# The effect of educational intervention based on the health belief model on osteoarthritis-preventive behaviors in middle-aged women

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**Abstract:**

**BACKGROUND AND AIM:** Arthritis is the most common type of arthritis in people over 40 years. This study aimed to determine the effect of an educational intervention on the prevention of arthritis among middle-aged women using the health belief model.

**MATERIALS AND METHODS:** This was a randomized controlled field trial. The study population was women aged 29–59 years who referred to health centers in Birjand. Seventy-three women were selected by a systematic random sampling method and were randomly divided into intervention ($n = 36$) and control ($n = 37$) groups. The data collection tool was a researcher-made questionnaire. Data were analyzed using the Chi-square test, Fisher's exact test, $t$-test, repeated-measures ANOVA, and Bonferroni *post hoc* test. As for the cases where the data were not normally distributed, the Friedman nonparametric test, Mann–Whitney U-test, and Wilcoxon *post hoc* tests were used.

**RESULTS:** In the intervention group, the mean score of knowledge, perceived susceptibility, severity, benefits, self–efficacy, and behavior significantly increased, and the mean score of perceived barriers significantly decreased after the intervention ($\leq 0.001$). In the control group, there were significant differences in the mean scores of perceived susceptibility, perceived severity, perceived self-efficacy, and performance after an intervention ($P \leq 0.001$). However, this increase was significantly higher in the intervention group than in the control group.

**CONCLUSION:** Based on the present study and according to the positive impact of the educational intervention based on the health belief model on the prevention of arthritis, it is recommended to use this theory in educational programs to prevent arthritis.

**Keywords:**

Arthritis, education, middle aged, women health

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## Introduction

Musculoskeletal diseases are among the most common diseases in both developed and developing countries.[1] One of the most significant types of musculoskeletal disorders is arthritis.[2] Arthritis in developed countries is the primary cause of disability in people over 65 years of age and has a huge economic burden for health-care providers.[2] Osteoarthritis is one of the most common types of arthritis among various human communities, including Iran.[3] Osteoarthritis is the most common disease in the elderly and its incidence is more than even heart disease, hypertension, and diabetes.[4] This debilitating disease is associated with a decline in quality of life and is currently increasing with increasing life expectancy.[5] In the United States after coronary artery disease, osteoarthritis is the most common cause of disability and inability to work in men over 50 years of age.[2] In Iran, of every 10 patients over the age of 20–35 years referring to doctors with

major complaints of the knee, back, and neck pain, nine have osteoarthritis.[6] The majority of people will have radiographic evidence of osteoarthritis up to the age of 65 years, in a way that at the age of 75 years, about 80% of people will have this disease.[7] Factors such as family history, obesity, osteoporosis, trauma, and working in some occupations increase the chance of developing osteoarthritis.[2] Changes in lifestyle, weight loss in obese individuals, and movement modification before the incidence of osteoarthritis can be effective in preventing or reducing the severity and symptoms of this disease.[8] The effectiveness of education depends on the proper use of behavioral science theory.[9] One of the most effective models for behavior change is the health belief model, which considers behavior as a function of one's knowledge and attitude [Figure 1].[9] Since the 1950s, the health belief model has been the most widely used conceptual framework for health behavior studies to explain the change or maintenance of health-related behaviors.[10] Based on this model, the probability of adopting a health behavior depends on two issues: first, one's perception of the extent of the threat (perceived susceptibility and severity) and second, the individual's assessment of the barriers and benefits of health behavior (perceived barriers and benefits).[11]

A relatively high percentage of people in Iran have symptoms of osteoarthritis in their late middle age and old age, and the onset of the disease is in the middle age. The purpose of this study was to determine the effect of educational intervention based on the health belief model on osteoarthritis-preventive behaviors in middle-aged women, that along with investigating the effectiveness of this type of education on promoting health behaviors of middle-aged women, a small step is taken toward promoting the health of women, especially middle-aged women.

## Materials and Methods

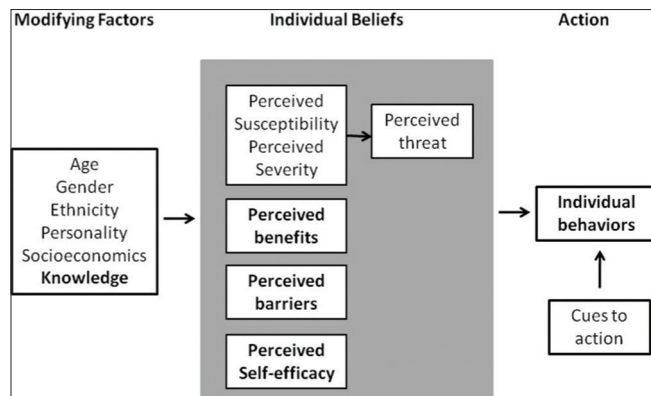The present study is a randomized controlled field trial which was conducted in late 2017 and early 2018. The



**Figure 1:** Conceptual framework of Health Belief Model (HBM – GLANZ)

study population consisted of women aged 29–59 years who referred to health centers in Birjand (Iran city). To determine the sample size according to the results of the study done by Shojaezadeh *et al*.,[12] the standard deviation of perceived benefits before and after the intervention was used in the experimental group ($\alpha = 0.05$, $\beta = 0.8$), and the maximum number of the sample for each group was considered 37 individuals with 20% attrition rate. Inclusion criteria were women in the age range of 29–59 years, with the ability to read and write, lack of osteoarthritis according to the individual's claim, and willingness to participate in the study, and exclusion criteria were lack of punctuality and ineffective attendance at training sessions (two sessions and more).

Sampling was done by systematic random sampling. First, the city of Birjand was divided into two regions of North and South, and from the list of comprehensive urban health centers, in each region, two centers were selected, randomly one center was chosen as the control and the other as the intervention group. Then, by referring to each center and coordinating with the head of the center, a list of eligible women aged 29–59 years was prepared based on the inclusion criteria and the samples (36 cases and 37 controls) were randomly and systematically selected.

Data were gathered through a self-administered researcher-made questionnaire. The questionnaire included items on demographic information, awareness, and health belief model constructs (including perceived susceptibility, perceived benefits, perceived barriers, perceived severity, cues to action, self-efficacy, and behavioral questions). The demographic questions included 13 questions including date of birth, marital status, age of marriage, number of children, level of education, and so on. The awareness questions consisted of 10 multiple-choice questions that were assigned to the correct score of 1 and the false score of 0, the range of scores was from 0 to 10. Perceived susceptibility consisted of five questions, perceived severity of nine questions, perceived benefits of four questions, perceived barriers of eight questions, and perceived self-efficacy of eight questions that were answered in a 5-point Likert scale (strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree) which were given a score of 1–5. The cues to action had six questions, three of which were 5-point Likert (strongly agree, agree, neither agree nor disagree, disagree, and strongly disagree) with a score of 1–5, and three questions were multiple choice. Questions related to behavior had 13 questions, with yes and no answers, with a score of 1 being yes and zero being no. In questions related to behavior, the amount of doing stretching and strengthening exercises (swimming and walking) in preventing osteoarthritis; the amount of consuming milk, dairy, and

vegetables; the status of weight control by the studied subjects; the way of properly using the joints; the status of doing corrective exercises and taking rest after doing the heavy work, as well as the degree of adjustment to the living space were examined. The validity of the questionnaire was assessed by asking the professors to comment on the quality of the questionnaire items, and the CVR and CVI of the questionnaire were determined. The reliability of the measuring tool was determined by calculating Cronbach's alpha coefficient with emphasis on internal correlations which was done by completing 30 questionnaires by the studied population. Cronbach's alpha of the perceived susceptibility was 0.69, perceived severity was 0.76, perceived benefits were 0.69, perceived barriers were 0.74, perceived self-efficacy was 0.81, and the total alpha was calculated to be 0.78.

The curriculum included general content about osteoarthritis, people at risk, early symptoms of the disease, presenting various methods for early detection of osteoarthritis and preventive behaviors of osteoarthritis through lecture and questions and answers, group discussion, showing educational slides and presenting a book, and a pamphlet to the experimental group. The sessions were conducted by a senior expert in health education and health promotion and a physiotherapist and each session lasted 60 min. The resources of the training package were based on the books and training packages available at the Ministry of Health. The training program was based on the constructs of the health belief model [Table 1].

The data were entered into SPSS19 software (SPSS Inc. Chicago, Illinois, USA) and analyzed by inferential statistical tests at the significant level of $\alpha = 0.05$. In cases where the data were distributed normally, the independent *t*-test, repeated analysis of variance, Bonferroni *post hoc* test, and Chi-square test, or Fisher's exact test were employed. As for the cases where the data were not normally distributed, the Friedman nonparametric test, Mann–Whitney U-test, and Wilcoxon *post hoc* tests were used.

It should be noted that to comply with ethical principles, the purpose of the research was explained before collecting data for each sample, and the individual was assured that the obtained information was completely confidential and that information was collected only from those who were willing to participate. To prevent the control group from being deprived of educational subjects, after the end of the study, one educational session was held for the control group.

## Results

The mean age in the intervention group was $37.98 \pm 6.7$ years and in the control group was $38.13 \pm 6.7$ yearsa. About 37.8% of the intervention group ($n = 14$) and 44.4% of the control group ($n = 16$) had a high school diploma, and there was no statistically significant difference between the two groups. About 56.1% ($n = 31$) of the intervention group and 43.9% ($n = 25$) of the control group were housewives with no statistically significant difference ($P = 0.06$).

The investigation of the normality in two intervention and control groups ($n = 73$) using Kolmogorov–Smirnov test showed that the variables of perceived severity, perceived barriers, perceived self-efficacy, and behavior were normal and knowledge, perceived susceptibility, and perceived benefits were nonnormal, regarding which nonparametric tests (Friedman, Mann–Whitney U-test, and Wilcoxon *post hoc* tests) were used.

The results of comparing the mean scores of the three structures of knowledge, perceived susceptibility, and perceived severity of arthritis are presented in Table 2.

### Table 1: Structure and content of training sessions

| Session number | Session title | Target variables |
| --- | --- | --- |
| First and Second sessions | Introducing, expressing goals, defining osteoarthritis, the importance of the disease, presenting statistics on prevalence and disability caused by osteoarthritis in women. | Increasing awareness, perceived susceptibility and severity |
| Third session | Introducing preventive behaviors for osteoarthritis and the effects of these behaviors | Promoting perceived benefits |
| Fourth session | Nutrition Principles for Preventing osteoarthritis and Ways to Overcome Perceived Barriers to Adopt Nutritional Behaviors. | Promoting self-efficacy to overcome barriers of nutritional behaviors. |
| Fifth session | Training proper physical activity to prevent osteoarthritis | Promoting self-efficacy to overcome barriers of physical activity. |
| Sixth session | Correction of upper trunk movements | Promoting self-efficacy to overcome barriers of physical activity. |
| Seventh session | Correction of lower trunk movements | Promoting self-efficacy to overcome barriers of physical activity. |
| Eighth session | Doing body warm-up exercises | Promoting self-efficacy of physical activity. |
| Ninth session | Solving problems related to educational content from the previous session. | Promoting self-efficacy to overcome obstacles |
| Tenth session | Presenting a summary of what has been said and answering women's questions | - |

The results of the mean scores of benefits, barriers, perceived self-efficacy in relation to arthritis-preventing behaviors as well as behavior are presented in Table 3.

## Discussion

The objective of this study was to evaluate the effect of education based on the health belief model on arthritis-preventing behaviors among middle-aged women referred to Birjand comprehensive health services centers. Knowledge is one of the necessary components for changing the health behaviors. People's knowledge of the disease and its predisposing factors can play a significant role in preventing and reducing harm in the rest of their life. The results of the present study indicated the effectiveness of a theory-based intervention on enhancing women's knowledge of arthritis, which was in line with the results of the studies conducted by Berarducci *et al.*[13] and Gammage *et al.*[14] who aimed at enhancing the knowledge of arthritis-preventing behaviors. The reason to enhance the knowledge of people in the present study was applying

awareness-raising strategies such as face-to-face education and questions and answers during the study to enhance their knowledge on arthritis, its symptoms, and factors affecting arthritis and identifying the factors that prevent it.

Cognitive beliefs regarding the complications of arthritis can make middle-aged women sensitive to the disease. Based on the results of this study, theory-based educational intervention enhanced the perceived susceptibility of women of the intervention group to arthritis. Perceived susceptibility in the control group also increased significantly over time, but this difference was more evident in the intervention group. The results of studies conducted by Sanaei Nasab *et al.*,[15] Hazavehei *et al.*,[16] Ghaffari *et al.*,[17] and Tussing and Chapman-Novakofski[18] with the aim of enhancing the perceived susceptibility of female students to osteoporosis also confirmed the results of the current study. The reason for an increase in the perceived susceptibility in the intervention group

**Table 2: Comparison of the mean scores of structures of knowledge, perceived sensitivity, and perceived severity in the three groups before, immediately and three months after the intervention in the two study groups**

| Model Structures | Group | Before | After | Three months later | Test |
|---|---|---|---|---|---|
| Knowledge | Case | 92/1±16/3 | 72/0±62/8 | 95/0±16/8 | $\chi^2$91/65=$P$001/0≥ (Friedman test) |
| | Control | 97/1±16/4 | 90/1±83/4 | 95/1±30/5 | 81/4=$\chi^2$, 09/0=$P$, (Friedman test) |
| | Mann Whitney test result | 27/3=$z$, 001/0≥$P$ | 25/7=$z$, 001/0≥$P$ | 43/6=$z$, 001/0≥$P$ | |
| Perceived susceptibility | Case | 52/3±46/11 | 46/23±89/1 | 23/2±59/22 | 10/56=$\chi^2$, 001/0≥$P$, (Friedman test) |
| | Control | 57/3±39/9 | 61/21±34/2 | 08/22±64/2 | 75/54=$\chi^2$, 001/0≥$P$, (Friedman test) |
| | Mann Whitney test result | 69/2=$z$, 007/0 $P$= | 51/3=$z$, 001/0≥$P$ | 73/0=$z$, 4/0 $P$= | |
| Perceived severity | case | 29/7±41/33 | 93/2±35/42 | 35/39±45/6 | $F$=1/3583, $P$001/0≥, (Repetitive variance) |
| | Control | 02/36±05/1 | 73/0±33/38 | 85/0±33/38 | F5/2752=$P$001/0≥, (Repetitive variance) |
| | Independent *t*-test result | *t*61/1=$P$=1/0 | *t*57/4=$P$001/0≥ | *t*74/0=$P$=4/0 | |

**Table 3: Comparison of the mean scores of structures of benefits, barriers, perceived self-efficacy and behavior in the three intervals of before, immediately and three months after the intervention in the two studied groups**

| Model Structures | Group | Before | After | Three months later | Test |
|---|---|---|---|---|---|
| Perceived benefits | case | 83/10±53/3 | 82/1±32/19 | 08/1±32/19 | $\chi^2$=29/40, $P$ 001/0≥ ) Friedman test( |
| | Control | 58/17±77/2 | 96/1±88/17 | 11/2±97/17 | $\chi^2$34/0=8/0 $P$=) Friedman test( |
| | Mann Whitney test result | $z$43/2=$P$001/0≥ | $z$96/3=$P$001/0≥ | $z$93/2=$P$003/0= | |
| Perceived barriers | case | 78/24±45/5 | 68/7±89/20 | 19/22±28/8 | F23/547=$P$001/0 ≥, (Repetitive variance) |
| | Control | 83/28±6/0 | 73/7±14/29 | 72/7±89/28 | F52/660=$P$001/0 ≥ (Repetitive variance) |
| | Independent *t*-test result | t61/2=$P$=001/0 | t57/4=$P$001/0≥ | t57/3=$P$001/0≥ | |
| Self-efficacy | case | 27/28±78/6 | 58/4±29/36 | 7/34±06/4 | F1/3171=$P$001/0≥ (Repetitive variance) |
| | Control | 63/29±9/8 | 53/32±21/7 | 55/33±71/7 | F7/699=$P$001/0 ≥ (Repetitive variance) |
| | Independent *t*-test result | *t*74/0=$P$=38/0 | 74/0=$t$ $P$=01/0 | $t$=48/1, $P$=1/0 | |
| Behavior | case | 97/1±73/4 | 71/2±46/9 | 53/2±41/9 | F=865/3, $P$001/0≥, (Repetitive variance) |
| | Control | 03/3±6 | 47/6±06/3 | 17/3±47/4 | F 95/210=$P$001/0 ≥, (Repetitive variance) |
| | Independent *t*-test result | *t*11/2=$P$=03/0 | *t*41/4=$P$001/0≥ | *t*88/2=$P$=005/0 | |

was the use of various educational strategies such as group discussion and question and answer. Moreover, obtaining information from other sources could increase the perceived susceptibility in the control group.

Perceived severity is the belief in the level of damage or injury caused by the disease or any harmful situation. According to the results of the present study, there was a statistically significant difference between intervention and control groups in the mean scores of perceived severity at three times of before, immediately after, and 3 months after the intervention. However, the mean score of perceived severity immediately after the intervention was significantly higher in the intervention group than that in the control group. This result was consistent with the results of the studies conducted by Shojaezadeh *et al*.,[12] Ghaffari *et al*.,[17] Gimaje *et al*.,[14] and Hazavehei *et al*.[16] with regard to the effect of calcium intake in preventing osteoporosis in the clients of the health center, but it was inconsistent with the results of the studies conducted by Sanaei Nasab *et al*.[15] and Tussing and Chapman-Novakofski[18] who showed that educational intervention did not have a significant impact on perceived severity. Increasing this construct in our intervention group was due to applying the educational strategies in accordance with the goal of identifying the pathogenicity of this disease in individuals, but increasing this construct in the control group was probably due to the result of obtaining information from other sources and organizations.

Perceived benefits refer to people's perception of the value and benefits of performing arthritis preventing behaviors such as the benefits of proper nutrition, regular stretching exercises, and articular movements modification. Based on the results of this study, the educational intervention had a significant effect on increasing the perceived benefits in the intervention group. This result was in line with the results of the studies conducted by Shojaezadeh *et al*.,[12] Ghaffari *et al*.,[17] Gimaje *et al*.,[14] and Hazavehei *et al*.[16] to increase the perceived benefits in preventing osteoporosis. However, it was inconsistent with the results of the studies conducted by Sanaei Nasab *et al*.[15] and Torshizi *et al*.,[19] in which educational intervention did not increase perceived benefits of calcium intake and physical activity to prevent osteoporosis. Improvement of perceived benefits in the intervention group was due to applying educational methods such as group discussion to identify the benefits of arthritis preventing behaviors.

The barriers that individuals face in the prevention of arthritis are considered perceived barriers. The perceived barriers before the intervention were significantly higher in the control group than those in the intervention group, but the perceived barriers in the intervention group were significantly higher than those in the control group. The results of the present study were consistent with those of the studies conducted by Piaseu *et al*.[20] and Franko *et al*.[21] who eliminated the perceived barriers of physical activity in adolescent girls, but they were inconsistent with the results of the studies conducted by Sanaei Nasab *et al*.,[15] in which the educational intervention did not lead to a significant reduction in the perceived barriers of the subjects. The results of this study revealed that the educational intervention led to the elimination of barriers of arthritis-preventing behaviors such as the cost of nutrition and regular physical activity, lack of easiness of change in lifestyle, and family mocking while doing the stretching exercises and lack of necessary knowledge on arthritis led to corrective behaviors to prevent arthritis.

Perceived self-efficacy refers to one's ability to perform arthritis-preventing behaviors in a way that results in desirable outcomes. The results revealed that there was a statistically significant difference in perceived self-efficacy between intervention and control groups at three times of before, immediately after, and 3 months after the intervention. However, the level of increase in perceived self-efficacy was higher in the intervention group compared to the control group. It was in line with the results of studies conducted by Piaseu *et al*.[20] and Tassing *et al*. who assessed the association between calcium intake and doing physical activity in girl adolescents. The results of the present study indicated the positive effect of educational intervention on increasing perceived self-efficacy in terms of caring of joints, compliance with nutritional principles, regular physical activity, and a change in the lifestyle.

Activities that are performed by a person to promote and maintain health before arthritis are considered as one's behavior. The present study also revealed that the mean score of behavior at all three times of before and immediately after the intervention and 3 months after the intervention increased in both the groups, but in the intervention group, the mean score of behavior was significantly higher than that of the control group. The results of the present study were consistent with those of the studies conducted by Ghaffari *et al*.[17] and Hazavehei *et al*.[16] who indicated the positive effect of education on increased intake of calcium in the prevention of osteoporosis. The reason for an increase in the mean score of behavior in the intervention group was using the educational methods aimed at promoting arthritis-preventing behaviors (doing daily stretching and strengthening exercises for 30 min, consumption of sufficient dairy and vegetables, regular weight control, using appropriate shoes and chairs, and proper use of joints) and enhancing knowledge, susceptibility, severity, benefits, and self-efficacy. One of the reasons for an increase in the mean score of behavior in the control

group could be related to holding educational classes in health centers and receiving education from the mass media and social media that were out of the control of the researcher. They might also be sensitive to this issue after completing the questionnaire and might obtain information from various sources, including books and the Internet.

One of the strengths of this study was the conduction of the study on the general population of both single and married middle-aged women of the community aged 29–59 years who referred to health centers, but previous studies have focused on a specific group of women, such as pregnant mothers, lactating mothers, employed women, or other groups. Other strength of this study was that it focused on the primary prevention of arthritis. Most people in the community believe that the onset of arthritis disease is at old age, but the onset of this disease is before aging. The onset of the disease is mild and asymptomatic. Its symptoms are manifested in the person when joints have degraded and deformed. Furthermore, arthritis does not have a specific cure; however, its pain and progression can be prevented through medication and certain exercises. Thus, the focus of interventions in primary prevention of arthritis has a particular importance. Other strength of this study was performing a descriptive study before the intervention, indicating the level of knowledge and status of arthritis-preventing behaviors and the perception of middle-aged women, which helped us to design educational intervention. Having a control group and comparing the intervention and control groups with each other and randomly assigning of the subjects into two groups were other strengths of this study. One of the weaknesses of this study was the lack of previous studies on the prevention of arthritis using health education theories to compare their results, filling out a self-report questionnaire, identifying non-arthritis cases based on subjects' self-statements, and the short follow-up period (3 months).

## Conclusion

In the present study, an educational intervention based on the health belief model was used to promote arthritis-preventing behaviors. The intervention yielded effective results, and a larger number of the intervention group subjects adopted the behavior over a 3-month follow-up period, indicating the potential of the health belief model to promote arthritis-preventing behavior. The results of this study confirmed the effect of using this model in arthritis-preventing programs and could be used by authorities and planners to implement interventions for arthritis-preventing behaviors.

### Conflicts of interest
There are no conflicts of interest.

## References

1. Keshtkaran Z, Ghodsbin F, Solouki S, Razeghi M, Zare N. The Impact of Self Care Education on Quality of Life of those Clients Suffering from Osteoarthritis in Rehabilitation Centers of Shiraz University of Medical Science (Iran); 2010.
2. Paul L, Gudith H. Overcoming Arthritis. Tehran: Hayyan; 2011. p. 128.
3. Mehdinasab S, Haddadpoor A, Sarrafan N, Dashtbozorg A, Ebrahimi M. Prevalence and evaluation of risk factors in primary knee osteoarthritis. Sci Med J 2010;9:135-41.
4. Abdohadi N, Masoomeh A. Osteoarthritis. Tehran: Tehran University of Medical Sciences; 2012. p. 552.
5. Dahaghin S, Tehrani-Banihashemi S, Frouzanfar M, Barghamdi M, Norollahzadeh E, Gholami J, *et al*. Risk factors of knee osteoarthritis, WHO-ILAR-COPCORD study. Tehran Univer Med J 2009;6:721-8.
6. Mousavi SH, Al-hammadi W, Azimi SA. The knowledge of people referred to Al-Zahra Hospital Orthopedic Clinic (Isfahan, Iran) about risk factors of knee osteoarthritis. J Isfahan Med Sch 2013;31:258.
7. Enjezab B, Farajzadegan Z, Taleghani F, Aflatoonian A, Morowatisharifabad MA. Health promoting behaviors in a population-based sample of middle-aged women and its relevant factors in Yazd, Iran. Int J Prev Med 2012;3:S191-8.
8. Mazloumi MS, Bajalan M, Dormohammadi TT, Tarahi M, Bonyadi F. The Effect of Training on Adopting Behaviors Preventing from Knee Osteoarthritis Based on Planned Behavior Theory; 2015.
9. Sadeghi R, Rezaeian M, Khanjani N, Iranpour A. The applied of health belief model in knowledge, attitude and practice in people referred for diabetes screening program: An educational trial. J Rafsanjan Univer Med Sci 2015;13:1061-72.
10. Tehrani FJ, Nikpoor S. Evaluation of the effect of health belief model on preventive behaviors of urinary tract infection in women. Faculty Nurs Univer Med Sci Iran 2014;3:1-11.
11. Ghafari M, Nasirzadeh M, Aligol M, Davoodi F, Nejatifar M, Kabiri S, *et al*. Determinants of physical activity for prevention of osteoporosis among female students of Shahid Beheshti University of Medical Sciences: Application of health belief model. Pajoohandeh J 2014;19:244-50.
12. Shojaezadeh D, Sadeghi R, Tarrahi MJ, Asadi M, Lashgarara B. Application of Health Belief Model in Prevention of Osteoporosis in Volunteers of Khorramabad City Health Centers, Iran; 2012.
13. Berarducci A, Lengacher CA, Keller R. The impact of osteoporosis continuing education on nurses' knowledge and attitudes. J Contin Educ Nurs 2002;33:210-6.

14. Gammage KL, Francoeur C, Mack DE, Klentrou P. Osteoporosis health beliefs and knowledge in college students: The role of dietary restraint. Eat Behav 2009;10:65-7.

15. Sanaei Nasab H, Tavakoli R, Farrokhian A, Karimi Zarchi AA, Haji Amini Z. 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. J Urmia Univer Med Sci 2013;24:163-9.

16. Hazavehei SM, Taghdisi MH, Saidi M. Application of the health belief model for osteoporosis prevention among middle school girl students, Garmsar, Iran. Educ Health (Abingdon) 2007;20:23.

17. Ghaffari M, Tavassoli E, Esmaillzadeh A, Hasanzadeh 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; 2011.

18. Tussing L, Chapman-Novakofski K. Osteoporosis prevention education: Behavior theories and calcium intake. J Am Diet Assoc 2005;105:92-7.

19. Torshizi L, Anoosheh M, Ghofranipour F, Ahmadi F, Houshyar-Rad A. The effect of education based on health belief model on preventive factors of osteoporosis among postmenopausal women. Iran J Nurs 2009;22:71-82.

20. Piaseu N, Belza B, Mitchell P. Testing the effectiveness of an osteoporosis educational program for nursing students in Thailand. Arthritis Rheum 2001;45:246-51.

21. Franko DL, Cousineau TM, Trant M, Green TC, Rancourt D, Thompson D, *et al*. Motivation, self-efficacy, physical activity and nutrition in college students: Randomized controlled trial of an internet-based education program. Prev Med 2008;47:369-77.