

Osteoporosis knowledge and beliefs among postmenopausal women: A cross-sectional study from a teaching hospital in southern India

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ABSTRACT

Objectives: Osteoporosis continues to be underrecognized in many parts of India. This study was undertaken to assess the level of knowledge of osteoporosis among postmenopausal women referred for a dual-energy X-ray absorptiometry (DXA) scan in a teaching hospital in southern India. **Methodology:** This cross-sectional study assessed the state of awareness in consecutive postmenopausal women referred for a DXA scan using a validated questionnaire - Osteoporosis Knowledge Assessment Tool. The proportion of correct responses was expressed as percentages. The mean scores obtained were also compared between different educational groups. **Results:** A total of 302 consecutive postmenopausal women who were referred for DXA participated in this study. The mean (standard deviation) age of the postmenopausal women included in this study was 58.8 (6) years. Although most subjects were aware of the consequences of osteoporosis, there was generalized lack of awareness with regard to risk factors and available treatment options. Overall about 60% had poor awareness about osteoporosis. **Conclusion:** This study showed a gross deficit in awareness of osteoporosis in Indian postmenopausal women. There is a need to prioritize on designing appropriate awareness campaigns in subjects at risk, according to their level of literacy.

Keywords: Awareness, India, OKAT, osteoporosis, postmenopausal women

Introduction

Osteoporosis is characterized by low bone mass and is associated with deterioration of bone microarchitecture. Osteoporosis causes the bones to be fragile and increases susceptibility to fracture even with trivial trauma.^[1] After attainment of menopause in women, the process of osteoporosis is accelerated by estrogen deficiency. Estrogen helps in maintaining a positive calcium balance and in osteogenesis. Menopause accelerates the rate of bone loss by 2%–5% per year, and this may continue for the next 10 years.^[2] In a recent study, the prevalence of

osteoporosis in ambulatory postmenopausal women was shown to be 50% at any site.^[3] The 1-year mortality after osteoporotic hip fractures is estimated to be about 20%.^[4]

The basic requirement for managing any chronic health disorder starts with evaluation of the awareness about the disease among the target subjects. Although a good understanding of the disease may not be sufficient to bring about changes in health-related behavior, adequate knowledge is a prerequisite for the success of preventive efforts.^[5] There is evidence suggesting that knowledge about osteoporosis is a contributor to osteoporosis preventive behavior, although this is not a clear-cut relationship. In India, awareness of osteoporosis is low, since there has been relatively little effort to publicize the disease. Although few surveys indicate

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that awareness about the disease in the urban population is inadequate, there are no large-scale surveys undertaken to assess the depth of awareness and understanding of osteoporosis in postmenopausal women. Since osteoporosis is a significant problem in Indian postmenopausal women with significant increase in morbidity and mortality following fragility fractures, it is absolutely imperative that they be screened preemptively for the presence of osteoporosis. Very often, screening efforts are hampered by the lack of awareness of this condition among rural postmenopausal subjects. To promote knowledge and better health seeking behavior among postmenopausal women, it is necessary to assess their current state of awareness and work towards reducing the identified gaps in knowledge. The results of this study are relevant for family and primary care physicians as well as for policy makers to conduct programs periodically to increase the awareness among postmenopausal women regarding osteoporosis.

Hence, this study was done to assess the awareness of osteoporosis among postmenopausal women, attending a teaching hospital in southern India. The study was done using a previously validated questionnaire-based tool [Osteoporosis knowledge assessment tool (OKAT)].^[6]

Subjects and Methods

This was a cross-sectional study conducted among postmenopausal women referred for assessment of bone mineral density (BMD) by dual-energy X-ray absorptiometry (DXA) scan at a teaching hospital in southern India. About 650–700 patients are referred by different departments for a DXA scan every month.^[7] Participants were included in the study after signing informed consent. This study was approved by the Institutional Review Board.

Sample size estimation: Based on a previous study, where the awareness of osteoporosis was about 49%, and using the formula $4pq/d^2$, where P is the prevalence of poor awareness, $q = 1 - p$, and d is the allowable error, that is, 12% of p, the sample size was estimated to be 289.^[8]

Anthropometric indices such as height and weight of subjects were assessed by standard techniques as follows.

Assessment of height (cm): Height was measured to the nearest centimeter (cm) using a wall-mounted stadiometer, with feet together, heels against the wall, knees straight, without headgear and footwear, and looking straight ahead.

Assessment of weight (kg): Weight was measured using a calibrated digital weighing scale Tulaman HT 500 series with accuracy up to 100 g (Hyderabad Tulaman Private Limited, Hyderabad, India), with the patient barefoot, in light clothing, one foot on each side of the scale, facing forward, and arms by the side of the body.

Assessment of BMD: This was done using DXA machine. The DXA scanner used in this study was Hologic Discovery A-QDR 4500 series (Hologic, Waltham, Massachusetts, USA). The Co-

efficient of Variation (CV) for measurement of BMD at lumbar spine and femoral neck is 1%–2% and 2%–3%, respectively.

Assessment of osteoporosis awareness: Knowledge regarding osteoporosis was assessed using OKAT questionnaire. OKAT is a valid and reliable tool to assess knowledge about osteoporosis^[6] and consists of 20 questions. The first 12 questions pertain to knowledge; questions 13–17 were to assess their understanding of risk factors of osteoporosis and the last three questions assessed practice and perception of osteoporosis prevention. It consists of multiple choice questions with each question having three options such as “true,” “false,” and “I don’t know.” The response “I don’t know” and unanswered questions were regarded as incorrect. Correct answers were awarded one point and wrong answers were awarded zero point. The total score of the participant was multiplied by 5 and further categorization of state of awareness was done as follows: <20: very poor, 21–40: poor, 41–60: average, 61–80: good, and ≥ 81 : very good.

Assessment of educational status: The educational status of the participants was assessed, and it is classified as follows:

- a. Illiterate or up to primary level of school education
- b. Completed secondary level of school education (class 10 or class 12)
- c. Graduate from college after completion of school education

Data were analyzed using SPSS v. 20. Continuous variables were expressed as mean [standard deviation (SD)]. Categorical variables were expressed as percentages. A *P* value < 0.05 indicated clinical significance.

Results

A total of 302 consecutive postmenopausal women who were referred for DXA participated in this study. Their demographic details, educational status, and level of osteoporosis awareness were studied as follows.

Demographic and clinical features

The mean (SD) age of the post menopausal women included in this study was 58.8 (6) years. The mean (SD) age of menopause was 46 (5.5) years. The mean (SD) BMI of the subjects was 27.1 (5.2) kg/m². The mean (SD) BMD (g/cm²) was 0.672 (0.116) at the neck of femur and 0.842 (0.145) at the lumbar spine. The demographic and clinical characteristics of the women are shown in Table 1. A total of 106 subjects (35%) were found to have osteoporosis at any site.

Educational status

The majority of the study participants had completed secondary level of school education ($n = 183, 60.6\%$), 95 (31.5%) of them were either illiterate or had completed primary level of school education, and only 24 (7.9%) of them had received college education.

Osteoporosis awareness from OKAT questionnaire

On an average, 37.1% of the questions (7.4/20) were correctly answered. Of the total responses, a worrying deficit in knowledge was seen in about 60% of the participants. The state of awareness in the study group was characterized as follows:

Very poor – 22.5%
 Poor – 38.1%
 Average – 34.1%
 Good – 5.3%

The percentage of correct responses to each item in the questionnaire is shown in Table 2. Knowledge and beliefs regarding osteoporosis were analyzed in three separate domains from the information available in OKAT questionnaire.

Basic knowledge regarding osteoporosis (questions 1–12)

On analyzing the responses to these questions, it was seen that 77% ($n = 234$) were aware that osteoporosis leads to increased risk of bone fractures, and 58.2% understood the relationship between poor bone strength, falls, and fractures. Although

Table 1: Demographic and clinical details

Variable	Mean (SD)
Age (years)	58.8 (6)
Age at menopause (years)	46 (5.5)
BMI (kg/m ²)	27.1 (5.2)
BMD (neck of femur, g/cm ²)	0.672 (0.116)
BMD (lumbar spine-g/cm ²)	0.842 (0.145)

SD: standard deviation; BMI: body mass index; bone mineral density

about 60.2% knew that a majority of women would be affected with osteoporosis by the age of 80 years, 46% ($n = 140$) of the study subjects had a misconception that osteoporosis was more common in men than in women and a majority of women (66%, $n = 199$) failed to understand the temporal relationship between advancing age and fracture risk. About 67% ($n = 201$) were unaware that cigarette smoking could contribute to osteoporosis. A majority of participants (59%, $n = 178$) were unaware that the chances of developing osteoporosis were higher in the presence of a positive family history.

Sources of calcium and risk factors for osteoporosis (questions 13–17)

Excessive intake of alcohol and high salt intake as risk factors for osteoporosis was correctly recognized by 32.8% ($n = 99$) and 34.4% ($n = 104$), respectively. Although most women (65%, $n = 198$) were aware that two glasses of milk yielded sufficient dietary calcium, only 45% ($n = 136$) identified ragi as a good source of calcium, and an alarming majority of them (74%, $n = 222$) believed that calcium supplements alone could prevent the development of osteoporosis.

Perceptions about treatment (questions 18–20)

A majority of the women (86%, $n = 259$) were unaware of the fact that hormone replacement therapy could help in preventing progression of osteoporosis. Only 13% ($n = 40$) women knew that effective treatments for osteoporosis existed in India.

Educational status and osteoporosis awareness

To determine whether educational status had any bearing on the level of osteoporosis awareness among the participants, the mean

Table 2: Percentage of correct responses on the OKAT questionnaire

Items	Correct answer	% of correct answer (No.)
1. Osteoporosis leads to an increased risk of bone fractures.	True	77.4 (234)
2. Osteoporosis usually causes symptoms (e.g, pain) before fractures occur.	False	8.6 (26)
3. Having a higher peak bone mass at the end of childhood gives no protection against the development of osteoporosis in later life.	True	21.8 (66)
4. Osteoporosis is more common in men.	False	46.3 (140)
5. Cigarette smoking can contribute to osteoporosis.	True	33.4 (101)
6. White women are at highest risk of fracture when compared with other races.	True	22.51 (68)
7. A fall is just as important as low bone strength in causing fractures.	True	58.2 (176)
8. By age 80 years, a majority of women have osteoporosis.	True	62.5 (189)
9. From age 50 years, most women can expect at least one fracture before they die.	True	34.1 (103)
10. Any type of physical activity is beneficial for osteoporosis.	False	39.7 (120)
11. It is easy to tell whether I am at risk of osteoporosis by my clinical risk factors.	True	46.0 (139)
12. Family history of osteoporosis strongly predisposes a person to osteoporosis.	True	41.0 (124)
13. An adequate calcium intake can be achieved from two glasses of milk a day.	True	65.5 (198)
14. Ragi and broccoli are good sources of calcium for people who cannot take dairy products.	True	45.0 (136)
15. Calcium supplements alone can prevent bone loss.	False	26.4 (80)
16. Alcohol in moderation has little effect on osteoporosis.	True	32.8 (99)
17. A high salt intake is a risk factor for osteoporosis.	True	34.4 (104)
18. There is a small amount of bone loss in the 10 years following the onset of menopause.	False	6.7 (20)
19. Hormone therapy prevents further bone loss at any age after menopause.	True	28.4 (86)
20. There are no effective treatments for osteoporosis available in India.	False	13.2 (40)

scores obtained from the OKAT questionnaire were compared between different educational groups. For convenience, those who were illiterate or had completed primary school were compared with the rest of the participants. The mean scores obtained in different domains are shown in Table 3. It was observed that those who had completed secondary school or college had better mean (SD) scores than primary educated/illiterate women [24.1 (11.8) vs 21.3 (11.7)] in the domain “basic knowledge regarding osteoporosis,” although the difference did not achieve statistical significance ($P = 0.05$). There was no significant difference in scores in the other domains between the two groups.

Discussion

The purpose of the study was to assess the level of awareness of osteoporosis among postmenopausal women attending a teaching hospital in southern India, especially with regard to risk factors, treatment options, and consequences. The purpose of selecting postmenopausal women as study participants was that they are at the highest risk for osteoporosis and fragility fractures, and this warrants early and pre-emptive screening in this group.

In this study, the mean age of attainment of menopause was 46 years. This is consistent with the study conducted by Ahuja *et al.*, in which the average age of menopause of an Indian woman was 46.2 years.^[9] The median age at menopause among white women from industrialized countries ranges between 50 and 52 years.^[10-13] Earlier menopause is associated with increased risk of osteoporosis and fragility fractures. This underscores the need for timely screening of postmenopausal women and early initiation of treatment to prevent the occurrence of fractures.

To the best of our knowledge, this is the first study from south India to assess awareness regarding osteoporosis, among a cohort of postmenopausal women referred for DXA scan. Overall, it was found that the understanding about osteoporosis, its risk factors, and treatment was poor in this cohort. In a similar study done in 100 postmenopausal women, there was a great deficit in knowledge regarding osteoporosis and its prevention.^[5] In our study, good knowledge regarding osteoporosis was observed in less than 10% of the subjects. The mean and median scores of the entire cohort were 35.8 and 40, respectively. This was similar to a study conducted among female medical school entrants in Pakistan, where the mean score was shown to be 33%.^[8] A similar deficit in knowledge was observed among nursing students in Damascus, where the mean score was noted to be 39.6%.^[14] The grossly inadequate state of awareness with regard to osteoporosis

mandates that remedial measures be adopted to bridge this gap in knowledge.

The participants of our study had poor knowledge about the risk factors and the consequences of osteoporosis and only 13% were aware that effective treatments for osteoporosis existed in India. In a survey conducted by Ungan and Tumer among Turkish women to assess the knowledge regarding osteoporosis, it was found that more than 40% of the women studied were not aware of the risk factors and more than 65% were unaware that osteoporosis was directly responsible for disabling hip fractures.^[15] Pande *et al.* surveyed 73 female staff members of a teaching institute and found that 74% were aware that osteoporosis is characterized by fragile bones, but there was general lack of awareness in all the areas assessed.^[16] This unfortunately reflects the significant lacunae in understanding of the disabling consequences of osteoporosis, its risk factors, and treatment.

On comparing the performance of participants stratified according to their educational status, no significant difference was observed between illiterate/primary level educated and the rest of the participants with regard to osteoporosis awareness. A small survey conducted in western India has shown media to be the most common source of information on osteoporosis and only a quarter of the subjects identified doctors as a source of information. This reveals the fact that with the current system of education, the weight of importance given to osteoporosis and its consequences is probably suboptimal. This calls for initiation of educational ventures that will enhance awareness about osteoporosis and its treatment. Family physicians who provide primary care to the elderly should discuss about osteoporosis during clinic visits for management of chronic diseases such as diabetes or hypertension. Conducting osteoporosis awareness programs in schools and colleges will assist in improving their knowledge in this regard. Utilizing mass media including print, broadcast, and digital media to improve awareness will help in reaching out to a majority of the general public. Individuals at risk of osteoporotic fractures who attend hospitals for other ailments can be provided information leaflets about osteoporosis and fall prevention.

The results of our survey are an eye-opener about the low level of awareness about osteoporosis in at-risk postmenopausal women. Primary care physicians have to prioritize on designing appropriate health education strategies for individuals at increased risk of osteoporosis based on their level of literacy. Osteoporosis awareness programs on the mass media in regional languages would reach a large proportion of people.

Table 3: Mean scores in OKAT questionnaire

Theme	Mean (SD) score	Mean (SD) score	P
	Illiterate/primary level	Secondary/college level	
Basic knowledge regarding osteoporosis	21.3 (11.7)	24.1 (11.8)	0.05
Sources of calcium and risk factors	10.2 (7.5)	10.2 (6.5)	0.99
Perceptions about treatment	2.4 (3.9)	2.4 (3.9)	0.99

OKAT: Osteoporosis Knowledge Assessment Tool; SD: standard deviation

Osteoporosis prevention should commence during the adolescent period. The community should be adequately sensitized to the burden of osteoporosis and its complications, potential risk factors, and options for treatment. In the management of chronic disease, increased knowledge about the disease is associated with improved patient compliance with treatment. Considering the suboptimal level of osteoporosis awareness in the Indian population, osteoporosis awareness campaigns should be conducted at regular intervals to improve the understanding of osteoporosis. This will facilitate appropriate screening, early diagnosis, timely initiation of treatment, and thus aid in fracture prevention.

Our study is limited by its cross-sectional design. Ideally, conducting a teaching session on osteoporosis, its risk factors, and treatment and assessing the questionnaire responses before and after the same will help in determining the effect of education on their existing state of awareness. Since the study was conducted among consecutive postmenopausal women referred for DXA scan from the outpatient department, the knowledge of osteoporosis among our study population is not representative of the community. However, as most postmenopausal women in our country reside in rural areas, and belong to the lower socioeconomic strata, it is reasonable to presume that the state of awareness among them might be worse than what was noted in this study. This justifies the widespread use of osteoporosis awareness campaigns to promote knowledge in this regard, especially at the grass-root level in the community. This is relevant in Indian primary care setting, where many of the Indian postmenopausal women visit for their ailments and family physicians especially primary care providers need to play a vital role in conducting these awareness programs.

Thus, this study is an attempt to identify the level of awareness among postmenopausal women, and hence these results can be used to implement health education measures to improve awareness of and attitude toward osteoporosis.

Compliance with ethical standards

No funding was received for this study. All procedures performed in this study involving human participants were in accordance with the ethical standards of the institutional and national research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. Informed consent was obtained from all individual participants included in the study.

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Conflicts of interest

There are no conflicts of interest.

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