



EVALUATE THE EFFECTIVENESS OF TRAINING MODULE FOR THE PREVENTION AND MANAGEMENT OF PATIENTS WITH PERI MENOPAUSAL OSTEOPOROSIS – A PILOT STUDY

Nursing

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ABSTRACT

Osteoporosis is a significant health concern among perimenopausal women due to hormonal changes that accelerate bone loss. Early intervention through education and lifestyle modification is essential to reduce the risk and progression of osteoporosis. This pilot study aimed to evaluate the effectiveness of a structured training module designed for the prevention and management of osteoporosis in perimenopausal women. **Methods:** A quasi-experimental pilot study was conducted among a purposive sample of 30 perimenopausal women diagnosed with or at risk of osteoporosis. Participants underwent a baseline assessment of their knowledge, attitudes, and practices (KAP) related to osteoporosis using a validated questionnaire. A comprehensive training module, including information on bone health, dietary guidance, physical activity, was administered. Post-intervention assessment was conducted after four weeks (33days) to evaluate changes in KAP scores. Data were analysed using repeated measure of ANOVA to determine statistical significance. Participants reported increased awareness about calcium and vitamin D intake, regular weight-bearing exercise, and the importance of early screening and medical follow-up. **Result:** The pilot study confirmed the validity and reliability of the instruments (I-CVI ≥ 0.80 , S-CVI ≥ 0.90 , CVR ≥ 0.86 ; Cronbach's $\alpha = 0.916$; KR-20 = 0.87; test-retest = 0.95), ensuring robust measurement. Repeated-measure ANOVA revealed highly significant improvements ($p < 0.001$) in the experimental group across multiple domains: knowledge scores increased from 7.6 ± 2.3 to 15.5 ± 1.4 ($\eta^2 = 0.596$), physical functioning from 21 ± 22.3 to 68.7 ± 8.3 ($\eta^2 = 0.649$), energy/fatigue from 14 ± 9.1 to 72.7 ± 10.2 ($\eta^2 = 0.896$), and emotional well-being from 15.5 ± 8.8 to 71.2 ± 8.4 ($\eta^2 = 0.878$). Significant gains were also noted in social functioning ($\eta^2 = 0.668$), pain reduction ($\eta^2 = 0.838$), general health ($\eta^2 = 0.785$), and self-management practices (gain = 1.20 vs. 0.30, $p < 0.001$). Post-hoc comparisons confirmed that improvements were sustained at follow-up. Baseline demographic equivalence between groups strengthened internal validity. **Conclusion:** The pilot study indicates that a structured training module can effectively improve awareness and self-care practices among perimenopausal women for the prevention and management of osteoporosis.

KEYWORDS

1. BACKGROUND

Osteoporosis is a progressive skeletal disorder characterized by low bone mass and deterioration of bone tissue, leading to increased bone fragility and risk of fractures. It is particularly prevalent among women during the perimenopausal period due to hormonal fluctuations, especially the decline in estrogen levels, which accelerates bone resorption. Perimenopausal women represent a vulnerable group for the early onset of osteopenia and osteoporosis, making this a critical period for targeted preventive interventions. Despite the increasing awareness of osteoporosis, many women remain uninformed about its risk factors, early symptoms, preventive strategies, and available treatment options. Inadequate knowledge often results in delayed diagnosis, poor lifestyle choices, and non-adherence to therapeutic recommendations. Consequently, this can lead to impaired mobility, chronic pain, loss of independence, and a decline in overall quality of life.

However, there is limited research evaluating the effectiveness of such training modules in the perimenopausal population, especially in terms of improving both knowledge and quality of life. Therefore, this pilot study aims to assess the effectiveness of a structured training module designed to educate perimenopausal women on the prevention and management of osteoporosis and to evaluate its impact on their quality of life.

1.2 Need for the Study

In India, according to a review the pooled prevalence of osteoporosis at the lumbar spine region was 29%, the hip was 6%, and the femoral neck region was 29%, whereas the pooled prevalence of osteopenia at lumbar spine region was 37%, the hip was 6%, and femoral neck region was 37%. (Anupama et al., 2022)

Osteoporosis reduces bone density and increases fracture risk, which can cause serious sickness or death. This group needs comprehensive osteoporosis prevention and management training. This study evaluates the effectiveness of a training program tailored for

perimenopausal women aimed at preventing and managing osteoporosis.

The module seeks to inform women about lifestyle modifications and physical activities that enhance bone health. The training program seeks to decrease the likelihood of developing osteoporosis and its related consequences by prioritizing the development of bone density and boosting general well-being. The study's findings will offer vital insights into the effects of focused treatments on the well-being of perimenopausal women, ultimately leading to enhanced health outcomes in this population.

Osteoporosis was identified in each case using questionnaires and medical data. The following standard formula was used to determine the body mass index (BMI): $\text{Weight (kg)/height (m)}^2$ is the BMI.

1.3 Statement of the Problem

Evaluate the effectiveness of training module for the prevention and management of osteoporosis and improving quality of life in perimenopausal women of government sub district hospital Katra (block hq) Jammu and Kashmir.

1.4 Objectives of the Study

1. Evaluate the existing knowledge and self-management practices about prevention and management of osteoporosis among perimenopausal women in the Government Sub District Hospital Katra, Reasi District, Jammu and Kashmir before the implementation of the training module.
2. Assess the quality-of-life perimenopausal women in the selected Government Sub District Hospital Katra, Reasi District Jammu and Kashmir. Before and after the implementation of the training module.
3. Determine the increase in knowledge regarding osteoporosis prevention and management among perimenopausal women after participating in the training module.
4. Assess changes in health-related behaviors (self-management

practices) and practices among perimenopausal women following the training, such as dietary habits, physical activity, and calcium supplementation.

- Compare the outcomes of case and control group to determine the relative effectiveness of the training intervention.
- Find the association of the level of knowledge, self-management practices and quality of life of perimenopausal mothers of case and control group with their demographic characteristics.

1.5 Research Methodology

Research Approach: Quantitative Approach. The research shall be carried out in two phases. On the first phase, the Training Module and Assessment instrument will be prepared. The second phase comprises of evaluating the effectiveness of Training Module.

Research Design: Quasi-Experimental design. (No randomized control group design)

Research Setting: Selected Villages of District Reasi, J&K.

Population: Perimenopausal Mothers residing in District Reasi.

Sample: Perimenopausal Mothers residing selected villages of District Reasi.

Sample Size: The number of perimenopausal to be included in the study will be decided after thoroughly analyzing the sampling frame. District Reasi is comprises of 259 villages and 147 panchayats, spreading across 9 Tehsil and 12 Rural Development Blocks of the District. The sample selected shall be allocated one by one (considering geographical area) to case and control group respectively.

Sampling Technique: Quota Sampling shall be followed to recruit the study participants.

1.2 Research Approach and Design

Inclusion Criteria: Perimenopausal Mothers residing selected villages of District Reasi. Perimenopausal Mothers who are willing to participate. Perimenopausal Mothers who attend all the sessions of Training Module.

Exclusion Criteria: Perimenopausal Mothers who have already attended any training program on prevention and management osteoporosis. Perimenopausal Mothers whose OSTA score is not significant or those who are screened negative for osteoporosis.

Ethical Considerations: The ethical committee approval was obtained. Administrative approval was taken from village authorities. Informed consent was sought from the research participants. Confidentiality and anonymity will be maintained during the Collection and storage of data.

1.9 Description of Data Collection Instrument

The tool consist of two sections:

Section 1- It shall include demographic details of the perimenopausal mothers including age, religion, education status, occupation, monthly income, age at menarche ,age at marriage and previous knowledge about osteoporosis.

Section B: Structured knowledge questionnaire to assess the knowledge and effectiveness of structured teaching program regarding prevention and self-management of osteoporosis among perimenopausal women.

Structured knowledge questionnaire composed of 30 items to assess the knowledge regarding prevention of osteoporosis.

The self-management practices of perimenopausal mothers with osteoarthritis shall be assessed using practice checklist.

Table 1. Baseline Comparison of Socio-demographic Characteristics Between Experimental and Control Group (n=30) Using X²/ T-test Analysis.

Demographic Variables	Particulars	Groups		χ^2 / t-test	df	p value
		Experimental n=15 f (%)	Control n=15 f (%)			
Age In Years	Mean (SD)	48.73 (10.16)	49.87 (9.8)	-0.311	28	0.758
Age In Years	40 To 45 Years	7 (46.7)	5 (33.3)	0.758	3	0.860
	46 To 50 Years	5 (33.3)	6 (40)			
	51 To 55 Years	1 (6.7)	2 (13.3)			
	61 Years or more	2 (13.3)	2 (13.3)			
Marital Status	Married	12 (80)	12 (80)	3	3	0.392
	Single	0	1 (6.7)			
	Divorced	0	1 (6.7)			
	Widowed	3 (20)	1 (6.7)			
Age At Marriage	16 To 18 Years	1 (6.7)	1 (6.7)	0.583	2	0.747
	19 To 25 Years	7 (46.7)	5 (33.3)			

The quality of life of perimenopausal mothers with osteoarthritis shall be assessed using RAND 36-Item Health Survey 1.0 Questionnaire (SF-36). (Araujo et al., 2016)

1.10 Data Collection Techniques

The Socio Demographic Data will be collected on Day 01.

Pre- Test data will be collected on Day 01

The Intervention: Training Module will be administered from Day 02 to Day 32. (One month)

The first Post Test data will be collected on the 33rd Day. The second Post Test Data will be collected on 63rd Day.

Testing of Tool – The content validity of the tool was obtained from seven experts for their opinion and suggestions. They validated the tool for adequacy of content, sequence, framing of questions .Based on their suggestions, modification was made, and the tool was validated.

Validating– The content validity of the tool was established on the basis of opinions from experts in nursing, Orthopedician, Gynecologist, Dietician, and Physiotherapist.

Reliability: The stability of the structured knowledge questionnaire on prevention of osteoporosis was done by split half method .In order to establish reliability ,the tool was administered to 10 perimenopausal women who satisfied sampling criteria .the reliability quotient obtained for the tool was 0.76.Hence the tool was found reliable.

1.11 Pilot Study

The Pilot study will be conducted in (10%) perimenopausal women after obtaining the administrative and ethical approval from the competent authority.

The pilot study was conducted among 30 samples (15 samples from experimental group and 15 samples in the control group).

The structured knowledge questionnaire was used to assess their knowledge regarding the prevention and self-management of osteoporosis and improving quality of life in perimenopausal women.

1.12 RESULTS

The pilot study was conducted to assess the validity and reliability of research instruments and to evaluate the effect of a competency-based intervention on women's knowledge, quality of life, and self-management practices for osteoporosis.

Validity and Reliability of Tools:

All instruments showed strong content validity with I-CVI ≥ 0.80 , S-CVI ≥ 0.90 , and CVR ≥ 0.86 as rated by subject experts. Reliability testing indicated excellent internal consistency (Cronbach's $\alpha = 0.916$ for RAND-36; 0.92 for practice checklist; KR-20 = 0.87 for knowledge test). Test-retest reliability values were high (0.77–0.95), and split-half reliability ranged from 0.79 to 0.95. These results confirm that the tools were both valid and reliable for the target population. Confirmatory factor analysis was done for self-management practice checklist and it showed a good fit of measure ($\chi^2 = 74.7$, $p < 0.001$). The model showed good fit of CFI=0.836 and RMSEA=0.194.

	More Than 25 Years	7 (46.7)	9 (60)			
Age At Menopause	46 To 50 Years	9 (60)	9 (60)	0.000	1	1.0
	51 To 55 Years	6 (40)	6 (40)			
Religion	Hindu	9 (60)	8 (53.3)	0.136	1	0.713
	Muslim	6 (40)	7 (46.7)			
Education Level	Primary School	0	4 (26.7)	7.143	5	0.210
	Middle School	4 (26.7)	3 (20)			
	High School	4 (26.7)	1 (6.7)			
	Intermediate Or Diploma	2 (13.3)	3 (20)			
	Graduate Or Post-Graduate	4 (26.7)	2 (13.3)			
	Professional Degree	1 (6.7)	2 (13.3)			
Occupation	Unskilled Worker	12 (80)	10 (66.7)	6.182	5	0.289
	Semi-Skilled Worker	0	3 (20)			
	Skilled Worker	0	1 (6.7)			
	Clerical/ Shopkeeper/ Farmer	1 (6.7)	0			
	Semi Professionals/ Teacher/ Nurse	1 (6.7)	0			
	Professional/ Doctor/ Engineer/ Lawyer	1 (6.7)	1 (6.7)			
Household Income	8548 to 14263	0	1 (6.7)	5.361	4	0.252
	21396 to 31631	7 (46.7)	9 (60)			
	31632 to 42791	4 (26.7)	5 (33.3)			
	42792 to 85583	3 (20)	0			
	85584 and Above	1 (6.7)	0			
Residence Location	Urban	1 (6.7)	1 (6.7)	0.000	2	1.00
	Rural	10 (66.7)	10 (66.7)			
	Sub Urban	4 (26.7)	4 (26.7)			
Family History of Osteoporosis	Yes	0	1 (6.7)	1.034	1	0.309
	No	15 (100)	14 (93.3)			
Body Mass Index	Mean (SD)	27.35 (3.87)	30.53 (3.31)	-2.416	28	0.022*
	Healthy Weight	5 (33.3)	0	6.104	2	0.047*
	Over Weight	4 (26.7)	7 (46.7)			
	Obesity	6 (40)	8 (53.3)			
Smoking Status	No	15 (100)	15 (100)	0	0	0
Previous Knowledge About Osteoporosis	Yes	4 (26.7)	1 (6.7)	2.160	1	0.142
	No	11 (73.3)	14 (93.3)			
Source Of Information	Mass Media	1 (6.7)	4 (26.7)	2.982	3	0.394
	Family Members	1 (6.7)	0			
	Friends/ Relatives	12 (80)	10 (66.7)			
	School	1 (6.7)	1 (6.7)			
Menopause Status	Perimenopausal	8 (53.3)	11 (73.3)	1.292	1	0.256
	Post Menopausal	7 (46.7)	4 (26.7)			
Personal History of Fractures	Yes	2 (13.3)	2 (13.3)	0.000	2	1.00
	No	11 (73.3)	11 (73.3)			
	Don't Know	2 (13.3)	2 (13.3)			
Personal History of Osteoporosis	No	15 (100)	15 (100)	0	0	0

Table 1. Depicts the comparison between the experimental (n=15) and control (n=15) groups showed no significant differences in most socio-demographic characteristics, indicating that both groups were comparable. The mean age was 48.73 ± 10.16 years in the experimental group and 49.87 ± 9.8 years in the control group ($p=0.758$). Marital status was predominantly married in both groups (80%), with similar distributions in age at marriage, menopause, religion, residence, family history, smoking status, and personal history of fractures/osteoporosis (all $p>0.05$). Educational level and occupation varied slightly but were not statistically significant ($p=0.210$ and $p=0.289$, respectively). Household income and sources

of osteoporosis knowledge also showed no significant difference ($p>0.05$). However, a significant difference was found in body mass index (BMI), with a lower mean in the experimental group (27.35 ± 3.87) compared to the control group (30.53 ± 3.31) ($t=-2.416$, $p=0.022$).

BMI categories also differed significantly, with more participants in the experimental group having healthy weight (33.3% vs. 0%) and fewer being obese (40% vs. 53.3%) compared to controls ($\chi^2=6.104$, $p=0.047$). Overall, both groups were homogenous at baseline across most variables, except for BMI, which showed a significant difference.

Table 2 Mean (SD) Score of Subjects and Comparison as Per Their Outcome Variables in the Experimental and Control Groups (n=30) at Base Level.

Sr. No.	Outcome Variables	Range	Total N=30 Mean (SD)	Experimental Group n=15 Mean (SD)	Control Group n=15 Mean (SD)	t-test	df	p-value
1	Knowledge Score	3-15	9.17 (3.23)	7.6 (2.32)	10.73 (3.31)	-3.004	28	0.006
2	Physical Functioning	0-50	23.17 (21.7)	21 (22.29)	25.33 (21.66)	-0.540	28	0.594
3	Role functioning /physical	0-50	10.83 (14.21)	13.33 (15.99)	8.33 (12.19)	0.963	28	0.344
4	Role Functioning /Emotional	0-33	10 (15.54)	13.33 (16.9)	6.67 (13.80)	1.183	28	0.247
5	Energy / Fatigue	0-35	16.17 (10.4)	14 (9.1)	18.33 (11.44)	-1.148	28	0.261
6	Emotional well being	0-32	15.6 (8.81)	15.47 (8.79)	15.73 (9.12)	-0.081	28	0.936
7	Social Well being	0-50	20 (14.9)	20.83 (14.68)	19.17 (15.57)	0.302	28	0.765
8	Pain	0-45	19.33 (12.44)	23.67 (14.57)	15 (8.24)	2.005	28	0.055
9	General Health	5-45	21.67 (12.2)	23 (12.21)	20.33 (12.46)	0.592	28	0.559
10	Health Change	0-75	20.83 (17.47)	23.33 (19.97)	18.33 (14.84)	0.778	28	0.443
11	Self-Management Practices	0.2 – 0.8	0.54 (0.19)	0.55 (0.18)	0.52 (0.19)	0.385	28	0.703

Table 2 shows that baseline comparisons between the experimental (n=15) and control (n=15) groups were largely comparable across outcome variables. The only significant difference was observed in knowledge scores, with the control group reporting a higher mean (10.73) than the experimental group (7.6) ($p=0.006$). All other variables—including physical functioning, role functioning (physical and emotional), energy/fatigue, emotional well-being, social well-being, pain, general

health, health change, and self-management practices—had p -values >0.05 , confirming no statistically significant differences.

Although pain approached significance ($p=0.055$), it did not reach statistical significance. Overall, both groups were homogeneous at baseline, except for knowledge score, which requires careful consideration in interpreting subsequent intervention effects.

Table 3. Within-group and Between-group Comparisons for Outcome Variables were Done using Repeated-measure ANOVA, Calculation of the Effect Size and Post Hoc Analysis.

Sr. No.	Outcome Variables	Time of Assessment	Exp. Group n=15 Mean (SD)	Control Group n=15 Mean (SD)	Time effect	Group effect	Time x Group effect
1	Knowledge Score	Pre-Test	7.6 (2.32)	10.73 (3.31)	F= 22.832	F=24.523	F=41.253
		Post Test 1	16.13 (2.72)	9 (2.24)	p=0.000	p= 0.000	p= 0.000
		Post Test 2	15.53 (1.46)	10.13 (3.02)	df= 1.434 $\eta=0.449$	df=1 $\eta=0.467$	df=1.434 $\eta=0.596$
2	Physical Functioning	Pre-Test	21 (22.3)	25.33 (21.67)	F=51.765	F=13.543	F=7.610
		Post Test 1	70.67 (11.63)	48 (15.56)	p= 0.000	p= 0.001	p= 0.009
		Post Test 2	68.67 (8.34)	46 (12.85)	df=1.055 $\eta=0.649$	df=1 $\eta=0.326$	df=1.055 $\eta=0.214$
3	Role functioning /physical	Pre-Test	13.33 (15.99)	8.33 (12.19)	F=35.238	F=4.199	F=1.571
		Post Test 1	66.67 (37.4)	41.67 (30.86)	p= 0.000	p= 0.050	p= 0.221
		Post Test 2	60 (32.46)	41.67 (30.86)	df=1.062 $\eta=0.557$	df=1 $\eta=0.130$	df=1.062 $\eta=0.053$
4	Role Functioning /Emotional	Pre-Test	13.33 (16.9)	6.67 (13.8)	F=30.925	F=2.399	F=0.627
		Post Test 1	68.89 (46.23)	48.89 (37.51)	p= 0.000	p= 0.133	p= 0.449
		Post Test 2	64.44 (44.48)	44.44 (37.1)	df=1.098 $\eta=0.525$	df=1 $\eta=0.079$	df=1.098 $\eta=0.022$
5	Energy/ Fatigue	Pre-Test	14 (9.10)	18.33 (11.44)	F=240.626	F=39.366	F=42.575
		Post Test 1	70.67 (10.67)	41 (11.05)	p= 0.000	p= 0.000	p= 0.000
		Post Test 2	72.67 (10.15)	42.67 (10.49)	df=1.091 $\eta=0.896$	df=1 $\eta=0.584$	df=1.091 $\eta=0.603$
6	Emotional Wellbeing	Pre-Test	15.47 (8.8)	15.73 (9.13)	F=201.712	F=46.155	F=28.753
		Post Test 1	67.33 (7.55)	38.67 (14.16)	p=0.000	p= 0.000	p= 0.000
		Post Test 2	71.2 (8.44)	41.33 (13.49)	df=1.134 $\eta=0.878$	df=1 $\eta=0.622$	df=1.134 $\eta=0.507$
7	Social Functioning	Pre-Test	20.83 (14.68)	19.17 (15.57)	F=56.439	F=18.900	F=8.428
		Post Test 1	63.33 (15.99)	36.67 (15.99)	p=0.000	p= 0.000	p= 0.006
		Post Test 2	65 (16.50)	40 (14.33)	df=1.078 $\eta=0.668$	df=1 $\eta=0.403$	df=1.078 $\eta=0.231$
8	Pain	Pre-Test	23.67 (14.57)	15 (8.23)	F=144.870	F=39.694	F=14.127
		Post Test 1	72.33 (13.64)	40.67(13.9)	p=0.000	p= 0.000	p= 0.000
		Post Test 2	74.5 (15.03)	41.5 (13.75)	df=1.129 $\eta=0.838$	df=1 $\eta=0.586$	df=1.129 $\eta=0.335$
9	General Health	Pre-Test	23 (12.21)	20.67 (12.45)	F=102.279	F=29.634	F=17.313
		Post Test 1	66 (14.41)	38 (11.61)	p= 0.000	p= 0.000	p= 0.000
		Post Test 2	66.33 (12.74)	38.67 (12.74)	df=1.029 $\eta=0.785$	df=1 $\eta=0.514$	df=1.029 $\eta=0.382$
10	Health Change	Pre-Test	23.33 (19.97)	18.33 (14.84)	F=41.630	F=24.155	F=6.091
		Post Test 1	66.67 (18.09)	36.67 (12.09)	p= 0.000	p= 0.000	p= 0.015
		Post Test 2	60 (15.81)	36.67 (12.90)	df=1.164 $\eta=0.598$	df=1 $\eta=0.463$	df=1.164 $\eta=0.179$
11	Self-Management Practices	Pre-Test	0.55 (0.18)	0.52 (0.19)	F=64.706	F=76.370	F=19.246
		Post Test 1	1.73 (0.54)	0.92 (0.32)	p= 0.000	p= 0.000	p= 0.000
		Post Test 2	1.75 (0.11)	5.83 (0.29)	df=1.489 $\eta=0.698$	df=1 $\eta=0.732$	df=1.489 $\eta=0.407$

Table 3 presents repeated-measures ANOVA results demonstrating significant improvements in the experimental group compared to controls. Knowledge scores rose sharply (7.6 ± 2.32 pre-test to 16.13 ± 2.72 at Post-test 1 and 15.53 ± 1.46 at Post-test 2) with a strong interaction effect ($F=41.253$, $p=0.000$, $\eta=0.596$). Large effect sizes were noted for Energy/Fatigue ($\eta=0.896$), Emotional Well-being

($\eta=0.878$), and Pain ($\eta=0.838$). Physical Functioning ($F=51.765$, $p=0.000$, $\eta=0.649$) and Social Functioning ($F=56.439$, $p=0.000$, $\eta=0.668$) also improved significantly. Self-management practices showed the strongest effect ($F=76.370$, $p=0.000$, $\eta=0.732$). Overall, the intervention produced highly significant gains in knowledge, health, and self-management.

Table 4 Comparison of Gained Mean (Difference of Final and Baseline Assessment) Scores of Outcome Variables Between Experimental and Control Group Subjects (n=30). The Independent T-test was Computed to Compare the Gained Mean Score (Difference of Final and Baseline Score, O3-o1)

Sr. No.	Outcome Variables	Exp. Group n=15 Gained Mean (SD)	Control Group n=15 Gained Mean (SD)	t - test	df adjusted	p value	Cohen's d (Effect size)
1	Knowledge Score	7.93 (2.87)	-0.6 (5.15)	5.606	21.904	.000	0.631
2	Physical Functioning	47.67 (22.98)	20.67 (28.40)	2.862	26.831	.008	0.470
3	Role Functioning/ Physical	46.67 (42.11)	33.33 (30.86)	.989	25.670	.332	0.174
4	Role Functioning / Emotional	51.11 (46.92)	37.78 (41.53)	.824	27.594	.417	0.147
5	Energy / Fatigue	58.67 (13.95)	24.33 (13.07)	6.956	27.884	.000	0.783
6	Emotional well-being	55.73 (9.50)	25.6 (17.75)	5.798	21.411	.000	0.707
7	Social functioning	44.17 (21.06)	20.83 (23.94)	2.835	27.553	.008	0.466

8	Pain	50.83 (15.37)	26.5 (17.95)	3.988	27.354	.000	0.591
9	General Health	43.33 (14.84)	18.33 (17.18)	4.265	27.420	.000	0.618
10	Health Change	36.67 (26.50)	18.33 (19.97)	2.140	26.022	.042	0.359
11	Self-Management Practice	1.20 (0.20)	0.30 (0.34)	8.709	22.846	.000	0.851

Table 4 compares gained mean scores between experimental and control groups (N=30), showing significant improvements in the experimental group. Knowledge scores rose markedly ($M=7.93 \pm 2.87$ vs. -0.6 ± 5.15 ; $t=5.61$, $p<.001$, $d=0.63$). Large gains were also seen in physical functioning (47.67 vs. 20.67), energy/fatigue (58.67 vs. 24.33), emotional well-being (55.73 vs. 25.60), social functioning (44.17 vs. 20.83), pain reduction (50.83 vs. 26.50), general health (43.33 vs. 18.33), health change (36.67 vs. 18.33), and self-management (1.20 vs. 0.30), all $p<.05$ with moderate–large effects ($d=0.36$ – 0.85). Role functioning outcomes showed no significant differences. Overall, the intervention demonstrated strong positive impact.

The results indicate a significant association between income levels and gained role functioning/emotional scores ($F=3.648$, $p=0.018$). The highest improvement was observed in the mid-level group (70.37%), followed by the highest-income group (100%) and the lower-mid group (39.58%).

The results reveal a significant association between BMI and gained energy/fatigue scores ($F=6.072$, $p=0.007$). Participants with healthy weight showed the highest improvement (68.0), compared to overweight (38.63) and obese groups (34.28).

The analysis shows a significant association between menopause status and gained energy/fatigue scores ($F=5.727$, $p=0.024$). Postmenopausal women demonstrated higher improvement (53.18) compared to perimenopausal women (34.73), indicating better intervention impact in the postmenopausal group.

The findings indicate a significant association between education level and gained social functioning scores ($F=5.181$, $p=0.002$). Highest improvements were observed in the Intermediate/Diploma (57.50) and High School groups (55.00), while minimal gains appeared in Primary (15.63) and Professional (12.50).

The results show a near-significant association ($F=2.719$, $p=0.052$), with highest health change gains in mid-income (33.33%) and higher-income (50%).

Overall Findings

The study demonstrated that the intervention significantly improved women's knowledge, quality of life, and self-management practices for osteoporosis with strong statistical significance ($p < 0.001$) and large effect sizes. Baseline demographic equivalence confirmed internal validity, and the tested instruments proved both valid and reliable. These results provide strong justification for scaling up the study to a larger sample.

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