

AWARENESS ABOUT OSTEOPOROSIS AMONG POSTMENOPAUSAL WOMEN: A CROSS-SECTIONAL STUDY IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Osteoporosis is a silent, progressive skeletal disorder that disproportionately affects postmenopausal women and is a major contributor to fragility fractures worldwide. Indian studies report a prevalence of 20–30% among postmenopausal women, yet awareness of its risk factors, diagnostic modalities, and treatment options among women attending Indian tertiary care hospitals remains poorly described. **Materials and Methods:** This was a descriptive cross-sectional study conducted over three months in the Department of Orthopaedics of a tertiary care hospital in Mandya. All consenting postmenopausal women aged 45–70 years attending the outpatient and inpatient services were enrolled by consecutive sampling (n = 100). A structured, interviewer-administered proforma recorded socio-demographic details, comorbidities, and lifestyle factors, together with a 20-item osteoporosis awareness questionnaire spanning basic knowledge, risk factors, prevention, and diagnosis/treatment. Data were analysed in SPSS version 30.0 using descriptive statistics and the Chi-square/Fisher's exact test. **Results:** Participants had a mean age of 61.2 ± 6.8 years and a mean age at menopause of 48.5 ± 4.5 years. Overall awareness of osteoporosis was low, with a mean total score of 13.7 ± 2.2 out of 20 (68.7%); only 35.0% of women demonstrated adequate awareness ($\geq 70\%$). Awareness varied by domain, ranging from 62.0% for basic knowledge to 76.2% for prevention strategies, with the poorest recognition seen for treatment options — only 34% knew that osteoporosis can be medically treated. None of the socio-demographic or lifestyle factors examined (age, education, dietary calcium intake, physical activity, or family history) showed a statistically significant association with awareness level. **Conclusion:** Awareness of osteoporosis was inadequate in nearly two-thirds of postmenopausal women attending this tertiary care orthopaedic department, with awareness of available medical treatment being the single most notable gap. These findings support incorporating structured, treatment-focused education and routine osteoporosis screening into every postmenopausal clinical encounter.

INTRODUCTION

Osteoporosis is a systemic skeletal disorder characterized by reduced bone mineral density (BMD) and micro-architectural deterioration of bone tissue, resulting in increased bone fragility and susceptibility to fracture. It is widely described as a “silent disease” because bone loss progresses

asymptotically until a fracture occurs, often with devastating consequences.^[1,2]

Post-menopausal women represent the highest-risk group for osteoporosis. The sharp decline in estrogen levels following cessation of menstruation accounts for a 2–3% annual decline in bone mineral density during the first 5–10 years after menopause.^[3] Globally, osteoporosis affects an estimated 200

million women, and one in three women over the age of 50 will sustain an osteoporotic fracture during their lifetime.^[1,2]

In the Indian context, studies report a prevalence of 20–30% osteoporosis among post-menopausal women, with hip fractures associated with a 20–24% one-year mortality rate and significant long-term disability.^[4] Cultural dietary patterns including vegetarian diets with suboptimal calcium content, limited engagement in weight-bearing exercise, inadequate Vitamin D exposure despite a tropical climate, and low health literacy further compound the risk in this population.^[5,6]

Modifiable risk factors — including inadequate dietary calcium and Vitamin D intake, physical inactivity, smoking, excessive alcohol consumption, and low body weight — interact with non-modifiable factors such as advancing age, genetic predisposition, and early menopause to determine fracture risk. A cross-sectional study from a teaching hospital in southern India found that about 60% of postmenopausal women referred for DXA scanning had poor overall awareness of osteoporosis, with particularly poor understanding of risk factors and available treatment options, underscoring the need for structured health-education programmes to bridge this knowledge gap.^[4] Despite the gravity of this public health problem, awareness among postmenopausal women regarding osteoporosis, its risk factors, diagnostic modalities (especially dual-energy X-ray absorptiometry, DEXA), and preventive strategies remains critically low.^[7]

Health literacy and awareness play a crucial role in osteoporosis prevention. Adequate dietary calcium and Vitamin D intake, regular weight-bearing exercise, and avoidance of smoking and excess alcohol are each established modifiable protective measures, yet awareness of these measures — and, more critically, awareness that effective medical treatments and screening tests exist — remains inconsistent among Indian postmenopausal women.^[6,7] Structured educational interventions have been shown to meaningfully raise osteoporosis knowledge scores, but their effectiveness depends on first identifying where the largest knowledge gaps lie.^[8,9]

At a tertiary care hospital such as the Mandya Institute of Medical Sciences (MIMS), a large number of postmenopausal women attend the outpatient and inpatient departments for various orthopaedic and general ailments and are at heightened risk of osteoporosis due to advancing age, comorbidities, and reduced physical activity. However, no study has evaluated the level of awareness of osteoporosis among the postmenopausal population in this region.

This study therefore aimed to describe the level of awareness of osteoporosis among postmenopausal women attending a tertiary care hospital in Mandya, and to identify knowledge gaps regarding basic disease knowledge, risk factors, prevention strategies, and diagnosis/treatment among the

participants. Thus, the results of this study would provide recommendations for targeted educational interventions to improve screening behaviour and quality of life among postmenopausal women attending this tertiary care centre.

MATERIALS AND METHODS

Study design: Cross-sectional study. Study period: Three months.

Sampling technique: Consecutive sampling. **Sample size:** 100.

Study set-up: Department of Orthopaedics (outpatient and inpatient services), Mandya Institute of Medical Sciences (MIMS), Mandya — a tertiary care hospital.

Selection Criteria: Inclusion criteria — 1) Postmenopausal women aged 45–70 years with natural menopause (absence of menstruation for ≥ 12 consecutive months). 2) Attending the outpatient or inpatient departments of MIMS, Mandya. 3) Willing to give informed written consent to participate in the study. Exclusion criteria — 1) Surgical or treatment-induced menopause (bilateral oophorectomy, chemotherapy/radiotherapy). 2) Disorders significantly affecting bone metabolism (hyperparathyroidism, Cushing's syndrome, chronic kidney disease, malabsorption syndromes). 3) Current use of bisphosphonates, hormone replacement therapy, or systemic corticosteroids. 4) Cognitive or sensory impairment precluding informed participation.

Institutional ethics committee approval was obtained before starting the research project, and written informed consent was obtained from every participant. All eligible postmenopausal women attending MIMS, Mandya were enrolled consecutively. A structured, interviewer-administered questionnaire was administered by the investigator in the patient's preferred language (Kannada/English).

The sample size was calculated using the formula $n = (Z_{1-\alpha/2})^2 \times p \times q / d^2$, based on a prevalence of poor awareness (p) of 49% from a previous study,^[4] with $q = 1 - p$ and an allowable error (d) of 20% of p, yielding a sample size of approximately 100.

The proforma consisted of socio-demographic data, a history section documenting menopausal status, comorbidities, and current medications, and a 20-item, interviewer-administered awareness questionnaire covering four domains — basic definition and knowledge (5 items), risk factors (5 items), prevention strategies (5 items), and diagnosis and treatment (5 items) — each item scored 1 for a correct (“true”) response and 0 for an incorrect or “don’t know” response, giving a maximum possible total score of 20.

After collection, data were entered in Microsoft Excel and analysed using IBM SPSS Statistics version 30.0. Descriptive statistics (percentages for categorical variables such as awareness items and

education; mean and standard deviation for continuous variables such as age) were computed, and the Chi-square test (or Fisher's exact test where expected cell counts were small) was used to assess the association of adequate awareness (total score $\geq 70\%$) with age group, educational status, dietary calcium intake, physical activity, and family history of osteoporosis. A p-value < 0.05 was considered statistically significant.

RESULTS

A total of 100 postmenopausal women aged 45–70 years were enrolled consecutively over the study period. The mean age was 61.2 ± 6.8 years, and the mean age at menopause was 48.5 ± 4.5 years. All participants had undergone natural menopause. The socio-demographic profile of participants — age, educational status, and physical activity — is summarised separately in Table 1, with the remaining clinical and lifestyle characteristics shown in Table 2.

Table 1: Socio-demographic Profile of Study Participants — Age, Education, and Physical Activity (N = 100)

Variable	Category	n	%
Age (years)	Mean $\pm$ SD	61.2 ± 6.8	—
Age group	45–54 yrs	18	18.0%
	55–64 yrs	39	39.0%
	≥ 65 yrs	43	43.0%
Educational status	Illiterate/Primary	19	19.0%
	Secondary	80	80.0%
	Graduate	1	1.0%
Physical activity	Regular	82	82.0%
	Irregular	15	15.0%

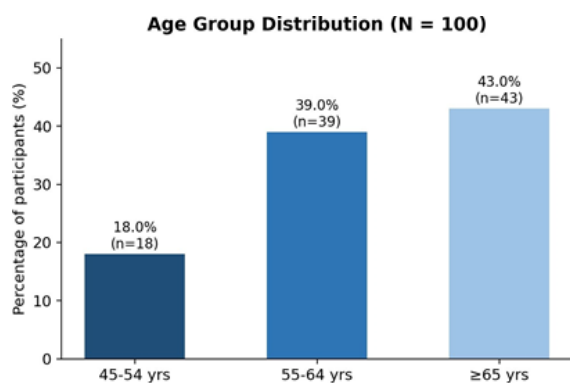


Figure 1: Age group distribution of study participants

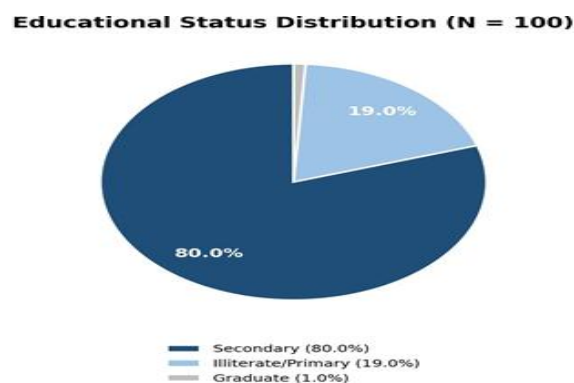


Figure 2: Educational status distribution of study participants

Educational attainment was concentrated in the secondary-education range (80.0%), reflecting the general literacy profile of women attending this hospital; only one participant (1.0%) had a graduate-level education, and regular physical activity was reported by 82.0% of participants.

Table 2: Clinical and Lifestyle Characteristics of Study Participants (N = 100)

Variable	Category	n	%
Age at menopause (years)	Mean $\pm$ SD	48.5 ± 4.5	—
Years since menopause	Mean $\pm$ SD	15.8 ± 9.2	—
Hypertension	Yes	25	25.0%
Diabetes mellitus	Yes	34	34.0%
Thyroid disorder	Yes	6	6.0%
Chronic kidney disease	Yes	3	3.0%
Dietary calcium intake	Adequate	90	90.0%
Vitamin D supplementation	Yes	7	7.0%
Smoking	Yes	2	2.0%
Alcohol use	Yes	2	2.0%
Family history of osteoporosis	Yes	1	1.0%
Prior fragility fracture	Yes	6	6.0%
Prior DEXA scan done	Yes	2	2.0%

Dietary calcium intake was reported as adequate by the large majority of participants (90.0%), while

comorbidities such as diabetes mellitus (34.0%) and hypertension (25.0%) were common; a family history

of osteoporosis was reported by only one participant (1.0%).

Overall osteoporosis awareness

Overall osteoporosis awareness scores are summarised below. The mean total awareness score was 13.7 ± 2.2 out of 20 (68.7%), with a median score of 13 (range 8–17). Only 35 participants (35.0%) met the pre-defined threshold for adequate awareness ($\geq 70\%$); the remaining 65 (65.0%) had inadequate awareness.

Overall Osteoporosis Awareness Level (N = 100)

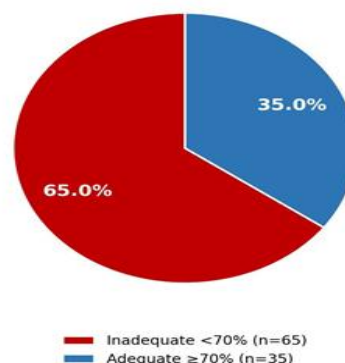


Figure 3: Overall osteoporosis awareness level

The percentage of correct responses to each item in the questionnaire is shown in Table 3.

Table 3: Percentage of Correct Responses on the Osteoporosis Awareness Questionnaire (N = 100)

Item (correct answer: True)	% correct (No.)
1. Osteoporosis means bones become weak and break easily.	58.0 (58)
2. Osteoporosis can occur without any pain or symptoms until a fracture happens.	48.0 (48)
3. Women are more likely to get osteoporosis than men.	66.0 (66)
4. Osteoporosis mainly affects people over 50 years of age.	65.0 (65)
5. After menopause, women lose bone mass more rapidly.	73.0 (73)
6. Low calcium intake can cause osteoporosis.	90.0 (90)
7. Lack of Vitamin D increases the risk of osteoporosis.	60.0 (60)
8. Physical inactivity increases the risk of osteoporosis.	73.0 (73)
9. Smoking and alcohol increase the risk of osteoporosis.	53.0 (53)
10. A family history of osteoporosis increases your own risk.	76.0 (76)
11. Eating calcium-rich foods (milk, curd, green vegetables) helps prevent osteoporosis.	83.0 (83)
12. Regular weight-bearing exercise (walking, jogging) helps strengthen bones.	79.0 (79)
13. Exposure to sunlight helps the body make Vitamin D which strengthens bones.	79.0 (79)
14. Vitamin D and calcium supplements can help prevent osteoporosis.	72.0 (72)
15. Avoiding smoking and alcohol helps reduce osteoporosis risk.	68.0 (68)
16. A DEXA scan is the gold standard test to diagnose osteoporosis.	67.0 (67)
17. Osteoporosis can be treated with medicines to strengthen bones.	34.0 (34)
18. Doctors can prescribe medicines to prevent bone loss in high-risk women.	73.0 (73)
19. Regular follow-up with a doctor helps in managing osteoporosis.	77.0 (77)
20. Physiotherapy and exercise programs can help patients with osteoporosis.	79.0 (79)

Within the questionnaire, the weakest individual items were awareness that osteoporosis can be treated with medicines to strengthen bone (34.0% correct), awareness that osteoporosis can be silent until a fracture occurs (48.0% correct), and awareness that smoking and alcohol increase risk (53.0% correct).

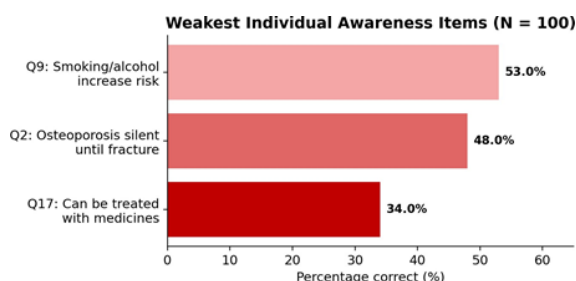


Figure 4: Weakest individual awareness items

Association between awareness and socio-demographic/lifestyle factors

On Chi-square/Fisher's exact testing for association with adequate awareness (Table 4), no statistically significant association was seen with age group, educational status, dietary calcium intake, physical activity, or family history of osteoporosis, although mean scores trended marginally higher among women with inadequate rather than adequate dietary calcium intake. [Figure 5]

Table 4: Association Between Adequate Awareness and Selected Variables

Variable	Category	Adequate awareness, n (%)	Inadequate awareness, n (%)	p-value
Age group	45–54 yrs	7 (38.9%)	11 (61.1%)	0.771
	55–64 yrs	12 (30.8%)	27 (69.2%)	
	≥ 65 yrs	16 (37.2%)	27 (62.8%)	

Educational status	Illiterate/Primary	4 (21.1%)	15 (78.9%)	0.157
	Secondary	30 (37.5%)	50 (62.5%)	
	Graduate	1 (100.0%)	0 (0.0%)	
Dietary calcium intake	Adequate	29 (32.2%)	61 (67.8%)	0.094
	Inadequate	6 (60.0%)	4 (40.0%)	
Physical activity	Regular	28 (34.1%)	54 (65.9%)	0.770
	Irregular	6 (40.0%)	9 (60.0%)	
Family history of osteoporosis	Yes	0 (0.0%)	1 (100.0%)	1.000
	No	35 (35.4%)	64 (64.6%)	

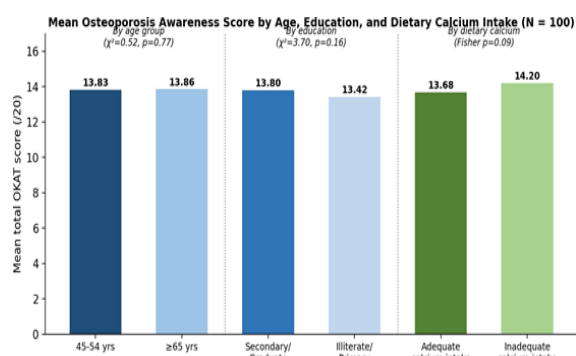


Figure 5: Mean awareness score by age group, education, and dietary calcium intake

DISCUSSION

This study aimed to describe the level of awareness of osteoporosis, and to identify domain-specific knowledge gaps, among postmenopausal women attending a tertiary care orthopaedic department in Mandya. This descriptive cross-sectional study enrolled 100 postmenopausal women (mean age 61.2 ± 6.8 years) attending the outpatient and inpatient services of MIMS, Mandya. All participants had undergone natural menopause at a mean age of 48.5 years, consistent with previously reported average menopausal ages among Indian women.^[4]

The mean total awareness score was 13.7 ± 2.2 out of 20 (68.7%), and only 35.0% of participants met the pre-defined threshold for adequate awareness ($\geq 70\%$). This is broadly consistent with — though somewhat more favourable than — a comparable cohort of 302 postmenopausal women referred for DXA scanning at a teaching hospital in southern India, where about 60% of participants showed poor overall awareness on a five-tier classification.^[4] This more favourable performance in the present cohort may reflect differences in recruitment setting or regional health-literacy patterns, reinforcing that inadequate osteoporosis awareness is a recurring finding across Indian tertiary care settings rather than an isolated observation at this centre.

Item-level analysis revealed a striking specific gap: only 34.0% of participants were aware that osteoporosis can be treated with medicines to strengthen bone — the single lowest-scoring item on the entire questionnaire — and only 48.0% knew that osteoporosis can be silent until a fracture occurs. This pattern suggests the deficit is not primarily about recognising risk but about knowing that effective help exists — a distinction with direct implications for intervention design: generic risk-factor education

is unlikely to close this particular gap, whereas structured counselling on treatment availability, delivered at the point of orthopaedic or gynaecological care, would target it directly.^[4,7]

Associations with awareness followed largely null or borderline patterns. No statistically significant association was found between awareness and age ($p=0.771$), educational status ($p=0.157$), dietary calcium adequacy ($p=0.094$), physical activity ($p=0.770$), or family history of osteoporosis ($p=1.000$, though only one participant reported a positive family history, limiting the power of this comparison). This is broadly consistent with the reference study, which likewise found no significant difference in awareness between illiterate/primary-educated and more educated participants in most domains assessed.^[4] The small proportion of graduates ($n=1$) and illiterate/primary-educated women ($n=19$) in the present cohort further limits statistical power to detect true differences by education.

These findings are consistent with the broader literature on osteoporosis awareness. Salaffi et al.'s systematic review across 14 countries reported that awareness averages 45–55% on standardized knowledge scales worldwide, with the lowest scores consistently seen for pharmacological prevention — a pattern also reflected in the present cohort's poor recognition of medical treatment options.^[7] Encouragingly, controlled intervention studies suggest that these gaps are modifiable: Janz and Becker demonstrated that nurse-led education sessions produced statistically significant improvements in knowledge, dietary calcium intake, and exercise frequency among postmenopausal women,^[8] and Brennan et al.'s meta-analysis of 22 quasi-experimental studies found consistently significant improvements in knowledge and self-efficacy following structured educational interventions, with moderate-to-large effect sizes across diverse cultural settings.^[9]

This study has several limitations. Its cross-sectional, single-centre design and modest sample size ($n=100$) limit generalisability, and the near-complete absence of participants reporting a positive family history of osteoporosis ($n=1$) precluded meaningful assessment of that association. Recruitment from a tertiary care orthopaedic department, rather than the general community, may also overestimate awareness relative to the broader postmenopausal population, particularly rural and less-literate women who were underrepresented in this cohort. Self-reported dietary calcium intake and physical activity were not

independently verified and may be subject to recall or social-desirability bias.

These findings carry practical implications. Rather than relying on generic risk-factor education alone, healthcare providers — including orthopaedic surgeons, physicians, and gynaecologists — could meaningfully close the largest identified gap by routinely informing postmenopausal women, at every encounter, that effective medical treatments and screening tests for osteoporosis are available and how to access them.

CONCLUSION

Among 100 postmenopausal women attending a tertiary care orthopaedic department in Mandya, awareness of osteoporosis was inadequate in nearly two-thirds (65.0%), with a mean awareness score of just under 69%. While participants had relatively good awareness of prevention strategies and risk factors, awareness that effective medical treatment for osteoporosis exists was markedly poor, identifying this as the single most actionable gap. Awareness showed no statistically significant association with age, education, dietary calcium intake, physical activity, or family history in this sample. These findings support incorporating structured, treatment-focused osteoporosis education and routine screening discussions into every postmenopausal clinical encounter in the orthopaedic OPD/IPD setting, rather than relying on patients' spontaneous awareness of when and where to seek help.

Data availability statement: The data supporting the findings of this study are available from the corresponding author on reasonable request.

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Conflicts of interest: There are no conflicts of interest.

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