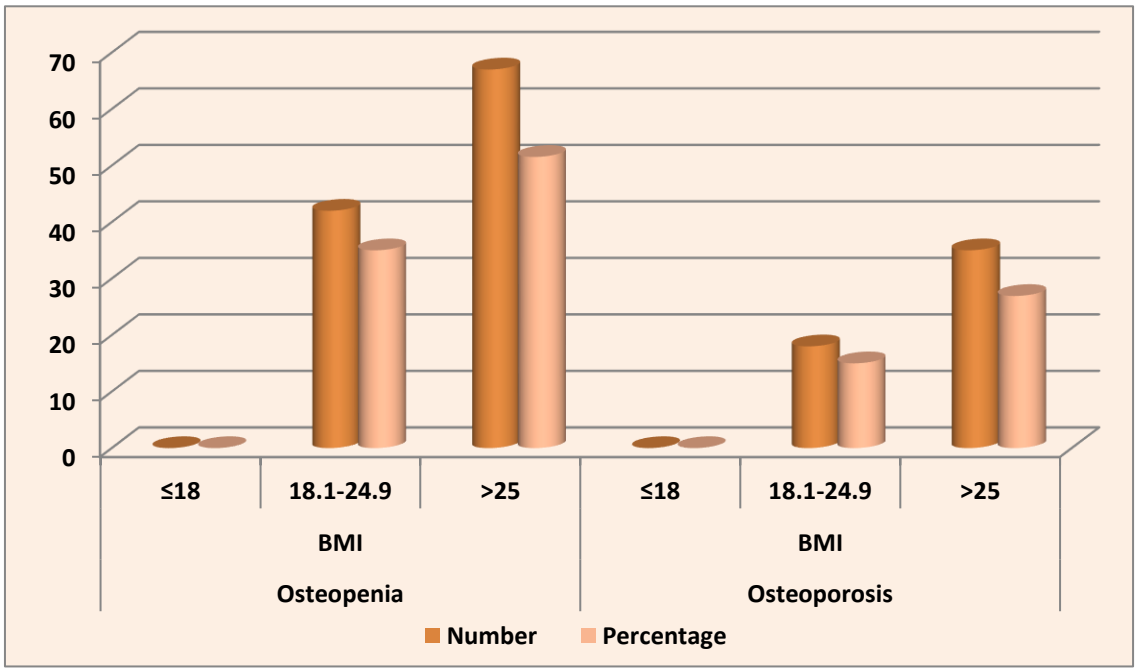

Table 3: Distribution of cases according to diagnosis category and Socio-economic status

Socio-economic status	Normal	Ostopenia	Osteoporosis	Total
Low	22 (22.68%)	45 (46.39%)	30 (30.92%)	97 (38.80%)
Middle	34 (37.77%)	44 (48.88%)	12 (13.33%)	90 (36.0%)

RESULTS

Table 1 and Graph 1 shows the distribution of cases according to diagnosis category and age groups. Among osteoporosis group, maximum patients belonged to the age group of 66 to 70 years. Patients with age of 66 years and above formed the majority group in terms of being affected by osteoporosis. Table 2 and Graph 2 shows the distribution of cases according to diagnosis category and BMI (kg/m²). In the osteoporosis group, majority of the patients had BMI of more than 25. Table 3 shows the distribution of cases according to diagnosis category and Socio-economic status. In the osteoporosis group, majority of the patients belonged to the lower socio-economic status. Among patients with osteopenia, majority of the patient's belonged to the lower socio-economic status (45 subjects) followed by subjects of middle socio-economic status (44 subjects). Only 20 subjects of the upper socio-economic status had osteopenia.

DISCUSSION

It is well recognised that as much as 20-40% of bone mass must be lost before a decrease in bone density can be detected on a conventional radiograph. A bone mineral density test can tell you whether or not you have this condition even before you break a bone.[10,12] Those with low bone mineral density can take precautions and start treatment to minimize their chances of breaking bones if they know they have this condition.

The most common way to check bone mineral density is through a test called dual energy X-ray absorptiometry or DEXA, according to Washington University. Other tests are also sometimes used, including ultrasound, quantitative computed tomography, magnetic resonance imaging, hand X-rays and single energy absorptiometry. The results of these tests are turned into what is called a T-score, which measure how many standard deviations from normal your bone density is.[13-16]

When a person knows whether or not her T-score for bone mineral density falls within the normal range or within that for osteopenia or osteoporosis, they can take appropriate measures to keep themselves healthy. Those with normal levels can continue making sure to get enough calcium and vitamin D, as well as weight-bearing exercise.[17]

Those with scores indicating osteopenia or osteoporosis can consider taking osteoporosis medication to minimize the loss of minerals from their bones as well as making sure they get enough calcium and vitamin D.[18] Hence, we planned this study to assess the risk associated with the development of osteoporosis in women after menopause.

In the present study, we observed that osteoporosis occurs in elderly people, who are most likely to have attained a relatively stable BMI before the onset of osteoporosis. We also observed a negative correlation of menopausal duration with BMD. Among postmenopausal women, history of fracture, and parity were negatively associated with BMD, whereas obesity, metabolic syndrome, physical activity, education, high serum ferritin, and polypharmacy were positively associated with BMD. Our results showed a linear increase of osteopenia and osteoporosis with advancing age. Brembeck P et al studied determinants of the previously observed changes in aBMD at lumbar spine, and cortical vBMD, microstructure and dimensions at ultra-distal tibia postpartum.

Women (25-40 years) were studied longitudinally at 2 weeks (baseline) and 4 months (n 81), 12 months (n 79) and 18 months (n 58) postpartum. At each visit, blood samples were collected, body weight and height were measured and information about lactation habits, oestrogen contraceptives and physical activity was obtained.

Ca intake was measured using 4-d food diaries at 4 months postpartum. Serum 25-hydroxyvitamin D (25OHD) was analysed by liquid chromatography-tandem MS. Skeletal changes were assessed with dual-energy X-ray absorptiometry and high-resolution peripheral quantitative computed tomography. Mean baseline BMI was 24·8 (sd 3·1) kg/m2. Median (quartiles 1-3) duration of total lactation was 8·1 (6·8-10·4) months. Longer duration of full lactation was associated with larger decreases of lumbar spine aBMD and tibia vBMD and microstructure. Higher baseline body weight was associated with smaller decreases in tibia vBMD and microstructure. Higher Ca intake was associated with smaller decreases in tibia cortical vBMD and thickness. Higher baseline 25OHD was only associated with larger decreases in lumbar spine aBMD.

In conclusion, lactation and body weight were the main determinants of skeletal changes during the first 18 months postpartum. Ca intake and serum concentrations of 25OHD appear to have different associations with cortical and trabecular bone.[19]

Haam JH et al evaluated the association between serum leptin, adiponectin, and high-molecular-weight (HMW) adiponectin levels and BMD according to menopause and central obesity status in Korean women. Their cross-sectional study comprised 255 women undergoing examinations at the CHA Bundang Medical Center. Participants were divided according to menopause, and central obesity status. They measured serum adipokine levels and BMD using an enzyme-linked immunosorbent assay and dual-energy X-ray absorptiometry, respectively. After adjusting for age, body mass index, alkaline phosphatase levels and the Homeostasis Model Assessment index, leptin levels were negatively associated with non-vertebral BMD in postmenopausal women without central obesity. Among women without central obesity, HMW adiponectin levels were positively associated with total hip BMD in premenopausal women but negatively associated with BMD in postmenopausal women. Thus, they suggested that the association between adipokine levels and BMD varies according to the menopause and central obesity status.[20]

Wasan A et al evaluated the correlation of Body Mass Index, Age, Gender with Bone Mineral Density in Osteopenia and Osteoporosis. They determined BMD in the femoral neck and lumbar (L2-L4) regions for 210 men and women with an average age of (57.41 ± 9.73) using dual energy X- ray absorptiometry (DEXA). They found the highest percentages of osteopenia and osteoporosis, 48.3% and 44.7%, respectively in obese patients. No significant correlations was found by them between the BMI and BMD in osteopenia and osteoporosis (p-value = 0.2001 and p-value = 0.4622), respectively. They found that the correlation of the independent variables (age, gender and BMI) together and the dependent variable (BMD) was significant (p-value = 0.034, $P \leq 0.05$) of osteoporosis only, but the correlation was not significant between BMD and each individual variables separately. They reported that most effective variable on the BMD was the BMI (p-value= 0.02) of osteopenia and the age (p-value = 0.011) was the most effective variable on the BMD of osteoporosis. According to them BMD was influenced significantly by all independent variables (age, gender and BMI) together in the osteoporosis not in osteopenia, so all variables together are considered as risk factors of osteoporosis. They didn't found any effect in the osteopenia patients.[21]

Soltanil A et al. investigated the association between anthropometric measures and osteoporosis in 3630 males and females visiting BMD clinic of Shariati Hospital, Tehran, Iran, a teaching hospital and referral center for osteoporosis affiliated to the Tehran University of Medical Sciences. Anthropometric measurements obtained and also Bone Mineral Density (BMD) measurement was done using a Lunar DPXMD densitometer. Data were analyzed using SPSS with Chi-square and ANOVA with post-hoc tests. Results of this study showed that the weight, BMI and age had the strongest correlation with the BMD values in the studied people. While age is negatively correlated with BMD in all the studied people, a positive association was noted between weight, height and BMI and BMD parameters ($P<0.01$). It was concluded that certain anthropometric parameters (BMI and weight) can considerably affect one's risk of developing osteoporosis. Further research on the effect of these variables on the association of weight and BMD is needed.[22]

CONCLUSION

From the above results, the authors concluded that postmenopausal women who had more reproductive years and a late menopause were came out at reduced risk for low bone mineral density, and thus may be less prone to the development of osteoporosis. Further studies are necessary to establish the use of reproductive years in selecting women who should be placed on estrogen replacement therapy, before the repercussions of decreased endogenous estrogen levels become apparent.

REFERENCES

1. Pande KC, Veeraji E, Pande SK. Normative reference database for bone mineral density in Indian men and women using digital X-ray radiogrammetry. J Indian Med Assoc. 2006; 104:288–91.
2. Hyldstrup L, Rosholm A, Backsgaard L, Grunkin M, ThodbergHH.; Estimation of bone density by digital X-ray radiogrammetry: theoretical background and clinical testing. Osteoporos Int. 2001; 12:961-969.
3. Talmage RV, Stinnett SS, Landwehr JT, Vincent LM, McCartney WH. Age-related loss of bone mineral density in non-athletic and athletic women. Bone and Mineral. 1986; 1(2):115-125
4. Ribot C, Tremollieres F, Pouilles JM, Bonneu M, Germain F, Louvet JP. Obesity and postmenopausal bone loss: the influence of obesity on vertebral density and bone turnover in postmenopausal women. Bone. 1987; 8(6):327-31.
5. Meltzer M, Lessig HJ, Siegel JA. Bone mineral density and fracture in postmenopausal women. Calcif Tissue Int 1989; 45:142–145.
6. Gotfredson, A., Christiansen, C. & Palshof T. The effect of tamoxifen on bone mineral content in premenopausal women with breast cancer. Cancer, 1984; 53, 853.
7. Eastell R, Simmons PS, Colwell A, Assiri AM, Burritt MF, Russell RG & Riggs BL. Nyctohemeral changes in bone turnover assessed by serum bone Gla-protein concentration and urinary deoxypyridinoline excretion: effects of growth and ageing. Clinical Science 1989; 83 375–382.
8. Bachrach LK, Guido D, Katzman D, Litt IF, Marcus R. Decreased bone density in adolescent girls with anorexia nervosa. Pediatrics. 1990 Sep; 86(3):440-7.
9. Salisbury JJ, Mitchell JE. Bone mineral density and anorexia nervosa in women. Am J Psychiatry. 1991 Jun; 148(6):768-74.
10. Seeman E, Delmas P. D, Hanley D. A et al. Microarchitectural deterioration of cortical and trabecular bone: differing effects of denosumab and alendronate; Journal of Bone and Mineral Research, 2010; vol. 25, no. 8, pp. 1886–1894.
11. Nguyen TV, Sambrook PN, Eisman JA. Prediction of bone density from vitamin D receptor alleles. Nature. 1994 Jan 20; 367(6460):284–287.
12. Middleton E. T., Steel, M. Aye S. A., and. Doherty S. M, "The effect of prior bisphosphonate therapy on the subsequent BMD and bone turnover response to strontium ranelate," Journal of Bone and Mineral Research, 2010; vol. 25, no. 3, pp. 455–462.
13. Booth, Eaton WW, Golden SH. Depression and osteoporosis: Epidemiology and potential mediating pathways. Osteoporos Int. 2003; 19:1–12.
14. Randolph JF Jr, Bab I. Major depression is a risk factor for low bone mineral density: A meta-analysis. Biol Psychiatry. 2003; 66:423–32.
15. Ho SC, Bastian LA, Kuchibhatla MN, Steffens DC, McBride CM, Skinner CS, et al. Depressive symptoms, menopausal status, and climacteric symptoms in women at midlife. Psychosom Med. 2003; 63:603–8.
16. Gur A, Cevik R, Nas K, Saraç AJ, Ataoğlu S, Karakoç M, Can A, Gürkan F. The influence of duration of breastfeeding on bone mass in postmenopausal women of different age groups. Int J Clin Pract. 2003 ; 57:82–86.
17. Gur A, Sarac AJ, Nas K, Cevik R. The relationship between educational level and bone mineral density in postmenopausal women. BMC Family Practice. 2004 ; 5:18.
18. Santoro, Ravn P, Chrousos GP, Gold PW. Depression: A major, unrecognized risk factor for osteoporosis? Trends Endocrinol Metab. 2004; 12:198–203.
19. Brembeck P1, Winkvist A1, Ohlsson C1, Lorentzon M1, Augustin H1. Determinants of microstructural, dimensional and bone mineral changes postpartum in Swedish women. Br J Nutr. 2016 Nov; 23:1-9. [Epub ahead of print]
20. Haam, JH., Kim, YS., Kim, M.J. et al. J Bone Miner Metab 2016; doi:10.1007/s00774-016-0801-8.
21. Wasan A, Solomon DH, Avorn J, Canning CF, Wang PS. Lipid levels and bone mineral density. Am J Med. 2014; 118:1414.
22. Soltani A, Larijani B, Khashayar P, Hemami MR, Fakhari S. The Relationship between Anthropometric Parameters and Bone Mineral Density in an Iranian Referral Population. Acta Medica Iranica, 2014; 52(7):505-510.

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