IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 24, Issue 12 Ser. 7 (December. 2025), PP 22-27
www.iosrjournals.org

Optimizing Bone Health in Menopausal Women – A Prospective Observational Study

Dr Bijay Laxmi Pradhan
(Pg resident, Department of Obstetrics and Gynecology , Hi-tech Medical College and Hospital)
GUIDE – DR SANGEETA PRADHAN
Dept of Obstetrics and Gynecology

Date of Submission: 11-12-2025 Date of Acceptance: 21-12-2025

I. INTRODUCTION

- Osteoporosis is a common public health problem affecting one in four women or one in eight men older than 50 years.
- The postmenopausal phase is a stage of experiencing permanent cessation of menstruation cycle over a year. It is now recognized as a time of decrease hormonal production with associated problems that reduce the quality and length of life for a large number of women.[1]
- Bone loss accelerates substantially in the late peri menopause and continues at a similar pace in the first post-menopausal years.[2]
- Menopause is associated with estrogen deficiency leading to enhance osteoclastic activity and reduced bone formation , culminating in osteopenia and osteoporosis.
- Osteoporosis is a growing major common public health problem recognized in both developed and developing countries.[3]
- a healthy lifestyle can have a major positive impact on the bone metabolism and bone health of Indian.[4]

II. AIMS AND OBJECTIVES

- The aim of the study was to categorize the percentage of women who are having normal BMD, osteoporosis and osteoporotic and to evaluate the relation between anthropometric profile, calcium intake (dietary and supplemental) and life style pattern with BMD.

III. MATERIALS AND METHODS

- Present study was conducted in Hi-Tech Medical College and Hospital , Bhubaneswar. Written consent was taken from patient before participation in the study. It was an observational study.
- 100 healthy post-menopausal women between the aged of 45 to 60 years were taken randomly as study subjects.
- Women who were below the age of 45 years or had a history of bone disease e.g. osteoporosis and osteoarthritis or had any surgery related to bone were excluded from the study.
- Data was analyzed using statistical package for social science (SPSS) software, version 21.0.
- All data were normally distributed and expressed as mean ± standard deviation. One way analysis of variance
- (ANOVA) and Pearson chi-test were used for the comparison of variables with P value less than 0.05 was considered significant.

IV. RESULTS

Table 1: Classification of BMI as per WHO cut offs

Table: Classification of BMI as per WHO

Classification	BMI (kg/m²)	Risk of Co-morbidities
Underweight	< 18.5	Low (but increased risk of other clinical problems)
Normal range	18.5 – 22.9	Average
Overweight	≥ 23	Increased
At Risk	23 – 24.9	Increased
Obese I	25 – 29.9	Moderate
Obese II	≥ 30	Severe

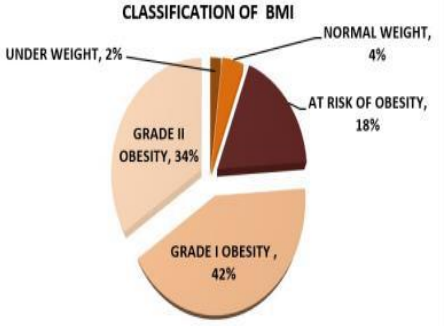
- The above table is the international classification proposed by World Health Organization (WHO), 2004.[5]
- DEXA Scan reports were used for the measurement of bone mineral density of post- menopausal women.
- World Health Organization WHO (Nordin et al, 1966) table was used to categorize bone density as: Normal bone: T-score better than or above -1, Osteopenia: T- score between -1 and -2.5, Osteoporosis: T-score less than - 2.5.[5]

Table 2: Demographic characteristics of subjects included in the study: (n=100)

Demographic Characters	Number of Subjects (n)	Percent %	Mean	± SD
Total number of subjects	50	-	-	-
Mean age of women	-	-	53.14	±4.777
Mean age at first menses	-	-	14.16	±1.283
Mean age at last menses	-	-	46.30	±3.315
Food habits: Vegetarian	1	2.0	-	-
Food habits: Lacto-Vegetarian	25	50.0	-	-
Food habits: Non-Vegetarian	24	48.0	-	-
Height (cm)	-	-	155.02	±5.220
Weight (kg)	-	-	67.18	±9.825
BMI (kg/m²)	-	-	28.37	±4.215

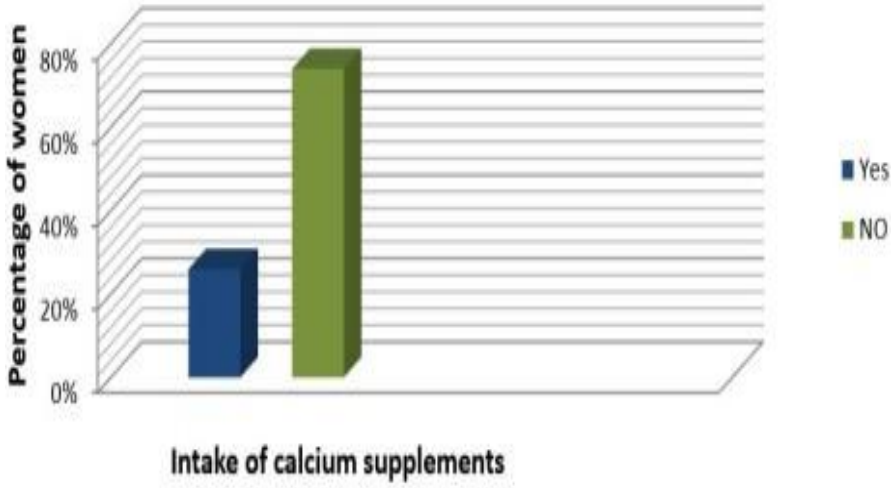
- 100 postmenopausal women were taken for the study. As shown in table no. 2.The mean ages of the women were 53 years. The Mean age of women at their menarche and last menses was 14.6 years and 46.3 years.
- As per their food habits, 50% of women were lacto vegetarian, 48% of women were non- vegetarian and only 2% of women were vegetarian (vegan). It shows that majority of women were lacto vegetarian.
- Anthropometric measurement was also taken. As per the measurements the mean of height, weight and BMI of the post- menopausal women was 155cm (±5.220), 53.1 kg (± 9.825) and 28.3 kg/m² (± 4.215) respectively.

Fig. 1: Percentage of subjects in various categories of BMI



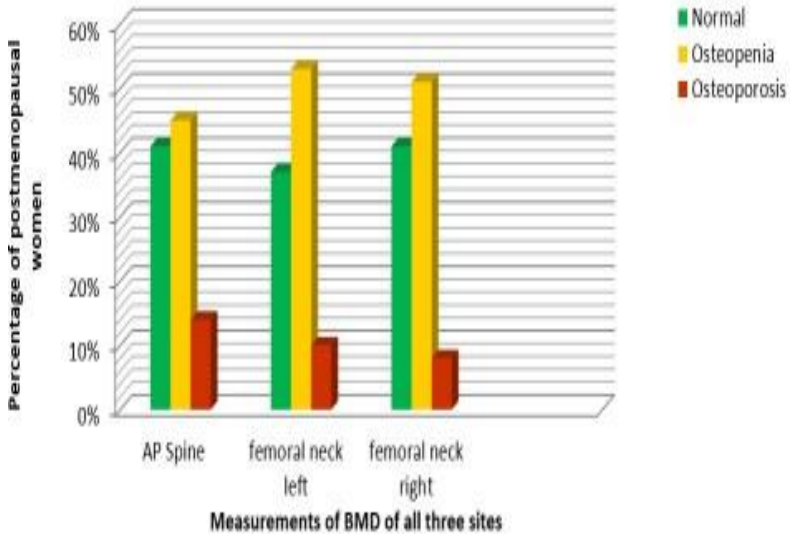
- As presented in the Fig. 1. The percentage of women with the category of underweight, normal weight, at risk of obesity, grade I obesity and grade II obesity were 2%, 4%, 18%, 42% and 34% respectively.
- This shows that majority of the women were in grade 1 and grade 2 obesity category and very few women were having normal body weight.

Fig.2Intakeofcalciumsupplementationofpost- menopausal women



- On the basis of the intake of calcium supplement by post- menopausal women about 26% women were taking calcium supplement regularly and 74% of women were not taking calcium supplement shown in Fig. 2.

Fig.3.BMDof3bonesitesofpost-menopausal women



- As per the BMD measurement of AP lumbar spine (L1-L2) region, about 41% of women were with normal BMD, 45% of women had osteopenia and 14% osteoporosis.
- According to the BMD measurement of femoral neck left, only 37% of women were had normal BMD, 53% osteopenia and 10% osteoporosis.
- As per the BMD measurement of femoral neck right 41% of women were having normal BMD, 51% osteopenia and 8% osteoporosis as shown in Fig. 3.

Fig.4 the normal BMD of normal, osteopenia and osteoporosis

Table: Percentage of Postmenopausal Women by BMD Category

BMD Category	Percentage (%)
Osteoporosis	10
Osteopenia	50
Normal BMD	40

- It was observed, 39.6% of women were having normal BMD, 49.6% of women were having osteopenia and 10.8% were having osteoporosis.
- As per the mean BMD measurement of all three sites shows that there was a majority of women were having osteopenia or were at risk of developing fracture and few already had osteoporosis presented in Fig. 4.

Table.3. Correlationofthefrequencycalcium rich food intake and their BMD

Food group	BMD measurements (p-values)		
	Ap lumbar spine (L1- L2)	Femoral neck left	Femoral neck right
Ragi (finger millet)	0.143	0.056*	0.009*
Red gram dal	0.159	0.643	0.472
Green gram dal	0.041*	0.240	0.322
Cauliflower leaves	0.202	0.389	0.503
Fenugreek leaves	0.422	0.158	0.120
Almonds	0.564	0.117	0.738
Coconut dry	0.703	0.029*	0.310
Piyal seeds	0.216	0.762	0.556
Gingelly seeds	0.330	0.001*	0.276
Milk (Buffalo's)	0.182	0.209	0.058*
Milk (Cow's)	0.474	0.223	0.045*
Curds	0.795	0.394	0.868
Cheese	0.503	0.288	0.219
Paneer(Buffalo's)	0.423	0.707	0.742
Paneer (cow's)	0.607	0.218	0.184

- In Table.3 the result of correlation with dietary intake shows that the increase frequency of consumption of calcium rich food is associated with a decrease risk of having low BMD in post-menopausal women. This shows higher intake of calcium rich food may have a positive effect on BMD of post-menopausal women.
- *Difference in the frequency of consumption are considered significant at a p value < 0.05

Table.4. Comparisonofcalciumsupplement withBMD

BMD measurements	Intake of calcium supplements		p-values
Ap lumbar spine	Yes	No	0.065
Normal	30.8%	45.7%	
Osteopenia	38.5%	48.6%	
Osteoporosis	30.8%	5.7%	

Femoral neck left	**Yes**	**No**	**0.033**
Normal	**46.2%**	**34.3%**	
Osteopenia	**30.8%**	**62.9%**	
Osteoporosis	**23.1%**	**2.9%**	
Femoral neck right	**Yes**	**No**	**0.280**
Normal	**38.5%**	**42.9%**	
Osteopenia	**46.2%**	**54.3%**	
Osteoporosis	**15.4%**	**2.9%**	

- Table. 4. Women who were taking calcium supplement they were more in numbers with normal BMD (46.2%) than women with osteopenia (30.8%) and women with osteoporotic (23.1%).
- In women who were not taking supplement, they were less in numbers of having normal BMD (34.3%) and more in numbers of women having osteopenia (62.9%).
- This shows there is significant correlation between the calcium supplement intakes with bone mineral density of post-menopausal women.

Table.5.Comparisonoflifestylehabitsof postmenopausal women with BMD

Table: Association of Lifestyle Habits with BMD

Lifestyle Habits	AP Lumbar Spine (L1-L2)	Femoral Neck Left	Femoral Neck Right
Exercise	0.264	0.186	0.758
Alcohol consumption	0.452	0.651	0.565
Coffee consumption	0.083	0.001	0.004
Tea consumption	0.457	0.721	0.228
Sun exposure	0.748	0.602	0.580
Use of any sunscreen cream	0.458	0.602	0.580
Intake of carbonated drinks	0.479	0.159	0.653

- There was a significant correlation found between the BMD of femoral neck left and femoral neck right with the coffee consumption (p=0.007 and p=0.004) of post- menopausal women as given in the Table 5.

Table.6.comparisionofpercentageof postmenopausalwomeninvariouscategoriesof BMD

Table: Association of Coffee Consumption with BMD Categories

BMD Site	BMD Category	Coffee: Yes	Coffee: No	P-value
Femoral Neck Left	Normal BMD	78.5%	55.6%	0.007*
	Osteopenia	10.8%	37.0%	
	Osteoporosis	10.8%	7.4%	
Femoral Neck Right	Normal BMD	78.5%	53.3%	0.004*
	Osteopenia	10.8%	59.3%	
	Osteoporosis	10.8%	3.7%	

- According to this comparison, based on the BMD of femoral neck left and femoral right, about 78% of women who consume coffee had osteopenia or were at risk of osteoporosis in both the site.
- This shows that consumption of coffee can have a negative effect on BMD of femoral neck left and femoral neck right of post-menopausal women and the differences were significant with a p value <0.05
- *Difference in the consumption of coffee in the BMD categories are considered significant at a p value < 0.05

V. DISCUSSION

- A total of 100 postmenopausal women were interviewed for the study. Data was collected on bone mineral density of postmenopausal women, anthropometry, their life style, dietary intake and physical activity for

the study. The age group of women was 40 - 60 years, as there is more prevalence of low BMD in this age group of women.

- Which is supported by the study Damodar et al, 2000 that incidence of osteoporosis occurs in at the age of 50-60 years.[6]
- The negative impact of low body weight on bone health should be more widely recognized (Helena et al, 2014). Same result was also found by Farzaneh et al 2014, indicated that older women with low BMI were at higher risk of low bone mass.[7]
- The supplementation of calcium should be recommended as a strategic option in helping to prevent early postmenopausal bone loss (Nicola et al, May 2004).[8]
- Nutrition, lifestyle, and genetics may all contribute to the decrease in BMD that comes with aging and leads to osteoporosis, a major cause of fractures in the elderly. Previous research implicated caffeine increased risk for hip fracture and poor calcium retention (Oct, 2001, American Journal of Clinical Nutrition).[9]
- In this study, a significant negative association was found between the coffee consumption and BMD of femoral neck right and femoral neck left ($p=0.004$ and $p=0.007$) of postmenopausal women. Women with positive coffee consumption were having osteopenia.
- Supported by Kristin et al, 2003, which also concluded that caffeine consumption may have a weak negative influence on BMD of postmenopausal women.[10]
- Study by Hellstrom et al, 2013 also showed high coffee consumption was associated with a small reduction in bone density that did not translate into an increased risk of fracture.[11]

VI. CONCLUSION

- As per the result, it is concluded that intake of calcium rich food, calcium and vitamin D supplements can have a positive effect on bone mineral density of post-menopausal women.
- On the otherhand lower BMI and coffee intake may have negative effects on bone mineral density of post-menopausal women.
- This study shows that dietary intake and life style patterns of postmenopausal women may have negative and positive effect on bone mineral density.

REFERENCES

[1]. Schwartz AV, Selimeyer DE, Ensrud KE, Cauley JA, Tabor HK, Schreiner PJ et al," Older women with diabetes have an increased risk of fracture a prospective study."*J Clin Endocrinol Metab* 2001;86(1):32-8.

[2]. Finkelstein J S, et al .J clin Endocrinol Metab 2008," Bone mineral density changes during the menopause transition in a multiethnic cohort of women."

[3]. Delmas PD, Fraser M. Strong bones in later life: luxury or necessity? *Bull World Health Organ* 1999;77(5):416-22.

[4]. Tandon N, Marwaha RK, Kalra S, Gupta N, Dudha A, Kochupillai N. Bone mineral parameters in healthy young Indian adults with optimal vitamin D availability. *Natl Med J India* 2003;16:298-302.

[5]. World Health Organization (WHO), 2004.

[6]. Damodaran P, Subramanian R, Omar SZ, Singapore Med J 2000;41(9)431-5.

[7]. Farzaneh Montazerifar 1; Mansour Karajibani 2; Sara Alamian 3; MahnazSandoughi 4; Zahra Zakeri 2,4; Ali Reza Dashipour "Age, Weight and Body Mass Index Effect on Bone Mineral Density in Postmenopausal Women" Health Scope. 2014;3(2):e14075.

[8]. Nicola Di Daniele, Maria Grazia Carbonelli, Nicola Candeloro, Leonardo Iacopino, Antonino De Lorenzo∗, Angela Andreoli. "Effect of supplementation of calcium and Vitamin D on bone mineral density and bone mineral content in peri- and post-menopause women A double-blind, randomized, controlled trial,". *Pharmacol Res* 2004;50:637– 41.

[9]. J.A. Mc LEAN, S.I. Bars & J.C. Prior. Cognitive dietary restraint is associated with higher urinary cortisal excretion in healthy premenopausal women, Am J Clin Nutr 2001;73:7-12.

[10]. Kristin Holvik1 and Haakon E. Meyer. "The association between caffeine intake and forearm bone mineral density in postmenopausal women: The Oslo Health Study". *Norsk Epidemiologi* 2003;13(1):177-83.

[11]. Hallström H, Byberg L, Glynn A, Lemming EW, Wolk A, Michaëlsson K. "Long- term coffee consumption in relation to fracture risk and bone mineral density in women". *Am J Epidemiol* 2013;178(6):898-909.