



RESEARCH ARTICLE

Impact of a Targeted Training Module on Premenopausal Osteoporosis Care: A Pilot Evaluation

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Abstract

Osteoporosis is a major health concern in premenopausal women due to hormonal changes that accelerate bone loss. Early intervention through education and lifestyle modification is essential to reduce risk and progression. This pilot study evaluated the effectiveness of a structured training module for osteoporosis prevention and management in this population. Methods: A quasi-experimental pilot study was conducted among 30 purposively selected perimenopausal women at risk of or diagnosed with osteoporosis. Baseline knowledge, attitudes, and practices (KAP) were assessed using a validated questionnaire. Participants received a comprehensive training module covering bone health, nutrition, and physical activity. Post-intervention assessment was performed after four weeks (33 days). Data were analysed using repeated-measures ANOVA. Results: The instruments demonstrated high validity and reliability (I-CVI \geq 0.80, S-CVI \geq 0.90, CVR \geq 0.86; Cronbach's α = 0.916; KR-20 = 0.87; test-retest = 0.95). Repeated-measures ANOVA showed significant improvements ($p < 0.001$) across multiple domains: knowledge (7.6 ± 2.3 to 15.5 ± 1.4 ; $\eta^2 = 0.596$), physical functioning (21 ± 22.3 to 68.7 ± 8.3 ; $\eta^2 = 0.649$), energy/fatigue (14 ± 9.1 to 72.7 ± 10.2 ; $\eta^2 = 0.896$), and emotional well-being (15.5 ± 8.8 to 71.2 ± 8.4 ; $\eta^2 = 0.878$). Significant gains were also observed 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 analyses confirmed that improvements were sustained at follow-up. Baseline demographic equivalence enhanced internal validity. Conclusion: The structured training module effectively improved knowledge, self-care practices, and overall well-being among perimenopausal women, supporting its use for osteoporosis prevention and management.

Keywords: Osteoporosis, Peri menopausal, Self – care practices, Structured training, OSTA, Knowledge attitude, Practices (KAP).

Introduction

Osteoporosis is understood as a progressive skeletal disorder marked with low bone mass and deterioration of bone tissue, resulting in increased fragility and risk for fracture. It is especially common for perimenopausal women due to hormonal fluctuations, particularly the decline in oestrogen, which accelerates bone resorption. This period represents a critical window for the early onset of osteopenia and osteoporosis, highlighting the need for targeted preventive interventions. Despite growing awareness, many women

remain uninformed about risk factors, early signs, preventive measures, and treatment options. Insufficient knowledge can lead to delayed diagnosis, unhealthy lifestyle choices, poor adherence to therapy, and ultimately impaired mobility, chronic pain, loss of independence, and reduced quality of life.

Limited research has evaluated the effectiveness of educational training modules for perimenopausal women, particularly in improving both knowledge and quality of life. This pilot study therefore aimed to assess the impact of a structured training module on osteoporosis prevention and management, as well as its effect on the quality of life of perimenopausal women.

Need for the study

In India, a review reported that the pooled prevalence of osteoporosis was 29% at the lumbar spine, 6% at the hip, and 29% at the femoral neck, while osteopenia prevalence was 37% at the lumbar spine, 6% at the hip, and 37% at the femoral neck (Anupama et al., 2022). Osteoporosis reduces bone density and increases fracture risk, potentially leading to serious morbidity or mortality. Perimenopausal women, in particular, require comprehensive prevention

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and management strategies. This study evaluates the effectiveness of a training program specifically designed for perimenopausal women to prevent and manage osteoporosis. The module provides guidance on lifestyle modifications, nutrition, and physical activities that promote bone health, aiming to enhance bone density and overall well-being while reducing the risk of osteoporosis and related complications. Findings from this study are expected to provide valuable insights into the impact of focused interventions on the health and quality of life of perimenopausal women.

Osteoporosis status was determined for each participant using clinical data and questionnaires. Body mass index (BMI) was calculated using the standard formula: weight (kg) divided by height squared (m^2).

Statement of the problem

To evaluate the effectiveness of a structured training module in the prevention and management of osteoporosis and in improving the quality of life among perimenopausal women attending the Government Sub-District Hospital, Katra (Block HQ), Jammu and Kashmir.

Objectives of the Study

- 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.
- Assess the quality of life of perimenopausal women in the selected Government Sub-District Hospital, Katra, Reasi, J&K, before and after the implementation of the training module.
- Determine the increase in knowledge regarding osteoporosis prevention and management among perimenopausal women after participating in the training module.
- Assess changes in health-related behaviours (self-management practices) and practices among perimenopausal women following the training, such as dietary habits, physical activity, and calcium supplementation.
- Compare the outcomes of the case and control groups 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 the case and control groups with their demographic characteristics.

Materials and Methods

Research Approach: Quantitative Approach. The study was conducted in two phases. The first phase involved developing the training module and assessment instruments.

The second phase focused on evaluating the effectiveness of the training module."

Research Design

Quasi-Experimental design. (No randomised control group design)

Research Setting

Selected Villages of District Reasi, J&K.

Population

Perimenopausal Mothers residing in District Reasi.

Sample

Perimenopausal Mothers residing in selected villages of District Reasi.

Sample Size

The number of perimenopausal women to be included in the study was determined after a detailed analysis of the sampling frame. District Reasi comprises 259 villages and 147 panchayats, spanning 9 tehsils and 12 Rural Development Blocks. The selected sample was allocated sequentially, taking geographical distribution into account, into case and control groups.

Sampling Technique

Quota Sampling was followed to recruit the study participants.

Research Approach and Design

Inclusion Criteria

Perimenopausal women residing in the selected villages of District Reasi. Exclusion Criteria: Perimenopausal Mothers who have already attended any training program on the prevention and management of osteoporosis. Perimenopausal Mothers whose OSTA score is not significant or those who are screened negative for osteoporosis.

Ethical Considerations

Ethical approval was obtained from the institutional ethics committee, and administrative permission was secured from the village authorities. Informed consent was obtained from all participants, and confidentiality and anonymity were maintained throughout data collection and storage.

Description of data collection instrument

The tool consists of two sections:

Section 1

Data collection will include demographic details of the perimenopausal women, such as age, religion, education, occupation, monthly income, age at menarche, age at marriage, and prior knowledge of osteoporosis

Section 2

A structured knowledge questionnaire will be used to assess both the baseline knowledge and the effectiveness

Table 1: Baseline comparison of socio-demographic characteristics between experimental and control group (N=30) using χ^2 / 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)						
	More Than 25 Years	8 (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	3 (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)	2.168	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 2: Mean (SD) score of subjects and comparison as per their outcome variables in the experimental and control groups (N=30) at the 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	20.17 (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	22.67 (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

of the structured teaching program on the prevention and self-management of osteoporosis among perimenopausal women.

- Structured knowledge questionnaire composed of 30 items to assess the knowledge regarding the prevention of osteoporosis.
- The self-management practices of perimenopausal mothers with osteoarthritis shall be assessed using a practice checklist.
- The quality of life of perimenopausal mothers with osteoarthritis shall be assessed using the RAND 36-Item Health Survey 1.0 Questionnaire (SF-36). (Araujo et al., 2016)

Data Collection techniques

The Socio-Demographic Data was collected on Day 01 along with Pre-Test data. The intervention (Training Module) was administered from Day 02 to Day 32. (One month). The first Post Test data was collected on the 33rd Day, and the second Post Test Data was collected on the 63rd Day.

Testing of Tool

seven experts, who provided feedback on the adequacy, sequence, and framing of the questions, evaluated the content validity of the tool. The tool was revised based on their suggestions and subsequently validated.

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 df= 1.434	p= 0.000 df=1	p= 0.000 df=1.434
		Post Test 2	15.53 (1.46)	10.13 (3.02)	$\eta=0.449$	$\eta=0.467$	$\eta=0.596$
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 df=1.055	p= 0.001 df=1	p= 0.009 df=1.055
		Post Test 2	68.67 (8.34)	46 (12.85)	$\eta=0.649$	$\eta=0.326$	$\eta=0.214$
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 df=1.062	p= 0.050 df=1	p= 0.221 df=1.062
		Post Test 2	60 (32.46)	41.67 (30.86)	$\eta=0.557$	$\eta=0.130$	$\eta=0.053$
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 df=1.098	p= 0.133 df=1	p= 0.449 df=1.098
		Post Test 2	64.44 (44.48)	44.44 (37.1)	$\eta=0.525$	$\eta=0.079$	$\eta=0.022$
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 df=1.091	p= 0.000 df=1	p= 0.000 df=1.091
		Post Test 2	72.67 (10.15)	42.67 (10.49)	$\eta=0.896$	$\eta=0.584$	$\eta=0.603$
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 df=1.134	p= 0.000 df=1	p= 0.000 df=1.134
		Post Test 2	71.2 (8.44)	41.33 (13.49)	$\eta=0.878$	$\eta=0.622$	$\eta=0.507$
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 df=1.078	p= 0.000 df=1	p= 0.006 df=1.078
		Post Test 2	65 (16.50)	40 (14.33)	$\eta=0.668$	$\eta=0.403$	$\eta=0.231$
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 df=1.129	p= 0.000 df=1	p= 0.000 df=1.129
		Post Test 2	74.5 (15.03)	41.5 (13.75)	$\eta=0.838$	$\eta=0.586$	$\eta=0.335$
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 df=1.029	p= 0.000 df=1	p= 0.000 df=1.029
		Post Test 2	66.33 (12.74)	38.67 (12.74)	$\eta=0.785$	$\eta=0.514$	$\eta=0.382$
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 df=1.164	p= 0.000 df=1	p= 0.015 df=1.164
		Post Test 2	60 (15.81)	36.67 (12.90)	$\eta=0.598$	$\eta=0.463$	$\eta=0.179$
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 df=1.489	p= 0.000 df=1	p= 0.000 df=1.489
		Post Test 2	1.75 (0.11)	0.29)	$\eta=0.698$	$\eta=0.732$	$\eta=0.407$

Validating

It was established based on the opinions of experts in nursing, orthopaedics, gynaecology, dietetics, and physiotherapy.

Reliability

The structured knowledge questionnaire on osteoporosis prevention was assessed using the split-half method. The

tool was administered to 10 perimenopausal women who met the sampling criteria, yielding a reliability coefficient of 0.76, indicating reliability.

Pilot Study

The pilot study will be conducted on 10% of the perimenopausal women after obtaining administrative and ethical approval from the relevant authorities. A total of

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

30 participants were included, with 15 in the experimental group and 15 in the control group. A structured knowledge questionnaire was used to assess participants' knowledge of osteoporosis prevention and self-management, and its impact on quality of life. 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.

Results

Validity and Reliability of Tools

All instruments demonstrated 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 the RAND-36, 0.92 for the practice checklist, and KR-20 = 0.87 for the knowledge test). Test-retest reliability ranged from 0.77 to 0.95, and split-half reliability ranged from 0.79 to 0.95, confirming the tools' validity and reliability for the target population. Confirmatory factor analysis of the self-management practice checklist demonstrated an acceptable model fit ($\chi^2 = 74.7$, $p < 0.001$; CFI = 0.836; RMSEA = 0.194).

Table 1. Comparison between the experimental (n = 15) and control (n = 15) groups revealed no significant differences in most socio-demographic characteristics, indicating that the groups were largely comparable. The mean age was 48.73 ± 10.16 years in the experimental group and 49.87 ± 9.8 years in the control group ($p = 0.758$). Most participants were married (80%), with similar distributions in age at marriage, menopause, religion, residence, family history, smoking status, and personal history of fractures or osteoporosis (all $p > 0.05$). Educational level, occupation, household income, and sources of osteoporosis knowledge also showed no significant differences ($p > 0.05$). However, BMI differed

significantly, 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 varied, with more participants in the experimental group having a healthy weight (33.3% vs. 0%) and fewer classified as obese (40% vs. 53.3%) than controls ($\chi^2 = 6.104$, $p = 0.047$). Overall, both groups were homogeneous at baseline for most variables, with BMI being the only exception.

Table 2 Baseline comparisons between the experimental (n = 15) and control (n = 15) groups showed that the groups were largely comparable across outcome variables. The only significant difference was in knowledge scores, with the control group having a higher mean score (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 functioning, pain, general health, health change, and self-management practices—showed no statistically significant differences ($p > 0.05$), although pain approached significance ($p = 0.055$). Overall, both groups were homogeneous at baseline, with the exception of knowledge score, which should be considered when interpreting the effects of the intervention.

Table 3 Repeated-measures ANOVA demonstrated significant improvements in the experimental group compared to controls. Knowledge scores increased markedly from 7.6 ± 2.32 (pre-test) to 16.13 ± 2.72 (Post-test 1) and 15.53 ± 1.46 (Post-test 2), with a strong interaction effect ($F = 41.253$, $p < 0.001$, $\eta^2 = 0.596$). Large effect sizes were also observed for Energy/Fatigue ($\eta^2 = 0.896$), Emotional Well-being ($\eta^2 = 0.878$), and Pain ($\eta^2 = 0.838$). Significant improvements were noted in Physical Functioning ($F = 51.765$, $p < 0.001$, $\eta^2 = 0.649$) and Social Functioning ($F = 56.439$, $p < 0.001$, $\eta^2 = 0.668$). Self-management practices showed the greatest effect ($F = 76.370$, $p < 0.001$, $\eta^2 =$

0.732). Overall, the intervention produced highly significant gains in knowledge, health, and self-management among premenopausal women

Table 4 Comparison of gain scores between the experimental and control groups (N = 30) showed significant improvements in the experimental group. Knowledge scores increased substantially ($M = 7.93 \pm 2.87$ vs. -0.6 ± 5.15 ; $t = 5.61$, $p < 0.001$, $d = 0.63$). Large gains were also observed 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 practices (1.20 vs. 0.30), all $p < 0.05$ with moderate-to-large effect sizes ($d = 0.36-0.85$). Role functioning outcomes showed no significant differences. Overall, the intervention demonstrated a strong positive impact.

Further analysis revealed significant associations between demographic variables and gain scores. Income level was associated with improvements in role functioning and emotional well-being ($F = 3.648$, $p = 0.018$), with the highest gains in the mid-level income group (70.37%), followed by the high-income (100%) and lower-mid groups (39.58%). BMI was significantly associated with energy/fatigue gains ($F = 6.072$, $p = 0.007$), with participants of healthy weight showing the greatest improvement (68.0) compared to overweight (38.63) and obese (34.28) groups. Menopause status also influenced energy/fatigue gains ($F = 5.727$, $p = 0.024$), with postmenopausal women demonstrating higher improvement (53.18) than perimenopausal women (34.73). Education level was significantly associated with gains in social functioning ($F = 5.181$, $p = 0.002$), with the largest improvements in Intermediate/Diploma (57.50) and High School groups (55.00), while minimal gains were observed in Primary (15.63) and Professional (12.50) groups. A near-significant association was observed for health change ($F = 2.719$, $p = 0.052$), with the highest gains in mid-income (33.33%) and high-income participants (50%)

Discussion

The study demonstrated that the intervention led to significant improvements in women's knowledge, quality of life, and self-management practices for osteoporosis, with strong statistical significance ($p < 0.001$) and large effect sizes. Baseline equivalence in demographic characteristics supported internal validity, and the assessment tools were confirmed to be valid and reliable. These findings provide robust justification for conducting a larger-scale study to further evaluate the intervention's effectiveness.

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Mr. Jony Kutty Joseph, Associate Professor, SMVDCoN, Jammu and Kashmir.

References

- 2021 Annual Meeting of the North American Menopause Society September 22 – 25, 2021, Washington, DC. (2021). *Menopause*, 28(12). https://journals.lww.com/menopausejournal/fulltext/2021/12000/2021_annual_meeting_of_the_north_american.17.aspx
- Anupama, D. S., Noronha, J. A., Acharya, K. K. V., Prabhu, M. M., Shetty, J., Shankar, R., & Nayak, B. S. (2022). Burden of Osteopenia and Osteoporosis among Postmenopausal Women in India. *Journal of Mid-Life Health*, 13(2), 107–114. https://doi.org/10.4103/jmh.jmh_207_21
- Brown, L., Hunter, M. S., Chen, R., Crandall, C. J., Gordon, J. L., Mishra, G. D., Rother, V., Joffe, H., & Hickey, M. (2024). Promoting good mental health over the menopause transition. *The Lancet*, 403(10430), 969–983. [https://doi.org/10.1016/S0140-6736\(23\)02801-5](https://doi.org/10.1016/S0140-6736(23)02801-5)
- Cohen, L. S., Soares, C. N., Vitonis, A. F., Otto, M. W., & Harlow, B. L. (2006). Risk for new onset of depression during the menopausal transition: The Harvard study of moods and cycles. *Archives of General Psychiatry*, 63(4), 385–390. <https://doi.org/10.1001/ARCHPSYC.63.4.385>
- Francis, K. L., Matthews, B. L., Van Mechelen, W., Bennell, K. L., & Osborne, R. H. (2009). Effectiveness of a community-based osteoporosis education and self-management course: A wait list controlled trial. *Osteoporosis International*, 20(9), 1563–1570. <https://doi.org/10.1007/>