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**THE SURVEY OF OSTEOPOROSIS PREVENTIVE BEHAVIORS IN
SAMPLE OF IRANIAN WOMEN: APPLICATION HEALTH BELIEF
MODEL AND SOCIAL COGNITIVE THEORY**

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ABSTRACT

Background and Purpose: 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 treatment of osteoporosis in women in Fasa, Fars Province of Iran's southeastern city, using the health belief model and social cognitive theory in 2014. **Materials and Methods:** In this cross-sectional study, 401 women 30 to 50 years old, who were covered by Fasa health centers had been randomly selected. Scale factors for health belief model (perceived susceptibility, severity, threat, benefits, barriers and self-efficacy, practice guidelines) and the structure of self-regulation and social support of social cognitive theory, and function of feeding and walking were determined to prevent osteoporosis in women. The data were analyzed using SPSS version 16 software. **Results:** The average age of women was 40.9 ± 6.2 years. The variables of perceived susceptibility, motivation, social support and self-regulation for walking behavior and variables of perceived sensitivity and self-regulation for feeding behavior were predicted. There was a significant association between walking performance and perceived susceptibility ($r=0.136$, $p=0.007$), motivation ($r=.120$, $p=0.016$), social support ($r=0.068$, $p=0.030$) and Self-regulation ($r=0.118$, $p=0.018$). In this study, there was a significant association between nutritional performance and perceived susceptibility ($r=0.068$, $p=0.003$), Self-efficacy ($r=0.039$, $p=0.042$), self-regulation ($r=0.069$, $p=0.070$) and there was a significant inverse correlation with perceived barriers ($r=-0.047$, $p=0.050$). **Conclusions:** This study indicated that health belief model, self-regulatory structures and social support in predicting feeding and walking behavior of participants for the prevention of osteoporosis is necessary. Hence, these models can be used as a framework for designing and implementing educational interventions for the prevention of osteoporosis in women.

Keywords: Health Belief Model, Nutrition, Self-regulation, Social Cognitive Theory, Social Support, Walking

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 (Brown and Josse, 2002).

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 (Shari and Sarah, 2006). This disease is a serious health problem in health care facilities in developed and developing countries (Cohen and Roe, 2000).

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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 (Bayat *et al.*, 2008) and the most common cause of fractures in the world (Naemi and Sadaghat, 2003).

Women are 8 times more at risk of osteoporosis than men (Castro *et al.*, 2005) so that, about 200 million women worldwide suffer from the disease (Shirazi *et al.*, 2007). Bone mass in women in all age groups is significantly less than men of the same age and race (Scott, 2003). 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-years of age group (Gangar, 2001). This group of people assumes the responsibilities of life but 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 (Khorsandi *et al.*, 2011).

In Iran, the national program for prevention, diagnosis and treatment of osteoporosis reported that 70% of women and 50 percent of men over 50 years of age suffer from osteoporosis and osteopenia (is a condition in which bone mineral density is lower than normal. More specifically, osteopenia is defined as a bone mineral density T-score between -1.0 and -2.5) (Pajouhi *et al.*, 2004).

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 (Adinepour *et al.*, 2010). In our previous study carried out in Fasa (Fasa in Fars Province of Iran's southeastern city of approximately one million in population) demonstrated that 34.1% of women had osteoporosis (Khani *et al.*, 2013). 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 (Sarah and Morgan, 2001).

Regular physical activity not only contributes to bone health, but also it increases muscle strength, creates balance and harmony in the body and has a direct impact on the overall health of the body (Henderson & Christopher, 1998). Exercises and physical activity are recommended as non-medical interventions that can increase bone density in young age and prevent loss of bone mass in middle age. 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 (Zhang *et al.*, 2012). Therefore, teaching preventive behaviors such as physical activity and 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 goals of WHO is to increase the number of women trained in osteoporosis (Sedlak *et al.*, 2005).

Understanding factors affecting behavior of changes, will lead us to plan better educational programming for these women. 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. Health Belief Model (HBM) and Social Cognitive Theory are among models effective in health education and promotion. 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 (Turner *et al.*, 2004). The Health Belief Model (HBM) was developed to explain and predict why people engage in behaviors to prevent disease (Glanz *et al.*, 2002).

The structures of the HBM model include Perceived Severity, Perceived Susceptibility, Perceived Benefits, Perceived Barriers, Modifying Variables, Cues to Action and Self-Efficacy (Shamsi *et al.*, 2013). In the context of osteoporosis prevention, adopting osteoporosis preventive behaviors (OPBs) requires long-term changes rather than activities of a one-shot nature. People who feel competent to overcome perceived barriers could increase the likelihood to initiate and maintain OPBs. Self-efficacy has also been added to the HBM because of its importance in accounting for initiation and maintenance of behavioral change. Prior studies have identified that constructs of the HBM (Turne *et al.*, 2004; Tussing

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and Chapman-Novakofski, 2005) are significant in predicting OPBs. This model is mostly used to collect data on individual behavior variables, But this does not lead to behavior of changes and there is another and determine which factors (Ryan, 2008). Preventive behavior adjustment programs are successful if they are flexible and tailored to individual features and characteristics. Social cognitive theory has been used in research related to osteoporosis. According to this theory, cognitive factors, environmental factors and behaviors are mutually related (Sharma and Romas, 2010). To compensate for the shortcomings of the Health Belief Model, social support and self-regulation structures of social cognitive theory were evaluated in this study. Studies show that social support has a positive impact on various aspects of self-care activities. Social support has been defined as assistance available from other people and as one's belief that one is respected and loved by others, is a valuable individual with dignity and belongs to a social network of relationships and mutual obligations (Levers-Landis et al., 2003). Evaluation of social support is done through collecting data from various other sources, such as a spouse, family and friends (Marmot & Wilkinson, 2008).

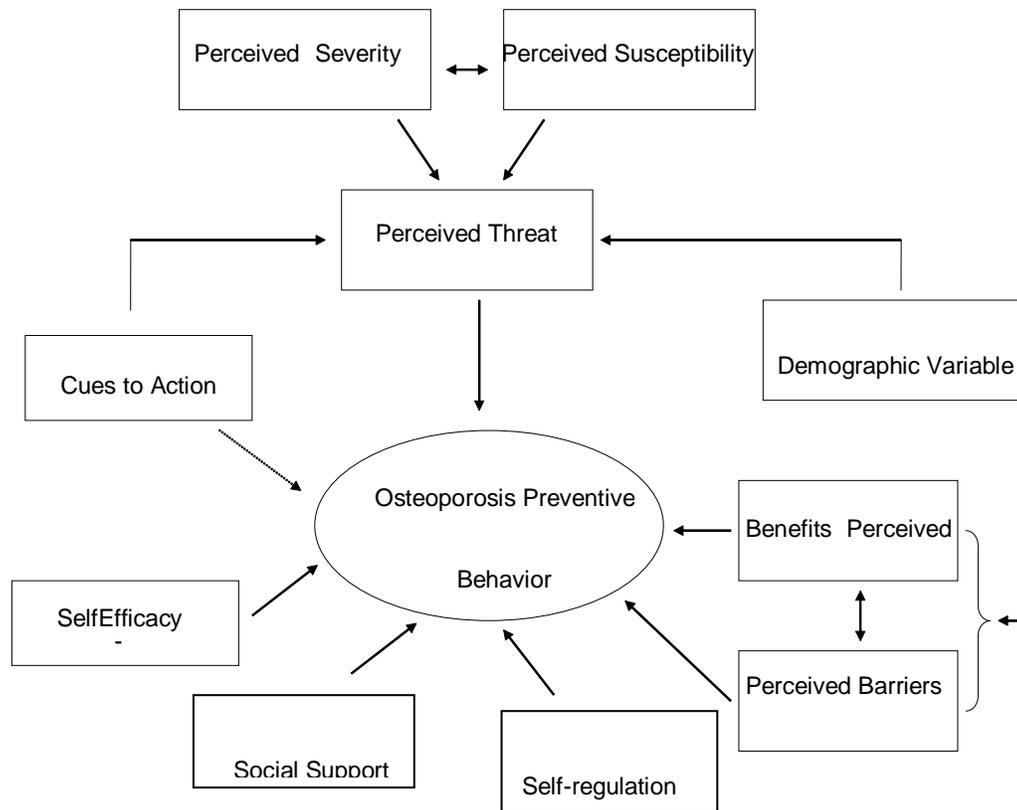


Figure 1: Conceptual framework of this study

This investigation examined a model to predict healthy lifestyle behaviors for the prevention of later development of osteoporosis among women. The relationships between social influences, self-efficacy, knowledge, and healthy lifestyle behaviors were examined with analyses based on Bandura's social cognitive theory's predictions (Bandura, 2005) and findings with children and adults (Duncan & McAuley, 1993; Shannon et al., 1990)

Self-regulation is the practice of behavior modification based on self-observation. Successful self-regulation is a continuous process of setting goals, following them and determining new goals. In fact, self-regulation is a technique that can be used to give the individual the power to change and guide

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him/her toward goals so that the likelihood of carrying out the intended behaviors by him/her will increase (Bandura, 2005). The conceptual framework of the proposed model is illustrated in Figure (1) According to what mentioned above, the present study aimed to assess the Health Belief Model constructs as well as self-regulatory and social support structures from social cognitive theory and their relationship with eating behaviors and physical activity for the prevention of osteoporosis among women.

MATERIALS AND METHODS

This study was a cross-sectional study of 401 participants was women aged 30 to 50 covered by health centers of Fasa in 2014. For this purpose the four urban health Fasa, two centers were selected at random. Health centers randomly sampled in each household and the number of cases of maternal health was mentioned centers (one center 200 and the other 201 were). The samples were then invited them to a special day at the health center brought together, While familiarity with the people and explaining the objectives of the study were informed consent to participate in the study. Inclusion criteria included women 30 to 50 years participated in the study meet and exclude criteria includes women who have disability, disease and problems that were not able to participate in the study, were removed.

The prevalence of osteoporosis in the study population was 34.1 (Khani *et al.*, 2013) and the other study was similar to the number (Looker *et al.*, 2012).

Therefore, with significance level set at 0.05 and a confidence level of 95%, 401 individuals were chosen as the sample.

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

In this study, a questionnaire developed and self-administered was built using other studies and literature review (Khorsandi *et al.*, 2011; Edmonds *et al.*, 2012; Levers-Landis *et al.*, 2003) by the researchers according to the Health Belief Model and constructs of self-regulation and social protection from Social Cognitive Theory. The questionnaire consists of the following parts:

The first part included demographic questions, including age, BMI (Body Mass Index), education level, marriage, occupation, delivery times, breastfeeding, smoking, history of osteoporosis, history of osteoporosis in the family, history of a special disease (Any disease other than osteoporosis, such as thyroid disease, diabetes, and immunodeficiency diseases ...) and history of BMD(Bone mineral density).

The second section included questions on structures of the Health Belief Model and social support and self-regulation. Questions included 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 self-efficacy (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); 15 questions on self-regulation (including setting goals and planning preventive behaviors of osteoporosis) and 9 questions on social support (support from person's family and friends to follow proper diet and carry out physical activity, bone density tests, etc.). Apart from questions of social support structures, all other 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 support were calculated as cumulative frequency. Questions on social support structures are based on four-point scale (very much, moderately, a little and not at all) (score 0 to 4).

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The third section included questions on nutritional performance and exercise, i.e. walking. Performance questions consisted of 10 questions about the type and amount of food consumed during the past week (score from 0 to 14). Exercise questions included 7 questions on the duration and type of walking (easy, moderate and heavy) during the last week based on received guidelines (score from 0 to 21). The subjects' performance was assessed via self-report method.

Validity items by calculation of the index scores of items (with quantity greater than 1.5) with CVI greater than 0.07 and CVR higher than 0.08 down found. For determine the face validity of the list of questions by 30 women 30 to 50 years old demographic characteristics, socio-economic and other target population completed. In order to determine the content validity of the comments professionals and experts (outside of the research team) in the field of health education and health promotion (n = 10), orthopedic specialist (n=1) and bio-statistician (n = 1) were 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, 0.73 for self-regulation, and 0.79 for social support. Since the alpha values calculated for each of the structures studied in this research were higher than 0.7, their reliability levels are acceptable.

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 are measured. The sum of these two factors is the women's perceived risk 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 walking 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.

Ethical consideration were performed by obtaining permission from ethical committee of Tarbiat Modares University (Tehran) and Fasa university of medical science, Iran. The aims and importance of the study were explained to the subjects and their written consents were obtained. Participants were assured that the information would remain confidential.

Data analysis was carried out through SPSS 16 and descriptive statistics (mean and standard deviation) and analytical tests including Pearson's correlation coefficient, multivariate linear regression, ANOVA and t-test. The significance level was set at 0.05.

RESULTS AND DISCUSSION

Results

The mean age of women participated in the study was 40.9 ± 6.2 years, their mean (Body Mass Index) BMI was 23.47 ± 3.67 , the average number of births was 2.93 ± 1.55 . Table 1 shows the demographic data. The results showed that there were significant relationships between nutritional performance and age, number of births, occupation, education level and breastfeeding ($P < 0.05$). The results showed that there were significant relationships between walking performance and BMI (Body Mass Index) and history of osteoporosis ($P < 0.05$).

Table 2 shows the mean of variables. Results showed a significant relationship between walking performance and perceived susceptibility ($r=0.136$, $p=0.007$), motivation ($r=0.120$, $p=0.016$), social support ($r=0.068$, $p=0.030$) and self-regulation ($r=0.118$, $p=0.018$). 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 3).

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Table 1: Frequency distribution of the study sample in terms of demographics (N=401)

Variable		Frequency	Percentage
Occupation	Employed	60	15
	Housewife	341	85
	Illiterate	6	1.5
Education	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
Smoking	No	345	86
	Yes	6	1.5
History of Osteoporosis	No	395	98.5
	Yes	93	2.32
History of a Special Disease	No	308	76.8
	Yes	78	19.5
History of Bone Densitometry	No	323	80.5
	Yes	37	9.2
History of Osteoporosis in The Family	No	364	90.8
	Yes	10	2.5
	No	391	97.5

Table 2: Mean of Variables (N=401)

Variable	Mean	Standard Deviation
Sensitivity Perceived	11.71	2.12
Severity Perceived	16.56	4.43
Benefit Perceived	24.49	4.49
Barrier Perceived	17.13	5.74
Motivation	13.02	2.19
Self efficacy	15.72	2.68
Internal Cues to Action	9.47	1.65
Social Support	12.40	5.41
Self- Regulation	43.72	5.13
Knowledge	7.62	2.25
Nutrition	9.46	3.28
Jogging	13.48	3.89

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Table 3: The relationship between Self-regulation and Social Support and the HBM structures with nutritional and walking performance of participants (N=401)

Variable		Nutritional Performance	Walking Performance
Perceived Susceptibility	r	0.068	0.136
	p	0.003	0.007
Perceived Severity	r	0.047	-0.026
	p	0.351	0.599
Perceived Benefits	r	-0.029	0.012
	P	0.557	0.818
Perceived Barriers	r	-0.047	-0.077
	p	0.050	0.121
Motivation	r	-0.005	0.120
	p	0.913	0.016
Self-efficacy	r	0.039	-0.026
	p	0.042	0.607
Internal Cues to Action	r	0.008	-0.040
	p	0.873	0.423
Social support	r	0.031	0.068
	p	0.541	0.030
Self-regulation	r	0.069	0.118
	p	0.05	0.018
Knowledge	r	0.003	0.047
	p	0.953	0.349

The subjects' external cues to action for nutritional behaviors and walking to prevent osteoporosis calculated by the cumulative frequency (Table 4)

The study of predicting how the subjects' performance can be predicted by the (Health Belief Model) HBM constructs, self-regulation and social support, and other variables, multivariate linear regression was used. Generally, variables predicted 29.1% of the variance in walking behavior and 20.2% of the variance in nutritional behavior for prevention of osteoporosis.

In addition, perceived susceptibility, motivation, social support and self-regulation had the highest predictive power for walking behavior and perceived susceptibility and self-regulation had the highest predictive power for nutrition behavior (Table 5). All the above statistics reviewed by a biostatistician and confirmed it.

Table 4: The subjects' external cues to action (N=401)

	Count	Percent
Health workers	100	24.9
Family	283	70.6
Book	171	42.6
Magazine	134	33.4
TV	96	23.9
Patient	20	5.0
Internet	6	1.5

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Table 5: Regression analysis of factors associated with nutritional and walking performance to prevent osteoporosis among women in Fasa(N=401)

Variables	Dependent variable	P	B	Beta	Dependent variable	B	Beta
	Nutritional Performance						
Occupation		0.122	0.794	0.086		0.249	-0.685
Education	(R ² =20.2,	0.473	-0.026	-0.040		0.685	-0.173
Marital status	R ² Adjusted=	0.280	-0.066	-0.056		0.382	-0.621
Age	0.001)	0.044	-0.05	-0.106		0.365	-0.29
BMI		0.909	0.005	0.006		0.012	-0.134
Perceived Susceptibility		0.020	0.10	0.085	Walking Performance	0.007	0.252
Perceived Severity		0.224	0.047	0.064		0.340	-0.043
Perceived Benefits		0.478	-0.02	-0.036	(R ² =29.1,	0.810	0.10
Perceived Barriers		0.613	-0.01	-0.026	R ² Adjusted =	0.366	-0.031
Motivation		0.780	-0.02	-0.014	0.047)	0.009	0.235
Self-efficacy		0.445	-0.05	-0.040		0.583	0.040
Internal Cues to Action		0.807	0.026	0.013		0.304	-0.125
Social support		0.459	0.023	0.038		0.030	0.078
Self-regulation		0.050	0.131	0.109		0.007	0.105
Knowledge		0.928	-0.007	-0.005		0.500	0.058

Discussion

This study showed that age, number of births, occupation, education and breastfeeding are associated with nutritional performance; and (Body Mass Index) BMI and history of osteoporosis are associated with walking 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.*, (2010), Sayed-Hassan *et al.*, (2013), Hsieh *et al.*, (2008) and Chang *et al.*, (2007). The results of this study showed that there is no significant relationship between nutritional performance and walking performance with marital status, smoking, history of osteoporosis in family, history of special diseases, and record of bone densitometry. This is consistent with results of Sayed-Hassan *et al.*, (2013) and with results of Lesan *et al.*, (2010) 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 and walking exercise performance for osteoporosis prevention. The results of this study are consistent with other research findings (Hernandez-Rauda and Martinez-Garcia, 2004; Lesan *et al.*, 2010). 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. They mostly have good physical condition for exercise. Performance (nutrition and walking exercise) had a significant relationship with the subjects' perceived susceptibility. They felt susceptible to osteoporosis. In Doheny's survey, subjects had higher perceived susceptibility for BMD (Bone mineral density) test (Doheny *et al.*, 2011). In Edmonds' study, individuals had low perceived susceptibility for calcium intake (Edmonds *et al.*, 2012). In the present stud, the subjects' performance (nutrition and walking exercise) had a significant relationship with self-regulation. Ryan's study showed that subjects with higher self-regulation had better health behavior (Ryan, 2008). Park's survey showed that self-regulation (including self-observation, goal setting and reinforcement) played an important role in doing and continuing exercise behaviors for osteoporosis prevention by older women (Park *et al.*, 2013).

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Self-regulation includes getting close to scenarios one has long awaited and getting away from those have been afraid of. Leventhal *et al.*, found that communication's fear increases problem solving activities so that if the person understands risk and has a plan of action to deal with it, he/she is likely to be able to reduce risk. Self-regulation is a technique that can help individuals recognize barriers and deal with them. In this case, when the person observes that he/she is responsible for the problem, he/she gains motivation to continue the program to remove the barrier and resolve it (Kelder *et al.*, 1994). 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 role of motivation and self-regulation in carrying out a behavior (Baumeister and Kathleen, 2007). The literature review by Mcleod introduces motivation as an effective and important factor that improves behavior to prevent osteoporosis (Mcleod and Johnson, 2011).

Walking performance was associated with social support. Edmonds *et al.*, (2012), Hsieh *et al.*, (2008) and Ievers-Landis *et al.*, (2003) showed in their studies that increased social support can increase physical activity for the prevention of osteoporosis. Study by Springer *et al.*, (2006) also showed that there is a significant relationship between physical activity and social support and the more the social support from family and friends, the better the subjects' exercise.

Social affects disease control support through two processes: 1) a direct effect through increasing health-related behaviors such as encouraging healthy behavior; and 2) modulating effects via reducing the effects of acute and chronic stress on health and helping patients cope with stress resulting from osteoporosis (Marmot and Wilkinson, 2008).

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 (Rachelle, 2008). Hsieh's study also found a significant relationship between the nutritional performance and self-efficacy (Hsieh *et al.*, 2008). the result of study by Sharoni showed the Self Efficacy behavior in Patients with Type 2 Diabetes is very effective (Sharoni and Wu, 2012).

In this study, there was an inverse association between nutritional performance and perceived barriers. In other words, the higher 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 found that nutritional behavior and perceived barriers were significantly associated (Sayed-Hassan *et al.*, 2013), but Edmonds found little perceived barriers to calcium intake (Edmonds *et al.*, 2012).

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 eating behaviors and exercises and provides necessary resources and guidance for bone densitometry.

In this study, in general, the Health Belief Model constructs and social support and self-regulation predicted 29.1% of the variance in walking behavior and 20.2% of the variance in dietary behavior for prevention of osteoporosis. In Hyejin's study on female students, HBM constructs predicted 6.7% of the variance in behavior for prevention of osteoporosis (Hyejin and Hee, 2011). In another study conducted on students in Yazd, the HBM structures predicted 29% of the variance in behavior (Mazlumi and Ruhani, 1999). Hence, we can say that the model's structures can be used as a reference framework for designing educational interventions to teach preventive behaviors of osteoporosis in women.

This study showed that perceived susceptibility, motivation, social support and self-regulation are important predictor variables for walking and eating behaviors to prevent osteoporosis.

Based on the Health Belief Model, when people feel they are at risk of a disease, they have a better performance in preventive behaviors. Doheny's results showed that the perceived susceptibility was an important predictor variable for behaviors such as exercise (Doheny *et al.*, 2011). Family and friends, and their provision of appropriate information and tools play an important role and have positive effects on

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various aspects of self-care and self-regulatory activities. Levers-Landis used social cognitive theory to investigate 454 8-11-year-old girls and found that support of friends and families were predictors of sports activities (Levers-Landis *et al.*, 2003). Wolfe reports self-regulation as the most important predictor of exercise behavior (Wolf, 2008).

In many other studies in the field of health behavior, the role of external support and incentives were positive (Giangregorio *et al.*, 2009; Wen *et al.*, 2004). Reminders from other people, subjective norms and significant others had positive impact on women's behaviors and encouraged them carry out osteoporosis prevention behaviors.

The limitations related to this research project include its sampling method. Convenience sampling is selecting research participants on the basis of being accessible and convenient to the researcher. Another concern about such data centers on whether subjects are able to accurately recall past behaviors. Cognitive psychologists have warned that the human memory is fallible (Schacter, 1999) and thus the reliability of self-reported data is tenuous on some items.

Conclusion

Due to the sensitivity and vulnerability of women and the importance of social support and self-regulation behavior, the need for providing a fundamental solution and proper planning to prevent osteoporosis is felt. Providing educational programs for all (public and health personnel) by radio and TV broadcasting, also health care support by government and family is necessary. This article investigated the important role of social support and self-regulation in the adoption of preventive behaviors for osteoporosis. A combination of social cognitive theory and the Health Belief Model was used. Women's confidence in engaging in appropriate calcium intake and weight-bearing exercise behaviors may be beneficial to osteoporosis prevention. Further studies should have more comprehensive interventions on the structures of calcium intake benefits and barriers and use other behavioral change theories. It is advised that researchers explain social and behavioral barriers in calcium intake in different cultural contexts.

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