

## Effect of Educational Intervention Based on Pender Health Promotion Model on Osteoporosis Preventive Behaviors among Employed Women

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**ABSTRACT:** Osteoporosis is one of major problems and is a common debilitating metabolic disease among women. Young women need to be aware of the risk factors and the proper preventive behaviors of osteoporosis to prevent its complications and subsequent effects. **Purpose:** To investigate the effect of an educational intervention based on Pender health promotion model on osteoporosis preventive behaviors among employed women. **Design:** Quasi-experimental design was used. **Setting:** five of ten non medical faculties affiliated to Menoufia University were chosen by multistage random selection. **Sample:** A convenience sample of 100 premenopausal an employed woman was selected from. **Instruments:** Self-administered questionnaire was utilized which included two main parts: the first part was socio-demographic characteristics; the second part was studied women's knowledge and Pender health promotion model variables regarding osteoporosis prevention. **Results:** a statistically significant difference between pre-post intervention regarding to the total knowledge score about defining osteoporosis and its related risk factors  $17 \pm 5.2$  in posttest compared to  $6 \pm 6.6$  in pre-test. A statistical significant improvement showed in the concepts of Pender health promotion in posttest comparable with pretest. **Conclusion:** educational intervention based on Pender health promotion model had significant effect on premenopausal employed women's knowledge and preventive behaviors of osteoporosis including; perceived benefits, barriers, self-efficacy, activity related-affect, interpersonal and situational influences. **Recommendations:** Health education based on Pender health promotion model for promoting osteoporosis preventive behaviors should be provided.

**Keywords:** Educational intervention, Osteoporosis, Pender Health Promotion Model, Preventive behaviors.

### Introduction

At midlife and beyond, women's musculoskeletal health is becoming a greater health risk. In addition to severely lowering quality of life, postmenopausal women's locomotors impairment and frailty, falls, and fractures also significantly raise related

mortality. Osteoporosis is a well-known, common bone condition that affects postmenopausal women. Falls are made more likely by weakness muscles, frailty and weakened joints (Khadilkar, 2019). Due to the enormous increases in suffering,

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mortality and economic impact brought by fracture risk, osteoporosis is one of the major health concerns (Iolascon, 2020).

The most common kind of metabolic bone problems; osteoporosis which characterized by weakened bones, increases the risk of fracture. Additionally, the combination of bone mass thickness and quality of bone is referred to bone development (Föger-Samwald, 2020). Women are more at risk than males for developing osteoporosis, which can occur at any age. Numerous modifiable variables, including as dietary deficits in vit D, calcium, and minerals like magnesium, phosphorous, and vitamin K that improve absorption of calcium, have an effect on the likelihood of osteoporosis and the severity of the disease (Hussein, 2021 & Tański, 2021). Age more than 75, female sex, menopausal state, and family history of osteoporosis are examples of unchangeable risk factors (Nawrat-Szołtysik, 2020).

The significant financial and social load of osteoporosis is connected to indirect expenses associated with various consequences such as depression, persistent pain, and poor health in besides the direct medical expenditures of intense and restorative care for breakage bone. In a recent Bone Health Index Survey, the National Osteoporosis Foundation found that decrease of independence and reduced movement were the top issues for older patients with osteoporosis. Moreover, 50% of caregivers said they were unsure about their capabilities to oversee their patient's (Gold, 2019).

Children, teenagers, and even foetuses should emphasise bone health throughout all stages of growth. These phases are crucial for creating behaviours that can help avoid

osteoporosis in adults as well as for strengthening bones (Redondo Cuevas, 2018). Therefore, maintaining a well-balanced lifestyle is critical for avoiding osteoporosis. This includes engaging in regular physical activity, abstaining from smoking and alcohol, eating a balanced diet rich in vitamins like vit D from fatty seafood and fish liver oils, calcium from milk and other dairy products, cheese, yoghurt, and some green vegetables, and vit K from cheeses. In addition, a greater shift in mindset is necessary for everyone, but it is especially important for women to understand the condition, its effects, and osteoporosis prevention techniques (Akhtar, 2016).

The PHPM is one of the broadly used models to map for and modify harmful behaviors and endorse health (Khodaveisi, 2017). Numerous research have demonstrated how effective (PHPM) is at reducing harmful habits (Bahabadi, 2020; Gorbani, 2020). The PHPM was created on the basis of the theory of social cognition which states that involvement in activities that promote wellness is influenced by cognitive-perceptual variables such as significant advantages, obstacles, and self-efficacy. They are thought to communicate with one another to affect cognition and perception processes. Adjusting elements included socioeconomic traits, interpersonal effects, and behavior.

Nola J. Pender considered that the purpose of nursing practice was to aid patients in attaining their utmost well-being and health (Tavakoly Sany, 2021). In order to help with the maintenance and avoidance of harmful habits, PHPM is an approach that nurses may use to develop behaviour management. Nursing places a lot of emphasis on supporting healthy behaviours. This concept helps nurses

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promote health as effectively as possible for their patients and the public (Habibzadeh, 2021).

Community health nurses are in a unique relationship with clients and their awareness of community problems and resources; so that they have a pivotal role in influencing women's beliefs and practices for health promotion and illness prevention. Community health nurse, as educators of women about health issues, incorporate the health promotion and disease prevention aims to motivate women to use preventive health services across the life span (Stanhope, 2017 & Kaya, 2019).

### **Significance of the study**

The prevalence of osteoporosis is becoming more common and a serious public health concern, progressing especially quickly in poorer nations because of the global increase in life expectancy (Gheita & Hammam, 2018).

In Morocco, the prevalence of osteoporosis is 44.6% among postmenopausal women (PMW) and 13.4% among males over 50 (Paruk, 2020). While this percentage was reported to be 29.8% among Saudi women aged 20 to 80. In Egypt, osteoporosis affected 21.9% of males and 28.4% of PMW with osteopenia affecting 53.9% of women. A later investigation discovered a greater frequency of rural PMW at 47.8% (Gheita & Hammam, 2018).

Due to longer life expectancies, osteoporosis incidence is gradually growing and is now a significant public health concern. By 2050, it is predicted that there will be close to 130 million people living in Egypt, with more than 30% of them being over the age of 50 (Salari, 2021). One of the popular models to prepare for, modify harmful habits, and improve health is the PHPM (Khodaveisi, 2017).

Numerous research have demonstrated how effective (PHPM) is at reducing harmful habits (Bahabadi, 2020 & Gorbani, 2020). As a result, this study was carried out to investigate the effect of an educational intervention based on PHPM on osteoporosis preventive behaviors among employed women.

### **Purpose of the study**

Investigate the effect of an educational intervention based on PHPM on osteoporosis preventive behaviors among employed women.

### **Research Hypotheses**

1. Women who receive educational interventions on osteoporosis prevention based on the PHPM will have a higher level of knowledge about osteoporosis prevention in the post intervention period compared to the pre intervention period.
2. Women who receive educational intervention about osteoporosis prevention behaviors based on the PHPM will experience improved benefits perception, self-efficacy, activity-related influences, positive interpersonal and situational influences, and decreased perceived barriers in the post intervention period compared to the pre intervention period.

### **Methods**

#### **Design:**

It was designed in a quasi-experimental manner.

#### **Setting:**

A multistage random sample selection of Menoufiya University non-medical faculties. Five of ten faculties were randomly selected. This five Faculties were; Faculty of Education, Law, Arts, Computer Science and Faculty of Commerce.

#### **Sampling:**

A convenience sample of 100 pre-menopausal women worked at the

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previously mentioned Faculties were chosen

**Sample size:**

The sample size was calculated according to the follow equation:

$$\text{Sample size } n = \frac{[DEFF * Np(1-p)]}{[(d2/Z21-\alpha/2*(N-1)+p*(1-p)]}$$

**n**= Sample size

**N**= population size = 285

**P**: hypothesized % frequency of outcome factor in the population (from pilot study) = 13% +/-5

**d**: confidence limits as % of 100(absolute +/- %) = 5%

**DEFF**: design effect = 1

**Z**: probability when P is less than 0.05 = 1.96

**α** : alpha error = 0.05

Confidence interval of 95% was used, with a sample size of 101 employed women, which approximated to 100 women. They were chosen randomly according to the proportional sampling selection of total employed women and were chosen based on the following Inclusion criteria: Employed women, their age between 20-40 years old and at least can read and write well. Exclusion criteria:- Participation in any training programs about osteoporosis.

**Data collection instrument:** Self-administered questionnaire was used as an instrument for this study. This questionnaire contained two main parts.

- **Part 1:** This part developed by the researchers and was concerned with sociodemographic characteristics of studied women included age, educational level, residence, monthly income, number of family member and workplace.
- **Part 2:** This part concerned with investigating; studied women's knowledge and concepts of Pender health promotion model regarding osteoporosis prevention and was included 7 sections. All these sections were modified by the researcher and translated from English to Arabic. The Arabic versions were reviewed by the supervisors. These versions then

reviewed by Arabic/English speaker specialist to ensure the accurate translation.

These sections were:

• **Section 1:** This section concerned with measuring the level of studied women's knowledge about osteoporosis using Facts on Osteoporosis Quiz (FOOQ). The Facts on Osteoporosis Quiz adopted from Osteoporosis Consensus Conference of the National Institutes of Health (OCCNIH) in 2000 in order to measure general knowledge about osteoporosis (Zhang, 2011). It included 20 questions (5 questions about defining osteoporosis and 15 questions about the risk factors of osteoporosis).

• **Scoring system:** The responses were in the form of yes, no and don't know. The responses for these questions were scored as Yes = 1 and No or Not know = 0. The overall score, which varied from 0 to 20, was divided into "poor knowledge" for percentages below 50% (0-10) and "good knowledge" for percentages above 50% (11-20).

• **Section 2:** This section concerned with determining the perceived benefits of action about exercise and healthy diet as preventive behaviors of osteoporosis. This section divided into 2 subsections:

1) **Subsection 1:** This subsection concerned with determining the perceptions of the positive consequences of practicing exercise as a healthy behavior to prevent osteoporosis using Exercise Benefits subscale. This subscale derived from Exercise Benefits-Barriers Scale [EBBS], which designed by Sechrist et al., 1987 to determine perceptions of studied women about the benefits and barriers of practicing exercise (Pender, 1987). It was consisted of 17 questions.

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Scoring system: The structure of this subscale is a forced-choice, three-response Likert scale. Each question had the following responses: disagree=1, somewhat agree=2, and absolutely agree=3. The scale had a total score that varied from 17 to 51, with "poor perception" accounting for less than 50% of the total (17 to 34) and "good perception" accounting for more than 50% (35 to 51) of the total.

- 2) **Subsection 2:** This subsection concerned with determining the perceptions of the positive consequences of eating healthy diet as a preventive behavior of osteoporosis using of Health-Promoting Lifestyle Profile [HPLP II] subscale. This subscale designed by Sechrist et al., 1987 to examine the perceptions of the positive consequences of eating healthy diet as a preventive behavior of osteoporosis. It consisted of 8 questions.

Scoring system: The structure of this subscale is a forced-choice, three-response Likert scale. The answers to each question were never =1, seldom =2, and frequently =3. The scale's overall score, which varied from 8 to 24, was classified as "bad perception" for less than 50% (8–16), and "excellent perception" for more than 50%. (17-24).

- **Section 3:** This section concerned with determining perceived barriers of practicing exercise to prevent osteoporosis using a subscale derived from Benefits/Barriers Scale [EBBS]. This subscale was used to find out how the women in the study felt about the barriers to exercising as a healthy habit and the associated personal expenditures. There were nine questions on it.

**Scoring system:** The structure of this subscale is a forced-choice, three-

response Likert scale. Each question had the following responses: disagree=3, somewhat agree=2, and absolutely agree=1. The overall score varied from 9 to 27 and was divided into "bad perception" for less than 50% (9–18) and "excellent perception" for more than 50% (18–27).

- **Section 4:** This section concerned with perceived self-efficacy toward preventive behaviors of osteoporosis using General Self-Efficacy Scale (GSE). It was used to determine the studied woman judgment of personal capability, self confidence in practicing exercise and having healthy diet as a healthy behavior successfully. It was created in 1979 by Matthias and Ralf to evaluate a broad feeling of perceived self-efficacy with the intention to forecast dealing with day-to-day annoyances as well as adaptability following exposure to all types of stressful life events (Lazić, 2021). It was consisted of 16 questions (10 questions for perceived self-efficacy of exercise and 6 questions for perceived self-efficacy of healthy diet).

**Scoring system:** This scale's format is a forced-choice, three-response Likert scale. The answers were not true =1, somewhat true =2, and exactly true =3 for each question. The perceived self-efficacy of exercise has 10 questions and the total score ranged from 10-30 and categorized into "poor perception" for  $\leq 50\%$  (10-20) of the total score, and "good perception" for  $>50\%$  (21-30) of the total score. The perceived self-efficacy of healthy diet has 6 questions and the total score ranged from 6-18 and categorized into "poor perception" for  $\leq 50\%$  (6-12) of the total score, and "good perception" for  $>50\%$  (13-18) of the total score.

- **Section 5:** This section concerned with activity-related affect toward preventive behaviors of osteoporosis using physical activity enjoyment scale

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(PACES). This scale was used to assess the emotional states or emotions of the study participants before, during, and after a particular health behavior. It was developed by Kendzierski & Decarlo in 1991 (Murrock, 2016). It consisted of 11 questions (8 questions for activity-related affect of exercise and 3 questions for activity-related affect of healthy diet).

**Scoring system:** This scale's format is a forced-choice, three-response Likert scale. The responses for each question were disagree=1, slightly agree=2, completely agree=3. The activity-related affect of exercise has 8 questions and the total score ranged from 8 -24 and categorized into "poor perception" for  $\leq 50\%$  (8-16) of the total score, and "good perception" for  $>50\%$  (17-24) of the total score. The activity-related affect of healthy diet has 3 questions and the total score ranged from 3– 9 and categorized into "poor perception" for  $\leq 50\%$  (3-6) of the total score and "good perception" for  $>50\%$  (7-9) of the total score.

- **Section 6:** This section concerned with determining interpersonal influences toward preventive behaviors of osteoporosis using a subscale derived from [HPLP II] and was concerned with interpersonal relations. This subscale was used to find out how the women in the study felt about how other people behaved and thought about taking part in a particular healthy habit. There were six questions on it.

**Scoring system:** The subscale has three responses in form of forced-choice Likert format. The responses and scores for each question were never =1, sometimes =2, often =3. The total score ranged from 6-18 and categorized into "negative interpersonal influences" for  $\leq 50\%$  (6-12) of the total score and "positive interpersonal influences" for  $>50\%$  (13-18) of the total score.

- **Section 7:** This section concerned with determining situational influences toward preventive behaviors of osteoporosis using a subscale derived from [HPLP II] and was concerned with stress management. This subscale was used to gauge how the women in the study felt about the environment's or the context's compatibility with engaging in a certain health practise. There were six questions on it.

**Scoring system:** Three responses forced Likert choice format. The answers to each question were never =1, sometimes =2, and often =3. The total score ranged from 6-18 and categorized into "negative situational influences" for  $\leq 50\%$  (6-12) of the total score and "positive situational influences" for  $>50\%$  (13-18) of the total score.

**Validity:**

After revision of translation, the data collection instrument was revised for content validity by a jury of four experts (2 in the field of Family and Community Health Nursing and 2 in the field of obstetric Health Nursing) and recommended modifications were carried out accordingly based on the jury comments.

**Reliability:**

The reliability of the instrument was done to determine to the internal consistency of study instruments items by using Cronbach's Alpha  $r= 0,98$ . The results of the test retest reliability revealed the reliability of the study instrument  $r=0.87$

**Pilot study:**

10% (10 employed women) of the study subjects underwent a pilot study to determine the viability, clarity, and application of the study instrument as well as the time required to complete it. According on the results of the pilot research, the necessary adjustments were made. The real research sample

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did not contain any of the pilot study's participants.

**Ethical consideration and consent:**

- The Menoufia University Faculty of Nursing's ethical research committee gave its approval for the study's execution.
- The dean of Menoufia University's nursing school addressed a formal letter to the deans of a few faculties asking them to participate in data gathering. The study's objectives, data gathering techniques, and data collection time were all provided.
- The agreement to conduct the study was obtained from previously mentioned settings to gain their support during period of data collection. Oral consent was obtained from the study's subjects and they were informed about confidentiality of their information and it will be used for the research purpose only.

**Data Collection Procedure:**

It was extended from first of April 2021 to end of August 2021.

The data collection was conducted in three phases

**Pre-intervention phase:**

The researchers identified the participants needed for the study in each Faculty and divided them into 2 groups, each group consisted of 5-10 women.

The instruments were administered to the participants to fill it. The duration for pretest took about one month.

The researcher designed the educational intervention based on the information obtained from initial assessment, in addition to literature review, and the concepts of Pender's health promotion model under guidance of the supervisors.

The instrument of data collection required 25-30 minutes to be filled by each participant.

**Implementation phase:**

- After the pretest, the researcher conducted the intervention based on PHPM.
- The implementation was carried out on 3 sessions for each group in each faculty on different days throughout a week, each session took 25 minutes.
- The researcher used lecture, videos and group discussion and a copy of booklet illustrating osteoporosis definition, risk factors and its preventive behaviors and the concepts of Pender health promotion model.

**First session:** designed to improve the study subjects' understanding of strong bones, osteoporosis, its risk factors (both controllable and non-controllable), diagnostic bone density screening, complications, and therapy preventative behaviors including exercise, sun exposure, and osteoporosis treatment. Group discussion was allowed to ensure their complete understanding and feedback was taken at the end of each session. The researcher distributed a booklet of intervention based on PHPM on all studied women.

**Second session:** The researcher began this session by summarizing the first one, outlining the goals of the new one, and describing the background information that was gathered. The researcher concentrated on enhancing women's perceptions of the advantages, obstacles, and self-efficacy of osteoporosis prevention behaviours such as engaging in weight-bearing activities like walking, jogging, step aerobics, climbing stairs, and lifting light weights, as well as resistance and flexibility exercises, strength and balance exercises, and eating a healthy, well-balanced diet that contains all the nutrients necessary for bone health. Throughout this session, the researcher demonstrated various techniques and

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repeated them. Role-playing games were also applied in problem-solving scenarios. For at least five days a week, they advised doing 30 minutes of any activity.

**Third session:** In order to set the stage for this session, the researcher began by summarising the previous one and outlining its goals.

The researcher clarified the concept of activity related –affect as their positive feelings during and after practicing exercises and having a well-balanced diet, and how to overcome their interpersonal and situational influences of preventive behaviors of osteoporosis as practicing exercises and eating a healthy well-balanced diet containing all essential nutrients needed for bone health by using group discussion.

•The duration for this phase took 2 month

**Phase 3 (evaluation phase):** The researcher recollected data after 1 month of implementation of the educational intervention and comparing it with pre-intervention data in order to know differences, similarities and gap of practices using the same instruments of pre-intervention.

## **RESULTS**

**Table (1):** This table shows that, 35% of studied women at age categories of < 25 years, 65% were at age group 25-40 years old, with mean age 39±8. Regarding to the level of education 50% of studied women has university education, 44% of them have institutional education and only 6% have secondary education. As regarding to the place of residence, 55% of studied women live in rural areas and 45% live in urban areas. In addition, 53 % have enough family income and 47% have not enough family income. Concerning to the workplace, 20% of studied women worked at faculty of commerce and

same percent at faculty of art, 22% worked at faculty of Education, 23% worked at faculty of law and only 15% worked at faculty of computer science. The mean number of family members for studied women was 4.6± 1.1.

**Table (2):** This table shows that, there are statistical significance improvement in the levels of knowledge about defining osteoporosis and its related risk factors in post-intervention compared to pre-intervention. In addition, there is statistical significance improvement in total knowledge scores, p=0.000 in which the percentage of women with good level knowledge increased to 90.4% in post-intervention compared to 28.6% in pre-intervention. The findings in this table provide support to first research hypothesis.

**Table (3):** This table illustrates that, there is a statistical significance improvement in mean score in post-intervention compared to mean score in pre-intervention for all concepts of Pender health promotion model in all items p=0.000. Additionally, there is statistical significance improvement the mean total score of PHPM concepts is improved to 175 ±33.8 in post-intervention compared to 113 ±41.7 in pre-intervention p=0.000.

**Table (4):** shows statistical significant improvement in studied women's levels of Pender health promotion model concepts in post-intervention compared to pre-intervention p=0.000. As shown from the table; the percentage of studied women with good level of perceived benefits of exercise is improved to 92% in post-intervention compared to 56.76% in pre-intervention, the percentage of studied women with good level of perceived benefits of healthy diet is improved to 90.75% in post-intervention compared to 69.5% in pre-intervention, the percentage of studied

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women with poor perception to overcome barriers of practicing exercise in pre-intervention 73.63% compared to 39.56% in post-intervention, the percentage of studied women with good level of perceived self-efficacy of exercise is improved to 89.2% in post-intervention compared to 54.1% in pre-intervention. Additionally, the percentage of studied women with good level of perceived self-efficacy of healthy diet is improved to 87.33% in post-intervention compared to 64.67% in pre-intervention, the percentage of studied women with good level of activity related-affect of exercise is improved to 92.83% in post-intervention compared to 58.75% in pre-intervention, the percentage of studied women with good level of activity related-affect of healthy diet was improved to 94.78% in post-intervention compared to 69.11% in pre-intervention, the percentage of studied women with positive

interpersonal influences is significantly increased to 89.7% in post-intervention compared to 51.22% in pre-intervention, and the percentage of studied women with the positive situational influences is significantly increased to 92.06 % in post-intervention compared to 58.7% in pre-intervention.

**Figure (1):** This figure clarifies, the effect of educational intervention based on (PHPM) regarding studied women's knowledge about defining and risk factors of osteoporosis, as well as the concepts of Pender health promotion model. The knowledge about risk factors of osteoporosis considered the most improved item 64.7% among the studied women, followed by 61.85% for total knowledge of osteoporosis, while perceived benefits of healthy diet considered less improved item 21.3% among studied women. The findings in the table 3,4 and figure 1 provide support to second research hypothesis.

**Table (1): Distribution of studied women according to socio-demographic characteristics (n=100).**

Socio-demographic characteristics		No.	%
Age category	<25	35	35.0
	25- <35	30	30.0
	35-40Yrs	35	35.0
Mean age		39± 8	
Level of Education	secondary education	6	6.0
	Institutional education	44	44.0
	University education	50	50.0
Place of residence	Urban	45	45.0
	Rural	55	55.0
Family income	Not enough	47	47.0
	Enough	53	53.0
Workplace	Faculty of Education	22	22.0
	Faculty of Law	23	23.0
	Faculty of Arts	20	20.0
	Faculty of Computer science	15	15.0
	Faculty of Commerce	20	20.0
Mean number of family members		4.6± 1.1	

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**Table (2): Distribution of studied women according to their level of knowledge about defining osteoporosis and its related risk factors in pre and post-intervention (n=100).**

Knowledge aspects	Pre intervention		Post intervention (after 1 month)	
	Poor knowledge %	Good knowledge%	Poor knowledge %	Good knowledge %
Defining disease knowledge (5 items)	63.2	36.8	9.0	91.0
Risk factors knowledge(15 items)	74.2	25.8	9.47	90.53
Total knowledge score (20 items)	71.5	28.5	9.6	90.4

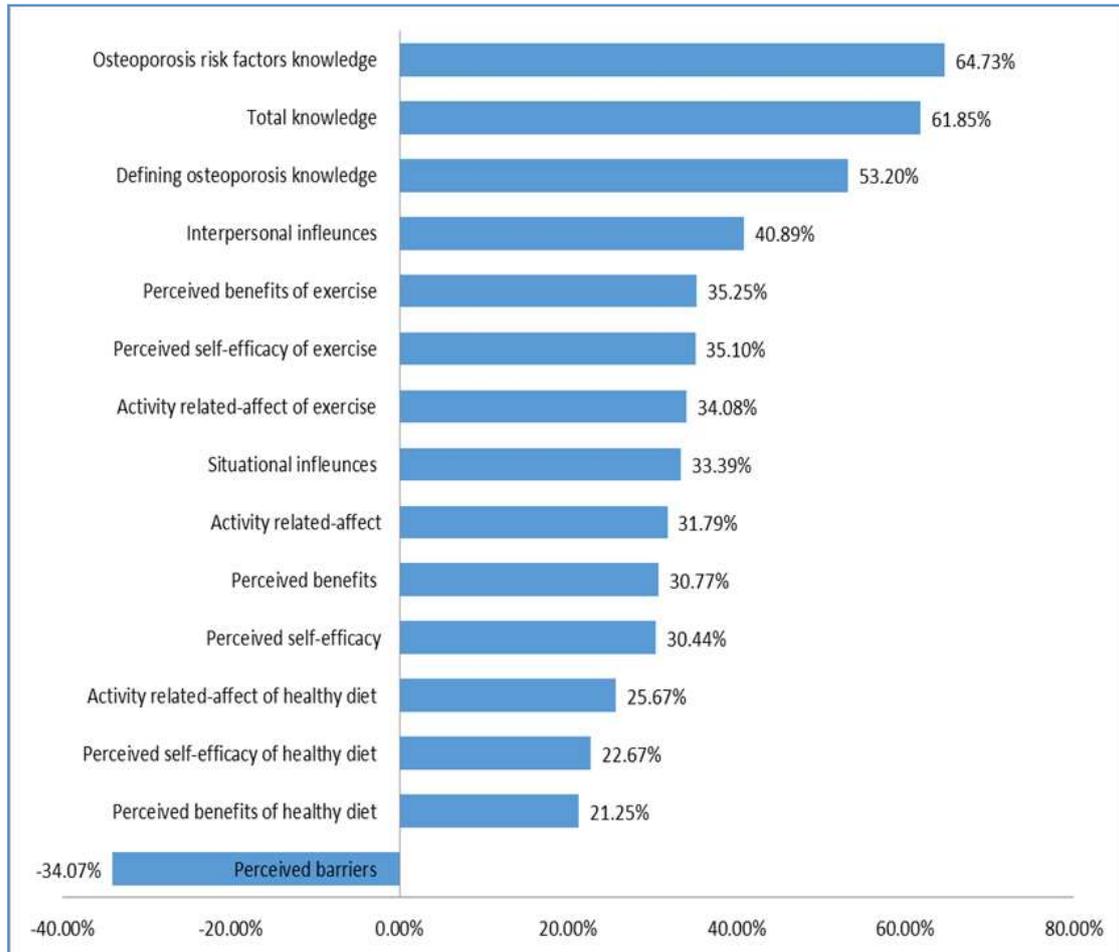
**Table (3): Comparison between mean score of pender health promotion model concepts in pre- post intervention among studied women.**

Pender health promotion model concepts	Mean ± SD		t. test	P- value
	pre	Post		
Perceived benefits of action	46 ±17.2	69 ±13.0	11.1	0.000
Perceived barriers of action	20 ±7.8	11 ±4.7	10.9	0.000
Perceived self-efficacy of action	28 ±11.9	42 ±9.6	10.6	0.000
Activity related-affect	20 ±7.5	31 ±5.7	11.5	0.000
Interpersonal influences of preventive behaviors	9 ±3.2	16 ±3.8	15.9	0.000
Situational influences of preventive behaviors.	11±3.8	17 ±3.4	12.7	0.000
Mean score of PHPM tool	113 ±41.7	175 ±33.8	12.2	0.000

**Table (4): Distribution of studied women regarding their levels of scores of Pender health promotion model concepts about preventive behaviors of osteoporosis in pre and post-intervention (n=100).**

Pender health promotion model concepts		Pre-intervention	Post-intervention	t. test	P- value
Perceived benefits of exercise	Poor perception	43.24%	7.98%	11.4	0.000
	Good perception	56.76%	92.02%		
Perceived benefits of healthy diet	Poor perception	30.5%	9.25%	7.9	0.000
	Good perception	69.5%	90.75%		
Perceived barriers	Poor perception	73.63%	39.56%	10.9	0.000
	Good perception	26.37%	60.44%		
Perceived self-efficacy of exercise	Poor perception	45.9%	10.8%	11.3	0.000
	Good perception	54.1%	89.2%		
Perceived self-efficacy of healthy diet	Poor perception	35.33%	12.67%	7.6	0.000
	Good perception	64.67%	87.33%		
Activity related-affect of exercise	Poor perception	41.25%	7.1%	10.8	0.000
	Good perception	58.75	92.83		
Activity related-affect of healthy diet	Poor perception	30.89%	5.22%	10.7	0.000
	Good perception	69.11%	94.78%		
Interpersonal influences of preventive behaviors	Negative influences	51.22%	10.33%	15.9	0.000
	positive influences	48.78%	89.67%		
Situational influences of preventive behaviors	Negative influences	41.33%	7.94%	12.7	0.000
	positive influences	58.67%	92.06%		

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**Figure (1): Gain percent after educational intervention regarding studied women’s knowledge about osteoporosis and Pender Health Promotion Model concepts.**

**DISCUSSION**

Osteoporosis is a highly common disorder characterized by lower in bone mineral thickness and increased risk of fracture related to osteoporosis (Kwok, 2020). Making decisions and developing strategies for the prevention and treatment of this illness requires awareness of the financial implications of osteoporosis (Kemmak, 2020). Children, teenagers, and even fetuses should emphasis bone health throughout all stages of growth. These phases are particularly crucial for creating behaviours that can help avoid adult osteoporosis and for strengthening bones. Several modifiable factors, including diet and exercise, have an impact on bone health (Redondo-Cuevas, 2018).

Therefore, the present study was conducted to examine the effect of educational intervention based on PHPM on osteoporosis preventive behaviors among employed women. Regarding to studied women’s knowledge about defining osteoporosis and its related risk factors (e.g: osteoporosis is a common disease, lack of physical activity increases the risk of osteoporosis), the existing study clarified that; pre-intervention knowledge was generally low for the majority of the study's women, whereas post-intervention knowledge was generally high.. These results concurred with those of another research conducted by El-sol, (2016). The study reported that, in comparison

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to pre-intervention, the study found that the majority of the study sample had enough knowledge after the intervention.

Moreover, the current findings were in accordance with the findings of a study conducted by Jo, (2018) in Wonk Wang University, to determine the impact of an educational intervention on the knowledge of osteoporosis among Korean women.; The study found that, with a p value of 0.001, there's been statistically significant improvement in the overall mean knowledge scores post-intervention compared to pre-intervention.. These consistencies might be due to similarity between sample characteristics and applying of preventive guidelines of osteoporosis in young age help in improving women's knowledge and awareness about osteoporosis prevention.

The results of this study revealed that the majority of the examined women had poor pre-intervention perceptions of the advantages of exercise, whereas the majority of the studied women had good post-intervention perceptions of the benefits of exercise (e.g., exercise promotes bone strength). These results corroborated those of a research carried out by Abd Elaziz (2021). According to the study, it found a statistically significant increase in people's perceptions of the advantages of exercise after the intervention as opposed to before it.

Furthermore, the concurrent findings were in accord with the findings of Sabuni, (2021) in India. The study clarified that, there had been statistically significant difference in the overall score of perceived benefits of exercise in post-intervention. These consistencies could be due to application of educational intervention of osteoporosis in young age help in

enhancing women's perceptions about benefits of exercise.

On the other hand, the present study finding was contradicted with a study finding conducted by Habibzadeh, (2021). The study clarified no statistical significance difference of the total mean score regarding perceived benefits of exercise as  $p = 0.871$ . From the researchers' point of view, this contradiction might be due to the differences in study sample characteristics (mean age and study subjects' disease).

According to the results of the current study, it showed a considerable improvement mostly in studied women's perceptions of the health benefits of a healthy diet in the post-intervention period (e.g., eating a diet low in fat, especially saturated fats, including processed meats like sausage, lowers the risk of osteoporosis). These results concurred with those of a research carried out by Khalaf (2020). The study pointed out that, as compared to pre-intervention, there had been significant statistical change in the perceived advantages of a healthy diet. These consistencies could be due to application of educational intervention of osteoporosis based on PHPM in young age help in enhancing women's perceptions about benefits of healthy diets.

Concerning to perceived barriers of exercise (e.g. exercise is very tiring), the findings of concurrent study showed that, there had been a significant decrease in the percentage of poor perception to overcome barriers of practicing exercise in pre-intervention compared to post-intervention among studied women. These findings were agreement with the findings of a study conducted by Metwally, (2019) in Egypt. According to the study, a significant difference

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existed between the pre- and post-intervention mean scores for perceived barriers.

Moreover, the recent findings concurred with those of Sabooteh (2021) in Indonesia. The study showed that, with a p value of 0.001, the mean score of perceived barriers considerably decreased post-intervention compared to pre-intervention. These consistencies could be due to application of educational intervention of osteoporosis based on PHPM in young age help in enhancing women's perceptions about measures that help in controlling barriers of practicing exercise.

Regarding to perceived self-efficacy of exercise (e.g. having ability to change exercise habits), The outcomes of the concurrent study revealed an increase in the percentage of the women who felt self-efficacy about exercising post-intervention versus pre-intervention. The perceived self-efficacy of exercising among the study women significantly improved after the intervention. These results corroborated those of a research carried out in Morocco by Rouholamini (2020). The results of the study showed that, while there was a significant difference in the mean self-efficacy score following the intervention, there was no significant difference in the mean self-efficacy score before to the intervention.

These agreements could be due to application of educational intervention of osteoporosis based on PHPM in young age help in enhancing women's self-efficacy to practice exercise.

Regarding to perceived self-efficacy of healthy diet (e.g. having ability to avoid foods that affect calcium absorption, such as chocolate), the concurrent findings showed the percentage of women with good level of perceived self-efficacy of healthy

diet was enhanced at post-intervention compared to pre-intervention. In addition, there was significant improvement in studied women's perceived self-efficacy of healthy diet in post-intervention. These findings were in agreement with the findings of a study conducted by Naserpoor, (2018) in Turkey. The study revealed that, there had been significant improvement into the mean total score of perceived self efficacy of healthy diet at post-intervention compared to pre-intervention.

These agreements could be due to application of educational intervention of osteoporosis based on PHPM in young age help in enhancing women's self-efficacy to eat healthy diet.

Concerning to activity related-affect of exercise (e.g. feeling enjoyed during exercising), our study findings pointed that, the percentage of women with good level of activity related-affect of exercise was improved at post-intervention compared to pre-intervention. In addition, there was significant improvement in studied women's activity related-affect of exercise in post-intervention. These outcomes were agreed with the findings of a Rahimian, (2016) study in Iran. The study clarified that, there had been high statistical difference in mean score of activity related-affect of exercise in post-intervention.

Regarding to activity related-affect of healthy diet (e.g. eating a healthy diet is enjoyable), the our findings showed on post-intervention compared to pre-intervention; the percentage of women with good level of activity related-affect of healthy diet was improved. In addition, there was significant improvement in studied women's activity related- affect of healthy diet in post-intervention. The present findings were congruent with Elseifi, (2020) in Zagazig District, Egypt. Who

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revealed that, the activity related-affect of healthy diet mean score significantly increased in the intervention group correspondent to control group.

These agreements could be due to application of educational intervention of osteoporosis based on PHPM in young age help in improving women's positivity toward eating healthy diet.

Regarding to interpersonal influences of preventive behaviors of osteoporosis (e.g. discussing problems and concerns about osteoporosis with close people.), the findings of this study showed that, the percentage of studied women with positive interpersonal influences was improved at post-intervention compared to pre-intervention. In addition, there was significant improvement in the level of studied women's interpersonal influences of preventive behaviors of osteoporosis in post-intervention. These findings were in agreement with the findings of a study conducted by Habibzadeh, (2021) in Jordan, to assess the effect of educational intervention based on Pender health promotion model on quality of life and health promotion in patients with heart failure; the study revealed that, the mean score of the interpersonal relations increased significantly in the intervention group compared to the control group.

These agreements could be due to application of educational intervention of osteoporosis based on PHPM in young age help in increasing women's ability to overcome inter-personnel influences toward preventive behaviors of osteoporosis.

Regarding to situational influences of preventive behaviors of osteoporosis (e.g. Specify time for walking every day), the findings of this study showed that, the percentage of studied women with positive Situational influences was improved at post-intervention compared to pre-intervention. In

addition, there was significant improvement in the level of studied women's situational influences of preventive behaviors of osteoporosis in post-intervention. These findings were in agreement with the findings of Tavakkoli, (2022) in Iran. The study revealed that, the mean score of the situational influences was improved in post-intervention compared to pre-intervention.

These agreements could be due to application of educational intervention of osteoporosis based on PHPM in young age help in increasing women's ability to overcome situational influences toward preventive behaviors of osteoporosis.

On the other hand, the findings of this study were contradicted with the findings of a study conducted by Mansourizadeh, (2018) in Iran. The study revealed that, there was no statistical increasing in situational influences at post-intervention.

From the researcher point of view, this may be due to that, the culture and protective behaviors e.g. healthy nutrition and physical exercise, seeing that are parts of healthy lifestyles not commonly known. for that reason, other researchers might not suggest these behaviors for community.

Concerning to health promoting behaviors of osteoporosis, the findings of this study showed that, there was significant improvement in the concepts of Pender health promotion model including perceived benefits of exercise and healthy diet, perceived barriers of exercise, perceived self-efficacy of exercise and healthy diet, activity related-affect of exercise and healthy diet, interpersonal and situational influences in post-intervention compared to pre-intervention. Our study findings were consistent with the findings of a study carried by Maksoud, (2019) in

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maternal and child health centers of Tanta, Egypt. the study concluded that, there had been significant improvement into mean total score of healthy promoting behaviors on post-intervention than on pre-intervention. As well, the findings of concurrent study were accord with the findings of a study delivered by Bayome, (2019) in women's health center at Nasser institute hospital, Egypt. The study illustrated; there had been significant improvement of healthy promoting behaviors total mean score on post-intervention than on pre-intervention. These agreements could be due to application of educational intervention of osteoporosis based on PHPM in young age help in improving health promoting behaviors of osteoporosis.

**Conclusion**

The adoption of an educational intervention based on the Pender health promotion model has beneficial effects on raising women's awareness on the definition of osteoporosis and the risk factors associated with it. Additionally, the application of Pender health promotion model concepts such as overcoming interpersonal and situational influences toward osteoporosis prevention behaviors, perceived benefits of exercise and healthy eating, perceived barriers to exercise, perceived self-efficacy of exercise and healthy eating, activity related-effect of exercise and healthy eating, and perceived self-efficacy of exercise and healthy diet has a significant impact on improving the perceptions of studied women about osteoporosis prevention behaviors.

**Recommendations**

**For education:**

Incorporating of models in curriculum of under graduate nursing students may be beneficial in building their knowledge, attitude and skills.

**For practice:**

Health education based on Pender health promotion model should be provided to encourage osteoporosis preventive behaviors.

Pender health promotion model educational intervention can result in better clients' outcomes.

**For further research:**

Using Pender health promotion model as a base for nursing research can be good guide in research process.

Re-applicability of the study at different settings including women across their life span.

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