

## Survey of Osteoporosis Preventive Nutritional Behaviors Based Health Belief Model in Sample of Iranian Women

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**Abstract:** Investigating factors affecting the adoption of preventive behaviors in women with osteoporosis using patterns that identify the effective factors which influence and reinforce on behavior is necessary. This study aims to evaluate the preventive nutritional behaviors of osteoporosis in women based health belief model in 2014. In this cross-sectional study, 401 women 30 to 50 years covered by health centers in Fasa, Iran were randomly chosen. Scale factors for health belief model (perceived susceptibility, severity, threat, benefits, barriers and self-efficacy, practice guidelines) and the function of nutrition were determined to prevent osteoporosis in women. Finally, using the SPSS version 16 software through tests, descriptive statistics (mean and standard deviation) test and analysis including Pearson correlation analysis, multiple linear regression, ANOVA and t-test were analyzed and significance level of less than 0.05. Results revealed that the average age of women was  $40/9 \pm 6/2$  years. The variable of perceived sensitivity for nutritional behavior were predicted. In this study, there was a significant association between nutritional performance and perceived susceptibility ( $r=0.068, p=0.003$ ), Self-efficacy ( $r=0.039, p=0.042$ ) and there was a significant inverse correlation with perceived barriers ( $r=-0.047, p=-0.050$ ). The variables under study expressed 20/2% of the variance in feeding behavior in osteoporosis prevention. In conclusion, this study indicated health belief model in predicting nutritional behavior for the prevention of osteoporosis. Hence, this model can be used as a framework for designing and implementing educational interventions for the prevention of osteoporosis in women and can help to improve and maintain their health.

**Key words:** Health Belief Model • Osteoporosis • Nutrition

### INTRODUCTION

Osteoporosis is a disease characterized by decreased bone density and loss of bone micro architecture quality which in turn lead to an increased risk of fracture. Bone density and bone mass reduce very slowly and most symptoms cannot be seen until the first fracture occurs. This disease is one of the main causes of disability and mortality in adults [1].

Nowadays osteoporosis is considered an important health issue and has been called the silent disease of the century. It is an asymptomatic disease and its

complications (Fractures) can impose high and irreparable physical and financial losses to the society and patients [2]. This disease is a serious health problem in health care facilities in developed and developing countries [3].

The years between 2000 and 2010 was entitled by World Health Organization as Bone and Joint Decade (BJD) which concerns Bone and Joint disease such as osteoporosis. It was also reported as the fourth main enemy of the human after heart failure, stroke and cancer [4] and the most common cause of fractures in the world [5].

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Women are 8 times more at risk of osteoporosis than men [6] so that, about 200 million women worldwide suffer from the disease [7]. Bone mass in women in all age groups is significantly less than men of the same age and race [8]. In both sexes, peak bone mass is achieved by age 30 and then bone mass gradually decreases with the increase in age. Therefore, the purpose of prevention programs is to maintain bone mass in the 30- to 50-year age group [9]. This group of people assume the responsibilities of life and pay less attention to their health. They play a key role in managing their families' health; therefore, their mortality, disability and behavior affect different aspects of health and behavior of their families [10].

In Iran, the national program for prevention, diagnosis and treatment of osteoporosis reported that 70% of women and 50 percent of men over 50 suffer from osteoporosis and osteopenia [11].

In a study in Fars province, prevalence of osteopenia and osteoporosis in a population based on T-score for spinal cord segments was recorded respectively as 42% and 24% in the back, 46% and 10% in femoral neck and 48% and 6% in the entire femur [12]. A study carried out in Fasa demonstrated that 34.1% of women had osteoporosis [13].

Good nutrition can maintain bone mass and strength in young people and adults. Varied and enjoyable diets that are rich in calcium can increase bone strength and improve quality of life at any time [14].

The disease is preventable and curable. An important point in preventing osteoporosis is to correct thinking, life style and daily habits in order to improve the quality and efficiency of individuals [15,16]. Therefore, teaching preventive behaviors such as correct nutrition as a simple and efficient method can help the disease prevention and the promotion and preservation of health. One of the most important global health goals is that of increasing the number of women trained in the area of osteoporosis [17].

To this end, identifying factors affecting behavior change can make changes easier. Therefore, investigating factors affecting the adoption of osteoporosis preventive behaviors among women, using models that identify factors affecting behavior is necessary. Researchers have used such models to change their subjects behavior of the models. Among models effective in health education and promotion are the Health Belief Model (HBM) and Social Cognitive Theory. A common cause for rejection of preventive behaviors of osteoporosis is the false belief that the disease is not

serious. Based on HBM, people change their behavior when they understand that the disease is serious, otherwise they might not turn to healthy behaviors [18, 19, 20, 21]. The structures of the HBM model include Perceived Severity, Perceived Susceptibility, Perceived Benefits, Perceived Barriers, Modifying Variables, Cues to Action and Self-Efficacy [22, 23, 24].

Perceived Susceptibility was used in this study to evaluate women's perception about the extent to which they are at risk of osteoporosis. In addition their Perceived Severity osteoporosis complications is measured. The sum of these two factors is the women's perceived threat of the disease. Other constructs include the perceived benefits and barriers i.e. individual's analysis about the benefits of adopting preventive behaviors of osteoporosis such as diet and of potential barriers to preventive behaviors of osteoporosis. These alongside women's perceived ability to carry out preventive behaviors and Cues to Action; incentives that affect women within and outside the family such as friends, doctors, health care providers, media and educational resources; their fear of osteoporosis complications and a sense of inner peace achieved in seeking preventive behaviors can lead women towards complying with preventive behaviors of osteoporosis [25].

According to what mentioned above, the present study aimed to assess the Health Belief Model constructs and their relationship with nutritional behaviors for the prevention of osteoporosis among women.

## MATERIALS AND METHODS

This study is a cross-sectional research in 2014. The sample included 401 women aged 30 to 50 covered by health centers in Fasa, Iran, From among urban health centers in Fasa, Iran two centers were randomly selected. Simple random sampling was carried out according to numbers of maternal health records in the centers. The subjects were invited in a health center and informed consent was obtained. Women with disability, disease and problems that prevented them from participating in the study, were excluded. The prevalence of osteoporosis in the study population was 34.1 [13]. Therefore, with significance level set at 0.05 and a confidence level of 95%, 401 individuals were chosen as the sample.

$$n = \frac{Z^2_{1-\frac{\alpha}{2}} p(1-p)}{d^2} = \frac{1.96^2}{0.0025} \cdot 0.2247 \approx 350$$

In this study, a questionnaire developed by the researchers according to the Health Belief Model constructs.

**The Questionnaire Consists of the Following Parts:** The first part includes demographic questions, including age, BMI, education level, marriage, occupation, household income, delivery times, breastfeeding, smoking, history of osteoporosis, history of osteoporosis in the family, history of a special disease and history of bone densitometry.

The second section includes questions on structures of the Health Belief Model. Questions include 23 questions on knowledge; 4 questions on perceived susceptibility (About the women's opinion of chances of getting osteoporosis); 6 questions on perceived severity (About complications due to osteoporosis); 8 questions on perceived benefits (About the benefits of preventive behaviors of osteoporosis, such as physical activity and calcium intake); 7 questions on perceived barriers (Including barriers to physical activity and consumption of calcium-rich foods), 4 questions on motivation (Such as motivation to receive health advice and conduct periodic examinations for prevention of osteoporosis); 5 questions on self-efficacy (Including the ability to do exercises and observe proper diet); questions on cues to action (1 question on external cues to action for prevention behaviors of osteoporosis including family and friends, doctors and health workers, mass media, books and magazines, internet and other patients with osteoporosis; and 3 questions on internal factor including the fear of suffering from complications of osteoporosis and a sense of inner peace following preventive behaviors). All questions are based on the standard 5-point Likert scale ranging from strongly disagree to strongly agree (Scores of 0 to 4). Scores of questions on external cues to action are calculated as cumulative frequency.

The third section includes questions on nutritional performance. Performance questions consist of 10 questions about the type and amount of food consumed during the last week based on received guidelines (Score from 0 to 21). The subjects performance was assessed via self-report method. The content validity of the instrument was assessed based on an expansive literature review and opinions of health education and health promotion specialists, biostatistics and orthopedics. The ambiguities were corrected and the final design was used. The overall reliability of the instrument

based on Cronbach's alpha was 0.87. Cronbach's alpha was 0.86 for knowledge, 0.71 for Perceived susceptibility, 0.82 for Perceived severity, 0.79 for Perceived benefits, 0.82 for Perceived barriers, 0.77 for Motivation, 0.79 for Self-efficacy, 0.77 for Cues to Action. Since the alpha values, calculated for each of the structures studied in this research were higher than 0.7, their reliability levels are acceptable.

For ethical considerations, permissions were obtained from ethics committee of Tarbiat Modares University and Fasa health center. The aims and importance of the study were explained to the subjects and their written consent were obtained. The sample was assured that the information would remain confidential. Data analysis was carried out through SPSS16 and descriptive statistics (Mean and standard deviation) and analytical tests including Pearson's correlation coefficient, multi variatelinear regression. ANOVA and t-test. The significance level was set at 0.05.

## RESULTS

The mean age of women participated in the study was  $40.9 \pm 6.2$  years, their mean BMI was  $23.47 \pm 3.67$ , the average number of births was  $2.93 \pm 1.55$  and the average family income was  $721596.01 \pm 320989.79$  Tomans. Table 1 shows the demographic data, including education level, marital status, occupation, breastfeeding, smoking, history of osteoporosis, history of osteoporosis in the family, history of special diseases and records of bone densitometry.

The results showed that there were significant relationships between nutritional performance and age, number of births, occupation, education level and breastfeeding ( $P < 0.05$ ). However, it did not have a significant relationship with marital status ( $P = 0.36$ ), smoking ( $P = 0.72$ ), history of osteoporosis ( $P = 0.28$ ), history of osteoporosis in the family ( $P = 0.40$ ), history of a special disease ( $P = 0.26$ ), history of densitometry ( $P = 0.29$ ), average household income ( $P = 0.36$ ) and BMI ( $P = 0.67$ ).

The mean nutritional performance score in preventing osteoporosis was  $9.46 \pm 3.28$ . Other mean scores included  $7.62 \pm 2.25$  for knowledge,  $11.71 \pm 2.12$  for Perceived susceptibility,  $16.56 \pm 4.43$  for Perceived severity,  $24.49 \pm 4.49$  for Perceived benefits,  $17.13 \pm 5.47$  for Perceived barriers,  $13.02 \pm 2.19$  for Motivation,  $15.72 \pm 2.68$  for Self-efficacy,  $9.47 \pm 1.65$  for internal Cues to Action.

Table 1: Frequency distribution of the study sample in terms of demographics

Variable		Frequency	Percentage
Occupation	Employed	60	15
	Housewife	341	85
Education	Illiterate	6	1.5
	Primary	64	16
	Secondary	126	31.4
	High school	136	33.9
	College	69	17.2
Marital Status	Single	17	4.2
	Married	367	91.5
	Divorced	8	2
	Widowed	9	2.2
Breastfeeding	Yes	56	14
	No	345	86
Smoking	Yes	6	1.5
	No	395	98.5
History of osteoporosis	Yes	93	2.32
	No	308	76.8
History of a special disease	Yes	78	19.5
	No	323	80.5
History of bone densitometry	Yes	37	9.2
	No	364	90.8
History of osteoporosis in the family	Yes	10	2.5
	No	391	97.5

Table 2: The relationship between the HBM structures with nutritional performance of participants

		Nutritional performance
Perceived Susceptibility (0 - 16)	r	0.068
	p	0.003
Perceived Severity (0 - 24)	r	0.047
	p	0.351
Perceived Benefits (0 - 32)	r	-0.029
	p	0.557
Perceived Barriers (0 - 28)	r	-0.047
	p	0.050
Motivation (0 - 16)	r	-0.005
	p	0.913
Self-efficacy (0 - 20)	r	0.039
	p	0.042
Internal Cues to Action (0 - 12)	r	0.008
	p	0.873
Knowledge (0 - 23)	r	0.003
	p	0.953

Results showed a direct relationship between nutritional performance and perceived susceptibility ( $r=0.068$ ,  $p=0.003$ ), Self-efficacy ( $r=0.039$ ,  $p=0.042$ ) and self-regulation ( $r=0.069$ ,  $p=0.070$ ); but it has a significant inverse relationship with perceived barriers ( $r=0.047$ ,  $p=0.05$ ) (Table 2).

The subjects' external cues to action for nutritional behaviors to prevent osteoporosis include family 283

(70.6 %), books 171 (42.6 %), magazines and periodicals 134 (33.4 %), doctors and health care workers 100 (24.9 %), TV 96 (23.9 %), patients with osteoporosis 20 (5%) and Internet 6 (1.5 %). The study of predicting how the subjects performance can be predicted by the HBM constructs and other variables, multivariate linear regression was used. Generally, variables predicted 20.2% of the variance in nutritional behavior for prevention of osteoporosis.

In addition, perceived susceptibility had the highest predictive power for nutrition behavior (Table 3).

## DISCUSSION

This study showed that age, number of births, occupation, education and breastfeeding are associated with nutritional performance. These variables are important factors affecting the incidence of osteoporosis and behaviors that prevent it. This is consistent with results of studies by Lesan *et al.* [26], Hatamzadeh *et al.* [27], Sayed-Hassan *et al.* [28], Hsieh *et al.* [29], Chang *et al.* [30]. The results showed that there is no significant relationship between nutritional performance with marital status, smoking, history of osteoporosis in family, history of special diseases, record of bone densitometry and the average household income. This is consistent with results of Hatamzadeh *et al.* [27], Sayed-Hassan *et al.* [28] Lesan *et al.* [26] that showed no significant relationship between marital status, family history of osteoporosis and nutrition performance for the prevention of osteoporosis.

In this study, the women had a moderate performance in nutritional performance for osteoporosis prevention. The results of this study are consistent with other research findings [26,31,32]. The relatively good performance of women can be attributed to their high level of education. On the other hand, 30- to 50-year old women play a key role in managing the health of their families and are mainly responsible for cooking for their family.

Nutritional Performance had a significant relationship with the subjects' perceived susceptibility. They felt susceptible to osteoporosis. In Doheny, subjects had higher perceived susceptibility for BMD test [33]. In Edmonds' study, individuals had low perceived susceptibility for calcium intake [34]. People will be successful in preventing osteoporosis provided they have motivation to create change and maintain appropriate behavior. In this study there was a significant relationship between people's walking behavior and their motivation. Baumeister's study pointed to the important

Table 3: Regression analysis of factors associated with nutritional performance to prevent osteoporosis among women in Fasa, Iran

Variables	Dependent variable	P	B	Beta
Occupation	Nutritional performance (R <sup>2</sup> =20.2, R <sup>2</sup> Adjusted= 0.001)	0.122	0.794	0.086
Education		0.473	-0.026	-0.040
Marital status		0.280	-0.066	-0.056
Age		0.044	-0.05	-0.106
BMI		0.909	0.005	0.006
Perceived Susceptibility		0.020	0.10	0.085
Perceived Severity		0.224	0.047	0.064
Perceived Benefits		0.478	-0.02	-0.036
Perceived Barriers		0.613	-0.01	-0.026
Motivation		0.780	-0.02	-0.014
Self-efficacy		0.445	-0.05	-0.040
Internal Cues to Action		0.807	0.026	0.013
Knowledge		0.928	-0.007	-0.005

role of motivation and self-regulation in carrying out a behavior [35]. The literature review by Mcleod introduces motivation as an effective and important factors that improves behavior to prevent osteoporosis [36].

Results of this study showed that the higher the subjects' self-efficacy, the better their nutritional practice. In a study by Rachelle A. that examined the relationship between health beliefs in postmenopausal women and their osteoporosis prevention behaviors, the findings showed that self-efficacy is positively associated with calcium intake [37]. Hsieh's study also found a significant relationship between the nutritional performance and self-efficacy [29]. The result of study by Zareban showed the Self Efficacy education program on reducing Blood Sugar Levels in Patients with Type 2 Diabetes is very effective [38].

In this study, there was an inverse association between nutritional performance and perceived barriers. In other words, the higher the perceived barriers the worse the nutritional performance. Among major obstacles to good nutritional behavior can be higher price and unavailability of foods containing calcium. Sayed-Hassan *et al.* [28] found that nutritional behavior and perceived barriers were significantly associated, but Edmonds found little perceived barriers to calcium intake [34].

In this study, the studied population received most of their external cues to action from, their families. Family has an influential role as a source of information and support for correct nutritional behaviors and provides necessary resources and guidance for bone densitometry.

### CONCLUSIONS

Due to the sensitivity and vulnerability of women, the need for providing a fundamental solution and

proper planning to prevent osteoporosis is felt. Providing educational programs in this regard for family members, physicians and other health personnel and also offering training programs in radio and television broadcasting is essential. One of the limitations of the study is that its findings are for 30-50-year-old women referring to health centers in Fasa, Iran and cannot be generalized to all women, especially older women who have a higher rate of osteoporosis.

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