

Study on Bone Mineral Density of Women Aged 35 Years and Above, in Adopted Villages of a Tertiary Care Hospital

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Abstract: *AIM:* 1. To find the prevalence of osteopenia and osteoporosis in women above the age of 35 years. 2. To evaluate the association of Bone Mineral Density (BMD) with age, education, socioeconomic status, age at menarche, menopause, Body Mass Index (BMI), exercise, type of diet. *METHODS:* Community based cross-sectional study was conducted for 6 months at six adopted villages under RHTC, MIMER Medical College, Talegaon(D), Pune. Data on 306 eligible women aged 35 years and above was collected by using pre-designed, pre-tested questionnaire & Dual Energy X ray Absorptiometry (DEXA) scan. Women on HRT or medications which cause bone loss, and those with chronic conditions affecting BMD were excluded. Women were classified according to WHO criteria for BMD. *RESULTS-*Prevalence of osteopenia & osteoporosis was 50.98% and 11.76% respectively. Following risk factors were significantly associated with low BMD: Increasing age ($p < 0.001$), delayed menarche ($p < 0.001$), menopause ($p < 0.001$), illiteracy ($p = 0.007$), socioeconomic status ($p = 0.007$). Overweight & obesity ($p < 0.001$), vegetarian diet ($p < 0.001$). In this study exercise did not have any statistically significant impact on BMD ($p = 0.079$) *CONCLUSION:* There is a significant association between BMD and age, education, SES, age at menarche, menopause, BMI and type of diet.

Keywords: Bone mineral density (BMD); DEXA; osteopenia; osteoporosis.

INTRODUCTION

The proportion of elderly population is rapidly increasing in the developed as well as the developing countries. The ageing population and public health workers are concerned about the disability, dependence, and associated economic and social problems that are caused by osteoporosis.

Even conservative estimates suggest that of the total Indian population above 50 years of age, 20% of women and about 10–15% of men would be osteoporotic [1]. There is an increase in bone loss during the 5–10 years after menopause, ranging from less than 1% to more than 5% per year [2]. Osteoporosis does not have a dramatic clinical presentation except when fractures result. It is therefore, called a 'silent epidemic'. Tools like dual energy X-ray absorptiometry (DEXA) have come to the rescue for screening women who would be more prone to osteoporosis, enabling us to manage them in a better way, that has helped to improve the quality of life [3].

In India osteoporosis is highly prevalent with an estimated 30 million women diagnosed to have osteoporosis. This causes an increased burden on the health care system. Studies suggest that Indians have lower bone density than their North American and European counterparts and osteoporotic fractures occur 10–20 years earlier in Indian women. Measurement of bone mineral content may help identify women likely to develop osteoporosis [4].

DEXA Instrument for estimating bone mineral density (BMD) is not yet easily available in India. Very

few centers are equipped with these facilities. Besides the level of awareness in general population regarding this sophisticated but important investigation is very low, not much data pertaining to Indian population with reference to BMD is available at present. In this study, we have tried to find out the prevalence of osteopenia and osteoporosis and their relation with age, menstruation, diet, exercise, socioeconomic status and body mass index.

AIM AND OBJECTIVES

- To find the prevalence of osteopenia and osteoporosis in women above the age of 35 yrs.
- To evaluate the relationship of BMD with age, education, socioeconomic status, age at menarche & menopause, Body Mass Index (BMI), exercise, type of diet in women above the age of 35 yrs.

MATERIALS AND METHODS

This community based cross sectional study was conducted for six months, at six adopted villages under RHTC, Department of Community Medicine, MIMER Medical College, and General Hospital, Talegaon (D), Pune. Institutional ethical committee approval was obtained before starting the study. Free BMD camps were organized, on the occasion of World Woman's Day. These were followed by one monthly camp at 6 adopted villages to gather baseline information.

A total of 500 participants attended the organized camps, out of which 306 were eligible for study. Women on hormone replacement therapy (HRT) or medications which cause bone loss), and those with chronic conditions affecting bone density were excluded. Informed consent was obtained from all participants. Sample size of 114 was estimated based on previous studies [3], but final study sample included all 306 eligible women aged 35 years and above who consented to participate in the free BMD camps. A pre designed, pre tested questionnaire was introduced to all participants and their detailed history was collected which included age, education, socioeconomic status,

age at menarche, menopause, exercise, type of diet. Their BMD was measured by using DEXA technique. Site of BMD Testing was heel. Measurement of BMD is the gold standard test for the diagnostic evaluation of osteoporosis. DEXA is the method which is commonly used for this, which can detect even a 1% loss of bone mass. BMD is an important diagnostic tool that not only measures the amount of calcium in certain bones but can also be used to estimate the risk of fractures. The test is easy, fast, painless and noninvasive. Women were classified according to WHO criteria[4] as,

- Normal (T score > -1.0)
- Osteopenic (T score between -1.0 to -2.49)
- Osteoporotic (T score < -2.5)

Patients were then consulted to the Orthopaedic department for further management and physiotherapy was advised. A 10 day free exercise workshop was arranged by coordinating with Physiotherapy department to create awareness regarding exercise.

STATISTICAL ANALYSIS

Descriptive statistics like frequencies and percentages were used to summarize the study variables. Difference between proportions between two groups (with normal and abnormal BMD) was analyzed using chi-square test. Computer software -Epi Info 7 and Statistical Package for Social Sciences (SPSS) version 18, was utilized for data management and analysis.

RESULTS

Table 1 gives distribution of women according to different study variables. Median age of women was 42 years. (Range 35-73 years) While the mean age at menarche was 13.6 years. (Range 11 – 16 years) Around two-thirds (61.8%) of women were literate, 64.1% belonged to lower socioeconomic class, 45.8% subjects were overweight and 28.4% women had already attained menopause.

Table-1: Distribution Of Study Subjects according to socio-demographic variables

T SCORE	NO.	PERCENTAGE (%)
NORMAL > -1.0	114	37.3 %
OSTEOPENIA (-1.0 to -2.49)	156	50.9 %
OSTEOPOROSIS (< -2.5)	36	11.8 %
TOTAL	306	100.0%

Table-2: Distribution of study subjects according to WHO classification of BMD

VARIABLE	Number	Percentage(%)
AGE GROUP(years)		
35-45	188	61.4
45-55	54	17.7
≥ 55	64	20.9
AGE AT MENARCHE(years)		
11	8	2.6
12	26	8.5
13	92	30.1
14	124	40.5
15	36	11.8
16	20	6.5
LITEARCY STATUS		
illiterate	117	38.2
literate	189	61.8
SOCIOECONOMIC STATUS*		
Lower	196	64.1
Higher	110	35.9
MENOPAUSE HISTORY		
Menopause attained	87	28.4
Menopause not attained	219	71.6
BMI		
Normal	102	33.3
Overweight	140	45.8
Obese	64	20.9
EXERCISE		
No	204	66.7
Yes	102	33.3
TYPE OF DIET		
Vegetarian	127	41.5
Mixed	179	58.5

*according to modified Prasad's classification of socioeconomic status
SES Higher = I + II+III, Lower = IV + V

Table 2 shows distribution of study subjects according to BMD and prevalence of osteoporosis and osteopenia in the study sample. As per the WHO classification of BMD, the prevalence of osteoporosis was found to be 11.76%: (8.2%-15.4%) and that of osteopenia was 50.98%: (45.3%-56.5%).

Table no. 3 gives Association of BMD with the study variables. Increasing age in women was found to be a significant risk factor ($p < 0.001$) for low BMD. Also delayed menarche ($p < 0.001$) and early menopause

($p < 0.001$) amongst women were significantly associated with the disease (low BMD). Women's education ($p = 0.007$) and their Socioeconomic Status were also directly associated with osteoporosis and osteopenia ($p = 0.007$). Prevalence of low BMD was significantly higher among the overweight & obese women ($p < 0.001$) and also higher among those with vegetarian food habits ($p < 0.001$). However exercise did not seem to have any significant impact on the prevalence of the disease ($p = 0.079$) in our study population.

Table-3: Association of BMD with variables under study

variable	Comparison Groups		X ² (Chi square Value)	p value
	(BMD > - 1) Normal	(BMD ≤ - 1) Osteopenia and osteoporosis		
AGE GROUP (years)				
≤ 45	93(49.47%)	95(50.53%)	43.60	< 0.001
45-55	22(40.74%)	32(59.26%)		
≥ 55	2(3.13%)	62(96.87%)		
AGE AT MENARCHE(years)				
≤ 14	160(64.0%)	90(36.0%)	39.45	<0.001
>14	10(42.86%)	46(57.14%)		
LITERACY STATUS				
Illiterate	41(35.04%)	76(64.96%)	7.25	0.007
Literate	96(50.79%)	93(49.21%)		
SOCIOECONOMIC STATUS				
LOWER	47(23.98%)	149(76.02%)	18.76	<0.001
HIGHER	53(48.18%)	57(51.82%)		
MENOPAUSE HISTORY				
Menopause attained	12(13.79%)	75(86.20%)	31.48	<0.001
Menopause not attained	106(48.40%)	113(51.60%)		

BMI				
Normal	44(43.14%)	58(56.86%)	17.11	< 0.001
Over-weight	62(44.29%)	78(55.71%)		
Obese	10(15.63%)	54(84.37%)		
EXERCISE				
Yes	45(44.12%)	57(55.88%)	3.08	0.079
No	69(33.82%)	135(66.18%)		
TYPE Of DIET				
Vegetarian	31(24.41%)	96(75.59%)	13.22	<0.001
Mixed	80(44.69%)	99(55.31%)		

DISCUSSION

The worldwide incidence of osteoporosis is continuously rising because of increase in the ageing population and sedentary lifestyle. As the life expectancy is increasing even in the developing countries, by the year 2035, the maximum number of osteoporosis cases in the world will be in India and China [5]. Once the woman is in her fourth decade, there is a gradual loss of bone mineral density. It is noteworthy that there is considerable increase in bone loss during the 5 years immediately following menopause [4]. From the findings of this study, it is evident that as age advances, prevalence of osteopenia and osteoporosis also advances. These findings are comparable to Agarwal *et al.* study [5].

Prevalence of osteoporosis in our study was 11.76% and that of osteopenia was 50.98% similar findings seen in study by Jyoti Unni *et al.* [3] with 8% and 34% prevalence. Curly *et al* in their study found very high prevalence of osteoporosis as 32.7%[6].

In our study, women who attained late menarche, were significantly associated with low BMD, 56 women had attained menarche late, out of which 46 (57.14%) were with disease. Similar findings are seen

in study by Nemade *et al* [7]. Like our study, age at menarche was negatively associated with BMD in study by Ito *et al.* and Nidhi *et al.* [8, 14]. Cury *et al.* also suggested that late menarche (above 16 years) increased the risk of osteoporosis by twofold [6], in contrast, no significant difference was observed in BMD based on age at menarche, in the study at Jahangir hospital, Pune by Ritu Garg and Jyoti U[3]. Literature suggests that early menarche is associated with higher bone mass because of early release of oestrogen and exposure of bones to oestrogen for more number of years.

Although mechanisms of association between education and osteoporosis remain partly unexplained, most of the risk factors examined show distinct trends according to educational level [10]. Ali Gaur studied the relationship between educational level and bone mineral density in postmenopausal women, and found significant correlation between educational level and BMD, as found similarly in our study [10]. This study shows that prevalence of osteopenia and osteoporosis increased in menopause and post-menopause age group (86.2 %). These findings are comparable to findings by Shah R.S *et al.*[11]

Present Study revealed highly significant effect of BMI on BMD. Prevalence of osteoporosis was more in obese women. But, In contrast, statistically BMI as a risk factor for low BMD was not found to be significant in studies by Agarwal *et al.* Bhalerao *et al.* Jyoti Unni *et al.* [5, 6, 3].

Majority of studies carried out on exercise and its effect on BMD have not shown any relation between BMD and exercise in post-menopausal women, as in this study. However literature suggests that exercise may have a significant impact on BMD at the age when peak bone mass is attained [3, 10, 13]. Women in this study, consuming mixed type of diet were protected from low BMD, Similar findings are seen in study by Mehta *et al.* [14]

CONCLUSION

The prevalence of osteopenia and osteoporosis was found to be high amongst women population above 35 years in 6 adopted villages of MIMER Medical College of Pune district. There was a significant positive association between low BMD and increasing age, delayed menarche, menopause, illiteracy, low socioeconomic Status, high BMI and vegetarian diet. Our study findings underline the need to institute preventive measures with early identification and diagnosis of BMD in the affected women population in the villages. Measurement of BMD from the age of 35 years will help in diagnosis of bone loss at an early stage. Awareness regarding tools like DEXA should be created. Pharmacological interventions are expensive and should, therefore, be targeted to only those at high risk of fractures.

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