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A Health Promotion Program based on the Health Belief Model regarding Women's Osteoporosis

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Background: Osteoporosis is one of the most common metabolic bone diseases. The purpose of this study is to investigate the effect of a walking education program based on the health belief model (HBM) on osteoporosis among women.
Material and Methods: In this quasi-experimental research design, 120 patients (60 experimental and 60 control),who were registered with the health centers in Fasa City of Fars Province, Iran, participated in the study in 2014. A questionnaire consisting of demographic information and HBM constructs was used at pre-intervention, immediately after their intervention, and then six months later. Bone mineral density (BMD) was recorded at the lumbar spine and femur prior to and six months post-intervention. Data were analyzed using SPSS19' through 'chi-square test, independent t-test, repeated measure ANOVA at a significance level of 0.05.
Results: Immediately and six months after the intervention, the experimental group showed increased in knowledge, perceived susceptibility, perceived severity, perceived benefits, perceived barriers perceived, self-efficacy, perceived internal cues to action and walking performance compared to the control group. Six months after the intervention, the value of lumbar spine BMD T-Score in the experimental group increased to 0.127, while in the control group it decreased to -0.043. The value of the hip BMD T Score in the intervention group increased to 0.125 and in contrast, it decreased to-0.028 in the control group.
Conclusions: This study showed the increased knowledge and walking behavior regarding walking benefits could improve bone density. Therefore, HBM model can be a basic framework for designing and 'carrying out' educational interventions for women's osteoporosis.

Keywords: Health Belief Model, Walking program, osteoporosis, woman

Introduction

Osteoporosis is a disease characterized with decreased bone density and or loss of bone microstructure, which can lead to raise risk of fracture (Stubbs, 2010).

Women are 8 times more at risk of osteoporosis than men (Adachi et al., 2010) and it is estimated that 200 million women worldwide suffer from the disease (Shirazi et al., 2007). Bone mass in women in all age groups is significantly less than that of men of the same age and race (Boot et al., 1997).

In a meta-analysis study in Iran, the prevalence of osteoporosis in lumbar spine was 0.17 and that of osteopenia was 0.35 (Irani et al., 2013) per 1000 women. A study carried out in Fasa revealed that 34.1% of the women with mean age of 56.4 ± 8.3 years had osteoporosis (Khani Jeihooni et al., 2013). The findings from other studies suggest that exercise and adequate intake of calcium and vitamin D have a

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significant effect on bone density loss and improving Bone Mineral Density (BMD) (Kelley & Kelley, 2006). Osteoporosis is preventable and preventing the disease requires modification in thinking, lifestyle, and daily habits in such a way to improve the quality of life (Baheiraei et al., 2005). Thus, educating preventive behaviors such as physical activity can help women to understand how to prevent osteoporosis and promote and maintain their health. One of the most important, raise factor for preventing this disease is to raise knowledge regarding osteoporosis (Sedlak et al., 2005).

In line with such a purpose, identifying factors affecting behavior change can potentially make these changes easier. Investigating factors that influence preventive behaviors among women with respect to osteoporosis requires the use of models that account for such factors affecting behavior. According to the Health Belief Model (HBM), people change their behavior when they understand that a disease is serious, otherwise they might not turn to healthy behaviors (Turner et al., 2004). The structures of the HBM model include perceived severity, perceived susceptibility, perceived benefits, perceived barriers, modifying variables like, cues to action and self-efficacy (Stubbs, 2010).

Perceived susceptibility was used to evaluate women’s perception about their risk of osteoporosis. Perceived severity of osteoporosis complications was also measured. Considered together, these two factors constitute the women’s perceived threat of the disease. The perceived benefits and barriers refer to the individual’s analysis about the benefits of adopting preventive behaviors' and in this instance behavior that would mitigate osteoporosis such as walking. Similarly, potential barriers to preventive behaviors of osteoporosis were investigated. These, alongside women's perceived ability to carry out preventive behaviors; their cues to action (the incentives that affect women in and outside the family such as friends, physicians, health care providers, media and educational resources); their fear of osteoporosis complications are factors affecting women's decision to adopt or engage in preventive behaviors regarding osteoporosis.

Considering what said above, this study aims to measure HBM constructs on physical activity/walking in preventing osteoporosis among women.

Material and Methods

A quasi-experimental design, supporting interventional research, was conducted on 120 females aged 30 to 50 years old referring to healthcare centers of Fasa Fars province in Iran in 2014. Among the six urban healthcare centers of Fasa, two centers were randomly selected, as intervention and the control groups. Simple random sampling was used at the healthcare center based on the number of health records of the households covered by the centers. The subjects of each group were then invited to a special meeting in the healthcare centers. The inclusion criteria were being in the age range of 30-50 years old, covered by one of the two healthcare centers. Suffering disability, from known rheumatoid disease, mental illness, or a genetic early osteoporosis, fractures decision to withdraw from the study and absence of more than 2 educational sessions were exclusion criteria. Figure 1 presents the study flow chart. Sample size was estimated based on a previous study by Ghaffari et al. in which the mean and standard deviation of calcium intake before and after the study were 813.31 ± 264.75 mg and 1096.61 ± 590.21 mg in the study groups, respectively12. Then, based on the mentioned study and considering $\beta = 0.90$, $\alpha = 0.05$, $S1 = 264.75$, $S2 = 590.21$, $\mu 1 = 813.31$, and $\mu 2 = 1096.61$, 55 the number a subjects were estimated to be needed in each group. Therefore 60 subjects were recruited in each group to compensate the possible attrition. All the research procedures were explained for the potential participants and the consent forms were signed by them before entering to the study.

After establishing the experimental and control groups, the pre-test questionnaire was administered to the two groups. These subjects were present from the beginning to the end study, i.e., there was no attrition among the subjects. Education for women by researchers and five public health experts was done. Training sessions were held in the Hall Health Center. Participants did not know 'whether they were affected by osteoporosis.

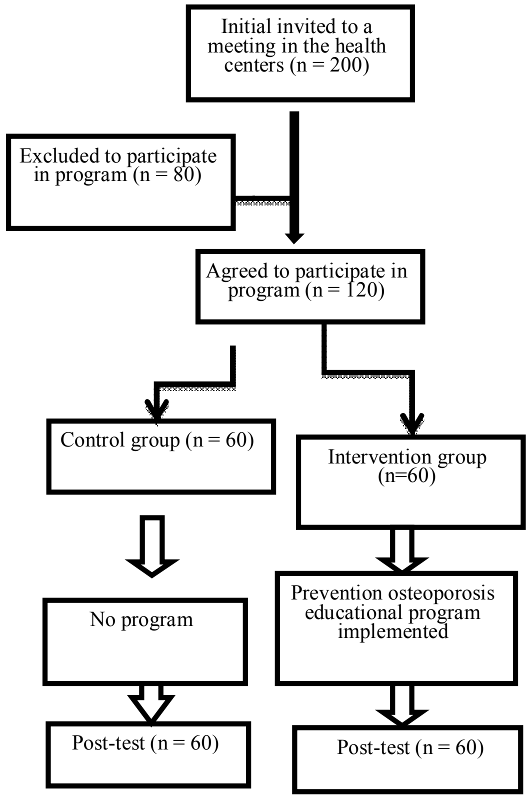

Figure 1. Flow chart of study participants.

Table 1. The Details of the training sessions.

Sessions	Details
First session	Introduction to osteoporosis and its symptoms, complications and diagnosis.
Second session	A 55-year-old female diagnosed with osteoporosis and had a fracture was invited as a model and talked to the subjects about osteoporosis and its risk factors, symptoms, complications, and diagnosis with the help of a physician
Third and fourth sessions	The role of exercise in preventing osteoporosis, benefits and barriers of exercise, following exercise recommendations, self-efficacy in observing proper exercise, and recording activities in the specified forms
Fifth and sixth sessions	The role of exercise, and appropriate exercises; the role and importance of walking, its benefits, barriers types, and self-efficacy, and recording the duration of walking in specified forms
Seventh session	The session was held with the presence of at least one family member and the role of family members in making, facilitating, and providing walking program, and BMD testing was explained
Eighth session	The previous sessions were reviewed and the subjects were provided with educational pamphlets

Next, to measure bone density, the subjects were sent to Fasa bone densitometry center. After testing, the results were recorded. Bone density was measured by a Hologic machine using Dual Energy X-Ray Absorptiometry (DEXA) method inL1 to L4 bones. The densitometry data including bone density in lumbar spine and femoral neck was collected based on the World Health Organization's T-Score values. The intervention for the experimental group included eight 60-minute educational sessions through, lecture group discussion, questions and answers, 'also showing posters and giving educational pamphlets, displaying film and PowerPoint. The details of the training sessions are presented in Table 1.

Immediately after the intervention, both groups completed the questionnaire. To preserve and enhance the physical activity of the experimental group, weekly educational text messages about osteoporosis were sent to them and they attended monthly training sessions so that the researchers could follow-up their activities. Six months later, the questionnaire was completed by both groups (experimental and control) and the subjects underwent BMD tests.

The questionnaire used in this study was developed based on the health belief model. The questionnaire includes the following parts: The first part includes demographic questions, including age, Body Mass Index (BMI) of women which calculated as weight in kilograms divided by height in meters squared (kg/m_2). BMI provides a reliable indicator of body fatness for most people and is used to screen for weight categories that may lead to health problems (WHO, 2004), education level, marital status, occupation, times of delivery, breastfeeding, smoking, history of osteoporosis, history of osteoporosis in the family, history of a specific disease that could affect bone health (any disease except osteoporosis, such as thyroid disease, diabetes, cancer and immunodeficiency diseases) and history of BMD.

The second section includes questions on structures of the HBM. This section include: 23 questions on knowledge; 4 questions on perceived susceptibility (the women's opinion about chances of getting osteoporosis); 6 questions on perceived severity (about complications of osteoporosis); 8 questions on perceived benefits (about the benefits of preventive behaviors of osteoporosis, such as physical activity); 7 questions on perceived barriers (including barriers to physical activity), 4 questions on self-efficacy (including the ability to do exercises); 1 question on external cues to action (resources including family and friends, doctors and health workers, mass media, books and magazines, Internet and other patients with osteoporosis that encourage the subjects 'toward prevention behaviors of osteoporosis); and 3 questions on internal cues to action (including the fear of suffering from complications of osteoporosis and a sense of inner peace following preventive behaviors). All questions were based on the standard 5-point Likert scale ranging from strongly disagree to strongly agree (scores of 1 to 5). Scores of questions on external cues to action were calculated as cumulative frequency. The third section consists of questions on exercise performance i.e. walking. Exercise questions include 7 questions on the duration and type of walking (light, moderate and heavy) during the last week based on received guidelines (score from 0 to 21). The subjects' behavior was assessed through self-report method.

To evaluate the validity of the questionnaire items, the item effect size higher than 0.15andcontent validity ratio above 0.79 were considered acceptable and based on the exploratory factor analysis, they were classified into nine factors. To determine face validity, a list of the items was checked by 30 women who aged 30 to 50 and were similar to those of the targeted subjects. Content validity was established by consulting twelve specialists and professionals (outside the research team) in the field of health education and health promotion (n = 10), orthopedic specialist (n = 1), and biostatistics (n = 1). Then, based on the Lawshe's table, items with higher CVR value (than 0.56 for 12 people) were considered acceptable and were retained for subsequent analysis. The calculated values in this study for 'many 'items were higher than 0.70. The reliability of the instrument based on the 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, 0.79 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, the reliability of the whole instrument was considered acceptable.

The conceptual framework of the proposed model is illustrated in Figure 2.

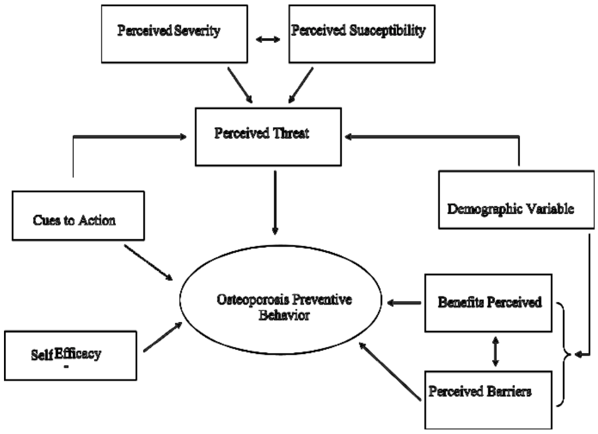

Figure 2. Conceptual framework of this study.

Ethical considerations underwent and approved by the ethics committee of Tarbiat Modares University. The aims and importance of the study were explained to the subjects and their written consent was obtained. The participants were assured that the information gathered from them would remain confidential. Data analysis was carried out through SPSS19 using chi-square test, independent t-test and repeated measure Anova at significance the (RMANOVA) 0.05.

Results

Based on the results, the mean age of women who participated in the study was 41.75 ± 5.4 years for the experimental group, and 41.77 ± 5.43 years of age for the control group. The mean BMI was 22.44 ± 3.30 for the experimental group and 22.27 ± 3.05 for the control group. The average number of births for the experimental group was 2.57 ± 1.47 and 2.50 ± 1.19 for the control group. The above parameters did not show a significant difference between the two groups based on the independent T-test. Table 2shows the rest demographic data. Based on the chi-square test, there is no significant difference between the two groups in education level (P = 0.77), marital status (P = 0.88), occupation (P = 0.67), breastfeeding (P = 0.76), smoking (P = 0.31), history of osteoporosis in the family (P = 0.37), history of particular diseases (P = 0.76) and records of bone densitometry (P = 0.54).

The results also showed that before the intervention there was no significant difference between the two groups regarding knowledge (P = 0.35), perceived susceptibility (P = 0.82), perceived severity (P = 0.19), perceived benefits (P = 0.70), perceived barriers (P = 0.29), self efficacy (P = 0.96), internal cues to action (P = 0.26) and walking behavior (P = 0.99). However, immediately after the intervention and six months later, the experimental group showed a statistically significant increase compared to the control group in all the foregoing subscales except for perceived barriers (P < 0.001). On structural barriers, the experimental group showed a significant decrease compared to the control group (Tables 3and 4) (P < 0.001).

Comparison of bone mineral density T-score in the lumbar spine (P = 0.96) and femur (P = 0.92) in women before and six months after intervention showed that before the intervention, there was no significant difference between the experimental group and the control group in this regard. Six months after the intervention, the value of lumbar spine BMD T-Score in the experimental group increased to 0.127, while in the control group it decreased to -0.043 (P = 0.42). The value of the hip BMD T-Score in the intervention group increased to 0.125 while it decreased to-0.028 in control group (P = 0.50) (Table 5).

Table 2. Frequency distribution of the subjects of two groups in terms of demographic information.

Variable	Control group		Intervention group		P value
	N (%)		N (%)		
Occupation					
Employed	10	16.7	12	20	0.67
Housewife	50	83.3	48	80	
Educational level					
Illiterate	2	3.3	2	3.3	0.77
Primary school	9	15	14	23.3	
Secondary school	22	36.7	17	28.3	
High school	17	28.3	18	30	
College	10	16.7	9	15	
Marital Status					
Single	6	10	8	13.3	0.88
Married	48	80	46	76.7	
Divorced	2	3.3	3	5	
Widowed	4	6.7	3	5	
Breast feeding					
No	54	90	53	88.3	0.76
Yes	6	10	7	11.7	
Smoking					
No	60	100	59	98.3	0.31
Yes	0	0	1	1.7	
History of osteoporosis in the Family					
No	52	86.7	55	91.7	0.37
Yes	8	13.3	5	8.3	
History of a special disease					
No	53	88.3	54	90	0.76
Yes	7	11.7	6	10	
History of bone densitometry					
No	53	88.3	55	91.7	0.54
Yes	7	11.7	5	8.3	

Table 3. Comparison of mean scores of walking behavior among two groups.

Variable	Experimental			Control			P-vlaue[b]
Walking behavior	Mean	SD	P-vlaue[a]	M	SD	P-vlaue[a]	
Pre- intervention	6.93	3.44		6.93	2.52		0.999
Post- intervention	11.83	3.31	< 0.001	7.85	2.38	< 0.001	< 0.001
Six months after intervention	18.72	2.17	< 0.001	8.45	2.47	< 0.001	< 0.001

P-vlaue[a]: Comparison with first evaluation (RM ANOVA-Bonferroni post hoc) P-value[b]: Comparison between experimental and control group (t test for evaluation).

Table 4. The mean T-Score of lumbar spine and femur in women in two groups.

Variables	Experimental		Control	t	
	Mean	SD	Mean	SD	P-value[c]
Spine					
Pre- intervention	0.118	1.254	0.108	1.220	0.965
Six months later	0.245	1.248	0.065	1.228	0.427
Hip					
Pre- intervention	-0.240	1.108	-0.222	1.114	0.928
Six months later	-0.115	1.087	- 0.250	1.107	0.502

P-value[c]: Comparison between experimental and control (t test).

Table 5. Comparison between the mean scores of participants' knowledge and HBM components in two groups.

Variable	Experimental (N = 60)			Control (N = 60)			P-vlaue[b]
	Mean	SD	P-vlaue[a]	Mean	SD	P-vlaue[a]	
Knowledge							
Pre- intervention	7.65	2.36		8.07	2.58		0.358
Post- intervention	10.82	17.3	< 0.001	8.67	2.50	< 0.001	< 0.001
Six months later	18.33	2.25	< 0.001	7.17	2.59	< 0.001	< 0.001
Perceived Susceptibility							
Pre- intervention	22/7	2.31		7.13	1.84		0.827
Post- intervention	10.50	2.65	< 0.001	7.65	1.71	< 0.001	< 0.001
Six months later	15.82	2.28	< 0.001	8	1.80	< 0.001	< 0.001
Perceived Severity							
Pre- intervention	9.73	2.34		9.22	1.99		0.196
Post- intervention	13.23	3.54	< 0.001	9.83	1.95	< 0.001	< 0.001
Six months later	19.92	4.31	< 0.001	10.35	2.05	< 0.001	< 0.001
Perceived Benefit							
Pre- intervention	13.53	3.76		13.30	2.98		0.707
Post- intervention	18.65	4.72	< 0.001	14.17	2.85	< 0.001	< 0.001
Six months later	28.60	5.01	< 0.001	14.98	3.01	< 0.001	< 0.001
Perceived Barrier							
Pre- intervention	26.50	4.01		25.70	4.28		0.293
Post- intervention	20.82	4.02	< 0.001	24.60	4.40	< 0.001	< 0.001
Six months later	13.55	3.95	< 0.001	23.80	4.46	< 0.001	< 0.001
Self–efficacy							
Pre- intervention	7.68	1.90		7.67	2.18		0.965
Post- intervention	10.93	2.37	< 0.001	8.80	2.19	< 0.001	< 0.001
Six months later	15.87	2.60	< 0.001	9.40	2.47	< 0.001	< 0.001
External Cues to Action							
Pre- intervention	5.57	1.91		5.93	1.65		0.262
Post- intervention	7.15	1.91	< 0.001	6.35	1.70	< 0.001	< 0.001
Six months later	12.25	1.46	< 0.001	7.53	1.56	< 0.001	< 0.001

Table 6 shows the distribution of external cues to action for osteoporosis, at three points of before, immediately after the intervention, and then six months after the intervention. The cues use especially family and friends, immediately after the intervention and six months after the intervention increased as compared to what obtained before the intervention.

Table 6. Distribution of external cues to action regarding osteoporosis prevention.

Variables		Before intervention			Immediately after intervention			Six months after the intervention		
		Intervention group	Control group	P value	Intervention group	Control group	P value	Intervention group	Control group	P value
Physicians and Health Personnel	yes	30	28	0.681	35	30	0.211	50	30	0.190
	no	30	32		25	30		10	30	
Families and Friends	yes	20	16	0.412	45	18	0.112	55	20	0.045
	no	40	44		15	42		5	40	
Books	yes	15	13	0.626	20	15	0.222	28	16	0.111
	no	45	47		40	45		32	44	
Journals and Publications	yes	12	15	0.911	14	17	0.721	20	16	0.412
	no	48	45		46	43		40	44	
Radio and Television	yes	25	20	0.724	27	18	0.120	35	21	0.090
	no	35	40		33	42		25	39	
Patients	yes	4	7	0.725	8	8	0.433	20	9	0.235
	no	56	53		52	52		40	51	
Internet	yes	3	4	0.355	10	6	0.101	15	7	0.010
	no	57	56		50	54		45	53	

Discussion

This study showed that a key prevention method for osteoporosis is that of community-based intervention strategies using a behavior change model, like Health Belief Model. Based on the results, there were significant differences between mean scores of knowledge before, immediately after and six months post-intervention in the experimental group. The knowledge scores in this group increased significantly after the intervention.

This finding is consistent with results of previous studies (Ghaffari et al., 2011; Winzenberg et al., 2005; Al Seraty & Ali, 2014). Although the mean score of knowledge significantly increased in the control group as well, there is a significant difference between the mean scores of knowledge for the two groups. The increase in knowledge and other constructs can be attributed to the participants' access to information, as well as their participation in the training course held by the Fasa health center about diseases and health issues for women and health volunteers. The significant increase in the knowledge score in the intervention group warrants consideration.

There was a significant difference between perceived susceptibility of the two groups six months after the intervention. This can be attributed to the effects of the intervention on the subjects' perceived susceptibility. In other words, after the intervention, most women believed they were at risk for osteoporosis. This is consistent with results of (Tussing and Chapman-Novakofski, 2005), Dohney et al (Doheny et al., 2010) (WHO, 2004).

After intervention the perceived severity of the experimental group significantly increased compared to the control group. This is also consistent with results of (Khorsandi, Shamsi & Lahani, 2010; Hazavehei Taghdisi & Saidi 2007). But, the perceived severity in (Tussing & Chapman-Novakofski, 2005 ; Sanaei Nasab et al., 2013) showed no significant increase after the intervention.

The mean scores for perceived benefits showed greater increase among the experimental group than in the control group immediately after and six months post-intervention. The existed study (Ebadi et al., 2012) showed that the construct of perceived benefits of physical activity in the intervention group significantly increased after training, but this was not true for the control group. This is consistent with the findings of the present study. In the previous study on preventing osteoporosis among women with low socioeconomic status, perceived benefits showed a significant increase after the intervention (Shojaezadeh et al., 2011) The increase in the perceived benefits can be the result of an emphasis in training on walking, and the physical and psychological benefits of walking in preventing osteoporosis.

The results of this study showed no significant difference between the two groups before intervention in terms of barriers. However, the difference was significant immediately and six months post intervention for the experimental group. In other words, the educational interventions significantly reduced perceived barriers to proper walking and thereby reduced the risk of osteoporosis. In the study (Anderson Chad, & Spink, 2005) and (Khorsandi, Shamsi & Jahani, 2010). Subjects' perceived barriers regarding physical activity decreased after intervention.

The mean scores of self-efficacy in the present study showed that before the intervention, both groups had lower ability to walking. After the intervention, the mean score of self-efficacy increased significantly in the experimental group. This is consistent with the results of (Tussing & Chapman-Novakofski, 2005; Piaseu Belza, & Mitchel, 2001), but is inconsistent with those of Jessup (Jessup et al., 2003).

External cues of actions are social factors in the HBM and refer to perceived social pressures leading to doing or not doing a behavior. These external cues alongside internal ones led the women toward osteoporosis prevention behaviors. In this study, external cues for the subject's included family, friends, physicians, and health workers. Immediately after and six months post intervention, external cues increased. These cues have an influential role as a source of information and support for walking behaviors and for providing resources and guidance people need to assess bone density. The mean score for the internal cues to action significantly increased after the intervention in the experimental group compared to the control. This is consistent with results of previous studies (Khorsandi, Shamsi & Jahani, 2010) and (Ebadi et al., 2012).

In this study, before the intervention, there was no significant difference between the mean score for women regarding osteoporosis prevention behaviors', and both groups reported low performance in maintaining walking. Immediately after and six months post-intervention, the mean performance score of the women in the intervention group significantly increased compared to the control group. This shows the positive effects of the education on women's performance. Hazavehei also reported an increase in walking in the intervention group after the intervention (Hazavehei, taghdisi & Saidi,, 2007). In a study on 100 female students using the HBM, the students' performance on exercise after the intervention showed a significant increase compared to pre-intervention (Al Seraty & Ali, 2014). This is consistent with previous study on the effects of physical activity education in prevention of osteoporosis among women 40 to 65 years old based on Trans-theoretical Model (Shirazi et al., 2007).

A study showed that the subjects' physical activity levels before the training was not appropriate. But, by applying the HBM training in the experimental group, a significant difference was observed in this area (Anoosheh et al., 2009). This result is in the line of the existed evidence (Costanzo et al., 2006) that verified counseling sessions could effect on physical activity promotion. This is consistent with the present study (Shojaeizadeh et al., 2011). The results of this study are consistent with results of Khorsandi (Khorsandi, Shamsi & Jahani, 2010; Wallace (Wallace, 2002) and Ebadi (Ebadi et al., 2012).

Six months after the intervention, the value of lumbar spine BMD T-score in the experimental group was increased to 0.127, while in the control group it was decreased to -0.043. The value of the thigh BMD T-score in the intervention group increased to 0.125 while it decreased to -0.028 in the control group. In a study, Huang investigated the effectiveness of an osteoporosis prevention program among women in Taiwan based on the Health Belief Model and the three factors of knowledge, self-efficacy and social support. The results showed that in the intervention group, perceived barriers and benefits improved significantly. Self-efficacy and knowledge variables also were increased because of the training program. BMD improved in the intervention group, while it was reduced in the control group (Huang et al., 2011).

Zhao et al showed that exercise improved bone density (Zhao Hang & Tian, 2007). Similarly, Jessup, in a research regarding the effects of exercise on bone density, balance and self-efficacy in older women, showed that in the experimental group, compared to the control group, BMD in the femur and balance improved significantly. However, no significant change was observed in self-efficacy in both groups (Jessup et al., 2003). These results suggest the effectiveness of the intervention program and the importance of educational interventions to improve osteoporosis prevention behaviors. The results of the education based on the health belief model showed that people with higher mean scores on these constructs performed better in activities for the prevention of osteoporosis and had better bone density.

The limitations related to this research project include its sampling method. Simple random sampling is selecting research participants on the basis of being accessible 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 and thus the reliability of self-reported data is tenuous on some items (Schacter, 1999).

Conclusions

The results of this study confirms the importance of ongoing investigations, including epidemiologic and education studies, about osteoporosis in women and should encourage policy makers to consider health-promotive interventions as a priority in health-related fields. The results of this study showed that although the education based on health belief Health can enhance the knowledge, perceived susceptibility, perceiving severitibility and obstacles to the proper conduct of the preventive role most importantly, it seems to change behavior, especially long-term behaviors and the behaviors that socioeconomic factors are interdependent, and failure to sort these issues should also be considered.

The results obtained from this study confirm that providing educational programs in this regard for family members, physicians and other health personnel and offering training programs in radio and television broadcasting is essential.

Conflict of interests

The authors declare that they have no conflicts of interest.

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Author contribution

AKJ, AA, AH, SMK, SG; Study Importation, Data collection and analysis, Writing the first draft of the Paper.

AKJ, AA, AH: Study design and data analysis, editing and confirming the final draft of the paper.

AKJ, AA, AH: Study design, confirming the final draft of the paper .

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References

Adaghi, J. D., Adami, S., Gehlbach, S., Anderson, F. A., Boonen, S., Chapurl AT, R. D et al. (2010) Impact of prevalent fractures on quality of life: baseline results from the global longitudinal study of osteoporosis in women. Mayo Clinic Proceedings. 85(9),806-813.

Al Seraty, W. H. H. & ALI, W. G. M. (2014) The impacts of health belief model based intervention for osteoporosis prevention among female students in Al Dawadmi Applied Medical Science, Shaqraa University, Saudi Arabia. *Journal of Biology, Agriculture and Healthcare.* 4(7)**,** 125-131.

Anderson, K. D., Chad, K. E. & Spink, K. S. (2005) Osteoporosis knowledge, beliefs, and practices among adolescent females. *Journal of Adolescent Health.* 36**,** 305-312.

Anoosheh, M., Ghofranipour, F., Ahmadi, F. & Houshiar-rad A. (2009) The effect of education based on health belief model on preventive factors of osteoporosis among postmenopausal women. *Iran Journal of Nursing.* 22**,** 71-82.

Baheiraei, A., Ritchie, J. E., Eisman, J. A. & Nguyen, T. V. (2005) Psychometric properties of the Persian version of the osteoporosis knowledge and health belief questionnaires. *Maturitas.*50**,** 134-139.

Boot, A. M., DE Ridder, M. A., Pols, H. A., Krenning, E. P. & De Muinck Keizer-Schrama, S. M. (1997) Bone Mineral Density in Children and Adolescents: Relation to Puberty, Calcium Intake, and Physical Activity 1. *The Journal of Clinical Endocrinology & Metabolism.*82**,** 57-62.

Costanzo, C., Walker, S. N., Yatez, B. C., Mccabe, B. & Berg, K. (2006) Physical activity counseling for older women. *Western journal of nursing research.* 28**,** 786-801.

Doheny, M. O., Sedlak, C. A., Hall, R. J. & Estok, P. J. (2010) Structural model for osteoporosis preventing behavior in men. *American journal of men's health*.

Ebadi FardAzar F, Solhi M, Zohoor AR, Ali Hosseini M. The effect of health belief model on promoting preventive behaviors of osteoporosis among rural women of Malayer. JQUMS. 2012;16 (2):58-64. [Persian]

Hazavehei S., TaghdisiI, M. & Saidi, M. (2007) Application of the Health Belief Model for osteoporosis prevention among middle school girl students, Garmsar, Iran. *Education for health.* 20 (1)**,** 23.

Huang, C.-M., SU, C.-Y., Chien, L.-Y. & GUO, J.-L. (2011) The effectiveness of an osteoporosis prevention program among women in Taiwan. *Applied Nursing Research.* 24**,** 29-37.

Ghaffari M, Tavassoli E, Esmaill Zadeh A, Hasan Zadeh A. the effect of education based on health belief model on the improvement of osteoporosis preventive nutritional behaviors of second grade middle school girls in Isfahan. J Health Sys Res. 2011; 6 (4):1-10. [Persian]

Irani, A. D., PoorolajalL, J., Khalilian, A., Esmailnasab, N. & Cheraghi, Z. (2013) Prevalence of osteoporosis in Iran: A meta-analysis. *Journal of research in medical sciences: the official journal of Isfahan University of Medical Sciences.* 18 (9)**,** 759-766.

Jessup, J. V., Horne, C., Vishen, R. & Wheeler, D. (2003) Effects of exercise on bone density, balance, and self-efficacy in older women. *Biological Research for nursing.* 4 (3)**,** 171-180.

Kelley, G. A. & Kelley, K. S. (2006) Exercise and bone mineral density at the femoral neck in postmenopausal women: a meta-analysis of controlled clinical trials with individual patient data. *American journal of obstetrics and gynecology.* 194 (3)**,** 760-767.

Khani Jeihooni, A., Hidarnia, A., Kaveh, M., Hajizadeh, E., Babaei Heydarabadi, A. & Nobakht Motlagh, B. (2013) Prevalence of osteoporosis and its related factors in women referred to Fasas densitometry center. *Scientific Journal of Ilam University of Medical Sciences.* 21 (4)**,** 150-158.

Khosandi, M., Shamsi, M. & Jahani, F. (2010) The effect of education based on Health Belief Model on osteporosis preventive behaviors among pregnant women referred to Arak health centers. *Daneshvar.* 18 (89)**,** 23-32.

Plaseu, N., Belza, B. & Mitchelil, P. (2001) Testing the effectiveness of an osteoporosis educational program for nursing students in Thailand. *Arthritis Care & Research.* 45 (3)**,** 246-251.

Sanaeinasab, H., Tavakoli, R., Farrokhian, A., Karimi Zarchi, A. A. & Hajiamini, Z. (2013) The effect of educational intervention with the health belief model on knowledge, perceptions and self-efficacy among adolescent of high school girls about osteoporosis, Tehran, Iran 2010-2011. *Urmia Medical Journal.* 24 (3)**,** 163-169.

Schacter, D. L. (1999) The seven sins of memory: insights from psychology and cognitive neuroscience. *American psychologist.* 54 (3), 182-203.

Shirazi, K. K., Wallace, L. M., Niknami, S., Hidarnia, A., Torkaman, G., Gilchrist, M et al., (2007) A home-based, transtheoretical change model designed strength training intervention to increase exercise to prevent osteoporosis in Iranian women aged 40-65 years: a randomized controlled trial. *Health education research.* 22 (3)**,** 305-317.

Shojaezadeh D, Mehrab baic A, Mahmoodi M, Salehi L. To Evaluate of efficacy of education based on health belief model on knowledge, attitude and practice among women with low socioeconomic status regarding osteoporosis prevention. Iran J Epidemiol. 2011; 7 (2): 30-37. [Persian].

Stubss, B. (2010) Osteoporosis and falls: some further considerations for the nursing profession. *British Journal of Nursing.* 19 (22)**,** 1431-1431.

Turner, L. W., Hunt, S. B., Dibrezzo, R. & Jones, C. (2004) Design and implementation of an osteoporosis prevention program using the health belief model. *American journal of health studies.*19 (2)**,** 115-121.

Tussing, L. & Chapman-Novakofski, K. (2005) Osteoporosis prevention education: behavior theories and calcium intake. *Journal of the American Dietetic Association.* 105 (1)**,** 92-97.

Wallace, L. S. (2002) Osteoporosis prevention in college women: application of the expanded health belief model. *American journal of health behavior.*26 (3)**,** 163-172.

WHO, E. C. (2004) Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. *Lancet.* 363 (9403)**,** 157-163.

Winzenberg, T., Oldenburg, B., Frendin, S., Dewit, L. & Jones, G. (2005) Effects of bone density feedback and group education on osteoporosis knowledge and osteoporosis self-efficacy in premenopausal women: a randomized controlled trial. *Journal of Clinical Densitometry.* 8 (1)**,** 95-103.

Zhao, J., ZHANG, L. & TIAN, Y. (2007) Effect of 6 months of Tai Chi Chuan and calcium supplementation on bone health in females aged 50-59 years. *Journal of Exercise Science & Fitness.* 5 (2)**,** 88-94.

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