



Prevalence and risk factors of osteoporosis among postmenopausal women

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Abstract

Background: Menopause marks the cessation of reproductive life in women and brings hormonal changes that influence bone metabolism. Decline in estrogen levels accelerates bone loss, predisposing women to osteoporosis and fracture risk.

Aim: To assess the prevalence and risk factors of osteoporosis among postmenopausal women residing in a selected community of Chennai.

Methods: A descriptive correlational study was conducted among 75 postmenopausal women residing in Ayanambakkam village, Chennai. Participants fulfilling inclusion criteria were selected by consecutive sampling. Data were collected using validated instruments-demographic, health, and menstrual variables proformas, and the Fracture Risk Assessment Tool (FRAX® online calculator). Statistical analysis included frequency, percentage, mean, standard deviation, and Chi-square tests.

Results: Most participants were aged 55-59 years (67%) with mean $\pm$ SD = 55.36 ± 3.42 . Majority had normal BMI (68%) and moderate physical activity (68%). About 27% had diabetes mellitus and 28% had hypertension. FRAX analysis revealed that 72% had low risk for hip fractures and 67% had low risk for major osteoporotic fractures. Mean $\pm$ SD of 10-year probability of hip fracture (without BMD) was 2.12 ± 2.55 and for major osteoporotic fracture was 9.98 ± 9.16 . Risk level was significantly associated with age ($p = 0.009$), activity ($p = 0.016$), medical illness ($p = 0.0008$), number of children ($p = 0.006$) and age at menopause ($p = 0.0162$).

Conclusion: Most postmenopausal women exhibited low fracture risk; however, older age, early menopause, higher parity, medical comorbidities, and moderate-to-heavy physical activity increased the probability of osteoporotic fractures. Nursing professionals play a vital role in screening, education, and lifestyle modification programs to prevent osteoporosis.

Keywords: Osteoporosis, prevalence, risk factors, postmenopausal women, fracture risk assessment tool, FRAX, hip fracture, major osteoporotic fracture

Introduction

Osteoporosis is a chronic skeletal disorder characterized by diminished bone mass and micro-architectural deterioration of bone tissue, leading to fragility and increased fracture risk. It is often referred to as a *silent disease* because it remains asymptomatic until a fracture occurs. Common fracture sites include the vertebrae, hip, and wrist, which contribute significantly to morbidity, disability, and mortality among women [1].

Menopause is a crucial determinant of osteoporosis owing to estrogen deficiency that accelerates bone resorption. Postmenopausal women lose approximately 3-5% of bone mass annually during the early menopausal years, followed by a slower, continuous loss [2]. Studies report that early menopause (<50 years), multiparity, sedentary lifestyle, poor calcium intake, and chronic diseases like diabetes mellitus increase osteoporosis risk [3].

In India, osteoporosis poses a major public health issue due to limited awareness and lack of routine screening. This study was undertaken to determine the prevalence and

associated risk factors of osteoporosis among postmenopausal women in a selected community of Chennai.

Methods

A descriptive correlational design was used to assess prevalence and risk factors of osteoporosis among postmenopausal women. The study was conducted in Ayanambakkam village, Chennai. A total of 75 postmenopausal women aged 45-59 years, meeting the inclusion criteria, were selected through consecutive sampling.

Data collection tools included

- 1. Demographic Proforma:** Age, education, occupation, marital status, residence, and activity level.
- 2. Health Variables Proforma:** BMI, medical illness, sunlight exposure, supplements, caffeine intake, and fracture history.

3. **Menstrual Variables Proforma:** Age at menarche, age at menopause, type of delivery, and type of menopause.
4. **FRAX® online calculator (University of Sheffield):** To estimate 10-year probability of hip and major osteoporotic fractures (without BMD).

The instruments underwent content validation by nursing experts. Pilot testing ensured reliability and feasibility. Ethical clearance was obtained from the Institutional Review Board and written informed consent was taken from all participants.

Data were analyzed using descriptive statistics (frequency, percentage, mean, SD) and inferential statistics (Chi-square test) to identify associations between osteoporosis risk and selected variables.

Results

Table 1: Demographic Proforma

Demographic variables	f	%
Age		
45-49	5	7
50-54	20	26
55-59	50	67
Mean $\pm$ SD	55.36 $\pm$ 3.42	
Education		
No-formal education	25	33
Primary education & Secondary education	37	49
High school & Higher secondary education	11	15
Graduate	2	3
Marital status		
Married	68	91
Unmarried	6	8
Divorced/ Separated	1	1
Number of children		
Single	9	12
Two	38	51
Three/More	22	29
No children	6	8
Residence		
Rural	39	52
Semi urban	34	45
Urban	2	3
Religion		
Hindu	58	70
Christian	15	20
Muslim	2	3
Others	0	0
Occupation		
Retired	1	1
Homemaker	51	68
Employed in organized sector	12	16
Employed in unorganisedsector	11	15
Activity		
Sedentary	19	25
Moderate	51	68
Heavy	5	7

Majority of participants were aged 55-59 years (67%) with mean age 55.36 ± 3.42 years. Most were married (91%), homemakers (68%), and belonged to rural areas (52%) as shown in Table 1. Nearly half (49%) had primary or secondary education.

Health and Lifestyle Factors

Most women had normal BMI (23.89 ± 2.72). About 47% reported adequate sunlight exposure and 50% used some form of supplement (Vitamin D, Calcium or both). Medical conditions included hypertension (28%), diabetes mellitus (27%), and arthritis (17%). Around 31% consumed caffeine more than thrice daily as shown in Table 2.

Table 2: Health and Lifestyle Factors

Health variables	f	%
BMI		
18.5-24.9 kg/m ²	51	68
25-29.9 kg/m ²	23	31
Above 30 kg/m ²	1	1
Mean $\pm$ SD	23.89 $\pm$ 2.72	
Exposure to Sunlight		
Yes	35	47
No	40	53
Intake of Supplement		
Vitamin D	11	15
Calcium	9	12
Vitamin D & Calcium	11	15
Other supplements	6	8
Nil	38	50
History of previous fracture		
Yes	17	23
No	58	77
History of Medical illness		
Cardiovascular disorders	3	4
Respiratory disorders	5	7
Thyroid disorders	2	3
Diabetes mellitus	20	27
Hypertension	21	28
Arthritis	13	17
Others	11	14
Caffeine intake		
Nil	10	13
Once in Daily	24	32
2-3 times	18	24
More than 3 times	23	31

Table 3: Menstrual Proforma

Menstrual Variables	f	%
Age at menarche		
10-12year	6	8
13-15years	33	44
16-18 years	36	48
Mean $\pm$ SD	14.6 $\pm$ 1.47	
Age at Menopause in Years		
41-45 years	10	14
46-50 years	46	61
51-55 years	16	21
>55 years	3	4
Mean $\pm$ SD	48.95 $\pm$ 3.60	
Type of delivery		
Vaginal delivery	56	75
LSCS	9	12
Vaginal delivery + LSCS	4	5
No children	6	8
Type of menopause		
Natural	7	9
Induced	68	91

Mean age at menarche was 14.6 ± 1.47 years and mean age at menopause was 48.95 ± 3.60 years. Majority (61%)

attained menopause between 46-50 years and 91% experienced natural menopause as shown in Table 3.

Table 4: Osteoporosis Risk by FRAX

Fracture risk level (Score)	f	%
Hip Osteoporotic Fracture		
Low (Hip Fracture: <3%)	54	72
Moderate risk (Hip Fracture: 3-10%)	21	28
High risk (Hip Fracture: >10%)	0	0
Major Osteoporotic Fractures		
Low risk (Major Osteoporotic Fracture: <10%)	50	67
Moderate risk (Major Osteoporotic Fracture: 10-20%)	16	21
High risk (Major Osteoporotic Fracture: >20%)	9	12

- Hip fracture:** Low risk (<3%) in 72%, moderate risk (3-10%) in 28%, none in high risk (>10%) as shown in Table 4.
- Major osteoporotic fracture:** Low risk (<10%) in 67%, moderate risk (10-20%) in 21%, high risk (>20%) in 12%. Mean $\pm$ SD for 10-year hip fracture probability was 2.12 ± 2.55 ; for major fracture 9.98 ± 9.16 .

Associations

Significant associations were found between osteoporosis risk and age ($p = 0.009$), physical activity ($p = 0.016$), medical illness ($p = 0.0008$), number of children ($p = 0.006$), and age at menopause ($p = 0.0162$). Women aged >55 years, engaged in moderate-to-heavy physical work, multiparous, or with chronic illness had higher risk.

Discussion

The present study revealed that most participants had low risk of osteoporotic fractures; however, age >55 years, early menopause, multiparity, and presence of comorbidities significantly increased risk. Similar findings were reported by Jojo *et al.* (2019) [3], where majority of postmenopausal women were homemakers with moderate activity levels. In the current study, 27% of participants had diabetes mellitus and 28% had hypertension. Comparable results were observed by Yuvaraja *et al.* (2024) [4], who found 46% of postmenopausal women with comorbidities and 9% with prior fractures. Age at menopause was a strong determinant of osteoporosis, corroborating findings from Hyassal *et al.* (2017) [5], where 62% of Jordanian postmenopausal women attained menopause at ≤ 50 years and showed increased prevalence of osteoporosis. Early menopause (<50 years) was also identified as a risk factor in a prospective study by Svejme *et al.* (2012) [7], who found a 1.83-fold increased risk for osteoporosis at age 77 among women with early menopause. The association between activity level and osteoporosis in this study is consistent with Bijelic *et al.* (2018) [6], who reported that low or excessive physical activity correlated with reduced bone mass and higher fracture risk. Overall, findings emphasize the need for early identification and education of postmenopausal women regarding modifiable risk factors such as diet, physical activity, supplementation, and screening for chronic illnesses.

Conclusion

The majority of postmenopausal women had low osteoporotic fracture risk, yet factors such as age >55 years, early menopause, multiparity, chronic illnesses, and

moderate-to-heavy workload increased their vulnerability. Regular osteoporosis screening, nutritional counseling, calcium and vitamin D supplementation, and lifestyle modifications are essential to prevent fractures and preserve bone health. Nurses, as primary caregivers, play a pivotal role in risk assessment, health education, and community awareness programs for osteoporosis prevention.

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Conflicts of interest

There are no conflicts of interest.

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