

Research Article**A PROSPECTIVE COMMUNITY BASED STUDY TO EVALUATE THE PREVALENCE AND RISK FACTORS FOR OSTEOPOROSIS AMONG MENOPAUSAL AND PREMENOPAUSAL WOMEN****Dr Rohit Madhup Lal^{1*}, Dr Sweta Lal²**

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Abstract

Introduction: Osteoporosis is defined as a systemic skeletal muscle disease characterized by low bone mass leading to an increase in bone fragility and susceptibility to fractures. It is a major global health problem associated with significant morbidity, mortality, and socioeconomic burden. Osteoporosis can occur in both men and women at any age; however, due to a fall in estrogen production after menopause, women show a marked rise in osteoporosis. In India, it is said that every third woman and eight men are suffering from osteoporosis.

Materials and methods: This was a prospective epidemiological study conducted From April 2025 to March 2026 in a suburban area attached to Orthopaedic Surgery, Samford Hospital, Ranchi, Jharkhand, India. In order to create awareness among the public, one week prior to the camp, pamphlets describing the

purpose and the benefits of the study were distributed in and around the area with the help of voluntary health nurses. Perimenopausal women ≥ 40 years and post-menopausal women who had attained surgical/natural menopause were included in the study. Women with chronic medical illness such as diabetes, renal, thyroid disorders, and those using medications that might affect bone mass such as corticosteroids, diuretics and hormone therapy were excluded from the study.

Results: The mean age of the participants was 52.67 ± 9.41 , range being 40 to 76 years. 15 (10.16%) were nulliparous and 137 (89.8%) were parous women. 95 subjects (62.2%) were post-menopausal and among them 12 had surgical menopause. The mean years of menopause was 11.45 ± 7.22 and the range was 1 to 30 years. 114 (37.38%) were premenopausal. Among the 152 subjects, 145 (95.41%) were indoor and majority of them were involved in household activities

and 23 (15.08%) of them had a sedentary lifestyle. Only 7 women (4.6%) were involved in outdoor activities such as working in paddy field etc. 22 women (14.75%) had good exposure to sunlight and the remaining 130 women had either minimal exposure to <1 hour per week or no exposure at all.

Conclusion: The prevalence of osteoporosis is high among both pre-menopausal and menopausal women, but the awareness is limited. This study highlights the need for screening all women after the age of 40 years which is feasible using portable and easily available technology such as quantitative ultrasound of peripheral bones.

Key Words: Osteoporosis, Perimenopausal women, quantitative ultrasound, sedentary lifestyle.

INTRODUCTION

Osteoporosis is defined as a systemic skeletal muscle disease characterized by low bone mass leading to an increase in bone fragility and susceptibility to fractures. It is a major global health problem associated with significant morbidity, mortality, and socioeconomic burden.¹

Osteoporosis can occur in both men and women at any age; however, due to a fall in estrogen production after menopause, women show a marked rise in osteoporosis. In India, it is said that every third woman and eight men are suffering from osteoporosis. Bone loss in postmenopausal women occurs in two phases.² The initial short phase lasts for 3-5 years, in which trabecular bone loss occurs rapidly, and in the long-term phase, both cortical and trabecular bone loss occur for over 10–20 years (age-related loss). Stratification by age

shows that the prevalence of low bone mass is more than 40% from the age of 40 years and increases to more than 80% by the age of 65 years. According to the WHO, up to 70% of women over the age of 80 are suffering from osteoporosis. The peak incidence of osteoporosis in India occurs 10–20 years earlier than in Western countries.^{3,4}

With increasing life-expectancy more women are going to be diagnosed with osteoporosis and its associated morbidity. Most often, the diagnosis of osteoporosis is made only after the occurrence of the fractures. Osteoporosis related fractures can be prevented, if osteoporosis is diagnosed and treated early.⁵

Objectives

The primary objective of this study was to determine the prevalence of osteopenia and osteoporosis among pre and post menopausal women and the secondary objective was to identify the risk factors associated with low bone mineral density.

MATERIALS AND METHODS

This was a prospective epidemiological study conducted From April 2025 to March 2026 in a suburban area attached to Orthopaedic Surgery, Samford Hospital, Ranchi, Jharkhand, India. In order to create awareness among the public, one week prior to the camp, pamphlets describing the purpose and the benefits of the study were distributed in and around the area with the help of voluntary health nurses.

Inclusion criteria

Perimenopausal women ≥ 40 years and post-menopausal women who had attained surgical/natural menopause were included in the study.

Exclusion criteria

Women with chronic medical illness such as diabetes, renal, thyroid disorders, and those using medications that might affect bone mass such as corticosteroids, diuretics and hormone therapy were excluded from the study.

A total of 152 subjects met the inclusion and exclusion criteria. Informed consent was taken from each participant. Using a validated structured questionnaire, demographic details, obstetric, gynaecological and medical history were collected. Food-frequency questionnaire (FFQ) was modified and validated to suit our patients and was used to assess the calcium, vitamin D and caffeine consumption pattern. Consuming fish at least once a week, taking 3 eggs a week and drinking 2 glasses of milk everyday was considered adequate for calcium and vitamin D requirement. Details regarding daily activities, sunlight exposure, past history of fractures and awareness about osteoporosis were noted. Sunlight exposure was considered adequate if their face and arms were exposed to the sun light for at least 30 minutes a day. Symptoms such as knee pain, back pain were elicited and BMI was calculated.

After explaining the procedure to the participants, the BMD of the right calcaneal bone was measured using Lunar Achilles Ultrasound Densitometer (software version 1.3) which was calibrated before usage. The machine converts the BMD values into T-score (WHO). A T-score of -1 and above was considered normal; T-score between -1 and -2.5 was considered osteopenia; and T-score -2.5 and below considered

osteoporosis. All women were given advice on prevention of osteoporosis and those diagnosed with osteoporosis were referred for further management.

Statistical methods

BMD measured as T-score was considered as primary outcome variable. Demographic variables, anthropometric parameter, physical activity and food habits were considered as explanatory variables. Descriptive analysis was carried out by mean and standard deviation for quantitative variables, frequency and proportion for categorical variables. Shapiro-Wilk test was carried out to assess normal distribution. Categorical outcomes were compared between study groups using Chi square test/Fisher's Exact test and p value <0.05 was considered statistically significant. IBM SPSS version 22 was used for statistical analysis.

RESULTS

The mean age of the participants was 52.67 ± 9.41 , range being 40 to 76 years. 15 (10.16%) were nulliparous and 137 (89.8%) were parous women. 95 subjects (62.2%) were post-menopausal and among them 12 had surgical menopause. The mean years of menopause was 11.45 ± 7.22 and the range was 1 to 30 years. 114 (37.38%) were premenopausal. Among the 152 subjects, 145 (95.41%) were indoor and majority of them were involved in household activities and 23 (15.08%) of them had a sedentary lifestyle. Only 7 women (4.6%) were involved in outdoor activities such as working in paddy field etc. 22 women (14.75%) had good exposure to sunlight and the remaining 130 women had either

minimal exposure to <1 hour per week or no exposure at all. On analysing the nutritional status, majority of them (97.7%) consumed non-vegetarian diet and the calcium intake was adequate in 70 (46.23%) subjects and was deficient in 82 (53.77%). There was

family history of fracture in 23 (15.41%) women. 13 (8.85%) women have sustained fractures themselves in the past. 55 (36%) presented with musculoskeletal symptoms such as back ache and knee pain. The mean BMI in the subjects was 26.49±3.75.

Variables	Summary
Age in years	
Age mean ± SD (range)	52.67±9.41 (40-76)
40-45	48 (31.80%)
46-50	30 (19.34%)
51-55	14 (9.18%)
56-60	27 (17.70%)
>70	7 (4.59%)
Parity	
Nullipara	15 (10.16%)
1	22(14.43%)
2	74 (48.52%)
3 and above	41 (26.89%)
Menstruation status	
Pre-menopause	57(37.38%)
Post menopause (natural)	83 (54.75%)
Surgical menopause	12 (7.8%)
Years of menopause (N=95)	
Years of menopause (N=191) Mean±SD (range)	11.45±7.22 (1-30)
<2 years	11(11.11)
2-5 years	17(18.52%)
6-10 years	16 (16.93%)
>10 years	50 (53.44%)
Occupation	
Indoor	145 (95.41%)
Outdoor	7 (4.59%)
Sedentary Life	
Yes	23 (15.08%)
No	130 (84.92%)
Exposure to sunlight	
Adequate	22(14.75%)
Minimal	108 (70.49%)
Inadequate	22 (14.75%)
Calcium intake	
Adequate	120 (46.23%)
Not Adequate	132 (53.77%)
Food habits	

Veg	3 (2.30%)
Non-Veg	149 (53.77%)
Excessive coffee intake	
Yes	38 (25.25%)
No	114 (74.75%)
Family history of fracture	
Yes	23 (15.41%)
No	129 (84.59%)
Previous history of fracture	
Yes	14 (8.85%)
No	139 (91.15%)
Years since fracture	
<5 years	8 (59.26%)
5-10 years	2 (11.11%)
>10 years	4 (29.63%)
Body mass index	
BMI Mean±SD (range)	26.49±3.75 (18-36.76)
18.5-24.5	54 (35.74%)
25-29.9	74 (48.20%)
30 and above	25 (16.07%)
Complaints	
Back ache	30 (19.67%)
Knee pain	25 (16.39%)
Nil	97 (63.93%)

Table 1: Patient demographics (N=152)

BMD measured as T-score	Frequency	Percentage
Normal (-1 and above)	45	29.8
Osteopenia (-1 to -2.5)	59	38.4
Osteoporosis (-2.5 below)	49	31.8

Table 2: Descriptive analysis of BMD measured as T-score (N=152)

Demographic variables	BMD score Mean±SD	P value
Age in years		
40-45	-1.01±1.25	
46-50	-1.55±1.33	0.013
51-55	-1.21±1.12	0.485
56-60	-2.23±1.47	0.001
61-70	-1.75±1.08	0.001
≥70	-1.51±1.98	0.180
Parity		
Nulli para	-1.49±0.91	
1	-1.53±1.49	0.904
2	-1.62±1.47	0.628
3	-1.48±1.08	0.975

4	-0.95±1.47	0.128
Menstruation status		
Pre-menopause	-1.14±1.12	0.001
Post menopause	-1.77±1.51	
Years of menopause		
2-5 years of menopause	-1.71±1.51	0.003
6-10 years of menopause	-1.6±1.29	0.008
>10 years of menopause	-2.04±1.35	0.001

Table 3: Association between the demographic variables and the BMD score

Risk factors	BMD score Mean±SD	P value
Exposure to sunlight		
Adequate	-1.32±1.16	0.397
Minimal	-1.52±1.38	
Inadequate	-1.57±1.52	
Sedentary life		
Yes	-1.76±1.44	0.155
No	-1.45±1.35	
Food habits		
Beg	-2.31±0.93	0.115
Non Veg	-1.48±1.37	
Calcium intake		
Adequate	-1.51±1.55	0.907
Not Adequate	-1.49±1.19	
Coffee intake		
Yes	-1.35±1.3	0.259
No	-1.55±1.39	
Body mass index		
18.5-24.5	-1.77±1.18	0.143
25-29.9	-1.52±1.44	
30	-0.83±1.34	
Previous history of fractures		
Yes	-2.71±0.71	0.001
No	-1.38±1.36	
Family history of fractures		
Yes	-1.47±1.31	0.896
No	-1.5±1.38	
Musculo-skeletal symptoms		
Yes	-1.77±1.51	0.001
No	-1.14±1.12	

Table 4: Association between various risk factors and the BMD score

DISCUSSION

Osteoporosis is a major global health problem affecting 200 million women worldwide. Approximately one-tenth of women aged 60, one-fifth of women aged 70, two-fifths of women aged 80 and two-thirds of women aged 90 are affected. In a recent systematic review and meta-analysis, the prevalence of osteoporosis among women globally was found to be 23.1% (95% CI 19.8-26.9).⁶ Being a major health issue, this study was undertaken to know the prevalence of osteoporosis, its risk factors, the public awareness about the disease, so that preventive measures can be undertaken.⁸

The prevalence of osteoporosis in our study was 31.8% and 38.4% were osteopenic. Similar to our study, other Indian studies have also shown a high prevalence of osteopenia and osteoporosis. Babu et al have reported 44.1% of osteoporosis and 41.1% of osteopenia among 609 women using QUS of distal radius. Number of other studies have also shown a similar finding. In a study from Mumbai, 81% of women in peri and post-menopausal age group were found to have low BMD.⁹

Post-menopausal women are significantly more osteoporotic than menstruating women. Oestrogen acts directly on the osteoblasts promoting bone formation and decreases osteoclastic activity. In the absence of oestrogen, osteoclastic activity predominates resulting in bone resorption. The resultant bone loss initially presents with backaches, joint pains, and painful physical activity eventually leading to fragile fractures. By the combined effect of age and menopause, by the age of 70 a

woman would have lost almost 50% of her bone mass. In this analysis, the prevalence of osteoporosis was 42.4% among post menopausal and 14% among pre-menopausal women with postmenopausal women showing significantly low BMD (p value <0.001). As nearly 50% of pre-menopausal women are also osteopenic, it highlights the need for screening all women after the age of 40 years, so that preventive measures can be taken. Besides the absence of oestrogen, the duration of non-exposure to oestrogen is also an important contributing factor for low BMD. When compared to women who attained menopause <2 years, there was a statistically significant low level of mean BMD scores in those who attained menopause >2 years (p value <0.05).¹⁰

CONCLUSION

Osteoporotic fractures result in enormous economic and medical burden to the family and society. The World Health Organization (WHO) has identified osteoporosis as an important non communicable disease. Early detection and preventive measures are important to avoid morbidity and mortality related to osteoporosis. Our study has shown that the prevalence of osteoporosis and osteopenia is high among both pre-menopausal and menopausal women. Age of the individual, post menopausal status and duration of menopause have emerged as major risk factors related to osteoporosis, however, these are non-modifiable factors. Therefore, the emphasis should be on implementing screening strategies to pick up osteoporosis early and treat it adequately. Adequate calcium and vitamin D intake, encouraging exercise and mobility to build

strong bones are also important. As the awareness of osteoporosis is poor among the public, it is preferable to have community based screening programmes such as ours.

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