

Original Paper

The Performance of Postmenopausal Women in the Prevention of Osteoporosis Based on Health Belief Model



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ABSTRACT

Introduction: Osteoporosis is one of the most important causes of illness and disability in postmenopausal females, characterized by a decrease in bone mass and increased fracture probability. Determination of the factors influencing the adoption of preventive behaviors for osteoporosis in postmenopausal females is necessary by using patterns such as the health belief model that identifies and reinforces the factors affecting the behaviors.

Objective: The current study aimed at determining the performance of postmenopausal females living in Fasa City, Iran in preventing osteoporosis based on the Health Belief Model.

Materials and Methods: The current cross-sectional study was conducted on 380 females aged >50 years covered by Fasa health centers. They were selected by simple random sampling method. The data gathering tool was a questionnaire that its validity and reliability have already been confirmed. It included demographic information, knowledge assessment, health belief model scale constructs (susceptibility, severity, benefits, barriers, motivation, perceived self-efficacy, and guide to action), as well as nutritional and walking status questionnaires to prevent osteoporosis in females. Finally, the data were analyzed through descriptive indices (Mean, SD) and analytical statistic tests, including the Pearson correlation coefficient, and multiple linear regression analysis.

Results: The Mean age of the subjects was 58.25±6.59 years and their average Body Mass Index (BMI) was 22.25±3.01 kg/m². These variables predicted 31.5% and 28.4% of the walking and nutritional behavior variances of osteoporosis prevention, respectively. Meanwhile, among the health belief model constructs, perceived susceptibility constructs predicted both nutritional (P=0.001) and walking behaviors (P=0.02).

Conclusion: Based on the results of this study and considering the predicting power of the health belief model, especially the perceived susceptibility construct, and the vulnerability of the females, it is recommended to implement accurate educational programs based on the health belief model rather than using traditional methods of education to raise their perceived susceptibility to osteoporosis, as well as increasing self-efficacy and perceived benefits.

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Highlights

- This study was conducted on postmenopausal females to determine their performance at preventing osteoporosis based on the Health Belief Model.
- Perceived susceptibility construct predicts the performance of postmenopausal females with regard to preventing osteoporosis.
- The Health Belief Model can be used to design and implement preventive educational interventions of osteoporosis in postmenopausal females.

Plain Language Summary

Osteoporosis is one of the major causes of illness and disability in postmenopausal females. It is characterized by a decrease in bone mass and increased fracture probability. The current study aimed at determining the performance of postmenopausal females to prevent osteoporosis based on the Health Belief Model. The current cross-sectional study was conducted on 380 females aged >50 years covered by Fasa health care centers. The data gathering tool was a questionnaire, including demographic data, knowledge assessment, health belief model scale constructs (susceptibility, severity, benefits, barriers, motivation, perceived self-efficacy, and guide to action), as well as nutritional and walking status questionnaires to prevent osteoporosis in females. The perceived susceptibility constructs predicted the performance of postmenopausal females in preventing osteoporosis regarding the nutritional and walking behaviors. Health belief model can be used as a framework to design and implement educational interventions to apply preventive behaviors related to osteoporosis in postmenopausal females.

Introduction

Osteoporosis is the most prevalent metabolic bone disease that begins with bone mass loss and bone tissue destruction and gradually leads to thinness and brittleness of bones. This condition is due to not only the increase in life expectancy and aging but also the adverse changes in lifestyle and diet. Osteoporosis is one of the major causes of inability and death in the elderly [1]. Today, osteoporosis is known as a major problem in public health and is dubbed as the silent disease of the century. It is asymptomatic and its side effects (like fracture) can impose high and irreparable physical and financial losses to society and patients.

The World Health Organization (WHO) declared 2000-2010 as the decade of joint-bones diseases, including osteoporosis, and announced it as the fourth major human enemy after heart attack, stroke, and cancer, and as the most important cause of bone fracture in the world [2]. Females are 8 times more affected by osteoporosis than males, and about 200 million females have osteoporosis worldwide [3]. The comparison of bone mass in the upper femoral femur in samples collected in the United States over the past 200 years show that

today females have lower bone mass than the ones living in the past decades and centuries, possibly due to decreased physical activity, low calcium in the diet, and smoking. It is expected that the frequency of femoral fractures to be six fold from 1990 to 2050 [4]. Sex, menopause, white race (especially Caucasians), skeletal size, smoking, using caffeine, alcohol, and the like, decreased estrogen levels, early menopause (before the age of 45), decreased intake of calcium, and physical inactivity are considered as the main risk factors for this disease [5].

In a study in Fars Province, Iran, the prevalence rates of osteopenia and osteoporosis in rural males based on T-score in backbones were 42% and 24%, in the neck of the femur 46% and 10%, and in whole femur 48% and 6% [6], respectively. A study conducted in Fasa showed that 34.1% of the females referred to health centers had osteoporosis [7]. Results physicians and health crew of various studies indicate that exercise, along with adequate intake of calcium and vitamin D, greatly affects the loss of bone density and increased bone mineral density. Good nutrition can maintain bone mass and strength in adults.

A varied and tasteful dietary habit, rich in calcium at the same time, is a menu that increases bone strength at any time and improves the quality of life [8]. This disease is preventable and curable. Attitude toward life, lifestyle, and daily habits are crucial factors to improve the quality and efficiency of people's lives. Therefore, educating preventive behaviors such as physical activity and diet is among simple and effective methods that have a great influence on the prevention of the disease and improving health.

One of the most important goals of the WHO is to increase the number of females trained about osteoporosis. Achieving such a goal requires understanding the factors contributing to change of behavior, which make it easier to manage it. Therefore, it is necessary to study the factors influencing the adoption of preventive behaviors about osteoporosis in females using models that identify and reinforce the factors affecting the behaviors. Thus, researchers use different models of changing behavior. Health belief model is one of the effective models regarding health education and promotion. The common erroneous belief that makes people not to take the disease seriously enough causes them to reject preventive behaviors about osteoporosis.

Based on the health belief model, people change their behaviors when they perceive that the disease is serious, otherwise, they may not tend to behave wisely enough in respect to their health [9]. The constructs of this model include perceived susceptibility, severity, benefits, barriers, self-efficacy; and guide to action [10]. A systematic review of the osteoporosis model using the health belief model shows that high severity perceived self-efficacy, and reduced perceived barriers are the most effective constructs in predicting behavior [11].

Reza Masouleh et al. conducted a study on female teachers working in the Education Department in Rasht City and studied their performance with regard to the prevention of osteoporosis. The results showed that the majority of female teachers (81.6%) in the prevention of osteoporosis performed quite poorly. Moreover, in view of the majority of them (50.4%), the performance of mass media on the prevention of osteoporosis was poor, too [12].

In a cross-sectional study, Suleimanha et al. examined the knowledge level of nurses working in orthopedic wards, which in most cases their awareness of osteoporosis was less than expected. The relationship between the knowledge level of different aspects of osteoporosis as well as the total knowledge with demographic vari-

ables was significant. Also, there were significant relationships between age with awareness of care, education level with knowledge of prevention, risk factor and overall score [13].

Since the results of similar studies on educated women like nurses and teachers indicate their low knowledge and poor performance (less than expected), it is necessary to conduct a survey on postmenopausal females with no academic education in this field. On the other hand, considering the structure of the health belief model, the perceived susceptibility, i.e. the females' feelings about how they are exposed to osteoporosis and the perceived severity of females' understanding of the side effects of osteoporosis are measured. The combination of these two factors is the perceived threat in females in relation to this disease.

Perceived threat along with perceived benefits, in other words, the analyses of the benefits of adopting preventive behaviors for osteoporosis such as taking good dietary habits and walking; and analyzing the potential barriers for taking appropriate preventive measures for osteoporosis along with females perceived ability to take preventive behaviors, as well as guide to action or stimuli that internally or externally affect females like family, friends, physicians and health worker, media, educational resources, and manuals for internal actions, persuade females to conduct proper behavior, that is, to observe the preventive behaviors about osteoporosis [11].

Since, there is no study on determining the preventive behaviors toward osteoporosis in postmenopausal females and educational intervention in Fasa City, the current study aimed at determining the performance of postmenopausal females in Fasa City in preventing osteoporosis based on the health belief model.

Materials and Methods

The current cross-sectional study was conducted on 380 females aged >50 years covered by Fasa health centers in 2016. Two centers out of the 6 Fasa health centers were randomly selected. The districts of Fasa are almost homogeneous and economically, culturally, and socially identical. In each health care center, sampling was performed randomly and according to the recorded household file numbers of the mothers at the health centers. The samples were randomly selected from the household file numbers. Then, they were invited and gathered on an appointed day at the health center to

meet them while explaining the study goals and inviting them to voluntarily participate in the study.

The women who were disabled, sick, had problems or were reluctant to participate in the study were excluded. According to a previous study, in which the prevalence of osteoporosis in the study population was 34.1% [7], and considering the error of estimate of 0.05 and the confidence interval of 95%, it was estimated that 350 subjects are needed. However, the number increased to 380 after considering the probability of dropouts. The data collection tool for the study was a questionnaire based on the health belief model [14], including the following sections:

The first section consisted of the demographic information questionnaire including age; BMI; educational level; the number of childbirth; history of subject's osteoporosis, osteoporosis in the family, specific diseases, and bone density measurement.

The second section included knowledge assessment consisting of 23 questions (the correct option 1 and the wrong option 0, the minimum score 0, and maximum score 23) based on the construct model of health belief model; four questions were related to perceived susceptibility (with minimum score 0 and maximum score 16), six questions were related to perceived severity (with a minimum score of 0 and a maximum score of 24), eight questions were related to perceived benefits (with a minimum score of 0 and a maximum score of 32), seven questions were related to perceived barriers (with a minimum score of 0 and a maximum score of 28), four questions were related to motivation (with a minimum score of 0 and a maximum score of 16), five questions were related to self-efficacy (with a minimum score of 0 and a maximum score of 20), four questions related to guide to action (including one question about external resources compelling females to observe preventive behaviors toward osteoporosis like family, friends, physicians and health crew, media, magazine and book, the Internet, and other patients experiencing osteoporosis; and three questions about internal compelling sources, with minimum score of 0 and maximum score of 12).

All questions were scored based on 5-point Likert-type scale ranging from 'completely agree to completely disagree' (scored 0-4). Also, the external questions of the guide to action were calculated according to cumulative frequency.

The third section included questions related to nutrition and walking; 10 questions about nutritional per-

formance asked about the type and amount of food intake during the last week (scored 0-14). The walking performance questions included 7 questions about walking times during the last week depending on the given guideline (scored 0-21). The self-reported performance of the individuals was recorded. In order to determine the face validity of the tool, a list of compiled items by 30 females with homogeneous demographic, economic, and social characteristics was considered as the target group.

In order to determine the content validity, the comments of twelve experts and practitioners (outside the research team) in the field of health education and health promotion (10 people), orthopedic specialists (one person), and biostatistics (one person) were used. By using the Lawshe table index, each item that was more valid (0.56 for 12 people), was considered necessary and maintained for the later analysis. The calculated values in the current study were higher than 0.70 in all items. The overall reliability of this research tool was 0.87 calculated by Cronbach alpha test. The following calculations were confirmed: perceived susceptibility reliability as 0.71, perceived severity as 0.82, perceived benefits as 0.79, perceived barriers as 0.82, motivation as 0.77, self-efficacy as 0.79, and internal practice guide as 0.77.

To observe the study ethical considerations, while obtaining approval from the Ethics Committee of Fasa University of Medical Sciences (approved by project code: 94005 and the ethical code: IR.FUMS.REC.1394.196) and Fasa Health Center. The objectives, importance, and necessity of conducting the project were explained to the subjects and then the subjects' written consent was obtained. The participants were assured of the confidentiality of their information, too. The obtained data were analyzed through descriptive statistics (Mean, SD) and inferential statistics, including the Pearson correlation analysis, and linear regression analyses in SPSS version 20. The level of significance for all tests was considered 0.05.

Results

The results showed that the Mean±SD age of the subjects in the study was 58.25±6.59 years, the Mean±SD Body Mass Index (BMI) was 22.25±3.01 kg/m², and the Mean±SD number of childbirth was 2.95±1.74. [Table 1](#) presents the demographic information of the subjects, including their age, body mass index, educational level, history of fracture, history of osteoporosis in the family, and history of specific diseases.

Table 1. Demographic Information of the Study Participants

Variable	Status	No. (%)
Education	Illiterate	5(1.31)
	Primary school	60(15.78)
	Secondary school	120(31.57)
	High school	135(35.56)
	Higher education student	60(15.78)
History of osteoporosis	Yes	85(22.36)
	No	295(77.65)
History of any disease	Yes	111(29.21)
	No	269(70.79)
History of bone density	Yes	80(21.06)
	No	300(78.94)
History of osteoporosis in the family	Yes	25(6.58)
	No	355(93.42)

Table 2. The relationship between health belief model constructs and nutritional and walking performance of the studied females

Variable	Nutritional Performance	Walking Performance
Perceived susceptibility constructs (0-16)	r=0.075	r=0.76
	P=0.095*	P=0.001*
Perceived severity (0-24)	r=0.068	r=0.025
	P=0.411*	P=0.565*
Perceived benefits (0-32)	r=-0.68	r=0.88
	P=0.001*	P=0.001*
Perceived barriers (0-28)	r=-0.034	r=0.067
	P=0.001*	P=0.075*
Motivation (0-16)	r=0.415	r=0.65
	P=0.75*	P=0.001*
Self-efficacy (0-20)	r=0.28	r=0.69
	P=0.001*	P=0.001*
Internal guide to action (0-12)	r=0.068	r=0.045
	P=0.523*	P=0.311*
Awareness (0-23)	r=0.043	r=0.085
	P=0.752*	P=0.312*

* The Pearson correlation test

Table 3. Regression analysis of factors related to nutritional and walking performance to prevent osteoporosis in postmenopausal females

Variables	Beta	B	P	Dependent Variable (Walking Performance)	Beta	B	P	Dependent Variable (Nutritional Performance)
Age, year	-0.025	-0.025	-0.165		-0.216	-0.06	-0.025	
BMI, kg/m ²	-0.124	-0.225	-0.001		-0.006	-0.005	-0.909	
Perceived susceptibility	0.104	0.222	0.001		0.105	0.214	0.020	
Perceived severity	-0.019	-0.023	-0.325		-0.045	-0.046	-0.315	
Perceived benefits	0.114	0.015	0.725		-0.024	-0.03	0.267	
Perceived barriers	-0.026	-0.021	-0.265	R ² =0.315 Adjusted R ² =0.035	-0.125	-0.02	-0.113	R ² =0.284 Adjusted R ² =0.024
Motivation	0.112	0.215	0.119		-0.011	-0.03	0.681	
Self-efficacy	0.128	0.042	0.684		-0.043	-0.06	0.135	
Internal guide to action	-0.153	-0.235	-0.126		-0.024	-0.036	-0.136	
Awareness	0.026	0.075	0.090		-0.024	-0.017	0.534	

The Mean±SD nutritional performance score of the females to prevent osteoporosis was 8.35±3.01 and the Mean±SD walking performance score was 12.24±3.25. The Mean±SD scores of the health belief model constructs were as follows: awareness: 7.41±2.01, perceived susceptibility: 10.24±2.08, perceived benefits: 22.15±4.10, perceived barriers: 18.32±4.95, self-efficacy: 14.33±2.21, and internal guide to action: 9.32±1.22.

Regarding the relationship between model constructs and walking and nutritional behavior scores, the correlation coefficients showed a positive correlation between walking performance and perceived susceptibility ($r=0.76$, $P=0.001$), motivation ($r=0.65$ and $P=0.001$), perceived benefits ($r=0.88$, $P=0.001$), and self-efficacy ($r=0.69$, $P=0.001$). In the current study, there are positive correlation between nutritional performance and perceived benefits ($r=0.68$, $P=0.001$), self-efficacy ($r=0.28$, $P=0.001$), but a reverse correlation with perceived barriers ($r=0.034$ and $P=0.001$) (Table 2).

The women's external guide to action for nutritional and walking behaviors to prevent osteoporosis were as follows: family 245 people, books 160, journals and magazines 75, medical doctors and health staff 125, TV 85, patients with osteoporosis 35, and the Internet 15. Linear multiple regression analysis was used to assess the predictive power of women's performance through the health belief model and demographic variables. On the whole, the study variables predicted 31.5% of

walking behavior variance to prevent osteoporosis and 28.4% nutritional behavior variances to prevent osteoporosis. Meanwhile, among constructs of the health belief model, the perceived susceptibility constructs predicted both nutritional ($P=0.001$) and walking behaviors ($P=0.02$) (Table 3).

Discussion

The current study results showed a relationship between age, the number of childbirth, and education level with nutritional performance, and a relationship between BMI and history of osteoporosis with the walking performance of the subjects. The results of the studies by Akin Petide [15] and Sayed-Hassan [16] were compatible with those of the current study. The current study results showed no significant relationship between nutritional and walking performance with the history of osteoporosis in the family, history of specific diseases, and history of bone density measurement.

There was a significant relationship between these variables and nutritional and walking performance in the studies by Hatamzadeh [17] and Sayed-Hassan [16], but similar to the current study, in the Lesan study [18], no significant relationship was observed between the history of osteoporosis in the family and nutritional performance to prevent osteoporosis. One reason for such contradictory results in these findings may be due to cul-

tural and social complexities existing in behavior and the difference in the quality of individuals' understanding.

In Khorsandi study, the awareness about of the disease was not at a desirable level and the differences between the studied groups were significant [4]. There was a significant relationship between nutritional and walking performance and perceived susceptibility, and the subjects felt vulnerable against osteoporosis. In the study by Doheny [19], the subjects had more perceived susceptibility to bone density testing. In the studies by Edmonds and Hala, the subjects had less perceived susceptibility for calcium intake [20, 21]. People would have a successful performance in preventing osteoporosis if they had enough motivation to modify, perform, and maintain appropriate behaviors. In this study, there was a significant relationship between walking behavior and motivation. Piehowski and Mcleod in their studies pointed out the role of motivation in behavior [11, 22].

In the current study, there was a significant relationship between perceived benefits and self-efficacy with preventive behaviors toward osteoporosis. Khani Jayouni, Vahdian, Shahroudi, and Mahdavi studies report a positive correlation between self-efficacy and preventive behaviors in terms of the prevention of osteoporosis in females [23-25]. In addition, Endicott and Deo et al. identified perceived benefits as the predictive of behaviors, which were consistent with the results of the current study [26, 27].

In the current study, the family was the most referred external practice guide. Family has an important and vital role as a source of information for nutrition and walking behaviors, provision of necessary resources, and helping the patient do her bone density measurement. In the studies, the health belief model constructs generally predicted 31.5% and 28.4% of the walking and nutritional behavior variances to prevent osteoporosis, respectively. In the study by Min on female university students, the health belief model constructs predicted 6.7% of osteoporosis preventive behavior variances [28].

In another study by Jang on postmenopausal females, the constructs of this model predicted 33% of behavior variances [29]. This study showed that perceived susceptibility was the most important construct for predicting walking and nutritional behaviors in preventing osteoporosis. According to the health belief model, people adopt better preventive behaviors when they feel the risk of catching a disease. Dohenystudy results showed that perceived susceptibility was an important predictor variable for behaviors such as doing exercises [19]. Therefore, it can be said that the constructs of this model can be used as a

reference framework to design educational interventions to teach preventive behaviors relating to osteoporosis to postmenopausal females.

Based on the results of this study and considering the predicting power of the health belief model, especially the perceived susceptibility construct, and the vulnerability of the females, it is recommended to implement accurate educational programs based on the health belief model rather than using traditional methods of education to raise their perceived susceptibility to osteoporosis, as well as increasing self-efficacy and perceived benefits. One of the limitations of the current study was that its findings were related to elderly females referring to Fasa health centers; therefore, the results cannot be generalized to all females, especially the elderly females that are more likely to have osteoporosis and do not refer to health centers. Another limitation can be noted that nutritional and walking behaviors were self-reported.

Ethical Considerations

Compliance with ethical guidelines

To observe the study ethical considerations, while obtaining approval from the Ethics Committee of Fasa University of Medical Sciences (approved by project code: 94005 and the ethical code: IR.FUMS.REC.1394.196) and Fasa Health Center. The objectives, importance, and necessity of conducting the project were explained to the subjects and the subjects' written consent was obtained. The participants were assured of the confidentiality of their information, too.

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Authors contributions

All authors contributed in preparing this article.

Conflict of interest

The authors declared no conflict of interest.

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