Original Article

Effect of Health Belief Model based intervention on promoting nutritional behaviors about osteoporosis prevention among students of female middle schools in Isfahan, Iran

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ABSTRACT

Background: Osteoporosis is a systemic skeletal disorder characterized by reduction of one mass, deterioration of bone structure, increasing bone fragility, and increasing fracture risk. Prevention of osteoporosis during childhood and adolescence is one of the most important issues in World Health Organization. The purpose of this study was to determine the effect of Health Belief Model based intervention on promoting nutritional behaviors about preventive osteoporosis among the second grade middle school girl students. **Materials and Methods:** This was an experimental intervention study, the research population being 130 students who were randomly divided into groups, experimental (66) and control (64). Before the educational program, Health Belief Model based standard questionnaire and Food Frequency Questionnaire (FFQ) questionnaire were filled up by both the groups. The standard questionnaire was completed three times (before, immediately, and 2 months after education) and FFQ questionnaire was completed two times (before and 2 months after education) by the students. After pre-test, four educational session classes in the experimental group were performed. Finally, data collected were analyzed by SPSS 18 computer software. **Results:** The result of this study showed a significant increase in the mean score of knowledge, perceived susceptibility, seriousness, benefits, barriers, as well as taking health action among girl students in the experimental group. **Conclusion:** The findings of the present study confirmed the practicability and effectiveness of the Health Belief Model based educational program in promoting nutritional behaviors about prevention of osteoporosis.

Key words: Calcium intake, education, health belief model, osteoporosis, student

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INTRODUCTION

Osteoporosis is a clinically silent disease in its early stages. It can lead to hip and spine fractures later in life. According to the National Osteoporosis Association of America in 1999, 28.5 million people in the USA, of whom 89% were women, had osteoporosis. In addition, 10 million people in the US were categorized as having low bone mass, exposing them to the risk of osteoporosis and osteopenia.[1,2] There are no specific statistics in Iran about the prevalence of osteopenia, osteoporosis, and related fractures.[3,4] However, Larijani, in a 2005 study of osteoporosis rates in Iran, reported an estimated 7 million of the 70 million people in Iran to be at risk for

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fractures. In addition, the Research Center for Endocrinology and Metabolism of the Tehran University reported that in the subgroup of people who are more than 50 years old, 70% of the women and 50% of the men are suffering from osteoporosis or osteopenia.[4] Since bone density decreases with age, special consideration should be given to preventing this disease. Prevention of osteoporosis can be implemented at any age. However, because 40–45% of the bone mass develops in early adulthood, prevention is most effective if done in childhood and adolescence.[5-7] In addition, if people develop and commit to lifestyles that support strong bones when they are adolescents or young adults, they increase the likelihood that they will have healthy bones throughout their lives.[8] Measures such as high-calcium diet and exercise among adolescents have been very effective in preventing osteoporosis, particularly among women.[6,9,10] However, helping young people develop a healthy lifestyle is a major challenge.

The Health Belief Model (HBM) is one of the most widely used frameworks for trying to understand health behavior. Developed in the 1950s by Godfrey Hochbaum,[11] Irwin Rosenstock,[12] and Rosenstock and Kirscht,[13] the model has been used successfully for many decades to promote health behaviors such as seat belt use and the use of health screening.[14,15] HBM is based on the premise that people are most likely to take health-related action (e.g., eat a healthy diet) if they feel that by doing so they can avoid a negative health condition. The model asserts that to plan a successful educational intervention, the individual or group's perceived susceptibility (e.g., to osteoporosis), perceived severity of the condition and its consequences, perceived benefits in taking certain actions to reduce risk, perceived barriers (e.g., costs of the advised action), and cues to action (strategies for activating the "readiness" to undertake health actions) are required. HBM is based on the domains of perceived susceptibility (to disease), perceived severity, perceived threat, perceived barriers, perceived benefits, cues to action, and health action.[14] Familiarity to all of these factors is believed to be vital to the planning process for successful educational interventions [Figure 1]. The HBM framework was developed in the 1950s by Hochbaum (1958 and 1992), and Rosenstock (1974 and 1991) as a model for health educators. Use of this model has resulted in effective programs in which individuals experienced changes in beliefs that led to an increase in healthy behaviors.[14,15] This paper describes the results of a study that examines whether the application of the HBM can be used effectively to change the perception of middle school girls about their risk for developing osteoporosis and lead to a change in behavior for prevention of this disease later in life.

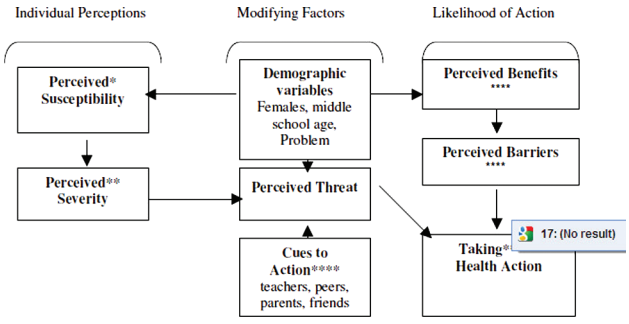

Figure 1: Theoretical model of relationships using the health belief model

MATERIALS AND METHODS

This was an experimental intervention study, the research population being 130 second grade middle school girl students who were randomly divided into groups, experimental (66) and controls (64). Sampling method in this research was multistage: From 5 districts in Isfahan, District 3 was selected districts in Isfahan was 5 and District 3 was selected by simple random sampling for study. The samples were selected from two schools by random sampling. The data gathering instrument was a three-part questionnaire; one part was used to obtain the demographic characteristics of the participants; the second part was a standard questionnaire which was HBM based that included: Knowledge (α=0/55), perceived threat [perceived susceptibility (α=0/78) and perceived severity (α=0/80)], benefits of calcium intake (α=0/77), barriers of calcium intake (α=0/70),[16] and healthy behavior action for osteoporosis prevention; and the third part was an FFQ questionnaire.[17]

To ensure clarity, pilot testing of the questionnaire was also performed using the coherence and consistency upon 30 students who were not included in the survey. Then, the questionnaire was modified based on their feedback. Education as an intervention factor was performed using lecturing and group discussion, brainstorming methods for girl students in four sessions (45–60 minutes), in the experimental group.

The standard questionnaire based on HBM was completed three times (pre-intervention, post-intervention, and two-month follow-up); also, FFQ questionnaire was completed two times (pre-intervention and two-month follow-up) by students to evaluate the effectiveness of the educational interventional program. The students were informed that all data obtained from the questionnaires were to be used without personal identifiers and were, therefore, confidential.

SPSS 18 software was used to analyze the data. Repeated measures analysis of variance (RM ANOVA), paired and independent-sample t-test were used to identify differences among the groups, pre- and post-test as well as for comparing variables such as knowledge, perceived susceptibility and severity, perceived benefits and barriers, and taking health action of two groups in pre-, post-, and follow-up in each group (with the level of 95% confidence).

RESULTS

In this study, 130 middle school female students from Isfahan fully cooperated with the researchers. Table 1 compares the two groups' mean scores in knowledge and in the HBM

Table 1: Comparison of means scorers of the students' knowledge and perceived susceptibility, severity, barriers, and benefits about osteoporosis in the two groups, studied pre-, post- and follow-up intervention

Health Belief Model components' variables	Experimental group (n=66)			Control group (n=64)			RM ANOVA test results		
	Pre-test mean (SD)	Post-test mean (SD)	Follow-up test mean (SD)	Pre-test mean (SD)	Post-test mean (SD)	Follow-up test mean (SD)	Pre-test *P* values	Post-test *P* values	Follow-up test *P* values
Knowledge	35.80 (15.08)	89.60 (11.68)	85.92 (10.83)	32.09 (12.83)	33.26 (14.82)	33.13 (13.37)	0.135	0.000*	0.000*
Perceived susceptibility	37.43 (21.99)	75.50 (11.99)	72.91 (13.60)	34.24 (17.94)	37.63 (17.04)	35.09 (16.39)	0.367	0.000*	0.000*
Perceived severity	47.41 (18.50)	72.60 (14.41)	72.03 (15.60)	45.18 (17.74)	50.13 (16.63)	45.44 (17.50)	0.485	0.000*	0.000*
Perceived benefits of calcium intake	68.62 (15.71)	87.50 (10.74)	84.02 (11.00)	64.71 (15.28)	66.60 (15.18)	64.71 (15.28)	0.153	0.000*	0.000*
Perceived barriers of calcium intake	34.97 (20.05)	78.47 (15.11)	74.62 (16.96)	42.31 (14.72)	42.05 (13.21)	41.79 (15.10)	0.218	0.000*	0.000*

*Repeated Measures ANOVA test result: Significant difference between the groups

Table 2: Comparison of the students' calcium intake for osteoporosis prevention in the groups studied during pre-, post- and follow-up interventions

Time of measurement mean (SD) Groups	Pre-test mean (SD)	Follow-up test mean (SD)	Paired *t*-test *P* value
Experimental group (n=66)	813.31 (264.75)	1096.61 (590.21)	0.000*
Control group (n=64)	811.16 (273.96)	812.86 (275.19)	0.928
t-test	0.964	0.000*	

*Significant difference between the groups

domains of perceived susceptibility, severity, barriers, and benefits, immediately before, immediately after, and 2 months after the intervention. The RM ANOVA test indicated that for each of the HBM domains, the differences among the two groups were significant before, immediately after, and 2 months after the intervention ($P<0.001$). Table 2 shows the health action taken related to the nutritional behavior (calcium intake) of the two groups before and 2 months after the intervention. While in the experiment group, the mean grade was 813.31 and 1096.61 before and after intervention, respectively, in the control group, the mean grade was 811.16 and 812.86 before and after intervention, respectively.

DISCUSSION

In this study, a health education program based on the HBM appears to have been more effective in changing the behaviors of female adolescents to reduce the risk for osteoporosis. The results of the study showed that prior to the intervention, all elements of the HBM were below average in the two groups. After the intervention, students in the experimental group showed significant improvement in the behavior assessed and students in the control group showed a slight improvement in this behavior. This supports our hypothesis that a health education program based on the HBM can be effective in promoting the adoption of behaviors by adolescent girls to prevent osteoporosis. Studies have identified several basic educational needs in participants, which increase their knowledge and change their intention for promoting preventive behaviors about osteoporosis. It was shown that the awareness of individuals about osteoporosis was low (35.80). Increasing the participants' awareness on the need for osteoporosis prevention through educational campaigns is likely to improve the participants' intention in healthy behavior (calcium intake). The awareness of individuals about osteoporosis significantly increased after intervention in the experimental group. The findings of this study are consistent with the observation of Gammage, who carried out a study on osteoporosis health beliefs and knowledge in college students,[18] and the findings of Brecher's study.[19] The increase in awareness in this study is also consistent with the finding of Abbasi *et al*.[20] and Hazavehei *et al*.,[21] the researches who observed the change and improvement in function of women.

Our findings showed that perceived susceptibility, severity, barriers, and benefits about osteoporosis of participants were significantly increased after intervention in the experimental group. The results of our study about perceived susceptibility, severity, barriers, and benefits about osteoporosis are consistent with the findings of studies conducted by Brecher[19] and Hazavehei *et al*.[21]

Mean scores on calcium intake of the experimental group were significant before and after intervention ($P<0.001$). Many young females from a variety of cultures have low calcium intake.[22] We used all components of HBM (perceived susceptibility, severity, benefits, and barriers) in order to better understand how the components influence the process of changing behavior to prevent disease and how educational interventions can influence each of these components. As a result of this study, we postulate that all components of the HBM are equally essential in inducing behavior change. It is paradoxical that as health researchers and educators become increasingly aware of the importance of good habits in nutrition in the prevention of a variety of chronic diseases, children and adolescents are adopting lifestyles that act counter to these. Diets in many developing as well as industrialized countries are moving toward foods that are poor in calcium and minerals. In

order to reverse this trend, it is necessary to actively promote healthy behaviors and lifestyles to adolescents. School health education programs are critical opportunities for facilitating healthy lifestyles for youth. The HBM is one approach to school health education that is effective in producing at least short-term behavior changes in order to prevent osteoporosis.

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REFERENCES

1. Mark S, Link H. Reducing osteoporosis: Prevention during childhood and adolescence. Bull World Health Organ 1999;77:423-4.
2. National Osteoporosis Foundation (2006). Available from: http://www.nof.org/osteoporosis/diseasefacts.htm. [Last retrieved 2007 Feb 25].
3. Gharibdoust F. Osteoporosis booklet of rheumatology center. Tehran University of medical sciences: 2003.
4. Larijani B. Osteoporosis in Iran and the world. Jame Jam Daily news paper, Tehran; p. 12. (2005, Nov 25).
5. American Academy of Orthopedic Surgeons or AAOS (June 2004). Osteoporosis Prevention Starts Early. AAOS-website, Available from: http://www.orthoinfo.aaos.org/fact/thr_report.cfm?Thread_ID=134andtopcategory=Osteoporosis [Last retrieved 2007 Feb 24].
6. Wallace LS. Osteoporosis prevention in college women: application of the expanded health belief model. Am J Health Behav. 2002 May-Jun;26(3):163-172.
7. Weaver CM. The growing years and prevention of orthopedic in later life. Proc Nutr Soc 2000;59:303-6.
8. Bachrach LK. Acquisition of optimal bone mass in childhood and adolescence. Trends Endoc Meta 2001;12:22-8.
9. Pfister AK. An implication of bone posterity: Dietary calcium intake in medical personnel in southern west Virginia. W V Med J 1993;89:280-1.
10. Galler SE, Derman R. Knowledge, beliefs, and risk factor osteoporosis among African – American and Hispanic women. J Natl Med Assoc 2001;93:13-21.
11. Hochbaum GM. Public participation in medical screening programs: A sociopsychological study. PHS publication no. 572. Washington, D.C.: U.S. Government Printing Office; 1958.
12. Rosenstock IM. Historical origins of the health belief model. Health Educ Monogr 1974;2:328-35.
13. Rosenstock IM, Kirscht JP. The health belief Model and personal health behavior. Health Educ Monogr 1974;2:470-3.
14. Becker MH. The health belief model and personal health behavior. Health Educ Monogr 1974;2:324-473.
15. Heidarinia A. Lectures on the process of health educator. Tehran: Zamani; 2002.
16. Baheiraei A, Ritchie JE, Eisman JA, Nguyen TV. Psychometric Properties of the Persian Version of the Osteoporosis Knowledge and Health Belief Questionnaires. Maturitas 2005;50:134-9.
17. Esmaillzadeh A, Mirmiran P, Azizi F. Whole grain intake and prevalence of the hypertriglyceridemic waist phenotype in tehranian adults. Am J Clin Nutr 2005;81:55-63.
18. Gammage KL, Francoeur C, Mack DE, Klentrou P. Osteoporosis health belief and knowledge in college students: The role of dietary restraint. Eating Behav 2009;10:65-7.
19. Brecher LS, Pomerantz SC, Snyder BA, Janora DM, Klotzbach-Shimomura KM, Cavalieri TA. Osteoporosis prevention project: A model multidisciplinary educational intervention. J Am Osteoporosis Assoc 2002;102:327-35.
20. Abbasi Giti, Hadian Nadia. The Effects of education on knowledge: View and function of women aged 45-65 regarding menopause and osteoporosis. Health issues Adult Women 2006;2:56-62.
21. Hazavehei SM, Taghdisi MH, Saidi M. Application of the health belief model for osteoporosis prevention among middle school girl students, Garmsar, Iran. Educ Health 2007;20:23.
22. Kelishadi R, Hashemipour M, Ansari R. Hashemipour M, Ansari R, *et al*. The comparison and physical activity level among adolescents of Isfahan in 1994 and 2001. J Res Med Sci 2002;7:112-7.

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