Application of the Precede-Proceed Model in Promoting Physical Activity for Prevention of Osteoporosis among Women

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ABSTRACT

Aims Osteoporosis is a major public health problem in the world, which can be prevented or its onset can be delayed through some lifestyle changes. The aim of this study was to assess the application of the precede-proceed model in promoting physical activity for prevention of osteoporosis among women.

Materials & Methods The present quasi-experimental study examined the application of precede-proceed model on the physical activity of 120 women with the age range of 15 to 49 years old, who were selected by multistage random sampling in Kerman in 2014. The participants were divided to the control (n=60) and intervention (n=60) groups. Among the preventive behaviors of osteoporosis, physical activity was selected for the educational intervention. The educational intervention lasted for 2 months. An international standard questionnaire was used to measure physical activity, and a researcher-made questionnaire, according to the constructs of precede model was used to collect data before and after the intervention. The data were analyzed by SPSS 20, using Mann-Whitney, Wilcoxon, and Chi-square tests as well as descriptive statistics.

Findings After educational interventions, the mean scores of predisposing, reinforcing and empowering factors, as well as osteoporosis preventive behaviors (physical activity) significantly increased only in the intervention group (p<0.001).

Conclusion Health education and health promotion interventions based on precede-proceed model can lead to increased physical activity and eventually prevent osteoporosis in women.

Keywords Osteoporosis; Women; Physical Activity

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CITATION LINKS

[1] The survey of practice about prevention of osteoporosis based on health belief model ... [2] Predicting factors influencing physical activity in women for the prevention of osteoporosis ... [3] Application of health belief model in prevention of osteoporosis in volunteers of Khorramabad ... [4] The effect of education based on health belief model on preventive factors of ... [5] Impacts of a health belief model-based education program about osteoporosis prevention ... [6] Efficacy of educational pamphlets for improvement ... [7] Ultra nalysis of prevalence of osteoporosis in Iranian women ... [8] Behavioral science theory and principles for ... [9] Health program planning: An educational and ecological ... [10] Applying Precede-Proceed to develop an intuitive ... [11] Application of the Precede model for controlling iron-deficiency ... [12] Evaluation of an educational intervention based on ... [13] Design and implementation of an osteoporosis prevention program ... [14] Tailored interventions to enhance osteoporosis ... [15] The effects of education on preventive behaviors toward osteoporosis ... [16] Planning and evaluation of an educational program based on Precede model to improve ... [17] Eliminating iodine deficiency disorders in Nepal through ... [18] Utility of the Precede model in differentiating users and nonusers of ... [19] Awareness and prevention of osteoporosis among South ... [20] Efficacy of Precede model in promoting nutritional behaviors ... [21] The effect of health education intervention based on Precede framework ... [22] The effect of health education on reduction of intestinal parasitic infection ... [23] The effect of stress management education based on Precede model on occupational stress ... [24] Effects of a community-based nutrition education program on the dietary behavior of ... [25] The positive impact of educational intervention program based on Precede model ... [26] Planning and evaluation of an educational intervention programme to improve ... [27] Effect of education based on Precede-Proceed model on knowledge, attitude and ... [28] Application of Precede in reducing Tehranian firemen ... [29] Effect of health education program base on Precede model in controlling iron-deficiency anemia among high school ...

Introduction

Osteoporosis is among the most prevalent skeletal diseases beginning with decrease in bone mass and gradual destruction of bone tissue, leading to fractures [1, 2]. Various risk factors such as gender, race, size of the skeleton, smoking cigarettes, consuming caffeine and alcohol, decrease in the amount of Estrogen, premature menopause, removal of ovaries before the age 45, decrease in calcium intake, and lack of physical activity have a role in the incidence of this disease [2].

Lifestyle also plays a very important role in the incidence of the disease [3]. According to some studies, nearly 75 million people in Europe, Japan, and America suffer from osteoporosis [4, 5].

The results of Comprehensive Osteoporosis Plan in Iran in 2000 indicated that 50% of men over 50 years and 70% of women over 50 years were suffering from osteopenia or osteoporosis [6].

Based on a meta-analysis, the prevalence of osteoporosis in women is 18% and ranges from 1% to 43% [7]. It is estimated that by 2020, about 61 million people in the world will be suffering from osteoporosis or experience decrease in bone mass [2].

In this study, precede-proceed model was used to implement health education and health promotion interventions for the prevention of osteoporosis. This model was introduced by Green and Kreuter as an evaluation framework for health education and health promotion planning. This model consists of stages, including social diagnosis, epidemiological diagnosis, behavioral and environmental diagnosis, educational and ecological diagnosis, managerial and political diagnosis, implementation, process evaluation, and evaluation of immediate and long-term results [8, 9].

The reason for using this model is its easy use in different subjects and populations, and in its ecological point of view, it not only changes the behavior of the individual alone, but also the surrounding environment and the factors influencing behavior change [8].

Many studies have proven the role of precede-proceed model in educational interventions. Cole and Horacek, for example, showed that the model provides useful guidelines for obese participants, who followed nutrition programs seeking to control their weight [10]. Hazavehei *et al.* demonstrated the positive effect of educational intervention based on this model to correct mothers' preventive behaviors to reduce iron-deficiency anemia in children between 1 and 5 years old [11]. Saffari *et al.* enhanced adolescents' lifestyle with an educational program based on precede-proceed model [12].

Other studies used other behavioral models to promote preventive behaviors of osteoporosis. For example, Turner *et al.* used educational programs for the prevention of osteoporosis based on the behavioral model on middle-aged women and reported considerable behavioral changes, especially regarding increased physical activity, weight tolerance exercises, and dairy products intake. In addition, many participants intended to increase physical activity and consume calcium supplements [13].

In a study conducted by Khorsandi *et al.*, by using educational intervention based on the Health Belief Model (HBM) about osteoporosis preventive practices, the perceived barriers for pregnant mothers regarding the prevention of osteoporosis and their performance had improved [1].

Using HBM, Sedlak *et al.* showed that women's perceived sensitivity and their intake of calcium and taking osteoporosis preventive medicine considerably increased [14]. Meanwhile, Mahamed *et al.*, through the intent behavior model on osteoporosis prevention practices in female university students, showed that individual's behavioral intent, knowledge, and attitude increased after their intervention about osteoporosis prevention [15].

Due to the gap in prior studies examining the impact of health education interventions using precede-proceed model and other models on different behaviors, especially osteoporosis preventive behaviors, the present study was conducted with the aim of determining the impact of health education and promoting interventions based on the precede-proceed model on women's physical activity for the prevention of osteoporosis.

Materials and Methods

The current quasi-experimental study examined the application of precede-proceed model on the physical activity of 120 women, who were selected by multistage random sampling, in Kerman in 2014. Of all areas in Kerman, two health centers, which were homogenous in terms of economic and social characteristics, were randomly selected. In each center, a health base was randomly selected. One of the bases was regarded as the intervention group and the other as the control group. Then, based on the framework, the names of 15- to 49-year-old women available in the health bases were chosen by random sampling and 60 people in each base were selected.

The inclusion criteria were being Iranian citizenship, 15 to 49 years old, self-consent, and having the ability to respond to the questionnaire, while the exclusion criteria included transferring to another area and lack of self or other family members' consent.

The International Physical Activity Questionnaire (IPAQ) and a researcher-made questionnaire, whose validity and reliability had been confirmed, were used for data collection [2].

After the approval of the Ethics Committee of the

Research and Technology Department of Kerman University of Medical Sciences (Ethic code: K/92/237), anonymous questionnaires were filled confidentially with informed consent, and, then, collected in both the intervention and control groups. In the researcher-made questionnaire, questions related to demographic features included 6 questions (age, height, weight, education level, marital status, and occupation of the subjects). Questions related to predisposing factors measured the knowledge and attitude of those who suffer from osteoporosis as well as physical activity behavior; there were 17 knowledge and 8 attitude questions, and for questions related to reinforcing behaviors of those around the patients to keep up the behaviors, there were 4 questions, including reinforcing behaviors for the family, neighbors, and health workers to encourage and approve the person. The next questions were empowering factors i.e. a set of facilities that help with the possibility of the desired behavior including income status, facilities for physical activities as well as obstacles disrupting physical activity that had 7 questions. IPAQ measured the length of people's physical activity in the past 7 days and classified them under high physical activity, medium physical activity, walking, and sitting [2].

After collecting the data using questionnaires, in the educational and ecological evaluation, in order to determine the axis of intervention, empowering factors were positioned as the strongest predictors of physical activity [2]. Health education and health promotion interventions were implemented for 2 months for the intervention group. In order to increase knowledge and attitude, trainings on osteoporosis and preventive factors from osteoporosis with an emphasis on physical activity were given through lectures, discussion groups, focus groups in 4 sessions (each session took 60 minutes), in which books and brochures published by the Ministry of Health Education were used as educational materials. To enhance the empowering factors, friends, acquaintances, family members, and staff of the health centers were invited to participate in the training sessions, and they attended two of the sessions.

In order to promote the empowering factors, 3 group discussion sessions were held, focusing on barriers to physical activity behavior and suggested strategies for the intervention group were discussed in small groups, so that they could think of a solution and be involved in decision making.

In addition, in line with upgrading public health programs, a public walking event was organized. Everyone was previously notified via short message service (SMS) and installation of banners in the intervention area group, and more than 200 residents, families, friends, and neighbors from the intervention group attended. The educational messages in numbered folders were given out to the participants in the event, so that they could take part in the lottery, whose winners would receive a free voucher of sportswear. Also, with the installation of educational banners in the area and texting the intervention group, researchers tried to strengthen and reinforce the behaviors.

Four weeks after all interventions, the data were collected again, using questionnaires. After the end of the research project, the members of the control group were morally informed about the contents of the pamphlets and educational materials. In order to evaluate the immediate results of the program, the difference in before and after mean scores in predisposing, reinforcing, and empowering factors impacting physical activity of the subjects were evaluated. But, evaluation of the outcomes of this study was not feasible due to the time limitations.

A part of the results of this study about factors affecting physical activity was published in another article [2].

Central and dispersion indices (mean, standard deviation, percent, and frequency) were calculated and the data were analyzed by SPSS 20, using Mann-Whitney, Wilcoxon, and Chi-square tests.

Findings

Subjects in the intervention and control groups were mainly housewives and had high school and college education (Table 1).

There was a significant increase between mean scores of knowledge, empowering factors, and physical activity after the intervention in the intervention group, while in the control group, no significant increase was observed in any of the indices (Table 2).

Table 1) Frequency distribution of demographic characteristics of the participants (the numbers in the parentheses are percentage)

Variables	Intervention group	Control group	Chi-square p-value
Occupation			
Housewife	51 (85)	45 (75)	
Student	2 (3.3)	6 (10)	
Permanently employed	3 (5)	6 (10)	1.000
Temporary worker	1 (1.7)	2 (3.3)	
Retired and others	3 (5)	1 (1.7)	
Total	60 (100)	60 (100)	
Marital status			
Single or divorced	5 (8.3)	5 (8.3)	
Married	55 (91.7)	55 (91.7)	1.000
Total	60 (100)	60 (100)	
Education			
Illiterate, elementary school education, or less	9 (15)	7 (11.7)	
High school or diploma	27 (45)	23 (38.30)	0.53
Academic	24 (40)	30 (50)	
Total	60 (100)	60 (100)	

Table 2) Comparison between the intervention and control groups based on the Wilcoxon test

Variables	Intervention group (Mean±SD)	p-value	Control group (Mean±SD)	p-value
Knowledge				
Before	11.36±2.033	<0.0001	10.33±2.77	0.059
After the intervention	16.51±1.47		10.11±2.93	
Attitude				
Before intervention	33.85±5.37	<0.0001	32.76±5.14	0.047
After the intervention	38.75±4.69		32.38±5.17	
Reinforcing factors				
Before intervention	10.93±3.73	<0.0001	13.31±03.46	<0.001
After the intervention	14.26±3.18		11.86±3.73	
Empowering factors				
Before intervention	15.80±3 .72	<0.0001	17.55±4.33	0.81
After the intervention	17.78±3.96		17.06±4.13	
Metabolic Equivalent of Task (MET) level of physical activity				
Before intervention	1161.13±2474.70	<0.001	1073.01±1457.50	0.12
After the intervention	1655.84±1364.60		808.98±1139.98	

While the mean scores of knowledge, attitude, reinforcing factors, and physical activity were not significantly different before intervention, the difference was significant after the intervention.

Mean scores of empowering factors before the intervention had no significant difference in the intervention and control group. But, the difference was significant after the intervention (Table 3).

Table 3) Comparison between the intervention and control groups before and after intervention based on Mann-Whitney test

Variables	Before intervention (Mean±SD)	p-value	After the intervention (Mean±SD)	p-value
Knowledge				
Intervention group	11.36±2.033	0.047	16.51±1.47	<0.0001
Control group	10.33±2.77		10.11±2.93	
Attitude				
Intervention group	33.85±5.37	0.12	38.75±4.69	<0.0001
Control group	32.76±5.14		32.38±5.17	
Reinforcing factors				
Intervention group	1093±3.73	0.65	14.26±3.18	<0.0001
Control group	13.31±3.46		11.86±3.73	
Empowering factors				
Intervention group	15.80±3.72	0.10	17.78±3.96	0.33
Control group	17.15±4.33		17.06±4.13	
Total physical activity in terms of MET				
Intervention group	1161.13±2474.70	0.72	1655.84±1364.6	<0.001
Control group	1073.01±1457.50		808.98±1139.98	

Discussion

The present study was conducted with the aim of determining the impact of precede-proceed model on physical activity to prevent osteoporosis in women in Kerman. Since articles similar to this study were not found, it was not possible to directly compare the results of the current study with many other similar studies. Therefore, articles that used precede-proceed model and other models to enhance targeted behaviors were discussed.

In this study, after applying the health education and health promotion interventions, the mean knowledge score of the subjects increased only in the intervention group. In this regard, the present study was consistent with studies conducted by Estebsari *et al.* [16], Jimba and Murakami [17], and Polcyn *et al.* [18]. These finding reflect the impact of the implementation of model-based interventions on raising the level of knowledge among people, especially regarding the fact that knowledge is of utmost importance in making the right attitude and behavior.

Also, in the semi-experimental study by Shakil *et al.*, about the prevention of osteoporosis [19] and the study conducted by Mahamed *et al.*, regarding the effect of training according to the Behavioral Intention Model on preventive behaviors for osteoporosis, the attitude and behavioral intention of the subjects increased after intervention [15].

In this study, after the intervention, a statistical significant difference was observed in the mean scores of the attitude of the participants in the intervention group, which is consistent with studies conducted by Estebsari *et al.* [16], Salehi and Haidari [20] and Hazavehei *et al.* [21], indicating the impact of applying the precede model.

However, contrary to the present study, in a study carried out by Sharify Rad *et al.* that applied the proceed model on the impact of education on the incidence of intestinal parasitic infections [22] and a study conducted by Didehvar *et al.* that examined the training of stress management based on the precede model, variation in the mean scores of attitude was not significant between the two groups of intervention and control [23]. It seems that the difference is due to the difference in the study

populations.
In the current research, after the interventions, the mean scores of the reinforcing factors in the intervention group improved, which is in line with the studies of Sun *et al.* [24], Jimba and Murakami and Murakami [17], and Hazavehei *et al.* [21]. It seems that appropriate interventions based on this model have a significant role in line with the target behavior in order to promote positive reinforcements and decrease negative reinforcements.

In this research, after the intervention, the mean scores of empowering factors in the intervention group, in contrast to the control group, considerably increased, which is consistent with the studies performed by Oruoji *et al.* [25], Dehdari *et al.* [26], and Hazavehei *et al.* [21], indicating that interventions based on the model are effective in promoting empowering factors that play a key role in the development of targeted study behaviors and can be achieved by reducing barriers.

Contrary to these research, in studies done by Zigheymat *et al.*, on the impact of education based on the precede-proceed model on knowledge, in the attitude and behavior of the patients with epilepsy, the mean scores of the empowering factors in the control and intervention group were not different after the intervention [27], which seems that this difference is in the population and targeted behaviors of the studies.

After the intervention, there was a significant difference in the mean scores of physical activity in the intervention group, which is probably because of the effects of the intervention. This is consistent with the studies of Lesan *et al.* [28], Estebsari *et al.* [16], Shakouri *et al.* [29], and Turner *et al.* [13].

In the precede model, with identifying educational and ecological factors as well as determining the effective factors on behavior, it is expected that the suggested behavior is put into practice. Fortunately, in this study, the physical activity behavior improved in the target group.

One the strengths of this study, compared with other studies, is the application of educational interventions along with health promotion interventions, which remarkably helped reinforcement and promotion of desired behavior among the women of the target population. Other studies, in contrast, focusing on the individual and the population were less involved, and they only worked on the individual's training.

The limitation of the current study was the inclusion of 15- to 49-year-old women. Thus, the results cannot be generalized to other age groups and the other gender. The choice of only two health centers among all health centers, and the low sample size of the population, in addition to the lack of funding for more extensive interventions were also other limitations of this study. Besides, regular physical activity and adequate intake of calcium and vitamin D are other effective factors to prevent osteoporosis,

while the present study solely focused on physical activity. On the other hand, the intervention duration was short and it is very difficult for people to change their lifestyle with some educational interventions during an 8-week period.
It is suggested to consider other age and sex groups in subsequent studies.

Conclusion
Health education and health promotion interventions based on precede-proceed model can lead to increased physical activity and eventually prevent osteoporosis in women.

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