

EFFECT OF NUTRITIONAL COUNSELING BASED ON HEALTH BELIEF MODEL FOR OSTEOPOROSIS PREVENTION IN WOMEN: A QUASI-EXPERIMENTAL RESEARCH

Fatemeh Shobeiri¹, Elham Hesami², Batul Khodakarami³, Alireza Soltanian⁴

¹ Mother and Child Care Research Center, Hamadan University of Medical Sciences, Hamadan - Iran.

^{2,3} Department of Midwifery, School of Nursing & Midwifery, Hamadan University of Medical Sciences, Hamadan - Iran.

⁴ Health Sciences Research Center, Department of Biostatistics, School of Public Health, Hamadan University of Medical Sciences, Hamadan - Iran.

Address for correspondence:
Dr. Elham Hesami

Department of Midwifery, School of Nursing & Midwifery, Hamadan University of Medical Sciences, Hamadan - Iran.

Email: ehesami89@yahoo.com

Date Received:

March 15, 2016

Date Revised:

October 06, 2016

Date Accepted:

October 12, 2016

ABSTRACT

Objective: To study the effect of nutritional counseling according to health belief model (HBM) for osteoporosis preventive behaviors in women referring to health centers in Hamadan City, Iran.

Methodology: This quasi-experimental research was performed among 80 women, which were allocated randomly into two groups of forty-members each of cases and controls. All participants filled the written informed consent. Four educational session classes were performed in the case group. Through three stages (before interposition, immediately after interposition, and two month after interposition) these groups were evaluated. Analysis of the data was performed by SPSS/18, using t test, chi square test, Fisher and repeated measurement test. P-value was considered significant if it was less than 0.05.

Results: Important difference was not observed among the two groups in terms of age, menarche age, education, job and BMI. There was no considerable difference among the two groups in terms of the average scores of the different structures of this model before the intervention. Mean scores of the awareness and various structures of the model (perceived vulnerability, perceived severity, perceived benefits, perceived barriers and performance) were enhanced considerably in the case group over time (immediately after and two month) after interposition ($P < 0.05$).

Conclusion: Based on HBM, the training has positive impact on information, opinions and performances of females about osteoporosis and its prevention.

Key Words: Health belief model, Prevention, Osteoporosis, women

This article may be cited as: Shobeiri F, Hesami E, Khodakarami B, Soltanian A. Effect of nutritional counseling based on health belief model for osteoporosis prevention in women: A quasi-experimental research. *J Postgrad Med Inst* 2016; 30(4): 345-51.

INTRODUCTION

The symptoms of osteoporosis, which is a systemic skeletal illness, are decreasing bone mass, bone structure deterioration, enhancing bone fragility, and enhancing risk of fracture. The osteoporosis prevention in females is one of the main subjects in World Health Organization. Osteoporosis is one of the recent century disasters. It is a disease that millions of people around the world suffer from it. This silent epidemic disease of present age has no symptoms before it first presents with a bone fracture unless it is prevented and cured, and approximately one – fifth of women with osteoporosis are diagnosed through bone fracture¹. The expanded health belief model seems to be suitable for prediction of prevention behaviors of osteoporosis in

teen girls. Interpositions should concentrate on recognizing barriers of consuming calcium and physical activity and enhancing the beliefs in the capability for overcoming them².

A meta-analysis conducted in Iran by Irani et al showed that, the osteoporosis prevalence was 0.17 (95% CI: 0.13, 0.20) in lumbar spine, while the osteopenia prevalence was 0.35 (95% CI: 0.30, 0.39). The prevalence was more in older age subjects, in females, and in the northern regions of the country, with a growing trend recently³. Today, osteoporosis is a major threat in the world and its annual deaths are more than that of various types of cancer⁴. Prevalence of the disease among women is on the rise; one out of every three women and one out of every 12 men have osteoporo-

sis¹. Gender, menopause, race, skeleton size, abuse of substances such as cigarettes, caffeine, alcohol, early menopause (before age 45), reducing calcium intake and physical inactivity are the main risk factors of this disease. Family history of bone fracture as well as taking glucocorticoids over 6 months, inherited diseases and malabsorption syndrome are secondary causes of osteoporosis^{5,6}. World Health Organization stated that osteoporosis is the fourth main enemy of mankind after stroke, cancer and heart disease and the leading cause of bone fractures in the world^{5,7}. Based on studies in the field of osteoporosis in different parts of the world, nearly 75 million people in Europe, Japan and America are suffering from this disease. Osteoporosis decreases the life quality as much or more than diabetes mellitus, arthritis and lung disease^{8,9}. This figure is very similar to heart disease^{10,11}. Statistics show that about 10 million people in America are affected by osteoporosis and 34 million American people suffer from low bone mass¹². The annual cost of osteoporosis-related fractures spent in England and America is estimated to be about 18 million dollars⁸. Various studies reported that 20 to 50% of bone density changes are affected by life style, nutrition and physical activity, female aging, body fat and family history of bone fractures^{7,13,14}.

Analysis of knowledge, attitude and performance of individuals of different age and sex groups in the field of osteoporosis in Iran and the world reflects the fact that the knowledge, attitude and performance of these people is not desirable^{5,15,16}. One of the most important measures is educational interventions by choosing a model or theory with the goal of training programs. Conditions of problem recognition and health education without program will be useless or ineffective¹⁷. Selecting a training model will lead to start the program and continue it in the right direction. The more the theoretical support for health needs exist, the greater will be the effectiveness of health education programs¹⁸. Regarding the subject of osteoporosis, the effectiveness of theory – driven educational interventions will be higher than routine educational interventions.

One of the educational models that are on the carpet is the health belief model (HBM). This model emphasizes that person's perception creates motivation, movement and behavior. According to this model, for the adoption of preventive behaviors, individuals must first perceive the danger of osteoporosis (perceived susceptibility), then perceive the depth of the risk and seriousness of its different effects in physical, mental, social and economical dimensions (perceived severity) until they believe usefulness and applicability of preventive programs (perceived benefits) and finally take preventive action against osteoporosis. HBM as the main framework used in this study is an individual model of health behavior study that was founded by Chbaun and Rosen

stock in the 1950s in America and amended by Backer and Maiman². This model has a role in the disease prevention and based on it, the decision and motivation of the person adopting a health behavior is due to three categories: personal perception, behavior modification and the likelihood of that behavior likely to lead to action. Personal perception affects the disease perception as well as the outcome of the health behavior. Possibility of action has to do with factors which affect the probability of adopting appropriate behavior whereas modifying factors including demographic variables, perceived threat and action guide, play their roles after the appearance of personal perception¹⁹⁻²¹. The reason of applying this model was to explain the behavior of people who thought they would never get sick, so they didn't accept health issues. This model was originally developed to explain health related behaviors. Using this model, one can design change strategies¹⁷.

HBM is appropriate for the design and implementation of educational interventions in order to prevent disease¹⁹. There are barriers in adopting preventive behaviors of osteoporosis that prevent people from actions such as taking calcium. So removing these obstacles in training interventions need serious attention and emphasis. HBM is one of the few models that explore the concept of perceived barriers affecting health behaviors²²⁻²⁵. These facts show an urgent need to report problems related with the osteoporosis prevention. The current research was aimed to study the effect of nutritional counseling according to health belief model (HBM) for preventive behaviors of osteoporosis in women referring to health centers in Hamadan City, Iran.

METHODOLOGY

This quasi-experimental research was performed for investigating the influence of intervention of nutritional counseling (based on HBM) on the information, attitude and performance of females referring to health centers, Hamadan City in west of Iran.

Hundred women were interested to participate in this research. Twenty women were omitted because of failure for meeting inclusion criteria or decreasing interest. Eighty women were stratified randomly in to two groups and each had 40 members of cases and controls, in order to access a uniform sample in terms of social, economic and cultural conditions. The recruitment took place between October 2014 and March 2015. Also, in order to prevent the information exchange between the two groups, only a case group or a control group was selected from each health centre. Finally, four health centers were considered as case groups and the other 4 centers were considered as control groups.

A standard questionnaire was used to collect data according to HBM²¹. The first section of the question-

naire was associated with demographic questions such as age, family size, age of menarche, history of tobacco consumption, body mass index, pregnancy and lactation status, contraceptive use, previous use of oral supplements, employment status, education level, income, marital status and family history of disease. To determine the information in the osteoporosis field, a questionnaire containing 25 questions with ($\alpha=0.60$) was used. To measure the perceived susceptibility, the standard scale contained 6 questions with ($\alpha=0.70$), to measure the perceived severity, 6 questions were used with ($\alpha=0.80$), to measure the perceived benefits of adequate calcium intake 6 questions were used with ($\alpha=0.77$) and to measure the perceived benefits of adequate calcium intake 6 questions with ($\alpha=0.70$) were used.

The questions were designed as 5 option Likert scale ranging in 4 dimensions (susceptibility, severity, benefits and barriers) from powerfully disagreement (= 1) to intensely agreement (= 5). The questions scores were calculated as cumulative frequency. Food Frequency Questionnaire (FFQ) was applied for measurement of performance according to the intake of calcium. This questionnaire has 21 options measuring calcium intake including; low fat milk, fat free milk, fat milk, chocolate milk, yogurt, etc. The participants were asked to complete options in the FFQ asking their average food consumption during the last 3 months (almost never, everyday, a week, a month, etc) ²²⁻²³. The amount of calcium contained in 100 gr of each food was calculated and the monthly average of calcium intake was obtained. According to the score obtained for different parts of the questionnaire (knowledge, perceived vulnerability, perceived severity, and perceived benefits of efficient intake of calcium) the educational content was designed in accordance with the structures of the HBM. Educational content was prepared tailored to the research objectives and participant's educational needs (based on the pre – test).

The intervention included four consultation sessions of 45-60 minutes²⁴. The training sessions were held every week in the form of 8 player groups. Every part comprised a mixture of lectures, group discussion, questions and answers displays. Furthermore, at the end of the last session, educational pamphlets were given to the participants. Both groups were assessed immediately after counseling sessions (second stage of intervention). We evaluated the two groups after two months of the intervention for examining the behavior continuity and endurance of the given trainings (the third stage of intervention).

The control subjects received no training and were just asked to participate at the special parts for filling out the questionnaires. Though, because of ethical considerations, the osteoporosis was taught to these subjects after completing the research. At the end we

compared the results obtained in these three steps and analyzed the collected data.

The research was conducted based on the protocol of Helsinki declaration. The aims of the research were clarified to females who participated in the study and asked them to fill informed consent. Women could leave the study at any time. The Ethical Committee of Hamadan University of Medical Sciences approved the research (approval number: 9311205855).

Analysis of the data was performed by SPSS/18, using t test, chi square test, Fisher and repeated measurement test. P-value <0.05 was considered as significant.

RESULTS

Eighty participants were enrolled in this research. Table 1 demonstrates demographic and medical characteristics of participants. The two groups were identical at the beginning of the study. Kolmogorov-Smirnov test demonstrated that two groups have no considerable difference in terms of age, BMI, education, occupation, parity ($P>0.05$). Baseline characteristics of the research population are shown in table 1).

There were no important differences between the two groups in terms of the average scores of the different structures of this model before the interpolation ($P>0.05$). The outcomes indicated considerable difference between the score of knowledge, perceived vulnerability, perceived severity, perceived benefits, and perceived barriers of subjects in the case group before and after intervention ($p<0.001$), whereas there was no considerable difference in control group (table 2).

However in performance, calcium intake increased significantly two months after intervention in case group ($p=0.04$). This change was not observed in control group (Table 3). According to analysis of variance with repeated measures, the changes in mean score of women taking calcium before, immediately after 2 months after interposition was considerable ($p=0.03$, $F=26.47$).

DISCUSSION

This study showed that one of the main ways to prevent osteoporosis in communities is using community based intervention strategies to reduce the risk factors. This kind of intervention requires understanding of knowledge, attitude and performance of the women in society.

The results showed that considerable difference between the average score of information before and after the interposition in case group and their knowledge significantly increased after the intervention that was consistent with the other studies conducted by Khani

et al²⁵, Hazavehei et al²⁶, Jeihooni et al¹⁷, Gammage² and Keramat et al²⁷. The results also showed that perceived vulnerability, perceived severity, perceived benefits and perceived barriers of intake of calcium, considerably enhanced after interposition based on HBM. In the present study, the results were similar to the findings of the study performed by Ghafari et al¹ and Naghashpour et al²³.

A number of earlier research stated the implementation of training programs could have a considerable influence on the beliefs of people about osteoporosis and its prevention^{5,28}. Though, Tussing et al¹⁵ and Sanaeinasab et al¹⁹ reported that the osteoporosis perceived severity did not considerably grow after education of osteoporosis prevention. Furthermore, Jessup et al²⁹ stated that exercise had no significant impact on the self-efficacy levels concerning the prevention of os-

teoporosis in older females. Jung et al³⁰ showed that self-efficacy was the only type of HBM for improving considerably more in the experimental group versus the control group ($p = 0.05$). The HBM did not mediate changes in calcium intake.

Gammage et al reported that HBM seems to be suitable for prediction of prevention behaviors of osteoporosis for teen girls and interpositions should emphasize on recognizing barriers of consuming calcium and physical activity and enhancing opinions about their capability². The findings of the present research are similar to those of the previously published studies and also support the nutrition education efficiency according to the HBM for development of the information, attitude, and practice corresponding to the intake of calcium among women.

Table 1: Baseline features and clinical information of the research population

Characteristics	Controls	Cases	P value
Age (years)	40.60(4.99)	40.05(4.75)	0.61
Menarch age (years)	13.18(0.98)	13.18(1.21)	1.00
Family size	4.67(1.67)	4.90(2.19)	0.60
Parity	2.60(1.55)	2.80(1.55)	0.43
Breast Feeding (%)			
Yes	39.00(97.50)	38.00(95.00)	1.00
No	1.00(2.50)	2.00(5.00)	
Body mass index (kg/m2) (%)			
19-24	5.00(12.50)	4.00(10.00)	0.74
25-29	31.00(77.50)	29.00(72.50)	
≥30	4.00(10.0)	7.00(17.50)	
Education (%)			
Undergraduate	7 (17.50)	4 (10.00)	0.73
Postgraduate	33 (82.50)	36 (90.00)	
Job (%)			
Housewife	32 (80.00)	30 (75.00)	0.59
Employed	8.00(20.00)	10.00(25.00)	
Smoking (%)			
Yes	1.00(2.50)	1.00(2.50)	1.00
No	39.00(97.50)	39.00(97.50)	
Supplement Usage (%)			
Yes	31(77.50)	34(85.00)	0.57
No	9.00(22.50)	6.00(15.00)	
History of Disease (%)			
Yes	5.00(12.50)	6.00(15.00)	0.74
No	35.00(87.50)	34.00(85.00)	

Data for continuous variables are given as mean (SD); Categorical variables data are given as frequency (percentage). P value for the difference between groups.

Table 2: Mean scores of knowledge and HBM components considering osteoporosis prevention

Variable	Case subjects (n=40)			Control subjects (n=40)			P- Value
	Pre-Test	Post-Test	2 Months Later	Pre-Test	Post-Test	2 Months Later	
Knowledge	15.87±4.00	23.30±2.52	20.30±2.46	14.95±3.91	17.7±2.69	17.32±2.73	F=10.96 P<0.001
Perceived Susceptibility	10.12±4.75	15.02±4.25	14.55±3.32	9.95±4.57	9.62±4.67	9.60±4.61	F=15.92 P<0.001
Perceived Severity	12.05±5.38	17.85±3.97	17.25±3.60	12.20±4.64	12.07±4.95	12.12±4.73	F=13.56 P<0.001
Perceived Benefits	37.62±8.02	42.80±5.04	42.90±4.40	39.15±4.81	38.30±4.13	39.45±3.89	F=7.43 P<0.001
Perceived Barriers	30.35±7.93	34.95±5.77	37.80±5.18	27.60±6.51	29.32±5.36	28.82±5.08	F=9.61 P<0.001

^a The values are given as mean ± SD.

Table 3: The average score of calcium intake in women of case and control groups before and 2 months after intervention

Variable Calcium intake (grs)	Cases (n=40)	Controls (n=40)	P- Value ^a
Pre intervention	19214.12±20880.57	17005.88±22911.02	0.759
Two months after intervention	33514.93±23181.60	13356.84±16168.90	0.016
Paired t-test, P value	0.04	0.20	

^a Comparison between experimental and control (Independent t- test).

LIMITATION

The limitations of this study were as follows: the reluctance of some women to participate in the study due to multiplicity of training sessions designed, and lack of appropriate space to hold these sessions, and self reported questionnaires, meaning that the target group reported the amount of calcium intake and there was no means to verify their report.

CONCLUSION

HBM based training leads to enhance the average score of females' information, beliefs, vulnerability, perceived severity, perceived benefits, perceived barriers and performance (calcium intake) due to knowledge enhancement and makes women ready to adopt preventive behaviors of osteoporosis. In current study, structures of the model (perceived vulnerability, severity, benefits and barriers) increased in case group significantly after intervention and women were prepared to osteoporosis prevention.

RECOMMENDATIONS

There is urgent need for implementation of community based interpositions for educating people about the osteoporosis risks during their life. The outcomes of the current research presented the importance of education considering osteoporosis in females and showed that policy creators should combine programs for prevention of osteoporosis in the standard cares presented in all centers of healthcare in Iran.

REFERENCES

1. Ghaffari M, Tavassoli E, Esmailzadeh A, Hassanzadeh A. Effect of Health Belief Model based intervention on promoting nutritional behaviors about osteoporosis prevention among students of female middle schools in Isfahan, Iran. *J Edu Health Promo* 2012; 1:14.
2. Gammage KL, Klentrou P. Predicting osteoporosis prevention behaviors: health beliefs and knowledge. *Am J Health behav* 2011; 35:371-82.
3. Irani AD, Poorolajal J, Khalilian A, Esmailnasab N, Cheraghi

- Z. Prevalence of osteoporosis in Iran: A meta-analysis. *J res med sci* 2013; 18:759-66.
4. Adachi JD, Adami S, Gehlbach S, Anderson FA Jr, Boonen S, Chapurlat RD, et al. Impact of prevalent fractures on quality of life: baseline results from the global longitudinal study of osteoporosis in women. *Mayo Clin Proc* 2010; 85:806-13.
 5. Keramat A, Patwardhan B, Larijani B, Chopra A, Mithal A, Chakravarty D, et al. The assessment of osteoporosis risk factors in Iranian women compared with Indian women. *Br Med Coll musculoskelet disord* 2008; 9:28.
 6. Shobeiri F, Nazari M. Age at menopause and its main predictors among Iranian women. *Int J Fertil Steril* 2014; 8:267-72.
 7. Betancourt Ortiz SL. [Bone mineral density, dietary calcium and risk factor for presumptive osteoporosis in Ecuadorian aged women]. *Nutr hospital* 2014; 30:372-84.
 8. Watts NB. Insights from the Global Longitudinal Study of Osteoporosis in Women (GLOW). *Nat Rev Endocrinol* 2014; 10:412-22.
 9. Tehranian N, Shobeiri F, Pour FH, Hagizadeh E. Risk factors for breast cancer in Iranian women aged less than 40 years. *Asian Pac J Cancer Prev* 2010; 11:1723-5.
 10. Soltani F, Shobeiri F. Menstrual patterns and its disorders in high school girls. *Iranian J Obstet Gynecol Infe* 2011; 14:28-36.
 11. Jenabi E, Shobeiri F, Hazavehei SM, Roshanaei G. Assessment of questionnaire measuring quality of life in menopausal women: a systematic review. *Oman Med J* 2015; 30:151.
 12. Kai MC, Anderson M, Lau E. Exercise interventions: defusing the world's osteoporosis time bomb. *Bull World Health Organ* 2003; 81:827-30.
 13. Shobeiri F, Nazari M. Assessment of cervical erosion in Hamedan city, Iran. *Pakistan Journal of biological sciences: Pak J Biol Sci* 2007; 10:3470-2.
 14. Shobeiri F, Tehranian N, Nazari M. Trend of ectopic pregnancy and its main determinants in Hamadan province, Iran (2000-2010). *Br Med Coll Res Notes* 2014; 17:733-7.
 15. Tussing L, Chapman-Novakofski K. Osteoporosis prevention education: behavior theories and calcium intake. *J Am Diet Assoc* 2005; 105:92-7.
 16. Ghaffari M, Sharifirad G, Malekmakan E, Hassanzadeh A. Effect of educational intervention on physical activity-related knowledge, attitude and behavior of among first-grade students of male high schools. *J Educ Health Promot* 2013; 2:4.
 17. Jeihooni AK, Hidarnia A, Kaveh MH, Hajizadeh E, Askari A. Effects of an Osteoporosis Prevention Program Based on Health Belief Model Among Females. *Nurs Midwifery Stud* 2015; 4:e26731.
 18. Khalaj M, MOHAMMADI ZE. Health education effects on nutritional behavior modification in primary school students. *Shahrekord Uni Med Sci J* 2006; 8:41-9.
 19. Sanaeinasab H, Tavakoli R, Karimizarchi A, Amini ZH, Farokhian A, Najarkolaei FR. The effectiveness of education using the health belief model in preventing osteoporosis among female students. *East Med Health J = La revue de sante de Sante la Mediterranee orientale* 2014;19:S38-44.
 20. Shobeiri F, Jenabi E. The effects of vitamin E on muscular pain reduction in students affected by premenstrual syndrome. *Iran J Obstet Gynecol Infertil* 2014;17(96):1-5.
 21. Shobeiri F, Nazari M. Patterns of weight gain and birth weight amongst Indian women. *Iranian J Med Sci* 2006; 31:94-7.
 22. 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.
 23. Naghashpour M, Shakerinejad G, Lourizadeh MR, Hajinajaf S, Jarvandi F. Nutrition Education Based on Health Belief Model Improves Dietary Calcium Intake among Female Students of Junior High Schools. *J Health Popul Nutr* 2014; 32:420-9.
 24. Solter C. Comprehensive reproductive health and family planning training curriculum. Module 3: Counseling for family planning services. *Med Serv Pathfind Int* 1998; 3:1-148.
 25. Khani Jeihooni A, Hidarnia A, Kaveh MH, Hajizadeh E. The effect of a prevention program based on health belief model on osteoporosis. *J Res Health Sci* 2015; 15:47-53.
 26. Hazavehei S, 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.
 27. Keramat A, Masoomi SZ, Mousavi SA, Poorolajal J, Shobeiri F, Hazavhei SM. Quality of life and its related factors in infertile couples. *J Res Health Sci* 2013; 14:57-64.
 28. Bhurosy T, Jeewon R. Effectiveness of a theory-driven nutritional education program in improving calcium intake among older Mauritian adults. *Scient World J* 2013; 2013:750128.
 29. Jessup JV, Horne C, Vishen RK, Wheeler D. Effects of exercise on bone density, balance, and self-efficacy in older women. *Biol Res Nurs* 2003; 4:171-80.

30. Jung ME, Martin Ginis KA, Phillips SM, Lordon CD. Increasing calcium intake in young women through gain-framed, targeted messages: a randomised controlled trial. *Psychol Health* 2011; 26:531-47.

CONTRIBUTORS

FS conceived the idea, planned the study, and drafted the manuscript. EH, BK and AS helped acquisition of data and did statistical analysis. All authors contributed significantly to the submitted manuscript.