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Effectiveness of a Structured Educational Intervention on Knowledge Regarding the Multifaceted Dimensions of Osteoporosis among Postmenopausal Women

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Abstract

Background: Osteoporosis is an important public health concern among postmenopausal women. Reduced bone mineral density and increased bone fragility can lead to fractures and impaired quality of life. Health education may help address gaps in knowledge regarding risk factors, diagnosis, prevention and management.

Objective: To assess the effectiveness of a structured educational intervention on knowledge regarding the multifaceted dimensions of osteoporosis among postmenopausal women in Mukkam Municipality, Kerala, and to examine the association between pre-test knowledge and selected demographic variables.

Methods: A quantitative evaluative approach with a pre-experimental, one-group pre-test–post-test design was used. One hundred postmenopausal women aged 45–60 years were selected by purposive sampling. Data were collected using a sociodemographic questionnaire and a 30-item structured knowledge questionnaire. The intervention was delivered through a 45-minute lecture. A post-test was conducted seven days later. Descriptive statistics, a paired t-test and chi-square tests were used for analysis.

Results: Before the intervention, 74% of participants had poor knowledge, 26% had average knowledge and none had good knowledge. After the intervention, 7% had poor knowledge, 74% had average knowledge and 19% had good knowledge. The mean knowledge score increased from 8.11 (SD 4.16) before the intervention to 15.76 (SD 4.61) afterwards. The mean difference was 7.65 (SD 3.41), and the paired t-value was 22.438 ($p < 0.001$). Education was the only demographic variable significantly associated with pre-test knowledge ($\chi^2 = 15.858$, $p = 0.001$).

Conclusion: The structured educational intervention was associated with a statistically significant improvement in osteoporosis-related knowledge. Community-based education may be a useful component of osteoporosis awareness activities for postmenopausal women. The one-group design and single geographical setting limit causal interpretation and generalisability.

Keywords: Osteoporosis; postmenopausal women; structured educational intervention; knowledge; community health nursing.

Introduction

Osteoporosis is a skeletal disorder characterized by reduced bone mass and deterioration of bone microarchitecture, resulting in increased bone fragility and susceptibility to fractures. Fractures commonly affect the hip, spine and wrist and can contribute to disability, morbidity and reduced quality of life. The burden of osteoporosis is particularly important among women after menopause.

Menopause is associated with a decline in estrogen levels. Estrogen has a protective role in bone metabolism, and its deficiency accelerates bone loss. Other factors described in the literature include increasing age, low body weight, inadequate calcium and vitamin D intake, limited sunlight exposure, physical inactivity and family history. Osteoporosis may progress without obvious symptoms until a fracture occurs, making awareness and prevention important.

Knowledge about osteoporosis, including its risk factors, signs and symptoms, diagnostic methods, complications, treatment and preventive measures, can support informed health decisions. Structured health education is one approach that nurses and other healthcare professionals can use to improve awareness in community settings. Previous studies have reported knowledge gaps among women and improvements following planned teaching or educational programmes [2,7,13,29,34].

In view of the importance of osteoporosis prevention among postmenopausal women and the need to identify knowledge gaps in community settings, the present study evaluated the effectiveness of a structured educational intervention among women residing in Mukkam Municipality, Kerala.

Objectives

1. To assess pre-test and post-test knowledge regarding the multifaceted dimensions of osteoporosis among postmenopausal women.
2. To evaluate the effectiveness of the structured educational intervention on knowledge regarding osteoporosis.
3. To determine the association between pre-test knowledge and selected demographic variables: age, education, socioeconomic status, marital status, number of children, food preference, family history of osteoporosis and previous knowledge.

Materials and Methods

Study design and setting

A quantitative evaluative approach using a pre-experimental, one-group pre-test–post-test design was adopted. The study was conducted in Mukkam Municipality, Kerala, India.

Participants and sampling

The sample comprised 100 postmenopausal women aged 45–60 years residing in Mukkam Municipality. Participants were selected using non-probability purposive sampling. Eligible participants were willing to participate and able to read and write Malayalam. Premenopausal women, women who had attended the same class previously, and health professionals were excluded.

Sample size

The dissertation reports that the sample size was estimated using the formula $n = (Z\alpha/2)^2\sigma^2/d^2$, with $Z\alpha/2 = 1.96$, $\sigma = 4.8$ and $d = 0.92$. The calculated sample was approximately 96 and was rounded to 100.

Study instruments

Two structured instruments were used: (1) a sociodemographic questionnaire covering age, education, socioeconomic status, marital status, number of children, food preference, family history of osteoporosis and previous knowledge; and (2) a 30-item structured knowledge questionnaire on the multifaceted dimensions of osteoporosis. The maximum score was 30. Scores were classified as poor (0–10), average (11–20) and good (21–30). The tools were prepared in English and Malayalam. Content validity was assessed by nine experts from relevant fields, and the reliability coefficient using Cronbach's alpha was 0.75.

Intervention and data collection

After obtaining the required institutional and local permissions, data collection was carried out from 23 December 2024 to 1 February 2025. Written informed consent was obtained. Sociodemographic data were collected, followed by the pre-test using the structured knowledge questionnaire. The structured educational intervention covered the study's stated dimensions of osteoporosis and was delivered through a 45-minute lecture to groups averaging approximately 10 participants per day. The post-test was administered seven days after the intervention using the same knowledge questionnaire. An informational leaflet was distributed after the post-test.

Ethical considerations

The dissertation reports approval from the Scientific Review Committee and Institutional Ethics Committee, together with permission from the Medical Officer, Community Health Centre, Mukkam, and the Mukkam Municipality Chairman. Informed consent was obtained from participants and confidentiality was assured. The institutional ethics approval number is not stated in the manuscript source and should be inserted if required by the target journal.

Data analysis

Data were analysed using descriptive and inferential statistics. Frequencies and percentages described knowledge categories. Means and standard deviations summarized knowledge scores. A paired t-test was used to compare pre-test and post-test scores, and chi-square tests were used to examine associations between pre-test knowledge and selected demographic variables. The reported significance level was 0.05.

Results

A total of 100 postmenopausal women participated. The most frequently represented age group was 53–56 years (34%). Most participants had school education (90%); 61% were above the poverty line according to ration-card classification; 97% were married; 63% had two children; and 81% reported a non-vegetarian food preference. Fifty-eight per cent reported no family history of osteoporosis. All participants reported no previous knowledge regarding osteoporosis.

Knowledge before and after the intervention

Knowledge level	Pre-test n (%)	Post-test n (%)	Score range
Poor	74 (74%)	7 (7%)	0–10
Average	26 (26%)	74 (74%)	11–20

Good	0 (0%)	19 (19%)	21–30

Before the intervention, nearly three-quarters of participants had poor knowledge and none had good knowledge. At the seven-day post-test, the proportion with poor knowledge had decreased to 7%, while 74% had average knowledge and 19% had good knowledge.

Comparison of mean knowledge scores

Assessment	Mean score	Standard deviation	n
Pre-test	8.11	4.16	100
Post-test	15.76	4.61	100
Mean difference	7.65	3.41	100

The mean post-test score (15.76 ± 4.61) was higher than the mean pre-test score (8.11 ± 4.16). The paired t-test showed a statistically significant difference ($t = 22.438$, $p < 0.001$).

Association with demographic variables

Variable	χ^2 value	p-value
Age	2.638	0.501
Education	15.858	0.001
Socioeconomic status	0.284	0.647
Marital status	0.086	1.000
Number of children	1.399	0.497
Food preference	0.298	0.773
Family history of osteoporosis	2.865	0.239
Previous knowledge	0.355	1.000

Education was the only variable significantly associated with pre-test knowledge ($\chi^2 = 15.858$, $p = 0.001$). No statistically significant association was reported for age, socioeconomic status, marital status, number of children, food preference, family history or previous knowledge.

Discussion

The study found a substantial increase in knowledge scores following the structured educational intervention. The mean score increased from 8.11 before the session to 15.76 at the seven-day post-test, with a mean difference of 7.65 and a paired t-value of 22.438 ($p < 0.001$). The distribution across knowledge categories also shifted: the proportion with poor knowledge decreased from 74% to 7%, and 19% achieved a good knowledge level after the intervention. These findings indicate that the educational session was effective in improving short-term knowledge scores in this group.

The findings are consistent with reports of improved osteoporosis-related knowledge following structured teaching programmes among women [2,7,34]. Previous studies have also identified limited awareness of osteoporosis and its prevention among postmenopausal women, supporting the relevance of community-based educational activities [13,26,29].

Education was the only selected demographic variable significantly associated with baseline knowledge. This may indicate that educational attainment is relevant to understanding health information. However, the study did not demonstrate significant associations for age, socioeconomic status, marital status, number of children, food preference, family history or previous knowledge.

The results should be interpreted in light of the study design. Since there was no control group, the observed improvement cannot be attributed to the intervention with the same certainty as in a controlled trial. In addition, the post-test was conducted after seven days; therefore, the study does not establish whether knowledge was retained over a longer period or translated into preventive behaviours or improved clinical outcomes.

Limitations

- The one-group pre-test–post-test design did not include a control group, limiting causal inference.
- The study was conducted in one municipality among women aged 45–60 years, which may limit generalisability to other populations and settings.
- Although 100 participants were included, a larger and more diverse sample may provide more generalisable findings.
- The study assessed knowledge improvement but did not measure subsequent lifestyle changes, preventive practices, bone mineral density or fracture outcomes.

Implications for Nursing Practice

Community health nurses and hospital nursing staff may use structured educational sessions and information leaflets to improve awareness of osteoporosis among postmenopausal women. Repeated community education and integration of osteoporosis awareness into primary healthcare and women's health programmes may be considered. The findings support education as a practical nursing activity, while further studies are needed to determine its longer-term effects.

Conclusion

The structured educational intervention was associated with a statistically significant improvement in knowledge regarding the multifaceted dimensions of osteoporosis among postmenopausal women in Mukkam Municipality. The mean knowledge score increased from 8.11 to 15.76 ($t = 22.438$, $p < 0.001$). Education was the only demographic variable significantly associated with pre-test knowledge. Community-based structured education may be a useful strategy for improving osteoporosis awareness; however, controlled studies with longer follow-up are needed to assess knowledge retention, behaviour change and clinical outcomes.

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