

The Effect of Application of Health Belief Model on Osteoporosis' Knowledge and Preventive Behaviors among Child Bearing Women

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Abstract Background: Osteoporosis is one of the most common metabolic bone diseases and is the silent epidemic of this age group. **Aim** of this study was to evaluate the effect of application of health belief model on Osteoporosis' knowledge and preventive behaviors among Child Bearing Women. **Design:** A quasi-experimental design was utilized. **Sample:** A purposive sample of ninety (90) women who attended the maternal and child health centers for antenatal follow up or for other maternal and child health services. **Setting:** This study was carried out at 5 maternal and child health care centers that are chosen randomly for application of osteoporosis prevention program from 50 maternal and child health care centers at El-Qualibia Governorate. **Tools:** Data were collected through: A self-administered questionnaire to assess women characteristics and knowledge regarding osteoporosis prevention, health belief model to assess perceived susceptibility, perceived severity, perceived barriers, perceived benefits and cues to action to practice osteoporosis preventive behaviors. **Results:** There were highly statistically significant differences after implementing osteoporosis prevention program based on health belief model regarding osteoporosis' knowledge and preventive behaviors among child bearing women. The mean scores of perceived susceptibility and severity of osteoporosis, as well as perceived benefits of early detection and cues to action to practice osteoporosis prevention behaviors were significantly higher. There were positive highly statistically significant correlations between total knowledge and total health beliefs scores of the studied women before and after program implementation. **Conclusion:** The implementing osteoporosis prevention based on health belief model enhances women knowledge; change positively health beliefs and cues to action regarding practice of osteoporosis preventive behaviors. **Recommendation:** Dissemination of implementing osteoporosis prevention based on health belief model among women at different age group to prevent the risk of osteoporosis.

Keywords: osteoporosis preventive behaviors, health belief model, child bearing women

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1. Introduction

Osteoporosis is a very important health condition that affects millions of people all over the world. As the world's population senility is ageing rapidly increasing, osteoporosis is predicted to become a serious public health condition from a medical, economic, and social aspects. Principally, osteoporosis is a systemic skeletal disease recognized by low density of bone and micro-architectural impairment of bone tissue, with a resultant rise in bone fragility as well as liability to fracture. [1] Till recent time, osteoporosis was an under estimated disease and considered an unavoidable senility condition. However, understandings have altered, as epidemiological studies

have shown the great load of the disease and its expenses on both community and the health care systems [2].

There is a significant difference in the prevalence of osteoporosis among different countries. The International Osteoporosis Foundation (IOF) estimates that 200 million women suffer from osteoporosis around the world, affecting more than 75 million people in Europe, Japan, Australia and North America [3]. In the general population, the levels of osteoporosis and osteopenia in the Iran were 22.2% men and 59.9% women, the level of osteoporosis is less than that in Pakistan with 55%, Turkey 33.3%, 53.9% Egypt, Bahrain 27.1%, Kenya 24.5%, Saudi Arabia 23%–24% and also less than United Arab Emirates 2.5% osteoporosis [4,5,6]

From the Literature point of view, Osteoporosis means "bones that have pores". As a person comes to his late 20th

years of age, the bone density reaches its peaks and at from the age of 35 years, bone starts to become weaker. With age, the rate of bone break down is more than that of building but if this takes place in an inordinate manner, osteoporosis develops. Osteoporosis is more or less a mute disease; most of cases are not detected and managed till they are presented with fractures. Sometimes, early warning symptoms and or signs of osteoporosis in the form of back pain, Loss of height over time or stooped posture area may be presented prior to real fractures [7] and [8]

Misunderstandings about osteoporosis and the deficient preventive precautions among women are still common, emphasizing the need for essential prevention at an early age. The method of planning a dynamic osteoporosis protective program needs enough information about women's osteoporosis health beliefs. [9]

Osteoporosis is a multi-factorial health problem including many risk agents. Some of them are not adjustable, such as gender, age, heredity, and race, while others are considered adjustable such as knowledge and health beliefs offer a good chance for women to share attitudes that postpone the onset or advancement of the disease [10,11].

In spite of awesome statistics, precocious interference and life style alternations can inhibit disease advancement, evidence suggests some lifestyle alternations can prohibit or postpone occurrence of osteoporosis. (OP) is affected by such factors such as genetic effect, age, size (height or weight) body mass index certain environmental conditions and lifestyle such as physical practices, smoking and alcohol intake are well-known reasons of osteoporosis. Some other risk factors for osteoporosis involve inactive lifestyle and low calcium and vitamin D in diet. [12]

Primary prevention was encouraged by educating young women to adopt simple but effective preventive behaviors. These preventive behaviors included adequate calcium intake, regular weight-bearing exercise, and getting proper sunlight for vitamin D production in the skin. According to existing evidence, calcium consumption, physical activity, and vitamin D obtained through food or synthesis in the skin after UV exposure all have positive impacts on bone density. One of the most important, raise factors for preventing this disease is to raise knowledge regarding osteoporosis [13,14,15].

Health belief model is mainly used for the prevention of diseases. Health belief model (HBM) tries to explain why some people adopt disease preventive behaviors while others do not. A Health Belief Model (HBM) has been used extensively to assess health-related beliefs regarding protective behaviors. It is a cognitive model attempting to identify the patterns of health behaviors. Females vary in strength of desire to do disease prevention and perception of costs and benefits from disease. [16]

Health Belief Model composed of four main constructs. First, perceived susceptibility to realize and believe that they are exposed to the risk. Second, perceived severity: to understand and belief that the disease is serious public health problem, and it can lead to serious complications. Third, perceived barriers: to identify physical, psychological or financial, barriers that can

hinder healthy behaviors so that the person can overcome it to assume healthy behavior. Fourth, perceived benefits: it refers to the insight of the constructive consequences that are caused by a specific act. In addition, the model suggested that cues to action can act as behavior stimuli. [17]

Programs based on HBM are effective and inexpensive method for enhancing the knowledge and practices that required for establishing behavioral changes such as increasing calcium intake and physical activities for prevention of osteoporosis. It is based on the idea that individuals are willing to maintain wellbeing through following health-related action to avoid an undesirable health condition. This model emphasize that to design and prepare a successful educational intervention, the females have to understand the perceived susceptibility and seriousness (to osteoporosis); severity of the disease and its consequences; perceived benefits to reduce the risk by performing specific actions; perceived barriers (e.g., advised action expenses) and action cues (approaches for initiating the "willingness" to attempt the health activities and actions) are required. [18]

Nursing is an essential part of the health care scheme and nurse's straight drives towards the advancement, preservation & resumption of health. Nurses' play a memorized job in alternating females' believes and attitudes and providing health education about avoidable. health problems. A leading point in disease prevention is to alter thinking, lifestyle, and daily behaviors in such a manner that they evolve the goodness of life and adequacy of persons. Thus, teaching protective behaviors such as physical activity and correct nutrition as a simple and efficient method can help us prevent the disease, promote and maintain our health. One of the most important World Health Organization (WHO) goals is to increase the number of women trained in the area of osteoporosis. Therefore, regular health education based on HBM in order to prevent its related problems can be recommended as an essential approach or strategy in this field [22].

1.1. Significance of the Study

Pregnancy and lactation is a special period in child bearing woman's life when calcium demands are increased to accommodate the requirement of the growing fetus and the losses that occur in breast milk during lactation that predispose the child bearing woman to osteoporosis more than other age groups [19].

The Osteoporosis health belief scale (OHBS) is one of the wide extensively applied conditions for trying to understand and scale health beliefs concerning osteoporosis. It involves items managing riskiness, probability, and health stimulus related to osteoporosis. It is instituted on the proof that women are most likely to make health related motions (e.g., be energetic, consume healthy food), if they recognize that by performing this action they can evade a passive health situation [20,21].

Due to the cost-effectiveness of teaching and protection compared to clinical interference, it is important to start and extend teaching plans for this age group. Maximizing bone mass together with lifestyle agents such as calcium intake and physical vitality are considered as modifiable factors in the prevention of osteoporosis.

1.2. Aim of the Study

This study undertaken to evaluate the effect of application of health belief model among child bearing women knowledge and health behaviors regarding osteoporosis prevention through:

- Assessing child bearing women knowledge, health beliefs regarding osteoporosis prevention.
- Designing and implementing osteoporosis prevention based on health belief model according to child bearing women needs.
- Evaluating the outcomes of application of health belief model

1.3. Research Hypothesis

The researchers hypothesized that

- Knowledge and preventive behavior of the studied women regarding osteoporosis will be improved after implementation of the program based on health belief model.

2. Subjects and Methods

2.1. Research Design

A quasi-experimental research design has been utilized in this study.

2.2. Setting

This study was conducted at five maternal and child health care centers (Benha, Kafr Shoukr, Kaha, Touch and Kalyub) which represent 10% of 50 maternal and child health (MCH) centers at Qualiobia Governorate which were chosen randomly for application of osteoporosis prevention program.

2.3. Sample Type and Criteria

A purposive sample of ninety (90) women who attended the previously mentioned maternal and child health centers for antenatal follow up or for other maternal and child health services. Women for this study was childbearing had one child or more, can read and write and accepted to participate in the study.

2.4. Tools of Data Collection

The following tools were used to collect data related to this study; Include the following: **Self-Administered Structured Questionnaire:** It was written in a simple Arabic language and comprises 4 parts as follows.

The first part: was concerned with demographic characteristics of studied women such as age, education, work and marital status, number of children, passive or active smoking. **The second part:** was concerned with presence or absence of family history of osteoporosis, weight losing and previous measures. **The third part:** It was developed by the researchers based on the related literature and validated by a group of five experts in community health nursing departments at Faculty of

Nursing, Ain Shams University and Benha University. It was used to assess woman's knowledge regarding osteoporosis included eight items related to definition, factors, symptoms, complications, diagnosis ,management, prevention of osteoporosis.

2.4.1. Scoring System of Knowledge

A correct answer was scored "two", incomplete answer was scored "one" and the unknown or incorrect answer scored "zero". The total knowledge score was calculated by adding the scores for the correct answers. The total possible score ranged from 0 to 16 point. The higher scores reflect higher levels of knowledge about osteoporosis prevention.

The fourth part: The Health Belief Model modified and translated into Arabic language by the researchers. The HBM sub constructs which used in this study were perceived susceptibility (four items), perceived severity to osteoporosis (five items), perceived barriers of modifying life style and habits (four items), and perceived benefits of protection from osteoporosis and its consequences (five items). cues to action to assess intention to practice osteoporosis preventive behaviors (pre/posttest format) which encompassing (six) questions about nutrition modification, vit D,calcium, sun exposure and the second, specific examination of Dexa test for early detection of the disease.

2.4.2. Scoring System of Health Belief Model

The questionnaire included 24 items on a 5-point Likert scale ranging from 1 (strongly disagree) to 5 (strongly agree). Subscale mean scores were obtained by summing and averaging the items (range 1-5). Each subscale was calculated separately, and therefore four different scores were obtained for each subject. The possible total score range was (24-120), and a higher score indicated a more positive belief toward osteoporosis preventive behaviors.

2.4.3. Tools Validity and Reliability

The tools and the package were reviewed for comprehensiveness, appropriateness, and legibility by an expert panel consisting of five community health nursing experts. The panel ascertained the face and content validity of the tools. The reliability was done by Cronbach's Alpha coefficient test which revealed that each of the three tools consisted of relatively homogenous items as indicated by the moderate to high reliability of each tool. The internal consistency of knowledge was 0.91; the total 24-items HBM was 0.81, with breakdowns by category: 0.72 (perceived susceptibility to the disease), 0.83(perceived severity of the disease), 0.86 (perceived benefits of prevention of osteoporosis), 0.78 (perceived barriers of performing DEXA test), and cues to action about osteoporosis health behaviors was 0.79.

2.5. Ethical Considerations

Each woman was informed about the purpose and benefits of the study then oral consent was obtained before starting the data collection. Strict confidentiality was ensured throughout the study process. The women were assured that all data was used only for research purpose and each woman was informed of the rights to refuse or

withdraw at any time with no consequences. After the study was completed, the education program was distributed.

2.6. Program Construction

2.6.1. Assessment Phase

Upon securing official permissions to conduct the study, the researchers approached and interviewed each woman individually, explained the purpose and procedures of the study, and asked for her participation. Upon consent to participate, the women was handed the self-administered questionnaire to assess women general characteristics and knowledge regarding osteoporosis prevention, health belief model, and questionnaire to assess intention to practice osteoporosis prevention behaviors and asked to fill it. The data obtained during this phase constituted the baseline for further comparisons to evaluate the effect health education. Average time for the completion of each woman interview was around (30-45 minutes). A number of interviewed women / week ranged from 6-8 women.

2.6.2. Planning and Implementation Phase

Based on the needs identified in the assessment phase, and in view of the related literature, the researchers developed education program about osteoporosis prevention based on HBM constructs with simple Arabic language to suit child bearing women level of understanding, which aimed to improve child bearing women knowledge, modify their health beliefs, and empower them to take health decisions for osteoporosis preventive behaviors. It emphasized the areas of major deficiency in child bearing women knowledge about osteoporosis prevention, health beliefs and intention to practice osteoporosis prevention behaviors such as meaning of osteoporosis, causes, risk factors, signs and symptoms, diagnosis, methods of treatment and prevention, osteoporosis screening, time, purposes, benefits and Dexa test measurement (benefits, safety, and availability). Education program distributed to each child bearing woman.

2.6.3. Evaluation Phase

The effect of the self-learning package based on health belief model was evaluated by using the same format of pre-test to constitute the post-test.

2.6.4. Statistical Analysis

Data were verified prior to computerized entry. The Statistical Package for Social Sciences (SPSS version 20.0) was used for that purpose, followed by data analysis and tabulation. Descriptive statistics were applied (e.g., mean, standard deviation, frequency and percentages). Test of significance (independent t test) were used to test the homogeneity of the outcome variables to test the study hypothesis. Pearson correlation coefficients were used. A statistically significant difference was considered at p-value ≤ 0.05 , and a highly statistically significant difference was considered at p-value ≤ 0.001 .

3. Results

Table 1: Shows socio demographic characteristics of the studied sample. It was clear that less than two thirds

(72.2%) were in age group $30 \geq 40$ years with a mean age of 43.63 ± 7.73 years. Regarding Residence about half of them 51.1% live in urban area, about three quarters 74.4% were married and working women. In addition, more than three quarters 76.7% have one to three numbers of children. As far as educational qualification, less than half of them had university education 44.4%.

Table 1. Distribution of personnel characteristics of the studied women (n=90)

Personnel characteristics	Frequency	%
Age in years		
30-40	65	72.2
41-50	17	18.9
51-60	8	8.9
Mean \pm SD	43.63 \pm 7.73	
Residence		
Rural	44	48.9
Urban	46	51.1
Work status		
Work	67	74.4
Not Work	23	25.6
Marital status		
Married	67	74.4
Widow	8	8.9
Divorced	15	16.7
Number of children		
No	3	3.3
1-3	69	76.7
4-6	15	16.7
≥ 7	3	3.3
Educational qualification		
High education	40	44.4
Basic education	20	22.2
Secondary education	30	33.4

Table 2: Illustrates that, more than half (53.3%) of studied women had family history of osteoporosis. Concerning family member affected with osteoporosis were mother, sister, aunt, grandmother. Regarding previous weight loss about two thirds 63.3% not exposed to weight loss, moreover, more than half (53.3%) of studied women making measures of bone tendency.

Table 2. Distribution of osteoporosis history among the studied women (n=90).

Variable	Frequency	%
Family history of osteoporosis		
Yes	48	53.3
No	42	46.7
Family member affected with osteoporosis		
No	42	46.7
First degree relation	28	31.1
Second degree relation	20	22.2
Previous weight loss		
Yes	33	36.7
No	57	63.3
Measures of bone tendency		
Yes	48	53.3
No	42	46.7

Table 3: Illustrates that, there were a positive highly statistically significant correlation between Pre-program and Post-program regarding total knowledge score of osteoporosis $-20.230 < 0.001^{**}$ with mean 10.6111 ± 4.11272 and 20.8000 ± 2.66142 respectively among studied women.

Figure 1: Illustrates that the majority (85.6%) have poor level of total knowledge score pre-program meanwhile more than half (56.7%) have good level of total knowledge score post-program of osteoporosis among studied women.

Figure 2: Shows that about one third of women attaining knowledge from nurses, friends and family (33.3% and 35.6%) mean while only 17.8 % from physician.

Table 4: Clarifies that, the mean scores of all health belief sub constructs before and after program

implementation. The mean scores of perceived susceptibility, perceived severity, and perceived benefits of osteoporosis prevention were significantly higher after program.

Figure 3: Illustrates that about two fifth (41.1%) of women have positive health belief model score before program implementation, however, after program implementation more than two thirds (71.1%).

Table 5: Clarifies that, there was a positive highly statistically significant correlation between total knowledge and total health beliefs scores of the studied women before and after program implementation.

Table 6: Reveals that, there was a positive highly statistically significant correlation between total health believe score and personnel characteristics of the studied women before and after program implementation.

Table 3. Distribution of the studied subjects according to their knowledge toward osteoporosis pre and post program (n = 90).

Knowledge	Pre-program	Post-program	Paired t test	P value
	Mean \pm SD	Mean \pm SD		
Definition of osteoporosis	1.2000 \pm .72204	1.6000 \pm .64998	-3.869	<0.001**
Risk factors of osteoporosis	1.3556 \pm 1.19278	4.1111 \pm .97663	-16.382	<0.001**
Symptoms of osteoporosis	1.6444 \pm .98655	3.2111 \pm .94208	-10.688	<0.001**
Complication of osteoporosis	1.1222 \pm .80487	1.7222 \pm .49781	-6.437	<0.001**
Investigations of osteoporosis	1.6444 \pm .98655	3.2111 \pm .94208	-10.688	<0.001**
Treatment of osteoporosis	.8222 \pm .94307	2.4667 \pm .76731	-14.121	<0.001**
Preventive measures of osteoporosis	2.8222 \pm 1.10746	4.4778 \pm .86411	-11.927	<0.001**
Total knowledge score	10.6111 \pm 4.11272	20.8000 \pm 2.66142	-20.230	<0.001**

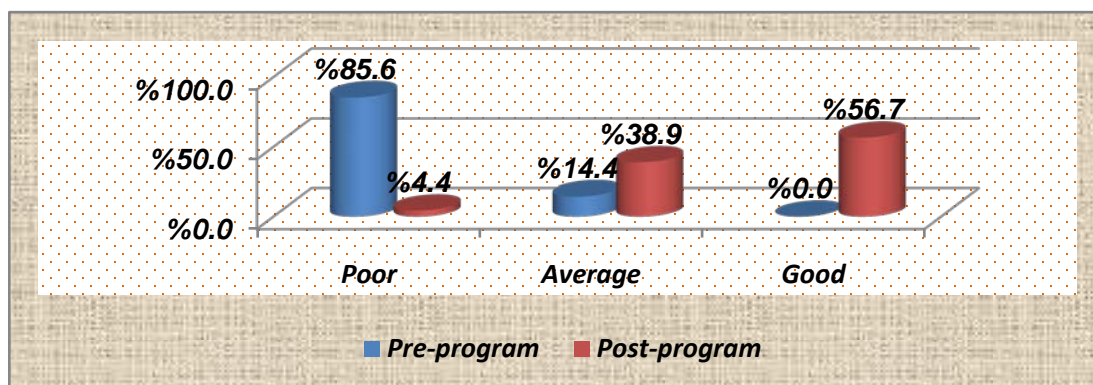


Figure 1. Percentage distribution of total knowledge score among the studied women pre and post program (n = 90).

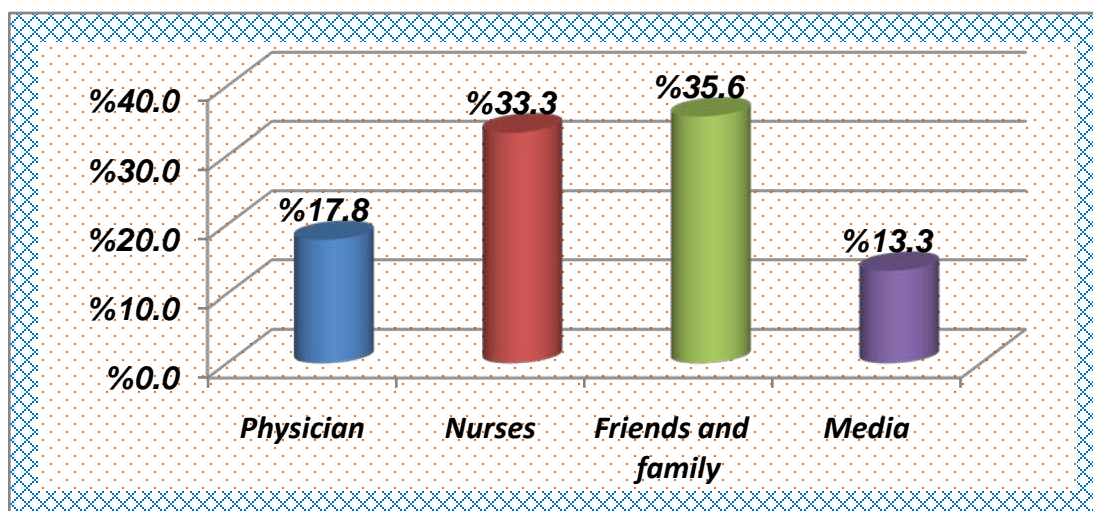


Figure 2. Percentage distribution of knowledge sources among the studied women pre and post program (n = 90).

Table 4. Mean scores of constructs of health belief model among the studied women pre and post program (n = 90).

health believe model	Pre-program	Post-program	Paired t test	P value
	Mean ±SD	Mean ±SD		
Perceived susceptibility				
Aging increases my likelihood of osteoporosis	3.1889±1.02655	4.6000±.49264	16.06	<0.001**
Family history of osteoporosis makes me susceptible to this disease	3.8333±.86440	4.7333±.44469	10.56	<0.001**
I am not prone to osteoporosis	1.3556±.48136	3.1444±.69607	19.002	<0.001**
My habits and lifestyle protect me from osteoporosis	1.4889±.56577	2.2222±.98046	7.178	<0.001**
Total score = 20	9.6111±2.09169	14.5667±1.89648	-25.874	<0.001**
Perceived severity				
Osteoporosis can lead to a broken spine	3.5111±.91485	4.6444±.48136	-15.577	<0.001**
Osteoarthritis is simple and does not cause serious complications	1.3333±.47405	2.2222±.98046	8.000	<0.001**
Osteoporosis may lead to a fracture of the hip bone	3.6333±.96512	4.5333±.60336	-12.414	<0.001**
Osteoporosis may lead to a decrease in length	3.5111±.91485	4.5333±.60336	-17.958	<0.001**
Osteoporosis may lead to inability to move	3.5111±.91485	4.6444±.48136	-15.577	<0.001**
Total score = 25	15.5000±3.59228	20.5556±2.31803	-20.467	<0.001**
Perceived barriers				
Preventing osteoporosis is difficult	2.2889±.99712	4.5444±.50081	-20.919	<0.001**
I don't have the physical means to prevent osteoporosis	2.0000±.00000	4.5444±.50081	-48.199	<0.001**
I can change my unhealthy habits easily	3.0889±.69742	4.6444±.48136	-21.952	<0.001**
I can save time and money for bone care	3.5333±.92651	4.2667±.68368	-7.178	<0.001**
Total score = 20	10.9111±1.92351	18.0000±1.98873	-31.515	<0.001**
Perceived benefits				
Prevention of osteoporosis protects me from serious complications	3.5889±.88552	4.6778±.46995	-14.812	<0.001**
Whatever it takes, I must prevent osteoporosis	3.7444±.85540	4.6778±.46995	-12.951	<0.001**
Easier to wait if osteoporosis and try to treat it	2.0000±.00000	4.6778±.46995	-54.057	<0.001**
Complications from osteoporosis require me to make a double effort to prevent them	3.7444±.85540	4.6778±.46995	-12.951	<0.001**
The physical and health cost of preventing osteoporosis is lower than the cost of treating it	3.6778±.76184	4.7333±.44469	-15.590	<0.001**
Total score = 25	16.7556±3.25787	23.4444±2.27893	-24.959	<0.001**
Cues to action				
I will eat a balanced and healthy diet to avoid osteoporosis	3.7444±.85540	4.7333±.44469	-12.911	<0.001**
I will take calcium and vitamin D when I do not eat a healthy meal to avoid osteoporosis	3.6111±.89561	3.7556±.95177	2.181	<0.05*
I will always follow medical orders because I believe it will improve my health and prevent osteoporosis	3.8333±.86440	4.7333±.44469	-10.567	<0.001**
I will constantly look for new information related to my health to prevent osteoporosis	3.8667±.83733	4.7333±.44469	-10.715	<0.001**
I will have a regular medical examination every year to avoid osteoporosis	3.4556±.97337	4.7333±.44469	-15.009	<0.001**
V p=I will exercise regularly at least 3 times a week to prevent osteoporosis	3.4111±1.01555	4.7333±.44469	-14.387	<0.001**
Total score = 30	22.0667±4.93281	27.2778±2.87972	-13.868	<0.001**
Total score = 120	74.8444±14.63558	103.8444±10.11497	-28.448	<0.001**

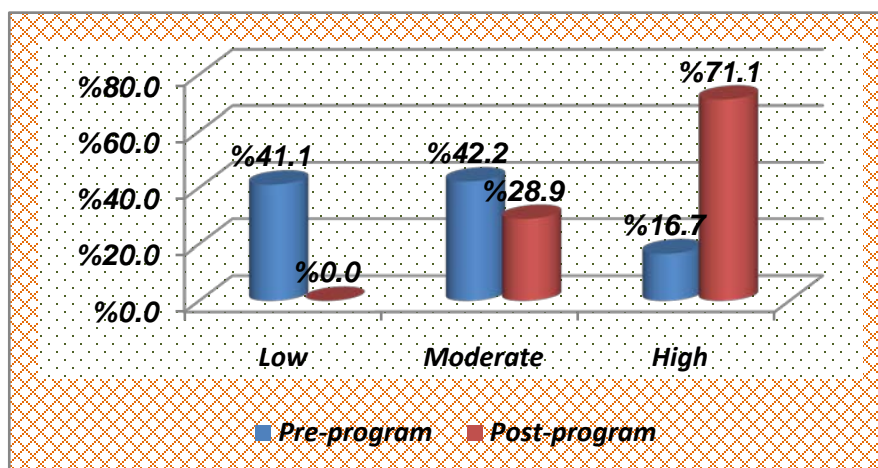


Figure 3. Percentage distribution of total health belief model score among studied women pre and post program (n = 90).

Table 5. Correlation coefficient between study subjects' subtotal score of health belief model construct and total knowledge pre and post program (n = 90).

Knowledge score	Health belief model	
	r	P value
Pre-program	0.156	>0.05
Post-program	0.465	<0.001**

**Correlation is highly statistically significant at P ≤ .001.

Table 6. Relation between total health belief model constructs and personnel characteristics of study subjects pre and post program (n = 90).

Personnel characteristics	Total health believe score					
	Pre-program			Post-program		
	Mean ±SD	Statistical test	P value	Mean ±SD	Statistical test	P value
Age in years						
30-40	76.5385±13.19810	4.54 (f test)	<0.05*	104.9846±9.7716	1.47 (f test)	<0.001**
41-50	65.8235±16.93456			99.8824±10.1173		
51-60	80.2500±14.75272			103.0000±11.952		
Work status						
Work	75.7164±14.35988	0.930 (independent t test)	>0.05	104.7761±9.7044	1.50 (independent t test)	>0.05
Not Work	72.3043±15.45502			101.1304±11.001		
Residence						
Rural	73.1591±12.31740	1.07 (independent t test)	>0.05	102.6818±10.469	1.06 (independent t test)	>0.05
Urban	76.4565±16.52971			104.9565±9.7478		
Marital status						
Married	76.1194±14.62824	3.72 (f test)	<0.05*	104.1791±9.8225	2.98 (f test)	<0.05*
Widow	80.5000±6.07101			109.5000±8.5523		
Divorced	66.1333±15.07063			96.3333±10.8803		
Number of children						
No	69.6667±10.01665	2.01 (f test)	>0.05	99.6667±9.29157	1.75 (f test)	>0.05
1-3	76.8696±14.19602			105.1739±9.4603		
4-6	67.3333±16.29928			99.6000±12.0641		
≥7	71.0000±9.64365			98.6667±11.9303		
Educational qualification						
Higher education	78.7250±12.78017	2.75	>0.05	106.4000±8.7495	2.99	<0.05*
Basic education	70.5000±17.83403			103.5000±9.8274		
Secondary education	72.5667±13.79076			99.6667±11.323		

**Correlation is highly statistically significant at P ≤ .001.

4. Discussion

This study showed that a key prevention method for osteoporosis is that of community-based intervention strategies using behavior change models such as the HBM. Curative and preventive schedules for osteoporosis by health education and promotion programs are effective and cheap ways of increasing knowledge and skills needed to establish behavioral changes like increasing calcium intake and physical activity, two of the known variable factors preventing osteoporosis regular weight-bearing exercise, and getting proper sunlight for vitamin D production in the skin Babatunde [23].

Regarding socio-demographic characteristics the results showed that, less than two thirds (72.2%) were in age group 30 ≥40 years with a mean age of 43.63±7.73 years this result is in agreement with Mersal et al., [24] who studied Effect of Mobile Based Educational Technology on Prevention of Osteoporosis among Child bearing Women at Eldemerdash Hospital found that the mean age of the studied 36.58±6.76. Regarding Residence about half of them 51.1% live in urban area, about three quarters 74.4% were married and working women. In addition, more than three quarters 76.7% have one to three numbers

of children. As far as educational qualification, less than half of them had university education 44.4%, Also this result in same line with Mersal et al, [24] highlighted that nearly half of women had secondary education, also nearly three quarters had work, and the majority of women were married and had one to three children.

On investigating knowledge of the studied samples regarding osteoporosis prevention, the results of this study indicated that, there were a positive highly statistically significant correlation between Pre-program and Post-program regarding total knowledge score of osteoporosis -20.230 <0.001** with mean 10.6111±4.11272 and 20.8000±2.66142 respectively among studied women. This may be attributed to the fact that changing the knowledge is the milestone for knowledge change. These findings are in same line with Mousaviasl, et al., [25] who studied The Effect of Education Based on the Health Belief Model on osteoporosis prevention behaviors in female high school students and El-Tawab et al., [12] who studied Knowledge of osteoporosis among women in Alexandria (Egypt): A community based survey, The Egyptian Rheumatologist revealed that an educational program based on the health belief model is effective in promoting osteoporosis prevention behaviors in female

adolescents. The results showed that the knowledge of female adolescents in the experimental group increased significantly after the intervention, and this is consistent also, the results of studies by Babatunde et al. [26] studied. A meta-analysis of brief high-impact exercises for enhancing bone health in premenopausal women. Osteoporosis International, Hosking et al. [27] who studied. Knowledge change regarding osteoporosis prevention: translating recommended guidelines into user-friendly messages within a community forum and Al Seraty and Ali [13] who studied the impacts of health belief model based intervention for osteoporosis prevention among female students. Also, this finding inconsistent with Jeihooni. et al [17] who studied The Effect of a Prevention Program Based On Health Belief Model on Osteoporosis clarified that, there were significant differences between mean scores of knowledge before, immediately after and six months post-intervention in the experimental group. The knowledge scores in this group increased significantly after the intervention. Lakeh et al, [6] also reported that the knowledge about osteoporosis among female health volunteers in the health care centers in Rasht were the most effective factor in the preventive behaviors of osteoporosis.

Also, this result in same line with Mersal et al., [24] who found that knowledge of osteoporosis showed that both groups had unsatisfactory knowledge pre intervention. Also it showed that there was a highly significant difference ($P > 0.000$) throughout the intervention program (pre, post and in the follow up) among women of study group comparing to women of control group regarding knowledge about osteoporosis; definition, Causes and risk factors, symptoms, Diagnosis, Preventive measures, Calcium sources and Vitamin D sources. Contrary to results done by Kalkim and Daghan [28] who studied theory-based osteoporosis prevention education and counseling program for women: a randomized controlled trial, there were no difference in sensitivity perception.

Regarding sources of knowledge about osteoporosis, our study found that the main source of knowledge from nurses, friends and family. This reflects the role of them as the source of information as they have an influential role and support for eating and walking behaviors and for providing resource and guidance women need to assess bone density. This is consistent with results of Khorsandi et al. [29] and [30] Azar et al. *The first*, study the effect of an educational program based on health belief model on preventing osteoporosis in women. *The second*, study the effect of education based on Health Belief Model about prevention from osteoporosis among pregnant mother. *The third*, study the effect of health belief model on promoting preventive behaviors of osteoporosis among rural women of Malayer. All of these studies found the same results of our study.

Concerning the overall health belief model constructs, the findings of the current study illustrated that, the mean scores of perceived susceptibility, perceived severity, and perceived benefits of osteoporosis prevention were significantly higher after program this result suggested that educational intervention increased perceptive susceptibility in women. Thus it is prudent to provide the necessary education about osteoporosis to young women. The Health belief Model (HBM) scale revealed

that perception of the seriousness of osteoporosis and susceptibility high before women engage in osteoporosis preventive behaviors. On the other hand, perceived benefits refer to the positive outcomes that women expect when engaging in a health-promoting behaviors. The increase in the perceived benefits can be the result of an emphasis in the training on walking and diet, physical and psychological benefits of walking and the role of nutrition in preventing osteoporosis. Moreover, perceived barriers refer to the negative aspects of participating in a health-promoting behavior. The perceived barriers will be the time and money spent on a bone density scan. Furthermore, self-efficacy in osteoporosis prevention as a belief in the ability to perform weight-bearing exercise and take dietary calcium to prevent osteoporosis.

Based on the results done by Lakeh et al., [6] who were studied health belief model in female health volunteers of health care centers in Rasht showed that, when people feel they are at risk of a disease, do better the preventive behaviors. Thus, it can be expected that whenever physical activity of people is high, they feel less at risk for the disease. It is logical that the higher the self-efficacy of the individual, the more confident they can resist the stimuli, and thus they can be successful in performing physical activity, its continuation and promotion.

These are supported by Jeihooni et al., [17] who found that the program could significantly affect the subjects' beliefs regarding osteoporosis in all domains of the HBM. Consequently, the participants' mean scores of perceived susceptibility, severity of the problem, benefits of the preventive behaviors and self-efficacy in osteoporosis prevention significantly increased. These findings showed that the intervention had positive effects on the subjects' beliefs about the importance of change behavior regarding osteoporosis prevention. Moreover, the intervention could significantly reduce the subjects' mean score in the domain of perceived barriers. This finding showed that the intervention induced this belief in the participants that it is possible to change behavior regarding osteoporosis prevention and adopt proper diet and exercise programs.

Thus it is prudent to provide the necessary education about osteoporosis to young women. Several previous studies confirmed that implementing training programs could significantly affect people's beliefs regarding osteoporosis and its prevention. Hazavehei and Taghdisi [31] However, Sanaeinasab et al. [32] and Malak and Toama [33] reported that the perceived severity of the osteoporosis did not significantly improve after osteoporosis prevention education. Moreover, reported that exercise did not significantly affect the levels of self-efficacy regarding osteoporosis prevention in older women. However, the current study results along with the majority of previous studies signifies the urgent need to implement community based interventions to educate people on the dangers of osteoporosis in their lives and especially in adulthood.

Also this result in same line with Sanaeinasab et al., [32] stated that the significant increase in students' knowledge after the intervention was similar to that found in the results of studies conducted by Nejati et al. [34] among high school students in central Tehran. Before the intervention, perceived susceptibility scores of the participants was moderate.

In this study, as regard perceived severity the mean scores before and after program implementation intervention of osteoporosis prevention were significantly higher after program than not cross ponding to the study done by Sanaeinasab et al. [32] who found that the perceived severity level was moderate before the intervention in more than half of the teenage girls and did not statistically change as shown after it. Therefore, it seems we need stronger interventions such as educational films about the side-effects of osteoporosis

Also this result in same line with Kalkım and Daghan, [28] stated that osteoporosis appears in people at an advanced age, that it causes changes in the life of individuals, but that the perception of seriousness in young women is low in an expected finding and saw that after the education program the perception of seriousness of the women in the intervention group increased with time, also thought that telephone counseling, the use of an exercise CD or the use of magnet boards as part of an education and counseling program could be effective in raising perceptions.

The findings done by Ghaffari et al., [11] showed that perceived susceptibility, severity, barriers, and benefits about osteoporosis of participants were significantly increased after intervention in the experimental group.

It was found that, there was a positive highly statistically significant correlation between total knowledge and total health beliefs scores of the studied women before and after program implementation. These findings are in congruence with at least three other studies, Rahimi et al., [35]. Abd El Aziz et al., [36], Mahmoud et al., [37] *The first*, showed a significant correlation between knowledge and all HBM construct with health behavior. *The Second*, found a positive highly statistically significant correlation between total knowledge and total HBM four main constructs in both intervention and control group. *The third* indicates a statistically significant correlation between both the study and control groups' total knowledge and health belief scores before educational intervention and after educational intervention. All these studies based on HBM which play on changing the belief. This may be attributed to the fact that changing the belief is the milestone for changing behavior.

5. Conclusion

Based on the results of the present study, it can be concluded that, the above mentioned results proved and reinforced the study hypothesis. The application of health belief model was effective in improving child bearing women's knowledge, preventive behavior regarding osteoporosis that was observed in increasing all constructs of health belief model after program as compared to before program. Also, the findings highlight the importance of the health belief model as a useful framework for promoting preventive behaviors.

6. Recommendations

Based on the findings of the current study, the following recommendations can be suggested:

1. Applying health belief model on large scale of women on different diseases.
2. Further researches: replication of the research on a large probability sample is recommended to achieve more generalization.
3. Comprehensive interventions activities on the benefits health promotion programs and the use of other behavioral modification theories.

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