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"A Quasi-Experimental Study To Assess The Effectiveness Of Structured Teaching Programme On Knowledge And Preventive Practices Regarding Osteoporosis Among Post-Menopausal Women In Selected Areas Of District Kangra (H.P.)"

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ABSTRACT

Background: Osteoporosis is a silent, progressive bone disease characterized by low bone mass and increased fragility, predominantly affecting postmenopausal women due to estrogen deficiency. In India, particularly in rural and semi-urban areas like District Kangra, Himachal Pradesh, the prevalence of osteoporosis is high, yet awareness remains critically low.

Aim: To assess the effectiveness of a structured teaching program on improving knowledge and preventive practices regarding osteoporosis among postmenopausal women in a selected area of District Kangra, Himachal Pradesh.

Methods: A quasi-experimental one-group pretest-posttest design was used. A total of 60 postmenopausal women aged 45–65 years were selected using purposive sampling. A structured knowledge questionnaire and a preventive practice checklist were administered before and after the intervention. The structured teaching program included educational sessions using lectures and visual aids. Data were analyzed using descriptive and inferential statistics.

Results: In the pretest, 33.3% of women had inadequate knowledge and only 6.6% had adequate knowledge. Post-intervention, 61.6% demonstrated adequate knowledge. The mean knowledge score increased from 13.12 to 21.58. Similarly, preventive practices improved significantly, with adequate practice levels rising

from 6.7% to 48.3%. Statistical analysis revealed a significant difference between pretest and posttest scores ($p < 0.05$), indicating the effectiveness of the intervention.

Conclusion: The structured teaching program was effective in significantly improving knowledge and preventive practices regarding osteoporosis among postmenopausal women. Such interventions should be integrated into community health strategies, particularly in underserved rural regions, to reduce the burden of osteoporosis-related complications.

Keywords:

Osteoporosis, Postmenopausal Women, Knowledge, Preventive Practices, Structured Teaching Program, Health Education, Kangra District

INTRODUCTION

BACKGROUND OF THE STUDY

"Osteoporosis is not an inevitable part of ageing; it is preventable. So, it is vital that all of us, of all ages, start taking care of our bones now, before it is too late."

-Camilla Parker Bowles

Osteoporosis is a progressive bone disease characterized by decreased bone mass and deterioration of bone tissue, leading to increased bone fragility and risk of fractures. Postmenopausal women are particularly vulnerable due to the decline in estrogen levels, a hormone that plays a critical role in maintaining bone density. The condition often remains silent until a fracture occurs, making early identification and preventive care crucial. With increasing life expectancy and changing lifestyles, the prevalence of postmenopausal osteoporosis is rising, especially in countries like India. Despite its growing burden, awareness about the disease, its risk factors, and preventive strategies remains low among women. Hence, there is an urgent need to educate postmenopausal women about osteoporosis to promote early prevention, lifestyle modification, and timely treatment.

As per WHO, Osteoporosis is a major global health issue, affecting approximately 18.3% of the population worldwide. It disproportionately impacts postmenopausal women, and the number of hip fractures globally is expected to reach 6.26 million by 2050.

In India, osteoporosis affects around 20% of women over the age of 50, while about 52% of the population has low bone mass. Among postmenopausal women, the prevalence ranges between 41% and 53%, mainly due to low dietary calcium, widespread vitamin D deficiency, and inadequate access to preventive healthcare. These factors contribute to over 10 million cases of osteoporosis reported each year in the country.

In Himachal Pradesh, the prevalence likely aligns with national estimates, with 40–50% of postmenopausal women at risk. Factors such as poor dietary intake, limited health awareness, and rural healthcare access barriers exacerbate the problem.In Kangra district, which has a population of about 1.5 million, predominantly rural,

osteoporosis is presumed to be prevalent in 45–50% of postmenopausal women. While the hilly geography may promote higher physical activity, challenges like nutritional deficiencies and low awareness persist.

Osteoporosis is a metabolic bone disease characterized by low bone mass and structural deterioration of bone tissue, leading to increased fragility and fracture risk. It commonly affects postmenopausal women due to the sharp decline in estrogen levels, which plays a crucial role in maintaining bone density. With increasing life expectancy, the number of women at risk is steadily rising.

Postmenopausal osteoporosis is a type of primary osteoporosis that typically begins within 5–10 years after menopause, characterized by low bone mass, deterioration of bone tissue, and increased bone fragility, which can lead to fractures—especially in the hip, spine, and wrist.

Osteoporosis in post-menopausal women can be attributed to a combination of hormonal, genetic, lifestyle, and medical factors. One of the primary causes is estrogen deficiency that occurs after menopause, which leads to decreased bone density. A family history of osteoporosis or fractures also increases the risk, suggesting a genetic predisposition. Nutritional factors such as low calcium and vitamin D intake contribute to poor bone health. Physical inactivity further exacerbates bone loss, as weight-bearing exercises are essential for maintaining bone strength. Lifestyle habits like smoking and excessive alcohol consumption negatively impact bone formation and accelerate bone loss. Additionally, women with a thin body frame or low body weight are at greater risk due to lower bone mass. Long-term use of corticosteroids is another significant factor, as these medications interfere with the bone rebuilding process and can lead to weakened bones over time.

Osteoporosis is often referred to as the "silent disease" because bone loss typically occurs without any noticeable symptoms until a fracture happens. In many cases, individuals are unaware of their condition until they experience a break or injury. However, when symptoms do appear, they may include sudden back pain, often caused by vertebral fractures. A gradual loss of height over time can also be observed, along with a stooped posture, medically known as kyphosis or “dowager’s hump.” Additionally, individuals with osteoporosis may suffer bone fractures from minimal or no trauma, indicating the fragile state of their bones.

Treatment Options for osteoporosis focus on reducing bone loss, increasing bone density, and preventing fractures. Bisphosphonates, such as alendronate and risedronate, are commonly prescribed as first-line medications to slow bone resorption and strengthen bones. Selective Estrogen Receptor Modulators (SERMs), like raloxifene, mimic estrogen’s protective effects on bones and are particularly useful for post-menopausal women. Hormone Replacement Therapy (HRT) may also be used, but it is recommended selectively due to potential cardiovascular and cancer risks.

For individuals who cannot tolerate bisphosphonates, denosumab—a monoclonal antibody—offers an alternative by inhibiting bone breakdown. Another option is teriparatide, a synthetic form of parathyroid hormone that actively stimulates new bone formation. Each treatment is chosen based on individual patient needs, risk factors, and overall health profile.

Prevention and Lifestyle Measures play a crucial role in reducing the risk of osteoporosis and maintaining bone health, especially among post-menopausal women. Adequate intake of calcium, around 1200 mg per day through diet and supplements, is essential for bone strength. Along with calcium, vitamin D intake of 800–1000 IU per day helps in the proper absorption of calcium and supports bone metabolism. Engaging in regular weight-bearing and muscle-strengthening exercises such as walking, dancing, and strength training can significantly improve bone density and reduce the risk of fractures.

It is also important to avoid smoking and limit alcohol consumption, as both can negatively affect bone health. Implementing fall prevention strategies at home, such as removing tripping hazards, using handrails, and ensuring proper lighting, can help prevent injuries and fractures in individuals at risk.

As life expectancy rises, osteoporosis has become a major health challenge, impacting millions of women worldwide. Although largely preventable, awareness and use of preventive measures are still low among postmenopausal women, particularly in rural and semi-urban areas.

NEED FOR THE STUDY

Osteoporosis is a silent epidemic that predominantly affects post-menopausal women, making it a significant public health concern. The decline in estrogen levels after menopause accelerates bone resorption, leading to weakened bones and an increased risk of fractures. Despite the high prevalence of osteoporosis among women in India, awareness about the disease remains alarmingly low. Many post-menopausal women fail to recognize the importance of preventive measures such as dietary modifications, physical activity, and medical interventions. Therefore, there is an urgent need to implement effective educational interventions to enhance knowledge and promote healthy practices among this vulnerable group.

In rural and semi-urban areas, the situation is even more critical due to a lack of health awareness and limited access to healthcare facilities. Women in these regions often have inadequate exposure to information about osteoporosis and its prevention. Cultural beliefs, socio-economic factors, and lack of formal education further contribute to the low levels of awareness. This gap in knowledge leads to poor bone health outcomes, higher incidences of fractures, and increased morbidity among post-menopausal women. Addressing this issue through targeted educational programs can significantly improve awareness and encourage women to adopt preventive measures.

Structured teaching programs have been recognized as an effective tool in health education. These programs provide systematic, evidence-based knowledge that helps individuals understand health risks and adopt necessary precautions. In the case of osteoporosis, structured teaching programme can play a crucial role in bridging the knowledge gap among post- menopausal women and encouraging them to adopt preventive measures.In the context of osteoporosis, a structured teaching program can help women learn about the risk factors, symptoms, preventive strategies, and the importance of early detection. Such programs have the potential to empower women with the necessary knowledge and motivation to take proactive steps toward maintaining their bone health.

This study aims to assess the effectiveness of a structured teaching program in improving knowledge and preventive practices regarding osteoporosis among post-menopausal women. The study will be conducted in a selected area of district Kangra, Himachal Pradesh (H.P.), where awareness levels may be low due to socio-cultural and geographical factors. By evaluating the impact of structured education, the study seeks to determine whether such interventions can be used as a preventive strategy at the community level.

One critical factor driving the need for this study is the low awareness of osteoporosis among rural populations, particularly postmenopausal women. Studies across India have consistently shown that awareness of osteoporosis risk factors, symptoms, and prevention strategies is inadequate, especially in areas with limited access to healthcare education. In Kangra, where literacy rates among women may be lower than urban averages and traditional beliefs may overshadow scientific understanding, misconceptions about bone health are likely widespread. For instance, many women may attribute bone pain or fractures to aging rather than osteoporosis, delaying preventive action. A structured teaching program can address these gaps by delivering clear, culturally relevant information, but its impact must be empirically tested to ensure efficacy, making this study essential.

This study is particularly significant because it focuses on an underserved population in district Kangra, where health education initiatives are limited. By assessing the effectiveness of a structured teaching program, this study aims to fill the knowledge gap and provide evidence-based recommendations for community health interventions. If successful, this intervention can be replicated in other rural and semi-urban areas to enhance osteoporosis awareness and prevention efforts.

PROBLEM STATEMENT

"A Quasi-Experimental Study To Assess The Effectiveness Of Structured Teaching Programme On Knowledge And Preventive Practices Regarding Osteoporosis Among Post-Menopausal Women In Selected Areas Of District Kangra (H.P.)"

OBJECTIVES

1. To assess pretest and posttest knowledge score regarding osteoporosis among post-

menopausal women.

2. To assess pretest and posttest preventive practices score regarding osteoporosis among post-menopausal women.

3. To compare the pretest and posttest knowledge score regarding osteoporosis among selected postmenopausal women.

4. To compare the pretest and posttest preventive practices score regarding osteoporosis of selected postmenopausal women.

5. To find out the correlation between posttest knowledge and preventive practices score regarding osteoporosis among postmenopausal women.

6. To find out association with posttest knowledge score regarding osteoporosis among post-menopausal women with selected socio demographic variables.

7. To find out association with posttest preventive practices score regarding osteoporosis among post-menopausal women with selected socio demographic variables.

HYPOTHESIS

• H01 : There will be no significant difference between pre test and post test knowledge score regarding osteoporosis among postmenopausal women as assessed by self structured knowledge questionnaire.

• H1: There will be significant difference between pretest and posttest knowledge score after receiving a structured teaching programme regarding osteoporosis among postmenopausal women as assessed by the self structured knowledge questionnaire.

• H02: There will be no significant difference between pretest and posttest preventive practices score regarding osteoporosis among postmenopausal women as assisted by preventive practices checklist.

• H2: There will be significant difference between pretest and posttest preventive practices score regarding osteoporosis among postmenopausal women as assisted by preventive practices checklist.

• H03: There will be no significant correlation between post test knowledge and preventive practices score regarding osteoporosis among postmenopausal women as assisted by self structured knowledge questionnaire and preventive practices checklist.

• H3: There will be significant correlation between post test knowledge and preventive practices score regarding osteoporosis among postmenopausal women as assisted by self structured knowledge questionnaire and preventive practices checklist.

• H04: There will be no significant association between posttest knowledge score regarding osteoporosis among postmenopausal women with their selected socio demographical variable.

• H4: There will be significant association between posttest knowledge score regarding osteoporosis among postmenopausal women with their selected socio demographical variable.

• H05: There will be no significant association between posttest preventive practice score regarding osteoporosis among postmenopausal women with their selected socio demographical variable.

• H5: There will be significant association between posttest preventive practice score regarding osteoporosis among postmenopausal women with their selected socio demographical variable.

OPERATIONAL DEFINITIONS

• **ASSESS**: In this study assess refers to gathering or collecting information regarding osteoporosis among postmenopausal women.

• **EFFECTIVENESS:** In this study effectiveness refers to significant gain in levels of knowledge and favorable expressed preventive practices regarding osteoporosis as measured by questionnaire and checklist.

• **STRUCTURED TEACHING PROGRAMME**: In this study structured teaching programme refers to a systematically developed teaching plan on various aspects of management and preventive practices of osteoporosis such as controlled diet, exercise etc.

• **KNOWLEDGE:** In this study knowledge refers to awareness and understanding regarding osteoporosis among post-menopausal women as measured by self-structured questionnaire.

• **PRACTICE:** In this study practice refers to awareness and understanding regarding preventive practices of osteoporosis among post-menopausal women as measured by preventive practices checklist.

• **OSTREOPOROSIS**: In this study, osteoporosis refers to bone disease that develops when bone mineral density and bone mass decreases, or when the structure and strength of bone changes.

• **POST MENOPAUSAL WOMEN**: In this study, postmenopausal women refer to women aged 45 to 65 and those who have not experienced menstruation for the last 12 months.

CONCEPTUAL FRAMEWORK

GENERAL SYSTEM MODEL (Ludwig von Bertalanffy)

A conceptual framework is a complex whole of interrelated concepts or abstracts that are assembled together in some rational scheme by virtue of their relevance to a common theme.

A conceptual model provides for local thinking for systemic observation and interpretation of observed data.The model also gives direction for relevant question on phenomenon and points out solutions to practical problems as well as serves as a spring board for the generation of hypotheses to be used.

The conceptual framework used for this study is based on general system model. It was developed by Ludwing von Bertanfy(1968) and modified by J.W. Kenay and is called open system model. The system consist of a set of interacting components with a boundary that filters the type and rate of exchange with the environment whole person. The system is defined as “set of components or units interacting with each other within a boundary that filters both the kind and rate of flow of inputs and outputs from the system. The general system theory is concerned with changes due to interaction between the various factors(variables) in a situation in human beings between person and environment change continuously. The general system theory provides a way to understand the many influences on the whole person and the possible input of any part of the whole.

REVIEW OF LITERATURE

This review of literature is organized into three sections to provide a clear understanding of the key areas relevant to the present study:

SECTION-A: Review of Literature related to osteoporosis among post-menopausal women.

SECTION-B: Review of Literature related to knowledge and preventive practices regarding osteoporosis.

SECTION-C: Review of Literature related to the effectiveness of structured teaching programs/health education interventions.

1. Review of Literature related to osteoporosis among post-menopausal women.

Singh et al. (2023) conducted a cross-sectional study in Northern India involving 539 postmenopausal women to assess bone mineral density (BMD) and the prevalence of osteoporotic fractures. The researchers used Dual-Energy X-ray Absorptiometry (DXA) scans for BMD assessment and collected data on fracture history and risk factors through structured interviews and medical records review. A convenience sampling technique was employed to recruit participants from outpatient departments. The findings showed a high prevalence of osteoporotic fractures (82.2%), with significant associations found between fracture occurrence and risk factors such as high parity (67%) and a positive family history of osteoporosis (54%). The study concluded that there is a critical need for early screening, public awareness, and targeted prevention programs to reduce osteoporosis-related complications among postmenopausal women in this region.

Frost et al. (2023) conducted a comparative study in the United Kingdom involving 300 postmenopausal women to evaluate the effectiveness of Quantitative Ultrasound (QUS) compared to Dual-Energy X-ray Absorptiometry (DXA) in assessing osteoporosis risk. Participants were selected through random sampling, and data were collected using both heel QUS measurements and DXA scans, along with structured questionnaires capturing demographic data and osteoporosis risk factors such as age, BMI, history of fractures, and lifestyle habits. The results showed that both QUS and DXA were strongly associated with established osteoporosis risk factors, with QUS demonstrating a sensitivity of 83% and specificity of 78% in detecting low bone density when benchmarked against DXA results. The study concluded that QUS is a valuable, low-cost, and portable screening tool that can be effectively used in resource-limited or rural settings to identify individuals at risk for osteoporosis, promoting early detection and timely referral for DXA confirmation and treatment.

2. Review Of Literature related to knowledge and preventive practices regarding osteoporosis.

Khanal et al. (2024) conducted a descriptive cross-sectional study in Kirtipur Municipality, Nepal, involving 400 women to evaluate their knowledge and preventive practices related to osteoporosis. Data were collected using structured face-to-face interviews with a pre-validated questionnaire that included sections on general awareness, risk factors, dietary habits, physical activity, and preventive measures. Participants were selected through a systematic random sampling technique from various wards within

the municipality. The findings revealed that although 78% of participants had heard of osteoporosis, only 32% demonstrated adequate knowledge of its risk factors and prevention. Preventive practices such as calcium-rich diet intake (27%) and engagement in weight-bearing exercises (22%) were also found to be low. The study concluded that there is a significant gap between awareness and actionable knowledge, highlighting the urgent need for community-based health education programs to improve both understanding and preventive behaviors among women in this region.

Behera et al. (2024) conducted a cross-sectional study in Odisha, India, involving 600 postmenopausal women to assess their awareness and health beliefs related to osteoporosis. Data were collected using the Osteoporosis Health Belief Scale (OHBS), which evaluated participants' perceived susceptibility, seriousness, benefits of preventive actions, and barriers to behavior change. The participants were selected using a cluster random sampling technique from both rural and urban areas. The results showed that a majority of women (over 70%) demonstrated low awareness levels, with very few engaging in preventive practices such as regular exercise (18%) or adequate calcium intake (24%). The study highlighted that cultural beliefs and lack of targeted information were major barriers. It concluded that culturally sensitive education and region-specific public health initiatives are essential to enhance awareness and preventive behaviors related to osteoporosis among postmenopausal women in the community.

3. Review of Literature related to the effectiveness of structured teaching programs/health education interventions.

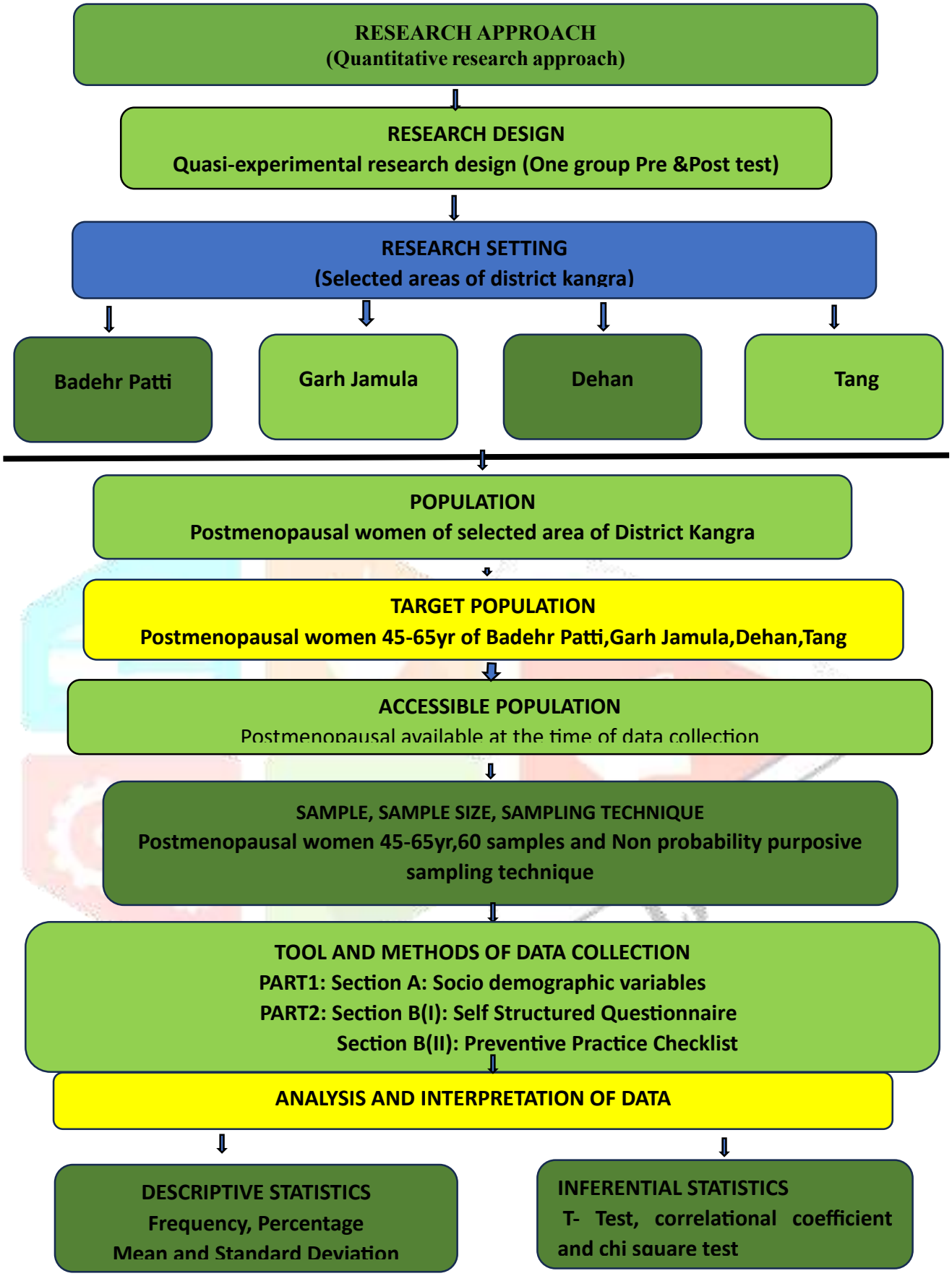
Anupama et al. (2023) conducted a randomized controlled trial at Kasturba Hospital, Manipal, India, to evaluate the effectiveness of a lifestyle modification intervention program on bone mineral density (BMD) among 120 postmenopausal women aged 45–65 years diagnosed with osteoporosis. Participants were randomly allocated into two equal groups: experimental (n = 60) and control (n = 60). The intervention group received a structured lifestyle modification program, which included dietary counseling, physical activity guidance, sun exposure, and health education, while the control group received standard care without targeted interventions. BMD was assessed at baseline, 3 months, and 6 months using a portable ultrasound densitometer. Results showed a median BMD increase from -2.2 to -1.5 in the experimental group, compared to a smaller increase from -2.3 to -2.0 in the control group. Statistical analysis using the Mann-Whitney U test revealed a significant difference between the groups at 6 months ($U = 505.5$; $p < 0.05$). The study concluded that lifestyle modification interventions are effective in improving BMD and recommended their integration into routine osteoporosis management for postmenopausal women.

Gupta, Sharma, and Kaur (2021) conducted a quasi-experimental study with a pre-test and post-test design to assess the effectiveness of a structured teaching program on knowledge regarding osteoporosis among 60 postmenopausal women in Ludhiana, Punjab, selected through purposive sampling. The results showed a significant increase in knowledge, with the mean pre-test score of 9.15 improving to 18.75 after the intervention, indicating the effectiveness of structured education. Similarly, Sivasankari and

Kalaivani (2021) carried out a pre-experimental study among 40 postmenopausal women in Tamil Nadu using convenience sampling. Their findings revealed that knowledge levels increased from 38% to 81% post-intervention, highlighting the impact of health education in rural settings.

MATERIAL AND METHODS

In this study, **A Quantitative Research Approach** was adopted to assess the effectiveness of structured teaching programme regarding osteoporosis among postmenopausal women in selected areas of district Kangra(H.P). In order to meet the aim and objective of the study an appropriate research design was selected that was Quasi Experimental Research Design. Three types of research variables were identified in this study. They are independent variables, Dependent variables & Socio demographic variables. In the present study independent variable was Structured teaching programme, Dependent variable was knowledge and practice regarding prevention of osteoporosis and Socio demographic variable were age, education, type of family, monthly income, drainage system previous knowledge, source of information. The research setting for the present study was selected areas of district Kangra(H.P). Postmenopausal women from selected areas of district kangra who were available at the time of data collection were selected as the research population. A total of 60 postmenopausal women were selected as the sample using a non-probability purposive sampling technique. To assess the knowledge and preventive preactices regarding osteoporosis, the tool was divided into two sections:Part 1 and Part 2. Part 1 included 9 items related to socio-demographic information such as age, educational status, number of children, marital status, religion, type of family, dietary preference, and previous knowledge. Part 2 was divided into two parts; section A consisted of a self-structured knowledge questionnaire with 30 multiple-choice questions related to osteoporosis. Each question had four options, and participants were instructed to choose one correct answer. Each correct response was given a score of 1, while incorrect answers or "I don’t know" responses were scored 0. The total possible score ranged from 0 to 30. Section B included preventive practices checklist each right statement contains 1 marks and a wrong statement contains 0 marks.



ANALYSIS AND INTERPRETATION OF DATA

Analysis and interpretation was done in accordance with the objectives laid down for the study. The purpose of analysis is to reduce the data into an interpretable and meaningful form so that the result can be compared and significance can be identified.

Organization of Analyzed Data:

The analysed data was organized according to the objectives and presented under the following sections:

SECTION I: Description of socio demographic variables in experimental group.

SECTION II:

- Frequency and percentage distribution of pre-test and post-test knowledge scores in experimental group.
- Frequency and percentage distribution of pre-test and post-test preventive practices scores in experimental group.

SECTION III:

- Comparison between the pretest and posttest knowledge and preventive practices score regarding osteoporosis of selected postmenopausal women
- Comparison between the pretest and posttest preventive practices score regarding osteoporosis of selected postmenopausal women

SECTION IV:

- Correlation between the posttest knowledge and preventive practice score regarding osteoporosis of selected postmenopausal women

SECTION V:

- Association between the posttest knowledge score regarding osteoporosis of selected postmenopausal women
- Association between the posttest preventive practices score regarding osteoporosis of selected postmenopausal women

SECTION-1

Data on description of socio demographical variables of the postmenopausal women.

This section describes the frequency and percentage distribution of socio demographical variables like Age, Marital Status, Religion, Education, Type Of Family, Number Of Children, Lifestyle Status, Area Of Residence, Dietary Preference, Previous Knowledge, If Yes, Source Of Information

Table-1

FREQUENCY AND PERCENTAGE DISTRIBUTION OF SOCIO DEMOGRAPHICAL VARIABLES IN EXPERIMENTAL GROUP

Variable	Category	Frequency (N=60)	Percentage (%)
Age (Years)	45–50	15	25.0%
	51–55	18	30.0%
	56–60	15	25.0%
	61–65	12	20.0%
Marital Status	Married	36	60.0%
	Widow	18	30.0%
	Divorced	6	10.0%
	Unmarried	0	0.0%
Religion	Hindu	57	95.0%
	Muslim	0	0.0%
	Sikh	4	5.0%
	Christian	0	0.0%
Education	No formal education	12	20.0%
	Primary education	15	25.0%
	Secondary education	18	30.0%
	Higher secondary	9	15.0%
	Graduate and above	6	10.0%
Type of Family	Nuclear	30	50.0%
	Joint	18	30.0%
	Extended	12	20.0%
Number of Children	1	6	10.0%
	2	24	40.0%
	3	18	30.0%
	More than 3	12	20.0%
Lifestyle Status	Sedentary work	24	40.0%
	Moderate work	27	45.0%
	Heavy work	9	15.0%
Dietary Preference	Vegetarian	39	65.0%
	Non-vegetarian	21	35.0%
Previous Knowledge	No	42	70.0%
	Yes	18	30.0%

Sources (if yes)	Book/Library	3	16.7%
	Internet	9	50.0%
	Mass Media	4	22.2%
	Other Sources	2	11.1%

Table 1: Shows the frequency and percentage distribution of socio-demographic variables**.**

SECTION-II

A. Frequency and percentage distribution of pre-test and post-test knowledge scores in the experimental group.

This section describes the frequency and percentage distribution of pretest and posttest knowledge scores in the experimental group of postmenopausal women.

TABLE 2:

Frequency and percentage distribution of pre-test and post-test knowledge scores in experimental group.

N=60

Level of Knowledge	**Pretest**		**Posttest**	
	f	**%**	**f**	**%**
Inadequate	20	33.3%	0	0.0%
Moderate	36	60.0%	23	38.3%
Adequate	4	6.6%	37	61.6%

Minimum-0
Maximum-30

B. Frequency and percentage distribution of pre-test and post-test Preventive Practices scores in experimental group.

TABLE 3

Frequency and percentage distribution of pre-test and post-test Preventive Practices scores in experimental group.

Level of Practice	Pretest		Posttest	
	f	%	f	%
Inadequate (0–3 correct)	21	35.0%	0	0.0%
Moderate (4–6 correct)	35	58.3%	31	51.7%
Adequate (7–10 correct)	4	6.7%	29	48.3%

Minimum-0
Maximum-10

Section III:

A. Comparison between the pretest and posttest knowledge score regarding osteoporosis of selected postmenopausal women

Table 4: Shows Comparison between the pretest and posttest knowledge score regarding osteoporosis of selected postmenopausal women

Group	Mean (SD)	Paired t-value	p-value	Result
Pretest	13.12 ± 14.60	4.737	<0.0001*	Significant
Posttest	21.58 ± 12.57			

B. Comparison between the pretest and posttest preventive practices score regarding osteoporosis of selected postmenopausal women

Table 5: Comparison between the pretest and posttest Preventive Practice score regarding osteoporosis of selected postmenopausal women

Group	Mean	S.D.	Paired t-value	p-value	Result
Pretest	4.48	4.83	**6.060**	**< 0.00001**	Significant
Posttest	6.22	4.70			

SECTION IV:

Correlation between the posttest knowledge and preventive practice score regarding osteoporosis of selected postmenopausal women

Table 6: Correlation between the posttest knowledge and preventive practice score regarding osteoporosis of selected postmenopausal women

Correlation Pair	Pearson's r	p- value	Interpretation
Knowledge vs. Preventive Practice	0.340	< 0.00786	Moderate positive correlation

SECTION V:

A. Association between the posttest knowledge score regarding osteoporosis of selected postmenopausal women and their selected demographic variables

Table 7: Association between the posttest knowledge score regarding osteoporosis of selected postmenopausal women and their selected demographic variables.

Variable	Level of Knowledge				
	Moderate	Adequate	DF	Chi Square	P Value
Age (Years)					
45–50	3	12	3	4.606	0.203 NS
51–55	8	10			
56–60	5	10			
61–65	7	5			
Marital Status					
Married	11	25	2	3.243	0.197 NS
Widow	8	10			
Divorced	4	2			
Unmarried	0	0			
Religion					
Hindu	21	36	1	1.072	0.300 NS
Muslim	0	0			
Sikh	2	1			
Christian	0	0			
Education					
No formal education	7	5	4	10.482	0.033 NS
Primary education	3	12			
Secondary education	6	12			
High secondary	2	7			
Graduate and above	5	1			
Type of Family					
Nuclear	12	18	2	4.042	0.132 NS
Joint	4	14			
Extended	7	5			
Number of Children					
1	2	4	3	4.183	0.242 NS
2	10	14			
3	4	14			
More than 3	7	5			
Lifestyle Status					
Sedentary work	12	12	2	4.222	0.121 NS
Moderate work	10	17			

Heavy work	1	8			
Dietary Preference					
Veg	14	25	1	0.280	0.595 NS
Non-vegetarian	9	12			
Previous Knowledge					
No	15	27	1	0.406	0.524 NS
Yes	8	10			
Sources (if yes)					
Book/Library	1	2	4	3.696	0.448 NS
Internet	3	6			
Mass Media	2	2			
Other Sources	2	0			

B. Association between the preventive practice score regarding osteoporosis of selected postmenopausal women and their selected demographic variables

Table 8: Association between the posttest preventive practice score regarding osteoporosis of selected postmenopausal women and their selected demographic variables.

Variable	**Level of Practice**				
	Moderate	**Adequate**	**DF**	**Chi Square**	**P Value**
Age (Years)					
45–50	6	9	3	3.471	0.324 NS
51–55	12	6			
56–60	6	9			
61–65	7	5			
Marital Status					
Married	19	17	2	0.044	0.978 NS
Widow	9	9			
Divorced	3	3			
Unmarried	0	0			
Religion					
Hindu	29	28	3	0.285	0.962 NS
Muslim	0	0			
Sikh	2	1			
Christian	0	0			
Education					
No formal education	7	5	4	3.871	0.423 NS
Primary education	6	9			
Secondary education	8	10			
High secondary	7	2			

Graduate and above	3	3			
Type of Family					
Nuclear	18	12	2	3.471	0.482 NS
Joint	6	12			
Extended	7	5			
Number of Children					
1	3	3	3	2.325	0.507 NS
2	13	11			
3	7	11			
More than 3	8	4			
Lifestyle Status					
Sedentary work	12	12	2	0.378	0.827 NS
Moderate work	15	12			
Heavy work	4	5			
Dietary Preference					
Veg	18	21	1	1.356	0.244 NS
Non-vegetarian	13	8			
Previous Knowledge					
No	19	23	1	2.317	0.127 NS
Yes	12	6			
Sources (if yes)					
Book/Library	2	1	4	7.100	0.130 NS
Internet	8	1			
Mass Media	1	3			
Other Sources	1	1			

DISCUSSION

To assess pretest and posttest knowledge score regarding osteoporosis among post-menopausal women, The data on the level of knowledge before and after the intervention shows a significant improvement among the participants. In the pretest phase, 33.3% of participants had inadequate knowledge, with scores of 10 or less (0-30%%), while the majority (60.0%) demonstrated a moderate level of knowledge, scoring between 11–20 (33.3%–66.6%). Only a small proportion (6.6%) had adequate knowledge, scoring above 20 (70-100%). However, after the intervention (posttest), there was a notable shift: none of the participants remained in the inadequate category, only 38.3% retained a moderate level, and a majority of 61.6% achieved adequate knowledge. This indicates that the planned teaching programme was highly effective in enhancing the participants' knowledge levels.

Present study was supported by **Gupta, Sharma, and Kaur (2021)** conducted a quasi-experimental study to evaluate the effectiveness of a structured teaching programme on knowledge regarding osteoporosis among postmenopausal women at a community health centre in Ludhiana, Punjab. The study included 60 postmenopausal women selected through purposive sampling. A structured and validated knowledge questionnaire with a reliability score of $\alpha = 0.85$ was used for data collection, which was done through face-

to-face interviews during both the pretest and posttest phases, spaced seven days apart. The pretest findings revealed that 36.7% of the participants had inadequate knowledge (≤33%), 55% had moderate knowledge (34–66%), and only 8.3% had adequate knowledge (>66%). However, after the teaching intervention, there was a significant improvement in knowledge levels: none of the participants remained in the inadequate category, 30% had moderate knowledge, and a notable 70% achieved adequate knowledge. The improvement was statistically significant ($p < 0.001$), confirming that the structured teaching programme was highly effective in enhancing osteoporosis-related knowledge among postmenopausal women.

To assess pretest and posttest preventive practices score regarding osteoporosis among post-menopausal women, The analysis of practice levels before and after the intervention demonstrates a marked improvement. In the pretest, 35.0% of participants had inadequate practice (0–3 correct responses), while the majority (58.3%) showed a moderate level of practice (4–6 correct). Only 6.7% exhibited adequate practice (7–10 correct). However, after the intervention, none of the participants remained in the inadequate category. Moderate practice levels were observed in 51.7% of participants, and the proportion of those with adequate practice increased significantly to 48.3%. These results indicate that the intervention was effective in enhancing practical application among the participants.

Present study was supported **Kumari and Rani (2020)** conducted a quasi-experimental study to assess the effectiveness of a planned teaching programme on preventive practices regarding osteoporosis among postmenopausal women in a selected rural area of Haryana. The study included 60 participants selected through purposive sampling. A structured practice checklist was used to evaluate preventive practices during the pretest and posttest phases. In the pretest, 38.3% of women demonstrated inadequate practice (0–3 correct responses), 53.3% had moderate practice (4–6 correct), and only 8.3% showed adequate practice (7–10 correct). After the educational intervention, the results significantly improved, with 0% in the inadequate category, 45% showing moderate practice, and 55% demonstrating adequate practice. The statistical analysis confirmed that the improvement in posttest scores was significant ($p < 0.01$), indicating the positive impact of the planned teaching programme on enhancing the preventive practices of postmenopausal women regarding osteoporosis.

To compare the pretest and posttest knowledge score regarding osteoporosis of selected postmenopausal women, The paired t-test analysis reveals a statistically significant improvement in knowledge scores following the intervention. The mean score in the pretest was 13.12 with a standard deviation of 14.60, while in the posttest, the mean increased to 21.58 with a standard deviation of 12.57. The calculated paired t-value was 4.737, and the p-value was less than 0.0001, which is highly significant. This indicates that the difference between pretest and posttest scores is not due to chance, confirming that the intervention had a substantial positive effect on the participants' knowledge levels.

Present study was supported by **Singh and Joseph (2020)**conducted a to evaluate the effectiveness of a structured teaching programme on knowledge regarding osteoporosis among postmenopausal women in a selected community setting in Bengaluru, Karnataka. The study adopted a quasi-experimental pretest-posttest design with 50 participants selected through purposive sampling. A structured knowledge questionnaire was

administered before and after the intervention. The mean pretest score was 12.6 (SD = 3.2), which increased to 22.1 (SD = 2.8) in the posttest. The paired t-test value was calculated as 6.45 with a p-value less than 0.001, indicating a highly significant improvement in knowledge after the intervention. The findings confirmed that the structured teaching programme was effective in increasing awareness and understanding of osteoporosis among postmenopausal women.

To compare the pretest and posttest preventive practices score regarding osteoporosis of selected postmenopausal women, The paired t-test results for practice scores show a statistically significant improvement after the intervention. In the pretest, the mean score was 4.48 with a standard deviation of 4.83, while the posttest mean increased to 6.22 with a slightly lower standard deviation of 4.70. The paired t-value was 6.060, and the p-value was less than 0.00001, indicating a highly significant difference between pre- and post-intervention scores. This confirms that the intervention was effective in enhancing the practical skills of the participants.

Present study was supported by **Rathod and Kulkarni (2019)** conducted a quasi-experimental study to assess the effectiveness of a structured teaching programme on preventive practices related to osteoporosis among postmenopausal women in a rural area of Maharashtra. The study involved 60 women selected through purposive sampling. A structured checklist was used to assess practices during pretest and posttest phases. The mean pretest score was 4.35 (SD = 3.9), which increased to 6.80 (SD = 3.6) in the posttest. The paired t-test yielded a value of 5.89 with a p-value less than 0.0001, indicating a highly significant difference in practice scores following the intervention. These results confirmed that the structured teaching programme had a substantial positive impact on improving the osteoporosis-related preventive practices among the participants.

To find out correlation between posttest knowledge score and preventive practices score regarding osteoporosis among postmenopausal women, The correlation analysis between knowledge and preventive practice shows a Pearson's correlation coefficient (r) of 0.340, with a p-value < 0.00786. This indicates a moderate positive correlation, meaning that as knowledge levels increase, preventive practices also tend to improve. The statistically significant p-value confirms that this relationship is not due to random chance, suggesting that enhancing knowledge can positively influence preventive behaviors among the participants.

Present study was supported by **Mehta and Desai (2020)** explored the relationship between knowledge and preventive practices regarding osteoporosis among postmenopausal women in urban Gujarat. The descriptive correlational study included 100 participants selected using purposive sampling. Data were collected using a structured knowledge questionnaire and a practice checklist. The findings revealed a Pearson's correlation coefficient (r) of 0.362 with a p-value of 0.005, indicating a moderate positive correlation between knowledge and practice scores. The statistically significant association suggested that women with higher knowledge levels were more likely to engage in appropriate preventive practices.

The authors concluded that increasing awareness through health education could effectively improve osteoporosis prevention behaviors among postmenopausal women.

To find out association with posttest knowledge score and practice score regarding osteoporosis among post-menopausal women with the selected socio demographic variables, The chi-square analysis indicates that there is no statistically significant association between any of the demographic variables and the level of knowledge among the participants, as all p-values are non-significant. Age-wise, while more individuals aged 51–55 and 56–60 years demonstrated adequate knowledge, the association was not significant ($\chi^2 = 4.606$, df = 3). Marital status also showed no significant link, though a higher number of married participants had adequate knowledge ($\chi^2 = 3.243$, df = 2). Similarly, religion, education, type of family, number of children, lifestyle status, dietary preference, previous knowledge, and sources of information all showed varying distributions between moderate and adequate knowledge levels, but none of these associations reached statistical significance. For example, education had the highest chi-square value ($\chi^2 = 10.482$, df = 4), suggesting some trend, but it was still not statistically significant. Overall, this analysis suggests that knowledge levels among participants were not significantly influenced by their socio-demographic characteristic

Present study was supported by **Khanal et al. (2024)** conducted a descriptive cross-sectional study in Kirtipur Municipality, Nepal, involving 400 women to evaluate their knowledge and preventive practices related to osteoporosis. Data were collected using structured face-to-face interviews with a pre-validated questionnaire that included sections on general awareness, risk factors, dietary habits, physical activity, and preventive measures. Participants were selected through a systematic random sampling technique from various wards within the municipality. The findings revealed that although 78% of participants had heard of osteoporosis, only 32% demonstrated adequate knowledge of its risk factors and prevention. Preventive practices such as calcium-rich diet intake (27%) and engagement in weight-bearing exercises (22%) were also found to be low. The study concluded that there is a significant gap between awareness and actionable knowledge, highlighting the urgent need for community-based health education programs to improve both understanding and preventive behaviors among women in this region.

The chi-square analysis assessing the relationship between various demographic variables and the level of preventive practice indicates no statistically significant associations across any of the variables. Although slight variations were observed—for example, participants aged 45–50 and 56–60 years, and those with secondary education or joint family backgrounds, showed somewhat higher levels of adequate practice—none of these differences reached statistical significance. Age ($\chi^2 = 3.471$, df = 3), marital status ($\chi^2 = 0.044$, df = 2), religion ($\chi^2 = 0.285$, df = 3), education ($\chi^2 = 3.871$, df = 4), type of family ($\chi^2 = 3.471$, df = 2), number of children ($\chi^2 = 2.325$, df = 3), lifestyle status ($\chi^2 = 0.378$, df = 2), dietary preference ($\chi^2 = 1.356$, df = 1), and previous knowledge ($\chi^2 = 2.317$, df = 1) all showed non-significant results. Even the sources of previous knowledge, such as books, internet, or mass media ($\chi^2 = 7.100$, df = 4), did not have a statistically meaningful impact on the level of preventive practice. These findings suggest that

preventive practice was not significantly influenced by socio-demographic characteristics among the participants.

Present study was supported by **SBehera et al. (2024)** conducted a cross-sectional study in Odisha, India, involving 600 postmenopausal women to assess their awareness and health beliefs related to osteoporosis. Data were collected using the Osteoporosis Health Belief Scale (OHBS), which evaluated participants' perceived susceptibility, seriousness, benefits of preventive actions, and barriers to behavior change. The participants were selected using a cluster random sampling technique from both rural and urban areas. The results showed that a majority of women (over 70%) demonstrated low awareness levels, with very few engaging in preventive practices such as regular exercise (18%) or adequate calcium intake (24%). The study highlighted that cultural beliefs and lack of targeted information were major barriers. It concluded that culturally sensitive education and region-specific public health initiatives are essential to enhance awareness and preventive behaviors related to osteoporosis among postmenopausal women in the community.

CONCLUSIONS

The finding of the present study was that there was an improvement in knowledge and preventive practice scores regarding osteoporosis among postmenopausal women after the structured teaching programme. It was observed that as knowledge increased, preventive practices also improved.

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