

Effect of Educational Intervention Based on PRECEDE-PROCEED Model on Osteoporosis Preventive Behaviors among Perimenopausal Women

Heba Mahmoud ⁽¹⁾, Hemmat Mostafa Hassan ⁽²⁾, Amira Morsy ⁽³⁾

(1) Lecturer of maternal and neonatal health nursing, Faculty of Nursing, Ain Shams University, Egypt

(2) Assist. Prof of obstetric and gynecological nursing, Faculty of Nursing, Banha University, Egypt

(3) Assist. Prof of maternal and neonatal health nursing, Faculty of Nursing, Ain Shams University, Egypt

Abstract

Background: Osteoporosis remains a serious public health issue around the world, especially among menopausal women, hence prevention is essential. **Aim:** To evaluate the effect of educational intervention based on the PRECEDE-PROCEED model (PPM) on osteoporosis preventive behaviors among perimenopausal women. **Design:** A quasi-experimental design was used. **Setting:** The research was carried out at Benha University Hospital's Obstetrics and Gynecology Clinic. **Sample:** A purposive sample of 109 perimenopausal women was randomly assigned to one of two groups (54 women in the control group and 55 women in the study group). **Tools:** Three tools were used for data collection: a structured interview questionnaire, a self-report-based health preventive behavior questionnaire a timetable, and a questionnaire on the construction of an antecedent model. **Results:** There was highly statistically significant difference was observed in all construction of the Precede-Proceed model of the study group compared with the control group after the application of health education based on PRECEDE - PRECEDE model ($p < 0.001$). **Conclusion:** applying PPM can positively affect osteoporosis preventive behaviors and result in improving women's knowledge, attitude, behavior, reinforcing factors, and enabling factors which supported the present study hypothesis. **Recommendations:** Application of a PRECEDE-PROCEED model-based awareness program in the healthcare system to enhance knowledge of osteoporosis and its prevention in perimenopausal women. To improve awareness of menopause and the long-term consequences of more effective coping mechanisms, educational programs for menopausal women should be developed.

Keywords: Education intervention, PRECEDE - PROCEED, model, preventive behaviors, Osteoporosis, Perimenopause.

Introduction:

Although all women eventually reach perimenopause and then menopause, physiologic differences in symptoms can lead some women to be more distressed than others (Parsa et al., 2017). Perimenopause is a natural physiological phase that affects all women of a particular age and is characterized by a decrease in ovarian hormone output. Perimenopause is the phase preceding menopause that begins with endocrine, biochemical, and clinical changes and lasts for 12 months after the last menstrual period (Worsley, 2020). When menstruation has been absent for 12 months, perimenopause is identified. Individuals and sociocultural groupings have different clinical presentations. Many factors influence these changes, including a woman's socioeconomic position, diet, lifestyle, and weight, as well as hereditary factors (Delanoë, 2020).

Due to a decline in estrogen levels, several changes in the body, such as periods, may occur during the transition to menopause. Osteoporosis

risk is increased by hot flashes and sleep issues, mood changes, and fast bone loss (Jalil et al., 2015). Low bone mass and bone tissue loss characterize osteoporosis, the most frequent type of bone disease, which can result in weak and brittle bones. Early detection of the disease and its underlying risk factors is critical for planning preventive actions and controlling its course (Sandhu & Hampson 2019).

Because osteoporosis does not produce symptoms until the bone breaks, it is a silent illness that can go unnoticed for decades. Furthermore, if osteoporotic fractures do not cause symptoms, they may lie unnoticed for years. As a result, individuals may not realize they have osteoporosis until a painful fracture occurs. The most common symptom of osteoporotic fractures is pain, which varies depending on the site of the fracture (Greendale, 2020). Treatment for osteoporosis is difficult, and there is presently no cure. As a result, a better understanding of osteoporosis can substantially aid in the prevention of the disease. Population

knowledge estimation aids in public health planning (Timby & Simth, 2019).

Health education and educational programs are the foundation of lifestyle and behavior change. At present, one of the most famous and applicable theories is the PRECEDE -PROCEED model (PPM), used for changing behavior. (PPM) is a comprehensive structure introduced by (Green & Kreuter 2005) for assessing health needs to design, implement and evaluate health promotion and other public health programs to meet these needs. PROCEED provides the structure for planning targeted and focused public health programs. PROCEED provides a structure for the implementation and evaluation of public health programs (Faraji, 2019). PRECEDE and PROCEED are acronyms. PRECEDE stands for Susceptibility, Reinforcement, and Empowerment Structure in Education/Environmental Diagnosis and Assessment. PROCEED describes policy, regulatory, and organizational structures in education and environmental development (Azar et al., 2018).

Nurses play an essential role in perimenopausal women's health and well-being, as well as in avoiding osteoporosis. Through nursing education, they can establish behavioral patterns to encourage healthy lives, which is an important component of self-management of the menopausal transition. To maximize bone density, educate women about unhealthy lifestyle changes, such as good eating habits, a balanced diet rich in calcium and vitamin D, and lifestyle changes that contribute to excessive bone loss, such as B. The significance of smoking caffeine intake and following medical advice (Timby & Simth, 2019). Caregivers face a difficult task in motivating women and families to adopt health-promoting behaviors. As a result, nursing positions should develop and promote comprehensive and realistic lifestyle education programs that are easy to implement on a big scale (Mckinney, 2020).

Significance of the study:

In perimenopausal women, the prevalence of osteoporosis is 9% in the United Kingdom, 15% in France and Germany, 16% in the United States, and 38% in the Middle East. According to previous studies, the prevalence of osteoporosis in women over 50 years old ranges from 7.9% to 22.6 percent. In 2020, there were approximately 9

million osteoporotic fractures reported, including 1.6 million and 1.7 million hip and forearm fractures, respectively, and 1.4 million clinical vertebral fractures. All data indicate that osteoporosis is a frequent condition; yet, when compared to other countries, it is not as prevalent (John & Kanis., 2020). In Egypt Menopausal women make up a considerable fraction of the entire population of Egypt, accounting for 20.5 percent of all women of all ages. According to recent Egyptian statistics, nearly 4.7 million women aged 45 and more have osteoporosis. By 2020, this number is predicted to rise to 7.7 million, and by 2030, to 13 million (Abd El Rahman et al. 2019). These increased rates highlight the necessity of early detection of asymptomatic disease and its underlying risk factors to take preventative measures and slow the disease's course. As a result, the goal of this study was to see how an educational intervention based on a prior model affected perimenopausal women's osteoporosis prevention behaviors.

Operational definition:

Preventive behaviors: Preventive health behavior is "any activity undertaken by an individual who believes himself to be healthy for the purpose of preventing or detecting illness in an asymptomatic state" (Australian Institute of Health and Welfare , 2000).

Educational interventions provide students with the support needed to acquire the skills being taught by the educational system and should address functional skills, academic, cognitive, behavioral, and social skills that directly affect the child's ability access an education. (Lestrud, 2020)

Aim of the research

This study aimed to evaluate the effect of educational intervention based on the PRECEDE-PROCEED model on osteoporosis preventive behaviors among perimenopausal women.

Research hypothesis

Perimenopausal women who received an educational intervention based on the PRECEDE PROCEED model showed improved osteoporosis prevention behaviors than women who did not receive the educational intervention.

Subjects and method

Research design:

A Quasi-experimental research design (pre-test /post-test control/study) was utilized to achieve the aim of the research.

Research setting: The research was carried out at Benha University Hospital's Obstetrics and Gynecology Nursing Clinic in Benha City. Due to a shortage of health care facilities for perimenopausal women and a high percentage of women with severe osteoporosis, this location was chosen.

Sampling:

Sample type:

- A purposive sample was used from the above-mentioned setting. They were chosen for the study based on the following criteria: age 42-55 years, naturally perimenopausal women, phone number, education, and a smartphone with internet access. Women with osteoporosis, premature menopause, and menopausal predisposing factors were also excluded (history of hysterectomy and oophorectomy).

Sample size:

- 109 perimenopausal women met the inclusion criteria. By randomly selecting, the samples were split into two groups (55 women in the research group and 54 women in the control group), with odd numbers in the control group and even numbers in the research group. The following formula applies:

Sample size Equation: The researchers depended on the following equation to calculate the sample size: Steven Thompson Equation (**Khuanbai, Yerkhanat, 2019**)

$$N = \frac{Z^2 (P (1-p))}{d^2} \text{Where,}$$

- N = Sample size
- Z: statistic for a level of confidence. (For the level of confidence of 95%, which is conventional, the Z value is 1.96).
- P = the expected proportion in population-based on previous studies.
- d = error percentage = (0.05). So,

$$N = \frac{(1.96)^2 (0.07 \times (1-0.07))}{.05 \times .05}$$

$$N = \frac{(1.96)^2 (0.07 \times 0.93)}{4 \times 0.260}$$

$$N = \frac{.05 \times .05}{.0025} = 109$$

Tools of data collection:

Two main tools were used for data collection:

Tool (I): A structured interviewing questionnaire:

It was developed by researchers following a review of the relevant literature (Azar et al., 2018), and it is written in Arabic with closed-ended and open-ended questions. The questionnaire asked about sociodemographic factors including (age, place of residence, education level, marital status, type of job, and monthly income).

Tool (II): titled self-reported practice related Healthy preventive behaviors questionnaires Schedule: It was adapted from (**Kuar, 2019**). The questionnaire contains 33 items that measure healthy habits and activities of women's physical activity in the previous month and are divided into seven dimensions: eating habits (16 points), exercise (3 points), sun exposure (1 point), smoking (1 point), regular check-ups (2 points), medication use (5 points), and fall risk reduction (5 points).

Scoring system:

Each item is given a Likert scale value ranging from 1 to 3, with 3 being always done, 2 being sometimes done, and 1 is never done. Two scales divide the overall score for health behaviors and activities (99 scores) as the following:

- Satisfactory level: $\geq 75\%$ (≥ 74.25 scores)
- Unsatisfactory level: $<75\%$ (< 74.25 - 99 scores)

Tool III: Precede-Proceed model constructs:

1- Predisposing factors for osteoporosis included osteoporosis knowledge. It consisted of 8 items such as (the definition of osteoporosis, factors that contribute to the occurrence of osteoporosis, symptoms of osteoporosis, diagnosis of osteoporosis, time when women need to measure bone density, prevention of osteoporosis, methods of protection to reduce the risk of falling, and treatment of osteoporosis) (Green, & Kreuter 2005) and (Orabi, 2017).

Scoring system:

Each item is scored (3) if the answer is completely correct, (2) if the answer is partially correct, and (1) if the answer is "don't know" or "incorrect" ". Yes. The total score for each section is calculated by adding up the scores for its items. The total score for women's knowledge is obtained by adding the total score for all sections. and the total knowledge value of women (24) is categorized as follows:

- Poor <50% of correct answers (<12 scores)
- Average 50% to <75% of correct answers (≥ 12 to <18 scores)
- Good ≥ 75% of correct answers (≥ 18 scores)

Part Two: Modified Likert scale to assess women's attitude toward osteoporosis and its prevention. This scale was adapted from (Ghaderi et al., 2010). Researchers modified it to explore attitudes about osteoporosis prevention in perimenopausal women. It was translated into Arabic to accommodate women's understanding. The questionnaire has 12 questions, including (Osteoporosis is harmful and can cause catastrophic fractures and death, Osteoporosis interferes with daily activities, Menopause and osteoporosis have been linked before. Bones and smoking A balanced diet helps prevent osteoporosis and fractures, dietary supplements such as calcium and vitamin D are protective against fractures, and eating calcium-rich foods is important for preventing osteoporosis. Importantly, there are numerous barriers to maintaining blood calcium levels, exercising has a preventive impact, avoiding osteoporosis

and fractures, selecting an appropriate sports venue, safety precautions, and preferably paying attention to health information.

Scoring system:

To obtain the outcome of the attitude scale, the items were judged according to a three-point Likert scale continuum from disagree (1), to some extent (2), and agree (3). Women's total attitude score(36scores) was expressed as a percentage and classified as the following:

- Negative attitude: < 50% (< 18 scores)
- Positive attitude: ≥50% (≥18 scores)

2- Enabling factor: adapted from (Meselhy et al., 2016) The questionnaire was translated into Arabic and included five items, including (logging in to a website to find useful information about healthy lifestyles during perimenopause, attending a seminar or seminar, discussing health concerns with a doctor, finding friends/family to address health concerns, coping with perimenopause-related health changes, allocating income to buy healthy foods and supplements).

Scoring system:

"Always," "some extent," and "never" are all possible responses to these statements. "Always" was rated (3), "sometimes" was rated (2), and "never" was scored (1). (1). There are two levels to the total enabler score (15 points):

- Strong factors: ≥ 60 % (≥ 9 scores)
- Weak factors: < 60 % (< 9-15 scores)

3- Reinforcing factor: was adapted from (Orabi, 2017) The questionnaire consisted of four items that measured how to maintain meaningful and fulfilling relationships with others (family, husband, friends, healthcare provider), spend time with close friends, demonstrate closeness, inclusion, and love for family and friends, and support those who care about life.

Scoring system:

"always", "to some extent" and "never". The "always" answer was allocated a score of (3) are all possible responses to these statements., "to some extent" was allocated a

score of (2), and "never" was allocated a score of (1). The total score of reinforcing

Factors (12 scores) were classified into two levels:

- Strong factors: $\geq 60\%$ (≥ 7.2 scores)
- Weak factors: $< 60\%$ (< 7.2 -12 scores)

II - Operational Design:

Tools Validity:

The questionnaire's validity is examined by a panel of judges consisting of (3) experts in the field of obstetrics and gynecology nursing to confirm the document's clarity, relevance, completeness, and applicability.

Tool reliability:

The internal consistency of the knowledge evaluation questionnaire was 0.81, the internal consistency of the attitude assessment scale was 0.79, and the internal consistency of the ability and magnification factor was 0.76, according to Cronbach's alpha coefficient.

Ethical considerations:

Before the start of the study, the Scientific Research Ethics Committee of the Faculty of Nursing at Benha University gave its approval. The research was conducted with official approval from the chosen research environment. Each lady was educated about the study's goal and benefits at the start of the interview and throughout the study. Before any data was collected, each woman had to sign a consent form. Throughout the research procedure, women are informed that their personal information will be kept private and that all data will be utilized solely for research reasons. Each lady was advised that participation was completely voluntary and that opting out would have no impact on her care. Participants in the study face no physical, social, or psychological hazards. The control group received a designed booklet after the model was implemented.

Pilot Study:

The research tool's clarity and applicability, as well as the estimation of the time required to complete the questionnaire, were tested in a pilot study on a 10% complete sample (11 women). Simple adjustments were made. Women who took part in the pilot project were

excluded from the study, and 11 more perimenopausal women are being added to avoid contamination of the samples.

II- Operational design:

Fieldwork:

The research was carried out using the PRECEDE-PROCEED model. PRECEDE-PROCEED consisted of four steps of assessment, followed by the design, implementation, and evaluation of relevant instructional interventions based on the assessment. For 12 months, the implementation began in June 2019 and ended in May 2020. Researchers visit the research environment three times a week, from 9:00 a.m. to 12:00 p.m. (Saturday, Sunday, and Monday).

Social assessment phase:

After evaluating the relevant articles, multiple data collection tools were employed to examine factors impacting perimenopausal health habits during this period. The researcher introduces himself, greets the woman, and explains the study's aim during this phase. Women who agreed to participate in the study gave their informed consent, and then questionnaires (pre-tests) on health practices and activities were provided to collect information on their negative health habits, social withdrawal, and stress. The questionnaire will take between 15 and 20 minutes to complete.

Epidemiological, environmental, and behavioral assessment phase:

Epidemiological assessment:

During this phase, the researcher collected existing data on the importance and prevalence of osteoporosis and related factors during menopause in Egypt and other countries using various internet sources.

Environmental and behavioral assessment:

- Researchers used structured interview questionnaire pretests to collect data on sociodemographic data, menstrual and obstetric data, and perimenopausal symptoms throughout this phase.

- After that, a questionnaire was pre-filled based on the PRECEDE-PROCEED model structure (precipitating, reinforcing, and contributing variables). The questionnaire takes roughly 30-40 minutes to complete on average.
- The average time required to complete the questionnaire was approximately (40-60) minutes based on women's responses to the questions, and the number of women interviewed was 12 per week (4 per day). Timing and frequency of training sessions for selected women to measure adherence to selected interventions

Educational and ecological assessment phase:

Predisposing factors, contributing factors, and reinforcing factors are all examined at this point. During the researchers' initial literature study. As triggers, knowledge, and attitudes were chosen. Logging on to websites and attending seminars and instructional sessions are examples of contributors. Family support, husbands, and friends are all reinforcing elements. A questionnaire was developed by prior criterion investigators.

Administrative phase:

At this phase, the requisite official consent for data collection was gained by submitting a written draught to the President of Benha University Hospital. The title and goal have already been stated. Selected researchers will assign and schedule responsibilities, as well as undertake essential educational and environmental intervention coordination. The information was obtained through interviews with women. The researchers created an Arabic booklet based on the results of the pre-program evaluation and available relevant scientific materials (Ibrahim & Rahimi, 2019). It included figures based on women's lack of information about osteoporosis and its preventative practices. The number of courses and their content, as well as different teaching methods and instructional media, were determined according to the study group, and telephone numbers were gathered from women to facilitate access to women, using the PRECEDE-PROCEED model as a reference. I was unable to keep my booked appointments.

Objectives of the educational program

General objectives:

By the end of the educational program, the study group would have healthy preventive behaviors regarding osteoporosis.

Specific objectives:

- Gain a basic understanding of perimenopause and osteoporosis health prevention.
- Can use belief to able to improve, mobilization, resources, coping, and health-improving actions.
- Recognizing the elements that reinforce and encourage osteoporosis prevention actions in premenopausal women.

Implementation phase:

According to the PRECEDE-PROCEED model, the study group received a six-session group-based educational program over ten weeks. The women in the (study group) were split into twenty subgroups. The total time for all sessions with each female is about an hour and a half, with each session lasting about 20-35 minutes. Each subgroup's sessions (2-3 women per session) were repeated. The content of program instructed the women at the start of the first session. Each group was notified of the next meeting's schedule after the meeting. The following sessions began with feedback from the previous session and goals for the next session, written in plain Arabic to represent the women's level of understanding. Women's issues are discussed at the end of each meeting to clear up any misunderstandings. To enhance reinforcement and facilitators, the researchers urged the women in the study group to pass on educational programs to their relatives and friends. Discussion, demonstration, and re-demonstration are among the teaching approaches employed. All of the program's material, including videos, is contained in educational media, as well as osteoporosis education produced in basic Arabic by researchers based on their knowledge of women's health practices and views on women's weaknesses in preventing osteoporosis manual.

The first session: The session begins with an overview of perimenopause, including causes, risk factors, perimenopausal symptoms,

consequences, and management. The brochure was provided to women during the meeting by the researchers. **The second session:** General information about osteoporosis, including causes, hazards, and prevention. **The third session:** A 57-year-old woman with osteoporosis and fractures was invited to describe the condition and its implications, as well as general knowledge about healthy behaviors (annual check-ups and examinations), the necessity of exercise, frequency, and type of exercise. The importance of participants' attitudes toward osteoporosis prevention (e.g. role-playing and sharing personal experiences; information and attitudes) is stressed in this section. **The fourth session:** Diet, proper nutrition, changing attitudes and decision-making, pursuing proper nutrition based on existing balanced eating patterns, changing unhealthy eating habits, restricting intake of processed and high-sugar foods and carbohydrates, and increasing fresh vegetables and vegetable intake are just a few examples. Increase your fruit and dairy intake. As well as weight management and obesity reduction. **The fifth session:** It is emphasized the need for exercise, adequate physical activity, regular walking, and recording walking time. **The six-session:** Reinforcing factors and social support, these sessions involve the presence of family members, supportive friends, and the Wellness Centre personnel, as well as their helpful role in promoting and delivering adequate diet and physical activity.

Evaluation of process:

The process (methods, materials, and activities utilized to deliver the program) was evaluated by comparing the study group's reaction to established educational objectives. The researcher informed the affirmative group with information about the research group's compliance with the program via phone and Whatsapp.

Evaluation of impact and outcome:

During this phase, Women's predisposing, reinforcing, and favorable factors, as well as osteoporosis health prevention behaviors, were assessed as program indicators (post-tests were conducted three months after the intervention, using the same format of tools, except for the first part, which was used in both groups before

program implementation). To eliminate bias, the evaluation began with the control group and subsequently the study group. Due to the Covid-19 scenario, the researchers monitored the women by phone and WhatsApp. The women in the control group were given a booklet.

Statistical design:

The social sciences statistical package (SPSS version 22.0) was employed, followed by data tabulation and analysis. We use descriptive statistics like mean, standard deviation, frequency, and percentage. Pearson's correlation coefficient is calculated using a significance test (t-test, chi-square). At $p < 0.05$, significant level values were evaluated. When $p < 0.01$ was used, level values were regarded as very significant.

Strength of this study:

This study was added according to specific planning and implemented on a comprehensive model. The interactive social media provided flexibility and convenience for participants, by supporting adherence to the program.

Results:

Table (1): It reveals that, for both control and study group respectively (42.6% -36.4 %) in the age group $>45 - <50$ years with mean age (47.67 ± 3.54 , 48.41 ± 2.34), (63.0%, 72.7%) were Rural, (55.6%, 50.9%) were secondary educational level, (75.9% , 83.6%,) were married , (96.3%, 89.1%) were working and (77.8%, 65.5%) has insufficient monthly income. Also, this table clarifies that there was no statistically significant difference between control and study groups regarding socio-demographic characteristics (age, residence, education, marital status, nature of work, and monthly income ($p > 0.05$) reflected group homogeneity.

Figure (1): shows that (24.1% & 20%) of both control and study groups respectively had poor knowledge scores about the prevention of osteoporosis before program implementation. Meanwhile, (76.4%) of the study group had a good knowledge score about the prevention of osteoporosis, and only (27.7%) of the control group had a good knowledge score about the prevention of osteoporosis after program implementation.

Figure (2): shows that (35.2% & 34.5%) of both the control and study respectively had a positive attitude regarding the prevention of osteoporosis before program implementation, meanwhile (70.9%) of the study group had a positive attitude regarding the prevention of osteoporosis after intervention and (33.3%) of the control group had positive attitude regarding prevention of osteoporosis.

Figure (3): shows that (31.5% & 29.1. %) of both the control and study respectively had satisfactory health practices regarding prevention of osteoporosis before program implementation, meanwhile about (65.5%) of the study group had satisfactory health practices regarding prevention of osteoporosis after intervention and only (29.6%) of the control group had satisfactory health practices regarding prevention of osteoporosis.

Table (2): clarifies that there was no statistically significant difference between control and study groups regarding all items of enabling factors for the prevention of osteoporosis before intervention ($P > 0.05$).

However, there was a highly statistically significant improvement was observed in the study group compared with the control group after intervention ($p < 0.001$).

Table (3): reports that there was no statistically significant difference between control and study groups regarding all items of reinforcing factors for the prevention of osteoporosis before intervention ($P > 0.05$). However, there was a highly statistically significant improvement was observed in the study group compared with the control group after intervention ($p < 0.001$).

Table (4): clarifies that there was a highly statistically significant positive correlation between total knowledge score and total attitude of both study and control groups before and after intervention ($P < 0.001$). Moreover, there was a highly statistically significant positive correlation between total knowledge score and total healthy behavior of both study and control groups before and after intervention ($P < 0.001$).

Table (1): Distribution of the studied women (control and study groups) according to their socio-demographic characteristics

Socio-demographic characteristics	Control group n= 54		Study group n=55		X2 p- value
	No	%	No	%	
Age in (years)					
42-<45	13	24.1	18	32.7	1.80 >0.05
45-<50	23	42.6	17	36.4	
50-55	18	33.3	20	30.9	
Mean ± SD	47.67 ± 3.54		48.41 ± 2.34		
Residence					
Rural	34	63.0	40	72.7	1.19 >0.05
Urban	20	37.0	15	27.3	
Education					
Reading and write	5	9.3	4	7.3	.552 >0.05
Secondary education	30	55.6	28	50.9	
University education	19	35.1	23	41.8	
Marital status					
Married	46	75.9	46	83.6	.524 >0.05
Divorced	3	5.6	2	3.6	
Widowed	5	18.5	7	12.7	
Nature of work					
Working	52	96.3	49	89.1	2.08 >0.05
Not Working	2	3.7	6	10.9	
Monthly income					
Enough	12	22.2	19	34.5	2.03 >0.05
Not enough	42	77.8	36	65.5	

Figure (1): Distribution of the studied women (control and study groups) according to their total knowledge score regarding the prevention of osteoporosis at pre and post-intervention phases.

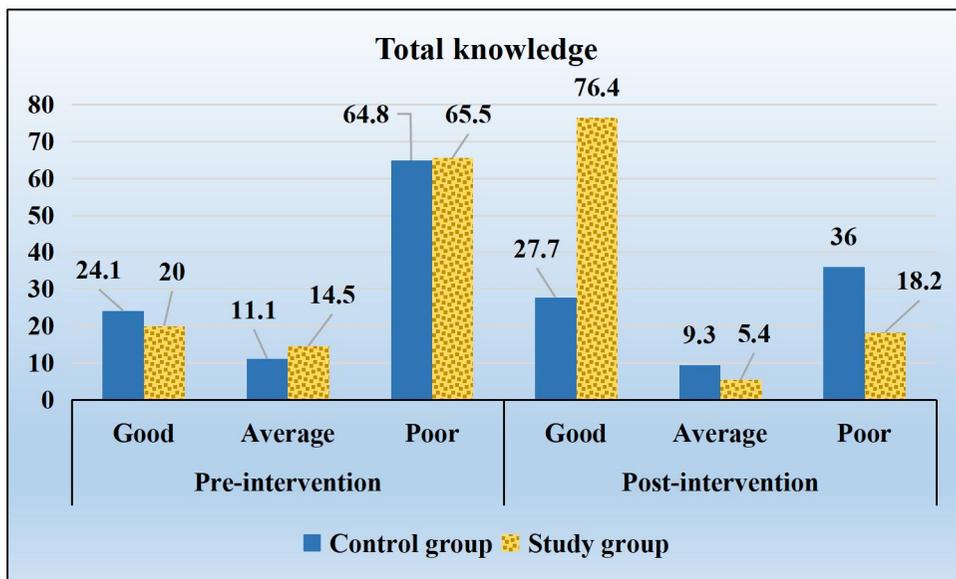


Figure (2): Distribution of the studied women (control and study groups) according to their total attitude score regarding prevention of osteoporosis at pre and post-intervention phases.

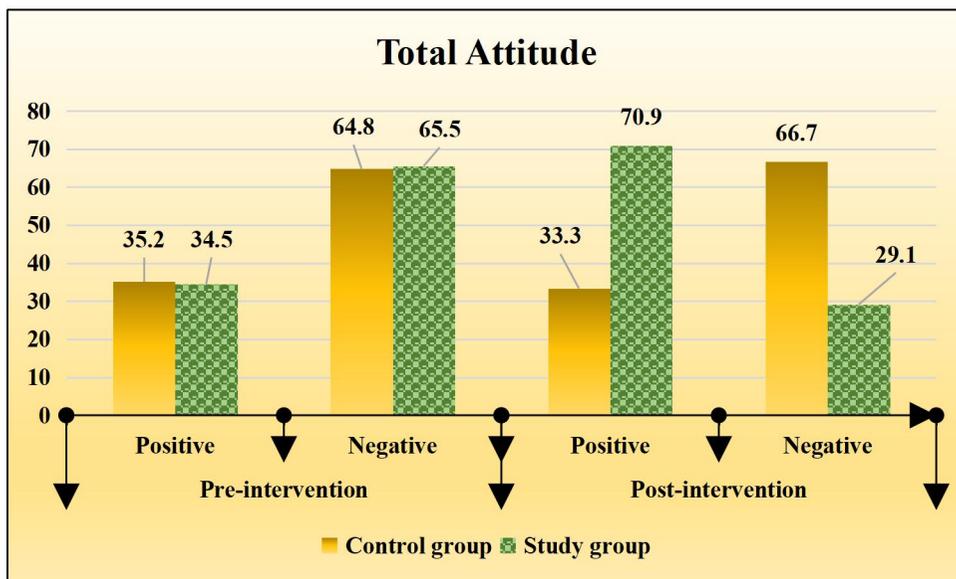


Figure (3): Distribution of the studied women (control and study groups) according to their total healthy practices and activities score regarding prevention of osteoporosis at pre and post-intervention phases.

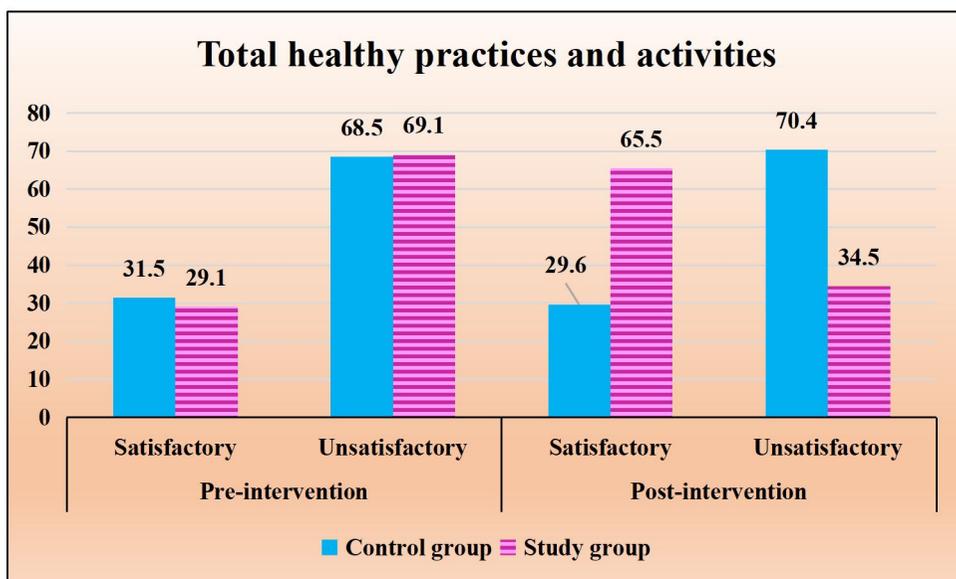


Table (2): Distribution of the studied women (control and study groups) according to their enabling factors at pre and post-intervention phases.

Enabling factors	Before intervention				X2 p-value	After intervention				X2 p-value
	Control group n=54		Study group n=55			Control group n=54		Study group n=55		
	No	%	No	%		No	%	No	%	
Logging onto websites, Attending workshops or seminars to find useful information about a healthy lifestyle during perimenopause										
Always	2	3.7	6	10.9	2.105	6	11.1	19	34.5	9.48 0.000**
To some extend	41	75.9	38	69.1		38	70.4	25	45.5	
Never	11	20.4	11	20	0.349	10	18.5	11	20	
Talking to a doctor about health concerns										
Always	3	5.6	3	5.5	0.260€ 0.878	3	5.6	31	56.4	34.73€ 0.000**
To some extend	30	55.6	28	50.9		34	63.0	20	36.3	
Never	21	38.8	24	43.6		17	31.4	4	7.3	
Seeking friends/family to help with health issues										
Always	10	18.5	8	14.5	1.77 0.412	9	16.7	43	78.2	42.98€ 0.000**
To some extend	33	61.1	40	72.7		37	68.5	12	21.8	
Never	11	20.4	7	12.7		8	14.8	0	0	
Coping with changes in health-related to perimenopause										
Always	6	11.1	8	14.5	2.743 0.254	5	9.3	35	63.6	40.150 0.000**
To some extend	14	25.9	21	38.2		20	37.0	15		
Never	34	63	26	47.3		29	53.6	5		
Allocating a portion of the income to the purchase of healthy food and nutritional supplements.										
Always	0	0	2	3.6	4.23€ 0.121	2	3.7	30	54.5	48.61€ 0.000**
To some extend	16	29.6	22	40		20	37	22	40	
Never	38	70.4	31	56.4		32	59.3	3	5.5	

Table (3): Distribution of the studied women (control and study groups) according to their reinforcing factors at pre and postintervention phases (n=109).

Reinforcing factors	Before intervention				X2 p-value	After intervention				X2 p-value
	Control group n=54		Study group n=55			Control group n=54		Study group n=55		
	No	%	No	%		No	%	No	%	
Maintaining meaningful and fulfilling relationships with others										
Always	10	18.5	8	14.5	1.11 0.573	10	18.5	30	54.5	0.000**
To some extend	25	46.3	31	56.4		30	55.6	20	36.4	
Never	19	35.2	16	29.1		14	25.9	5	9.1	
Spending time with close friends										
Always	2	3.7	6	10.9	2.10€ 0.349	3	5.6	24	43.6	0.000**
To some extend	41	75.9	38	69.1		36	66.7	22	40	
Never	11	20.4	11	20		15	27.7	9	16.4	
Showing intimacy, inclusion, and affection for family and friends.										
Always	3	5.6	2	3.6	4.84€ 0.089	4	7.4	31	56.4	0.000**
To some extend	22	40.7	34	61.9		23	42.6	19	34.5	
Never	29	53.7	19	34.5		27	50	5	9.1	
Support people caring about life										
Always	2	3.7	1	1.8	1.89€ 0.388	0	0	41	74.5	0.000**
To some extend	13	24.1	21	38.2		20	37	14	25.5	
Never	39	72.2	33	60		34	63	0	0	

Table (4): Correlation coefficient between total knowledge score, total attitude score, and total healthy preventive behaviors of the studied women at pre and post-intervention phases (n=109).

Variables	Total Knowledge							
	Control group				Study group			
	Before intervention		After intervention		Before intervention		After intervention	
	r	p-value	r	p-value	r	p-value	r	p-value
Total attitude	0.838	≤ 0.001**	0.674	≤ 0.001**	0.733	≤ 0.001**	0.759	≤ 0.001**
Total healthy preventive behaviors	0.739	≤ 0.001**	0.745	≤ 0.001**	0.515	≤ 0.001**	0.549	≤ 0.001**

Discussion

Model of PRECEDE-PROCEED **Green and Kreuter (2005)** developed this approach as an evaluation framework for health education and promotion planning. The model includes stages of social, epidemiological, behavioral, environmental, educational, and environmental diagnosis, implementation, process assessment, and assessment of short-term and long-term outcomes, and may be designed to reduce and prevent osteoporosis in perimenopausal women. As a result, this model is important for women to update their knowledge, change attitudes, promote healthy behaviors, and have the necessary insights and skills. **Didehvar and colleagues (2015)**.

This study aimed to evaluate the effect of educational intervention based on PRECEDE-PROCEED model on osteoporosis preventive behaviors among perimenopausal women.

Regarding the socio-demographic characteristics of the examined sample, the current findings show that more than two-fifths and more than one-third of the control and study groups were in the age group (45 < 50 years), with a mean age of 47.67 ± 2.34 and 48.41 ± 3.54 years, about two-thirds and more than two-thirds of the control and study groups lived in rural areas, more than half of both groups had secondary education, and more than three-quarters had The secondary education control group and almost two-thirds of the study group did not have enough monthly income.

Furthermore, no statistically significant differences were found between the study and control groups in terms of (age, place of residence, education level, marital status, type of job, and monthly income). These results imply that the two groups studied were homogeneous.

Faraji's (2019) results are practically the same. looked studied nonpharmacological and pharmacological treatments for osteoporosis in U.S. women, noting that all of the women in the study were between the ages of 39 and 51, with a mean age of 45.50 3.04 years and more than half having completed secondary school. As the level of science rises, the amount of information available to researchers may change; the amount of knowledge available must also rise. They also benefit research because they are easily understood and used. More than half of the women in the study resided in rural areas, and more than half of the women the study had a median monthly income, according to Gebretatyo et al. (2020). Two investigations used essentially identical criteria, which the researchers could explain.

Afshari et al. (2020) supported this finding in their study Menopause Insecurity: Effects of Two Educational Interventions on Women. During the Transition to and From Menopause, researchers found no significant differences in demographic factors such as age and education between the two groups. The current investigation found that one-fifth of the study group and less than one-quarter of the control group had good knowledge before the intervention in terms of the total knowledge value of women tested for osteoporosis prevention. Meanwhile, more than three-quarters of the study group had good knowledge following the intervention, compared to more than one-quarter of the control group. This is related to the model's involvement in knowledge enhancement.

This finding is similar to **Mohamed et al(2018)**, which used the Behavioral Intention Model (BIM) to assess the effect of education on osteoporosis prevention behaviors in female college students and found a lack of comprehension of the sample evaluated in preventing osteoporosis risk. This finding is also in line with **John and Kanis (2020)**, who looked at global estimates of osteoporosis prevalence and disability and found that the majority of women

were inadequately knowledgeable about osteoporosis prevention methods. This shows that educational interventions are critical for improving knowledge and, as a result, preventing the onset of osteoporosis later in life.

The views of the assessed women regarding perimenopausal osteoporosis prevention behavior and markers of attitude toward osteoporosis prevention before the intervention were not significantly different between the control and study groups. However, as compared to the intervention group, the study group saw a statistically significant improvement following the intervention ($p < 0.001$). Before the intervention, more than one-third of the study and control groups had positive sentiments. Meanwhile, more than two-thirds of the study group had positive opinions following the intervention, compared to only one-third of the control group. These are the primary influences on a person's attitude as a result of education, experience, and environment, ensuring that the model may be used to modify attitudes.

This finding is in line with **Shojaeizadehal., (2018)**, who used a health belief model to assess the effect of education on osteoporosis and bone mineral density in women, and found that after an educational intervention, the mean scores for attitudes only improved significantly in the female intervention group ($p < 0.001$). Morse et al. (2020), who investigated the evaluation of educational treatments in patients with osteoporosis using the Precede Progress model and found no statistical significance in the control and study groups, back up the findings of this study. Before utilizing PPM, there were differences in attitudes. After three and six months of PPM usage, however, highly statistically significant variations in attitudes were identified between the study and control groups.

Recent data reveal that previous to the intervention, more than a quarter and less than a third of the study and control groups, respectively, had sufficient levels of healthy health habits. Meanwhile, roughly two-thirds of the study group, compared to more than a quarter of the control group, achieved adequate levels after the intervention. **Aeed et al. (2020)**, attempted to investigate the influence of education based on a health belief model on osteoporosis and bone mineral density in women

and found no statistical difference between the two, backed by the findings of the current investigation. Before utilizing PPM, there were significant disparities between the control and research groups in terms of practicing and encouraging a healthy lifestyle. After three and six months of PPM usage, however, highly statistically significant changes in the practice and promotion of a healthy lifestyle were identified between the study group and the control group.

Delshad et al. (2020) did a cross-sectional study among El Salvadoran women to measure osteoporosis-related lifestyle habits and knowledge and found significant variations between factors "group" and "test time" in their findings. In the intervention group, there was a significant interaction ($p < 0.05$, $p < 0.001$) between the quality of life and osteoporosis prevention behavior, while no significant changes in the mean of the aforesaid constructs were detected in the control group.

Enablers and reinforcers are described as factors that enable (or facilitate) an individual or group to modify behavior or the environment in the PRECEDE-PROCEED model. Resources, living environment, social supports, and abilities that facilitate behavior are all contributing factors. As a result, it's critical to figure out what circumstances are capable of generating or preventing each of these actions. **Simeon and colleagues (2020)**.

Concerning **enabling factors**, the current study found no significant difference between the control group and the study group in terms of osteoporosis prevention influencing factors before intervention ($P < 0.05$). However, as compared to the intervention group, the study group saw a statistically significant improvement following the intervention ($p < 0.001$). Before the intervention, more than one-third and more than two-fifths of the study and control groups, respectively, had strong supporting factors. Meanwhile, more than three-quarters of the study group had strong supportive variables following the intervention, compared to more than one-third of the control group.

Concerning **reinforcing factors**, Before the intervention, there was no significant difference in any enhancing factor items for avoiding osteoporosis between the control and study groups ($P < 0.05$). However, as compared to the

intervention group, the study group saw a statistically significant improvement following the intervention ($p < 0.001$). Pre-intervention amplification factors were found in less than one-third and more than one-third of the study and control groups, respectively. Meanwhile, more than three-quarters of the study group exhibited strong reinforcing factors following the intervention, compared to only one-third of the control group.

The researchers feel that identifying which skills and resources are available to influence behaviors and the environment is crucial to the effectiveness of health promotion and disease prevention programs. This includes assessing organizational resources and assessing required abilities in the classroom. Then, public health practitioners should consider adding components to their plans or turning to alternative sources for expertise or resources that are lacking. It determines which organizational actions are required to alter the environment.

El-Said et al. (2020), aimed to analyze the lifestyle and quality of life in Egyptian women with osteoporosis and found no statistically significant changes between the control and study groups, backed by the findings of the current investigation. Before using PPM, reinforce and enabling factors. After three and six months of PPM usage, however, highly statistically significant variations in reinforcement and supporting factors were detected in the study group compared to the control group. Also, the result of the current study matched with **Tabasi et al., (2018)** whose study aimed to evaluate the Application of the Precede-Proceed and showed that after the interventions, the mean scores of the empowering and reinforcing factors in the intervention group improved.

In addition, appropriate treatments based on this model tend to be beneficial in boosting positive reinforcement and minimizing negative reinforcement targeted behaviors. Furthermore, these findings show that treatments based on this model can successfully enhance empowering characteristics that are important for the development of goal-directed learning behaviors and can be accomplished by removing barriers.

This finding is consistent with the findings of **Pourhaji et al. (2020)** who examined the effect of educational programs in promoting back pain-related behaviors (EPPLBP) among health care workers at Shahid Beheshti University of Medical Sciences, based on a look-ahead model: a randomized study reports, there was a significant interaction between the facilitators 'group' and 'test time' ($p < 0.05$, $p < 0.001$) in the intervention group, although no significant substitution was found on the mean scores for the above constructs in the control group.

A health behavior modification model similar to the PRECEDE-PROCEED model could be useful in this case. Through evaluations, it can be utilized to analyze needs, isolate requirements, and build relevant training programs. The subsequence employs the PRECEDE-PROCEED model to demonstrate health education and promotion while also improving the model builder's score, all of which contribute to (precipitating, enabling, and reinforcing factors, but also necessary elements). Stages to improve your quality of life and your low back pain behaviors

The results of this study revealed a highly statistically significant positive correlation between overall knowledge scores and overall attitudes in both the study and control groups when it came to the correlations between overall knowledge, overall attitudes, and overall health practices and activities. ($P < 0.001$) intervention Furthermore, total knowledge before and after the intervention was statistically significant and positively connected with total health behaviors ($P < 0.001$).

Khan et al. (2014) study aimed to evaluate the Knowledge, Attitudes, and Practices (KAP) survey on osteoporosis among university students in Malaysia and mentioned that correlations between different parts of the questionnaire were also analyzed. Knowledge is associated with a good attitude, and knowledge is associated with the practice.

Finally, the current findings support the hypothesis that perimenopausal women who receive educational interventions based on the PRECEDE PROCEED model improve their osteoporosis prevention behaviors as a result of improved knowledge, attitudes, healthy practices, and activities, which act as reinforcing factors

more than those of who don't will have more contributing elements.

Limitation of the study:

Lack of widespread and unavailability of the patient who uses smart mobile devices and uses of what's app to receive message

Conclusion

PPM is successful in increasing osteoporosis prevention behaviors and susceptibility variables in women, including B. knowledge and attitudes, healthy practices and activities, reinforcing factors, and contributing elements that support the study's hypothesis.

Recommendations:

- Implementation of a model-based educational program PRECEDE-PROCEED in the healthcare system to raise awareness of osteoporosis and its prevention among perimenopausal women.
- Menopausal women's educational programs should be enhanced to increase awareness of menopause and effective coping in the long run.

Further studies

- Large future studies in perimenopausal women with a larger sample probability are needed to increase the accuracy of the results.
- In Egypt, the development of a national program with regular osteoporosis prevention seminars for health center nurses.

References

- Abd El Rahman, A., Abd El Hamed ,H.s., & Ramadan,S.A.,(2019):**Osteoporosis education programs: change knowledge and behavior among 20-60 years old females. Bulletin of High Institute of public Health.33 (3):601-616.
- Aeedet, Kashfi ,S.M., Khiyali ,Z., Jamshidi ,H., & Kashfi, S.H., (2020):** The effect of education based on basedhealth belief model on osteoporosis and bone mineral density among women, Journal of Research & Health, Social Development & Health Promotion Research Center, 9(1): 11- 20 .

- Afshari, F., Bahri, N., Sajjadi, M., Mansoorian, M. R., & Tohidinik, H. R., (2020):** Menopause uncertainty: the impact of two educational interventions among women during menopausal transition and beyond, *Przegladmenopauzalny = Menopause review*, 19 (1), 18–24.
- Alshammari, K.F., (2014):** Women Knowledge, Attitude and Practices About Osteoporosis Prevention “Riyadh Saudi Arabia”, *World Journal of Medical Sciences* 11 (3): 422-431.
- Australian Institute of Health and Welfare (2000):** "Australia's Health 2000: The Seventh Biennial Health Report of the Australian Institute of Health and Welfare. Canberra: Author.
- Azar F., E., Solhi M., Darabi F., Rohban A., Abolfathi M., and Nejhadadgar Delamater, L., & Santoro, N., (2018):** Management of the Perimenopause,: *Clinical Obstetrics and Gynecology*, Wolters Kluwer Health, Inc., 61 (3), PP., 419 - 432.
- Delanoë, M.F., (2020):** Study impact of a designed nursing intervention protocol on performing self-care activities among rheumatoid arthritis women *Ass.Univ.Bull.Environ.Res*, 8(1)17-31.
- Delshad, Khaltayev, N., & Arrigada, M., (2020):** osteoporosis related life habit and knowledge about osteoporosis among women in Salvador, across sectional study located at <http://www.biomedcentral.com/1471-2474/5/29>. Accessed may, 26 2020.
- Didehvar, M., Zareban, I., Bakhshani, N.M., & Shahrakipour, M., (2015):** Strategies for the prevention and treatment of osteoporosis. *J Obstetrics, Gynecology* 194(2): S 12-23.
- Ebrahimi, C. & Rahimi, A., (2019):** Study on the effect of self-efficacy counseling on the management of menopausal symptoms in psychological dimension in perimenopause women, *Journal on nursing research*, 19(1):20-29.
- El-Said, C., Morse, R., & Aeed, A., (2020):** Osteoporosis: Egyptian women's life style and their quality of life 8th European Congress on menopause 63 (1): S1-S136.
- Estebesari, F., Shojaeizadeh, D., Mostafaei, D., & Farahbakhsh, ., (2019):** Planning and evaluation of an educational program based on Precede model to improve physical activity in female students. *Hayat*; 16(1):48-54
- Falkingham, J., Evandrou, M., Qin, M., & Vlachantoni, A., (2020):** Chinese women's health and wellbeing in middle life: Unpacking the influence of menopause, lifestyle activities and social participation, *Maturitas*, 143, 145 - 150.
- Faraji, K., (2019):** Osteoporosis part II : non pharmacological and pharmacological treatment American family physician 63(6)1121-1128.
- Gebretatyos, A., Gohar, I.E., Taylor, A., (2020):** Effect of health education on knowledge and attitude among middle-age. *Cochrane Database Systematic Rev.*, CD000340
- Ghaderi, E., Ghazanfarpour, M., Kaviani, M., (2010).** Evaluation of menopausal women's attitudes towards menopause in Shiraz. *Pak, J Med Sci.*, 26 (3): 698-703.
- Green, L., & Kreuter, M., (2005):** Health program planning: An educational and ecological approach. 4th Edition. New York City: McGraw-Hill Education; p. 1-22.
- Greendale, D.T.M., (2020):** The non-skeletal consequence of osteoporosis fractures :psychological outcomes, Springer Publishing Company, USA, PP 105-109
- Hurst, P.R., & Wham, C.A., (2017):** Attitudes and knowledge about osteoporosis risk prevention: a survey of New Zealand women, *Public Health Nutrition*: 10(7), 747–753.
- Jakimiuk, H., & Jackson, C., (2020):** Behavioral science theory and principles for practice in health education. *Health Educ Res.* 12 (1):143-150.
- Jalili, Z., Didehvar, M., Zareban, I., Bakhshani, N.M., & Shahrakipour, M., (2015):** The effect of stress management

- education based on Precede model on occupational stress of nurses in hospital of Iranshahr, Iran. *Strides Dev Med Educ*; 12(3):472-84.
- Jimba, M., & Murakami, I., (2018):** Eliminating iodine deficiency disorders in Nepal through Precede-Proceed. *Nihon KoshuEiseiZasshi*; 48(10):842-52.
- Joh, O., Kanis., & J.A., (2020):** An estimate of the worldwide prevalence and disability associated with osteoporotic fractures. *Osteoporosis Int* 2019; 17:1726–33. [PubMed] [Google Scholar] 2020.
- John, H.S., (2020): Early Detection and Prevention of Osteoporosis among Pre- and Postmenopausal Women in Saudi Arabia, *Clinical Nursing Research*, 29(1) 48– 55.
- Kaur,H., (2019):**Clinical practice guideline for midwifery and women health 3rd,jones and Bartlett publisher London p270.
- Khan, Y.H., Sarriff, A., Khan, A.H., & Mallhi, T.H., (2014):** Knowledge, Attitude and Practice (KAP) Survey of Osteoporosis among Students of a Tertiary Institution in Malaysia, *Tropical Journal of Pharmaceutical Research* January 2014; 13 (1): 155-162.
- Khani J. A., (2020):** Awareness of premenopausal women employed about menopausal change .*ASNJ*. 4(1):67-78.
- Khanjani,Kingsberg,S.A.,&Hinds,p.s., (2018):** Application of the Precede-Proceed Model in Promoting Physical Activity for Prevention of Osteoporosis among Women,*Int*,16(2):128-133.
- Khuanbai, Y. (2019):** "Re: Calculation of sample size". Retrieved from: https://www.researchgate.net/post/Calculation_of_Sample_Size/5deb25caf8ea52201008c327/citation/download
- Lestrud, M., (2020):** "Educational Interventions", enReference work entry *Encyclopedia of Autism Spectrum*, DOI: https://doi.org/10.1007/978-1-4419-1698-3_1457
- Mckinney ,K.L., (2020):**A meta-analysis of the effect of cigarette smoking on bone mineral density calcified tissue international, 68:259-270.
- Meselhy, H.M., AlShazly , H.A., Salama, A.A., & El Karsh, D.S., (2016):** Evaluation of osteoporosis educational program on knowledge, attitude, and practice of secondary school female students, *Menoufia Medical Journal* Volume : 29 | Issue : 1 | Page : 107-110
- Mohamed, F., Karimzadeh , Shirazi, K., Pourmahmoudi, A., Mossavi, A.M., (2018):** The effects of education on preventive behaviors toward osteoporosis based on Behavior Intention Model (BIM) on female students. *ArmaghaneDanesh*. 2019; 14(2):118-25.
- Mohseni, Olds, S.B., & Ladewing, P.W., (2018):** Effect of health education program base on Precede model in controlling iron-deficiency anemia among high school girl students *Clinical research & reviews*, 19(2):790-795.
- Morse, S., Mohammadipour, F., Gholami, M., Heydari, F., & Bayat, M., (2020):** The evaluation of an educational intervention based on Precede proceed model for patients with osteoporosis, *International journal of health promotion and education*, 58 (4):1-13.
- N., (2018):** Effect of educational intervention based on PRECEDE-PROCEED model combined with self-management theory on self-care behaviors in type 2 diabetic patients, *Diabetes & Metabolic Syndrome: Clinical Research & Reviews*, 12(6):1075-1078.
- Nadrian, Ghaffari ,M., Noori ,A., Khodadoost, M.,(2019):** Impacts of a health belief model-based education program about osteoporosis prevention on junior high school students' physical activity, *Kalaleh, Iran*, 2020. *Jorjani*. 2014; 1(1):1- 9.
- Narjes, B., Nooshin,Y., Mohammad ,A. M., Delshad, N. A., Moosa S., (2020):** the effects of menopausal health training for spouses on women's quality of life during menopause transitional period, *23 (2)* :183 -186 .

- Niknami, Oelsey, D., Center, J.R., & Eisman, J.A., (2020):** Effects of educational program based on Precede-Proceed model in promoting low back pain behaviors, *N Engl, J Med*, 344:1434-1441.
- Orabi, E.E., (2017):** Effect of Health Education Intervention on Knowledge, and attitude regarding Menopausal Period among Premenopausal Female Employees. *The Egyptian Journal of Community Medicine* Vol. 35 No. 3: 71-84
- Parente, C.M., (2019):** Appropriate body mass index for Asian population and its implication for policy and intervention strategies *lancet* ,157-163 .
- Parsa, P., Tabesh, R., A., Soltani, F., and Karami, M.,(2017):** Effect of Group Counseling on Quality of Life among Postmenopausal Women in Hamadan, Iran, *Journal of Menopausal Medicine* ,23:49-55.
- Polcyn, M.M. Price, J.H., Jurs, S.G., & Roberts, S.M., (2019):** Utility of the Precede model in differentiating users and nonusers of smokeless tobacco. *J Sch Health*; 61(4):166-71.
- Pourhaji ,F., Delshad, M.H., Tavafian, S.S., Niknami, S ,& Pourhaji,F., (2020):** Effects of educational program based on Precede-Proceed model in promoting low back pain behaviors (EPPLBP) in health care workers Shahid Beheshti University of medical sciences: randomized trial, *Heliyon* 6 (2020) e05236, available at: www.cell.com/heliyon.
- Rabiee,F., (2019):** signs of osteoporosis available at nice guidelines osteoporosis- assessing the risk fragility available at <http://www.nars.org> on 15 September 2020.
- Sandhu ,S.K., Hampson, G.,(2019):** The pathogenesis, diagnosis, investigation and management of osteoporosis , *J Clinical Pathology* . 2019; 64:1042–1050. [PubMed] (Google Scholar).
- Shojaeizadeh, Kashfi, S.M., Khiyali ,Z., Jamshidi ,H., & Kashfi, S.H., (2018):** The effect of education based on based health belief model on osteoporosis and bone mineral density among women, *Journal of Research & Health, Social Development & Health Promotion Research Center*, 9(1): 11- 20.
- Simeon, R., Dewidar, O., Trawin, J., Duench, S., Manson, H., Pardo, J.P., Petkovic, J., Roberts, J.H., Tugwell, P., & Yoganathan, M., (2020):** Behavior change techniques included in reports of social media interventions for promoting health behaviors in adults: S5-S12.
- Sis Çelik, A., & Pasinlioğlu, T., (2019):** Effects of imparting planned health education on hot flush beliefs and quality of life of climacteric women, *Climacteric*, 20 (1), 25 –30.
- Sullivan, P.L., Wong, F.Y.Y and Chan, S.S.C. (2017):** Psycho- educational intervention for achieving and maintaining adequate dietary calcium intake in pre –menopausal Chinese women, *Hong Kong Medical Journal*, 2017, (13(2)):S44-S47.
- TabasiNejad, N., Mohseni, M., Khanjani, N., & Ahmadi Tabatabaei, S.V., (2018):** Application of the Precede-Proceed Model in Promoting Physical Activity for Prevention of Osteoporosis among Women, *Health Education and Health Promotion*.; 6(3):103-108.
- Timby, B.K., Simth, S.C., (2019):** Introductory medical –surgical nursing 9th ed .p1237.
- Worsley, R.B., (2020):** Quality of life self-care ability and sense of coherence in hemodialysis patients comparative study *hemodialysis international*, 9:s8-s10.
- Zigheymat, F., Naderi, Z., Ebadi, A., Kachuei, H., Mehdizadeh, S., Ameli, J., (2019):** Effect of education based on Precede-Proceed model on knowledge, attitude and behavior of epilepsy patients. *J Behav Sci*; 3(3):223-9.