

Investigating Preventive Behaviors of Osteoporosis Using the Health Belief Model in Female Health volunteers in the Health Care Centers in Rasht

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Abstract

Background and objectives: Osteoporosis is a worldwide public health problem with an increasing prevalence especially in women. This study was conducted to predict the preventive behavior of osteoporosis through applying Health Belief Model in Health Volunteers of community health centers of Rasht city in 2016.

Methods: This descriptive-analytical study was done on all 217 female active Health Volunteers in community health centers in Rasht city in 2016 by survey method. The data collection tools were demographic data sheet, standard questionnaire on osteoporosis based on health belief model, food frequency questionnaire to evaluate milk and dairy group intake and short form of international physical activity questionnaire. Data was analyzed using SPSS21. Descriptive (mean and standard deviation) and inferential statistics (Spearman's correlation coefficient, analysis of multiple logistics regression and linear regression) were used.

Results: Average age of Health Volunteers was 42.13 ± 9.24 and their average physical activity was 1033.44 ± 1272 min/wk. – MET (Metabolic Equivalent of Task) and average milk and dairy group intake was 1.69 ± 0.96 unit per day. Multiple logistics regression showed that perceived susceptibility ($p=0.012$) and construct self-efficacy ($p=0.031$) were the predictors of physical activity performance (high and middle activity). Linear regression test also indicated that perceived barriers ($P=0.006$) and knowledge ($p=0.027$) served as predictors of milk and dairy group intake performance.

Conclusion: According to the present study findings, health belief model is a good predictor of preventive behaviors for osteoporosis in female Health Volunteers. Therefore implementing educational intervention based on this model with emphasis on knowledge and effective constructs of efficiency, susceptibility and barriers can help maintain and promote women's health.

Keywords: Health Belief Model, Osteoporosis, Health Volunteers, Preventive behavior.

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Introduction

Osteoporosis is a common metabolic bone disorder in women. This situation is associated with a reduction in bone density and loss of bone structure quality, which leads to an increased risk of fracture. Today, osteoporosis is a serious health problem in advanced and developing countries. Osteoporosis is asymptomatic and one of the most important complications of this disease is bone fracture. (1, 2). The World Health Organization has declared that this disease is a silent illness of the century and the fourth most important human enemy in the world after heart attack, stroke, and cancer (1). In Iran, the findings of the national program for the prevention, diagnosis and treatment of osteoporosis indicate that 70% of women and 50% of men over 50 years old have osteopenia and osteoporosis (1). Maximum bone mass is achieved by about age 30 years. Then, it gradually decreases in both genders with increasing age (3). This disease is responsible for 1.5 million fractures per year and is one of the major causes of the wrist, shoulder, spinal, and especially hip fractures, which results in an increase in mortality rates, a decrease in the quality of life, and the inability of people (4). It is anticipated that by 2050, the rate of hip fracture that is the most debilitating type of fracture with pain and reduced movement and increased mortality, will have reached 6.3 million (5). Osteoporosis affects women 8 times more than men to have osteoporosis than men. Thus, about 200 million women worldwide are affected by osteoporosis (6). The risk of death from this disease during a woman's life is equal to the likelihood of death from breast cancer and about four times the risk of death from uterine cancer (7).

Women are less concerned about their health because they are responsible for life, while they play a key role in family health management and their behaviors have an impact on the different aspects of the health and behavioral culture of family members (1, 8). Health volunteers are mainly the homemakers who are invited to work with community health centers. They are selected in terms of their appropriate social acceptability, motivation for social activities, minimum reading and writing literacy, and enough time and interest. This group of women can be one of the most important loops of Primary health care network (MAB) to educate the community, and to constitute the first point of contact between the community and the health network (9).

Osteoporosis is a preventable and curable disease. An important principle in preventing this disease is understanding the mindset, lifestyle, and daily habits of individuals to improve their quality and effectiveness. Therefore, the teaching of preventive behaviors as a simple and effective method has a great influence on prevention, promotion, and maintenance of health. In order to achieve such a goal, understanding the factors affecting the change of behavior will make it easier to achieve it. The most important goals of global health are increasing the number of trained women in the field of osteoporosis (10). Therefore, it is necessary to investigate the effective factors on the adoption of preventive behaviors, using patterns that identify and reinforce the factors that affect the behavior. For this purpose, researchers have used the health models to change behavior. Health Belief Model is an effective tool for understanding and

explaining health behaviors and assessing health education. This model was designed by a group of American social psychologists in the early 1950s. It was officially presented by Rosen Stock in 1966 and became more complete by Becker and Miaman in 1974 and 1975. Then, in 1988, the self-efficacy structure derived from the cognitive social theory of Bandura et al was added to help fit the model with habitual unhealthy behaviors (11). Sharemi identified the risk factors for osteoporosis in women over 50 years old in northern Iran. The results showed that among 796 women who participated in the study, 147 women (18.5%) had osteoporosis and there was a significant relationship between osteoporosis and age, number of childbirth, age of onset of the menstrual cycle and menopause, level of education, occupation, physical activity, and BMI (12). A systematic review of the osteoporosis using the health belief model has shown that the high severity, benefits, self-efficacy and reduction of perceived barriers are the most construct in predicting behavior (13). The aim of this study was to determine the preventive behaviors of osteoporosis using the Health Belief Model in female health volunteers in the Health Care Centers in Rasht.

Materials and Methods

This cross-sectional descriptive analytical study was conducted on female health volunteer in the health care centers of Rasht in 2016. The research population was all the urban health services with health volunteers. All 34 Urban Health Services (16 Health Care Centers and 18 Subsidiary Health Centers) were eligible to participate in the study. The data was obtained from the census sampling of all 34 units. Of the 238 female health volunteers, 217 were ready to cooperate. The inclusion criteria included having an identity

card, a history of at least one year of activity as a health volunteer, and absence of any physical problems. Before starting the program, the goals and method of research implementation were explained for the educators of health volunteers. Then, the questionnaires were given to health volunteers to be completed. In order to observe ethical considerations, while obtaining permission from the Ethics Committee of Guilan University of Medical Sciences, the goals, importance, and necessity of the study were expressed for health volunteers. In addition, we asked them to fill informed consent and assured them that their personal information would remain confidential.

The data collection tool is a self-report questionnaire including four sections, demographic data sheet, standard questionnaire based on health belief model in osteoporosis, nutritional practice questionnaire about dietary intake of calcium (milk and dairy group) and international physical activity questionnaire.

Demographic information questions are age, height, weight, marital status, education, occupation, housing, lactation status, average family income, history of osteoporosis in the family, smoking, and duration of activity in health volunteers. The second part consists of a standard questionnaire of preventive behaviors of osteoporosis based on the health belief model. The validity and reliability of the Persian version were investigated by Heidarnia and its Cronbach's alpha is $\alpha = 87.0$. This section has 33 questions that examine six domains of this model in osteoporosis. The questionnaire includes 4 questions about perceived Susceptibility construct (0-16 points), 6 questions about perceived severity (0-24), 8 questions about perceived benefits (0-32 points), 7 questions

about perceived barriers (0-28), 4 questions about self-efficacy construct (0-16 points), 4 questions about the Cues to Action construct, (3 questions for internal action (0-9 points) and 1 question for external operation guide). This questionnaire measured in a 4 Likert scale ranging from "strongly agree" to "strongly disagree" (4= strongly agree, 0= strongly disagree). Reverse scoring was used for the perceived barriers construct. The Cues to Action questions were calculated as cumulative frequency. Osteoporosis questionnaire that includes twenty-six questions with four points. The scores are 1 for a correct answer and 0 for an incorrect answer (0-23 points) (14).

The nutritional practice was evaluated using a food-frequency questionnaire for calcium intake (milk and dairy group). Validity and reliability of this instrument were investigated by Mirmiran and its Cronbach's Alpha was $\alpha = 74.0$ (15). In order to assess the nutritional practice in the field of the milk and dairy intake, the most important diet containing calcium, 16 food sources related to the milk and dairy group were extracted from the food frequency questionnaire and analyzed in this study. Accordingly, the amount and type of food consumed from the milk and dairy group were asked during the day, week, and month, and the weekly and monthly dietary intake was converted to day. Individuals were divided into 3 groups based on received units: receiving less than recommended, equal to the recommended amount and more than the recommended amount (scores less than 2 units up to more than 3 units per day).

The fourth part of the questions was about physical activity. In order to measure the

amount of physical activity, the International Physical Activity Questionnaire-Short Form (16, 17) was used. The questionnaire consists of 7 open questions that examine the amount of time spent on mild, moderate or severe physical activity in the last seven days. The total amount of physical activity in the past week was measured in terms of the metabolism unit (min/week) or Metabolic Equivalent of Task (MET). A MET is a unit for estimating the amount of energy consumed by the physical activity. MET is approximately equivalent to Energy consumption at rest calculated by the following formula: the amount of physical activity (minute) multiplied by the corresponding coefficient (walking or mild activity with a coefficient of 3.3, moderate physical activity with a coefficient of 4, and severe physical activity with a coefficient of 8) per week. To classify the average physical activity of health volunteers the criteria of severe physical activity ($MET > 3,000$ min/week), moderate physical activity ($600 < MET < 3000$ min/week), and mild physical activity ($600 > MET$ min/ week) were used (from a minimum of 600 to over 3000 MET-min/week).

Data were analyzed using SPSS 21 software, descriptive statistics (mean and standard deviation), and analytical tests including Pearson correlation coefficient, multiple logistic analyzes, linear regression. Data had normal distribution using Kolmogorov-Smirnov test. In analyzing the scatter plot, the linear relationship between independent and dependent variables was determined. The significance level was considered to be less than $P < 0.05$.

Results

The age range of health volunteers was 18-66 years with a mean age of 42.13 ± 9.24 years. 208 (95.9%) were married, 203 (93.5%) were housewives, and 101 (46.6%) had a diploma. 185 (85.3%) had a history of breastfeeding. Only 2 women (0.09%) were smokers and 64 (29.8%) had a history of osteoporosis in the family. 165 women (76%) had a private home. The mean body mass index was 27.69 ± 21.5 (overweight). The activity history of health volunteers (1-24 years old) was a mean of 8.41 ± 6.66 years.

According to the FFQ questionnaire, the mean intake of calcium sources was 1.69 ± 0.96 unit/day (less than the recommended amount). The mean intake of calcium in 138 women (63.6%) was less than the recommended amount, 63 (29%) equal to the recommended amount, and 16 (7.4%) more than the recommended amount. Based on the IPAQ questionnaire, the average weekly physical activity scores was 1033.44 ± 1272.07 MET-min/week with a median of 714. Physical activity of 90 women (41.5%) was mild, 122 (56.2%) moderate, and 5 (2.3%) severe.

Considering that all the constructs of the health belief model (except for the operation guide) had a significant relationship with physical activity, components with significant correlation were also significant in the logistic regression model. In the examination of the correlation between the knowledge score and the score of the health belief model constructs with score of physical activity using Pearson test, there was a significant correlation between perceived susceptibility construct of preventive behaviors of osteoporosis ($r = -0.208.0$, $p < 0.001$), and self-efficacy construct of preventive behaviors of osteoporosis ($r = 0.227.0$, $P = 0.001$). So that this correlation

was reverse in perceived susceptibility construct but in self-efficacy construct was direct (Table 1). In order to determine the predicting factors of physical activity, multiple logistic regression analysis was used by Forward stepwise (Likelihood Ratio) method. Physical activity was considered as mild and moderate and severe physical activity. According to the results, perceived susceptibility construct ($P = 0.012$) and self-efficacy construct ($P = 0.031$) was a predictor of proper physical activity. So that, by increasing the physical activity, the score of the perceived susceptibility construct decreases and for one unit increase in the score of the self-efficacy construct, the chances of physical activity increase by 1.2 times (17%) (Table 2). The correlation between knowledge scores and health belief model constructs in relation to the nutritional practice of dietary intake of calcium was measured by the Pearson test. In this examination, there was a significant positive correlation between knowledge score ($P = 0.002$, $r = 0.207$) and perceived barriers construct ($P = 0.002$, $r = 0.209$) (Table 2). Determination of predicting factors of nutritional practice using multiple linear regression via Stepwise method showed that perceived barrier construct ($P = 0.006$) and knowledge ($P = 0.27$) were the most important predictors of the nutritional practice of dietary intake of calcium. So that, by increasing per score of the perceived barriers, the nutritional practice score increased by 0.04 ± 0.016 and with increasing per percentage of knowledge score, the nutritional practice score increased by 0.005 ± 0.01 (Table 3).

Table 1. The results of the relationship between the health belief model and knowledge with nutritional practice and physical activity in female health volunteers

Independent variable	Physical activity		Nutrition practice of dietary intake of calcium	
	r	P	R	P
Knowledge	0.264	0.0001	0.207	0.002
Perceived susceptibility	- 0.208	0.002	-0.137	0.043
Perceived severity	-0.139	0.041	-0.122	0.073
Perceived benefits	0.166	0.014	0.064	0.352
Perceived barriers	0.283	0.0001	0.209	0.002
Self-efficacy	0.227	0.001	0.135	0.047
Operation guide	0.114	0.095	-0.035	0.610

*Pearson correlation coefficient test

Table 2: Relationship between the health belief model constructs and physical activity practice in Female health volunteers based on multiple logistic regression

Predictive variables	Regression coefficient	Standard error	Significance level	Relative Chance	% 95confidence interval for relative chance		Coefficient of determination
					Lower limit	Upper limit	
Perceived susceptibility	-0.114	-0.405	0.012	0.982	0.816	0.975	R ² =0.7
Self-efficacy	0.158	0.074	0.031	1.172	1.014	1.353	
Constant value	-0.509	0.907	0.575	0.601			

*Physical activity was considered as mild physical activity and physical activity (moderate and severe).

Table 3: The relationship between the health belief model and knowledge with the nutritional practice of dietary intake of calcium in female health volunteers based on multiple linear logistics regression

Predictive variables	Non-standard coefficient		Standard coefficient	*Significance level	Coefficient of determination
	Regression coefficient	Standard error	Beta		
Constant value	0.257	0.347		0.460	R ² =0.5
Perceived barriers	0.044	0/016	0.191	0.006	
Knowledge	0.011	0.005	0.153	0.027	

Discussion

The aim of this study was to investigate the preventive behaviors of osteoporosis using the Health Belief Model in female health volunteers of health care centers in Rasht. The results of the study showed that the health belief model constructs have predictive power in preventive behaviors of osteoporosis. Heidarnia and Lal Monfared conducted a study among women and Min among the students. They reported that the constructs of this model have a predictive power of osteoporosis (1, 18, and 19). In the present study, health volunteers had moderate physical activity levels. The findings of this study were consistent with the results of other studies (20, 21). Based on the results, perceived susceptibility and self-efficacy constructs were predictive of appropriate physical activity (moderate and severe). Hence, with the increase in physical activity, the score of the perceived susceptibility construct decreases and for one unit increase in the score of the self-efficacy construct the chances of appropriate physical activity increase by 1.2 times (17%).

According to the Health Believe Model, when people feel they are at risk of a disease, do better the preventive behaviors (1). 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. Doheny reported that the perceived susceptibility was an important predictor variable for behaviors such as exercise (22). In studies Haieh (23) and Chang (24), perceived susceptibility was the most important predictor of osteoporosis preventive behaviors. In the study of Hyderinia, perceived susceptibility construct compared to other constructs had more predictive power for walking behavior along with the nutritional behavior of women (1). Given that most of the women studied had high levels of education, they felt vulnerable to osteoporosis. In addition, the women 30-50 years have a key and active role in family health management; they were mainly responsible for providing food for family members, and they have an appropriate

physical condition for body exercises. However, in the studies of Sayad Hassan, there was no relationship between perceived susceptibility construct and screening and preventive behavior of osteoporosis in female students in Damascus (25). The probability of contradiction in this study may be the age, geographical, and cultural differences in the research groups. Hatfnia investigated the factors related to the regular physical activity for the prevention of osteoporosis in female employees based on the Health Belief Model. The results showed that self-efficacy was a predictor of physical activity behavior among the constructs of this model, which is in agreement with the results of the present study (5). Hossein Nejad et al reported a significant and positive relationship between the mean score of dietary behavior, athletic activity, and self-efficacy of female students (26). Landis reported that there was a positive correlation between self-efficacy and consumption of calcium-containing foods in girls (27). In the study of Wallace on predictors of the developed health belief model constructs in girl students, self-efficacy and perceived barriers constructs were considered as the most effective factors in the physical activity in the prevention of osteoporosis (28). In addition to the above, in some studies, including the study of Abood, to predict the preventive behaviors of osteoporosis, knowledge and perceived susceptibility have been identified as the most important factor in behavioral change (29). The results of a study on 1056 women aged 16-72 years in the Netherlands showed that osteoporosis was considered as a mild illness and a health problem. Therefore, the failure to take preventive behaviors was the lack of adequate knowledge about the disease (30). In a study conducted among girl students, knowledge and perceived susceptibility were

the most important factor in performing the preventive behaviors of osteoporosis (31), which is consistent with the results of the present study. It can be expected that by increasing knowledge of individuals about a behavior, the occurrence of that behavior increases.

According to the results, it seems that the health volunteers of the present study are in a relatively favorable condition in terms of physical activity. It can be stated that the level of women's participation in the Gilan province is significant due to the cultural and climatic characteristics of this province. Therefore, they try to provide their health by doing physical activity and protect their professional position as active health volunteers.

Health volunteers with moderate physical activity are the pioneer for participation. The results of the study showed that among the constructs of the health belief model, perceived barriers and knowledge constructs significantly had the most predictive power regarding the nutritional practice of dietary intake of calcium. Thus, by increasing the score of perceived barriers, the score of the nutritional practice of dietary intake of calcium increases by 0.04 ± 0.016 and by increasing knowledge score, the score of the nutritional practice of dietary intake of calcium increases by 0.01 ± 0.005 . In this regard, some studies are consistent with the results of the present study in that they suggest that the construct of the perceived barrier is effective on calcium intake. In the study of Lale Monfared, the perceived barrier structures had the most predictive power in obtaining calcium in women (19).

Sayad Hassan (25) and Wallace reported that among girl students, the perceived barriers

construct was one of the most influential factors in the performance of calcium intake (28). Tsai reported that the perceived barrier and health motivation were the most important factor in calcium intake. Hernandez-Rauda reported that the perceived barriers factors especially the economic factor is the most important factor in Lack of calcium intake using the results of the general regression model (20). In addition, studies have shown that in the field of preventive behaviors for osteoporosis, knowledge alone does not lead to change in behavior, and other socioeconomic factors along with knowledge and beliefs of individuals have the significant role in preventive behaviors of osteoporosis (32). In the study of Gharlipour, knowledge had a significant direct relationship with dietary intake of calcium and perceived barrier construct had a significant reverse relationship with dietary intake of calcium in adolescents (33). Chan also reported that the knowledge about osteoporosis among teenage girls is the most effective factor in the preventive behaviors of osteoporosis (34). In the Vafa Jamil study, there was a significant relationship between knowledge and dietary calcium intake of girl students (35). In Hyderinia's study, the predictive power of perceived susceptibility constructs for the nutritional behavior of women aged 30 to 50 years was more than the rest of the constructs, which was not consistent with the results of the study. This is probably due to differences in the nutritional pattern of the studied population as well as the combination of the health belief model and social cognitive theory to examine the predictors of the preventive behaviors of osteoporosis in women, in which other factors were also considered (1).

Conclusion

The results of this study showed that based on the health belief model, perceived susceptibility and self-efficacy for physical activity and perceived barriers and awareness for the nutritional practice of dietary milk and calcium intake were the strongest predictors of the preventive behaviors of osteoporosis. Regarding moderate physical activity and inadequate nutritional practice in dietary calcium intake (less than the recommended daily intake) among health volunteers studied, it is possible to maintain and promote women's health by implementing educational interventions based on health belief model with emphasis on knowledge as well as effective self-efficacy, perceived susceptibility, and perceived barriers constructs. Based on the results of this study, the health belief model was a good predictor of the preventive behaviors of osteoporosis in female health volunteers.

One of the limitations of this research was the effect of some factors such as personality traits, individual differences, and psychological states when answering the questionnaire, which was beyond the control of the researcher. The use of the self-report method was another limitation of the research, which could have an impact on the quality of the data.

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