ORIGINAL ARTICLE

The Effect of Pender's Health Promotion Model in Improving the Nutritional Behavior of Overweight and Obese Women

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Abstract

Background: Changes in lifestyle and eating habits have put women at risk of obesity and overweight more than ever. This aim of this study was to investigate the effect of Pender's Health Promotion Model (HPM) to improve the nutritional behavior of overweight and obese women admitted to Fatemiyeh Hospital clinics in Hamadan, west Iran in 2015.

Methods: n this quasi-experimental study, 108 eligible women were selected and randomly assigned to two groups: one experimental and one control. Data were gathered using three questionnaires: demographics, Pender's HPM constructs, and nutritional behavior. The questionnaires were filled out by both groups as pre-test and two months later. A Pender's HPM-based intervention was conducted for the experimental group. The data were analyzed by paired and independent t-tests, ANCOVA, and Spearmans' correlation coefficient in SPSS/16. The level of significance was considered to be <0.05.

Results: The mean score of nutritional behavior was 41.75±3.28 and 42.36±3.69 before the intervention and 79.09±5.27 and 49.72±9.49 after it in the experimental and control groups, respectively. The difference was significant only between before and after the intervention in the experimental group (P<0.001). Furthermore, the mean scores of the following variables were significantly different between before and after the intervention in the experimental group: nutritional behavior, perceived benefits, perceived self-efficacy, commitment to action, interpersonal and situational influences, behavior-related affect, and perceived barriers (P<0.001).

Conclusion: The results showed that Pender's HPM-based training improved nutritional behavior and some constructs of the model. Therefore, this educative model can be used by healthcare providers to improve the nutritional and other health promoting behaviors.

Keywords: Pender's health promotion model, Obesity, Women, Nutritional behaviours

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Introduction

Obesity is the most important nutritional disease in developed and developing countries, and has quickly become prevalent in the recent decades. Studies have shown that changes in lifestyle and certain factors such as inappropriate nutritional behaviors, stress, and physical inactivity are important causes of obesity.[1,2] Obesity has been known as a chronic disease and a major risk factor for hypertension, cardiovascular diseases, diabetes, and impaired quality of life, from both psychosocial and physiological perspectives, in men and women since 1985.[3,4]

Obesity was once a major health problem in developed countries; however, it has spread all over the world and developing countries, such as Iran, are currently faced with increasing rate of obesity.[5] The prevalence rate of obesity in people aged over 18 years in Iran has been reported to be 21.5% and higher in woman than men (27.3% vs. 13.7%).[1] It is estimated that 80% of premature stroke, heart disease, type 2 diabetes, as well as 40% of cancers can be avoided through healthy diet, regular physical activity and avoidance of tobacco use.[6]

In Hamadan, a city of western Iran, the prevalence of overweight and obesity in women was reported to be 33.7% and 15.8%, respectively, and inappropriate nutritional behaviors and fast foods were reported to be the risk factors for overweight and obesity.[1] These foods can lead to certain complications such as hypercholesterolemia, cardiovascular disease, type II diabetes, and certain cancers.[7]

Practicing health-promoting behaviors is one of the best approaches to maintain health. Health-promoting behaviors include activities that enable people to monitor their health and are, therefore, useful to improve individual and community health.[1] In this regard, the results of different studies show that education and intervention about nutrition can be effective if it emphasizes behavior rather than just knowledge.[8,9]

Pender's health promotion model (HPM) is one of the widely used models to plan for and change unhealthy behaviors and promote health. Different studies have highlighted the efficiency of this model to control unhealthy behaviors.[10,11] The HPM is based on social cognitive theory according to which cognitive-perceptual factors (perceived benefits, barriers, and self-efficacy) influence engagement in health-promoting behaviors. Modifying factors (demographic characteristics, interpersonal influences, and behavioral factors) are considered to interact with each other to influence cognitive perceptual processes.[1] The Pender's HPM consists of variables that comprise the main part of the interventions. These components provide a rich source of interventional content and strategies.[12] The increasing rate of obesity and strong influence of lifestyle factors, including diet, on the etiology of obesity have been frequently reported by the studies conducted in the western world, but the evidence is limited on developing countries.[9]

Obesity is considered a health priority in Iran. Currently, Iranian community is faced with increased rate of women's employment and hence long-term absence from home, lifestyle and dietary changes, and increased tendency to use high-calorie foods with low nutritional value. Iran's health care system should plan for improving lifestyle and changing behavior and eating habits, as the most sensible and economical approach to prevent obesity in the long term. This can prevent 5.18% of mortality in women.[1] In this regard, nurses can help women to make important health decisions, such as changing nutritional behaviors and increasing physical activities.[13]

Taken together, Iranian community is dealing with many nutritional problems including increased rate of obesity and overweight. Regarding the high costs of health care services, emphasis on prevention rather than treatment, the World Health Organization's emphasis on health promotion, introduction of women's health as a national development index,[1] the effect of mothers' obesity on children, and their role in protection of children's health,[14] and because no study

has yet been conducted in Iran on controlling obesity-related behaviors using the Pender's HPM, this study aimed to investigate the effect of the Pender's HPM to improve the nutritional behavior of overweight and obese women.

Materials and Methods

This quasi-experimental study was conducted using two groups, and pre-test and post-test to examine the effect of the Pender's HPM on nutritional behaviors of overweight women. The study protocol was approved by the Ethics Committee of the Hamadan University of Medical Sciences (approval no: p/16/35/9/5858) and written informed consent was obtained from the participants. The participants were enrolled from October 2014 to May 2015. The study population consisted of all overweight women referring to Fatemiyeh Hospital clinics in Hamadan in 2015. The sample size was decided to include 54 people in each group, according to the formula below, according to a similar study[15] and considering test power: 80%, α: 0.05, mean difference: 1.6, dropout rate: 20% and SD: 2.97, 2.89. Accordingly, 108 women who met the inclusion criteria were selected by random convenience sampling and randomly assigned to two groups of 54 each, experimental and control, by random number table.

$$n = \frac{(\sigma_1^2 + \sigma_2^2)(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta})^2}{(\mu_1 - \mu_2)^2}$$

d=2, $\sigma_1 = \frac{2}{97}$, $\sigma_2 = \frac{2}{89}$, $z_{1-\alpha} = \frac{1}{96}$, $z_{1-\beta} = \frac{1}{28}$

The inclusion criteria were being 18-60 years old, having body mass index (BMI) of 25 and higher, having physical ability, not being pregnant or breast feeding, having no underlying diseases influencing adherence to diet and diagnosed by a physician, being consent to participate in the study, not experiencing any acute events resulting in mental and physical problems within the previous month, and not using medications affecting obesity (e.g. oral contraceptive pills). Exclusion criteria were withdrawal from the study for any reasons such as death or movement and absence in more than one session.

The data were collected using these researcher-developed inventories: A. a demographic and BMI data inventory consisting of 10 items; B. an inventory on the components of the Pender's HPM, including perceived benefits (11 items), perceived barriers (11 items), perceived self-efficacy (12 items), and behavior-related affect, (11 items), interpersonal influences (12 items), and situational influences (5 items) with five-point Likert scale (5: very high, 4: high, 3: relative, 2: low, and 1: very low); and commitment to action (12 items) with four-point Likert scale (1: never, 2: sometimes, 3: often, and 4: always); C. nutritional behavior inventory consisting of 20 items with four-point Likert scale (1: never, 2: sometimes, 3: often, and 4: always). The scores were categorized into three levels: favorable (mean score of higher than 75), partly favorable (mean score between 75-50), and unfavorable (mean score of less than 50).

To ensure the content validity, the inventories were developed using reliable scientific resources and 10 experts confirmed their content validity. The reliability of the inventories was determined using test-retest. Each of the components and the entire test showed an acceptable reliability, as the overall reliability was 0.854. In this study, the inventories were filled out by both groups in the pretest. A training intervention was then held for the experimental group through lectures, questioning and answering, and group discussions in three 30-minute sessions within two weeks in the Lecture Hall of Fatemiyeh Hospital. In the first session, certain materials about the benefits of healthy nutritional behaviors and practical skills to promote them were presented. In the second session, the barriers to healthy nutritional behaviors and the ways to overcome them were presented. In the third session, the measures to promote women's self-efficacy and commitment to healthy nutritional behaviors were presented.

On the completion of the training sessions, a training manual with a content based on the interventional strategies to change the components of the model was given to women in the experimental group, and they were asked to apply the nutritional behavior promotion program in daily life. The post-test was administered two months after the intervention.

Certain indexes, such as mean, standard deviation, and contingency tables were used to describe the data. Paired t-test was used to compare mean values before and after the intervention in each group, and independent t-test to compare the data of the two groups after the intervention. Analysis of covariance was used to compare the scores of components after the intervention in both groups. Spearman's correlation coefficient was used to determine the correlation between nutritional behavior and the components of the Pender's HPM and demographic characteristics. The significance level was considered to be <0.05, and SPSS/16 was used to analyze the data.

Results

The mean age of the participants was 38.09±9.34 and 38.5±9.11 years, and mean BMI 29.12±2.12 and 29.09±24 in the experimental and control groups, respectively. The Independent t-test did not show any significant difference in age, BMI, educational level, occupation, place of residence, number of children and family size, and parity between the two groups (P>0.05). Therefore, the participants in the two groups were matched for demographic variables.

Table 1 shows the overall and qualitative comparison of the nutritional behaviors between the experimental and control groups before and after the intervention. Overall and qualitative comparison of the nutritional behaviors between the two groups demonstrated that the number of people with nutritional behaviors at the unfavorable level decreased and the number of people with nutritional behaviors at the favorable level increased (Table 1).

Independent t-test showed that the two groups were to a large extent similar in terms of the components of healthy nutritional behaviors before and after the intervention (Table 2). According to paired t-test, in the experimental group, there was a significant difference between the mean scores of perceived benefits, perceived barriers, perceived self-efficacy, behavior-related affect, interpersonal and situational influences, commitment to action, and nutritional behaviors between before and after the intervention (P<0.001) (Table 3).

Tables 4 and 5 show the results on the correlation of nutritional behavior with the components of the Pender's HPM and demographic characteristics of the two groups. The analysis showed that there was a significant relationship between educational level and nutritional behaviors (Anova); also, there was a significant correlation with feeding behavior between married and location(Independent t test).

Discussion

This study was conducted to investigate the effect of the Pender's HPM to improve the nutritional behavior of overweight and obese women. The results of this study revealed that the mean scores of nutritional behaviors before the intervention were favorable in neither of the

Table 1: Overall and qualitative comparison of the nutritional behaviors between the experimental and control groups before and after the intervention

Qualitative level of nutritional behaviors Number	Before Intervention		After Intervention	
	Experimental group Number (%)	Control group Number (%)	Experimental group Number (%)	Control group Number (%)
Unfavorable	19 (34%)	16 (29%)	5 (9%)	16 (30%)
Partly favorable	24 (45%)	26 (48%)	10 (18%)	26 (48%)
Favorable	11 (21%)	12 (23%)	39 (73%)	12 (22%)

Table 2: Comparison of the mean score (standard deviation) of Pender's Health Promotion Model components in terms of nutritional behaviors before and after intervention in experimental and control groups

Components		Before intervention			After intervention		
		Experimental group Mean±SD	Control group Mean±SD	P value*	Experimental group Mean±SD	Control group Mean±SD	P value
Perceived benefits		44.2±5.7	55.45±10.55	<0.001	80.9±4.41	55.82±11.08	0.36
Perceived barriers		72.72±6.86	71.64±7.89	0.45	39.52±4.62	71.07±9.1	0.04
Behavior-related affect	Positive	83.55±5.84	59.03±15	<0.001	51.34±2.65	26.83±6.82	0.000
	Negative	36.79±4.84	72.59±13.46	<0.001	20.06±2.64	52.4±7.34	0.04
Perceived self-efficacy		48.22±8.84	50.8±9.48	0.06	81.35±5.37	51.38±10.38	0.35
Interpersonal influences	Norms	25.99±4.88	27.44±5.68	0.16	53.92±12.69	60.59±12.32	<0.001
	Modeling	29.42±4.93	31.78±9.04	0.01	46.85±9.43	58.14±16.64	<0.001
Situational influences		48.99±8.96	51.91±10.61	0.13	46.07±8.18	51.46±10.76	<0.001
Commitment to action		43.11±6.43	44.38±9.3	0.41	63.76±3.2	48.79±6.9	0.05
Nutritional behaviors		41.75±3.28	42.36±3.69	0.37	79.09±5.27	49.73±9.49	0.03

*Paired t test

Table 3: Comparison of the mean differences of Pender's Health Promotion Model components before and after intervention in the experimental and control groups

Components		Group	Mean difference	Standard deviation	P value*
Perceived benefits		Intervention	-36.700034	6.55149	<0.001
		Control	-3.37037	3.52098	0.44
Perceived barriers		Intervention	33.19865	7.76374	<0.001
		Control	0.57239	4.2619	0.32
Behavior-related affect	Positive affect	Intervention	45.57576	3.19051	<0.001
		Control	0.77233	5.18488	0.55
	Negative affect	Intervention	16.72278	2.20183	<0.001
		Control	32.99663	6.12223	<0.001
Perceived self-efficacy		Intervention	-34.13580	10.79512	<0.001
		Control	-0.58642	4.30929	0.32
Situational influences		Intervention	4.91944	8.76727	<0.001
		Control	0.45093	3.17567	0.35
Interpersonal influences	Interpersonal norms	Intervention	-27.93266	11.62759	<0.001
		Control	-33.15152	6.72287	<0.001
	Interpersonal modeling	Intervention	-17.42424	7.86376	<0.001
		Control	-26.36364	7.62852	<0.001
Commitment to action		Intervention	-20.64815	7.28584	<0.001
		Control	0.58457	6.34904	0.50
Nutritional behavior		Intervention	-37.33796	5.82795	<0.001
		Control	0.68451	5.34902	0.62

*Paired t test

experimental and control groups. A significant change was observed in the mean scores of nutritional behaviors after the intervention in the experimental group; these results are consistent with those of the studies conducted by Scott-Sheldon et al.[16] and Quintiliani et al.[17]

In this study, 87.1% of the women in the experimental group had breakfast after the intervention; this result is consistent with Khodaveisi's study[1] but inconsistent with Lee's study.[18] The inconsistency might be due to cultural and social differences because Iranian families insist on having breakfast, as there are relevant proverbs in Persian language. The healthy nutritional behaviors, in the experimental group, improved after learning the perceived benefits. Similarly, in a study conducted by Gomes Guedes et al.'s study,[12] the mean score of perceived benefits significantly changed after the intervention.

In this study, as with another study,[19] the mean score of perceived barriers decreased

Table 4: The correlation of nutritional behavior with components of Pender's Health Promotion Model in experimental and control groups

Components		Nutritional behaviors in the experimental group		Nutritional behaviors in the Control group	
		Spearman Correlation coefficient	P value*	Spearman Correlation coefficient	P value*
Perceived benefits		0.787	0.03	-0.120	0.39
Perceived barriers		-0.009	0.95	-0.820	0.037
Behavior-related affect	Positive affect	0.849	0.02	-0.086	0.54
	Negative affect	-495	0.03	0.032	0.82
Perceived self-efficacy		0.221	0.11	0.818	0.03
Situational influences		0.657	0.04	-0.83	0.55

*P<0.05

Table 5: The correlation of nutritional behavior with demographic characteristics in experimental and control groups

Demographic variables	Nutritional behaviors in the experimental group		Nutritional behaviors in the control group	
	Spearman Correlation coefficient	P value*	Spearman Correlation coefficient	P value*
Family's income	-0.033	0.81	0.627	0.03
Body mass index	-0.964	0.01	-0.049	0.72
Number of children	0.503	0.06	0.479	0.07
Number of family members	0.645	0.06	0.235	0.43

*P<0.05

after the intervention. Studies have shown that the predicted barriers affect the intention to perform a behavior and performance of the behavior.[20] In this study, many important perceived barriers to healthy nutritional behaviors were identified. Therefore, it is necessary to set appropriate policies, as one of the most influential factors to institutionalize healthy nutrition in families, given the higher costs needed for preparing healthy food rather than unhealthy fast food, as a main barrier to healthy nutritional behavior, and lack of appropriate nutritional knowledge and culture.

The significant change in the mean score of perceived self-efficacy in the experimental group after the intervention is consistent with the results of Gomes Guedes et al.'s study.[12] Furthermore, Mohammadian et al. showed an increase in self-efficacy using the Pender's HPM, and reported that the knowledge about barriers and strategies increased the motivation and perceived social supports.[19]

There was a significant difference in the mean score of interpersonal influences before and after the intervention in the experimental group. Studies show that if an individual has positive attitudes toward a behavior, and significant others confirm the performance of that behavior, he decides to perform that behavior. Therefore, people are more likely to perform healthy nutritional behaviors when they feel their family members and relatives expect and encourage them frequently to perform those behaviors.[11] In this study, nurses and physicians were the most influential people on healthy nutritional behaviors in terms of interpersonal norms; this finding highlights the role of nurses in health promotion. Besides, children and husbands were the most influential people on healthy nutritional behaviors in terms of interpersonal modeling; this emphasizes the role of social support following health-promoting behaviors. Thus, failure of husband and even children to cooperate with the mother in making appropriate changes

in lifestyle may be a barrier to adherence to healthy nutritional behaviors. SooYoung et al.[21] showed that if parents have higher levels of knowledge about appropriate nutritional patterns, adolescents consume healthy foods, such as fruit and vegetables, more frequently. Jenkins et al. emphasized the role of parents as a main constituent of behavior moderating programs in adolescents. However, Ramezani[22] showed that children are interested in nutritional pattern of their family, including mother. Accordingly, it can be argued that there is a reciprocal relationship between nutritional behavior of mothers and children.

The results showed that nutritional behavior positively and significantly correlated with the family's income and educational level in the control group, probably due to their higher level of knowledge about health and nutrition and higher economic status. There was a significant, negative correlation between BMI and nutritional behaviors in the experimental group; that is, the higher the consumption of fruit and vegetables and the lower the consumption of saturated fats and fast and canned foods were, the lower the BMI was. Nutrition education is provided for the Canadian public through Canada's Food Guide.[6] The guide promotes adequate consumption of foods that have a high nutritional content, and are low in calories, fat, sugar and salt. At the same time, it promotes limited consumption of foods that are high in calories, fat, sugar and salt. However, less than 1% of the Canadian population meet the recommendations that are described in Canada's Food Guide.[23]

In this study, BMI significantly correlated with high-salt snacks, sweetened beverages, and different sandwiches. Menezes et al.'s study showed a significant correlation between some body composition indexes and the consumption of fat and sweet foods.[24]

There was a positive, significant correlation between perceived self-efficacy and nutritional behaviors. In other words, the more strictly people adhere to healthy nutritional behaviors regardless of their conditions and facilities, the more likely they are to become successful in this regard. This finding is consistent with Denise et al.'s study.[25] Clinical trials have also shown that self-efficacy promotion programs are effective, and people's self-efficacy and nutritional habits and behaviors may become more health-oriented after training interventions.[15,26] Iranagh et al. emphasized that instructors of healthy nutrition should pay attention to self-efficacy, as an important index, in implementing training interventions.[27]

A positive significant correlation was found between situational influences and nutritional behaviors in this study; this result is in agreement with Khodaveisi et al.'s study[1] but inconsistent with Bahmanpour et al.'s study.[28] The participants were most likely to practice healthy nutritional behaviors at home and workplace. This result was not unexpected because of easy access to food and the fact that people spend most of the time in these locations.

Based on the results, training programs in this study did not significantly change the BMI and weight in the experimental and control groups, which was not unexpected given the relative short duration of the studied intervention. However, continuous implementation of such interventions with appropriate strategies can cause desired changes. Studies have shown that a slight decrease in weight and BMI improves health. Although a weight loss of 2-3 kg may not be desirable to parents, they should be informed that a slight loss of weight can reduce many disease risk factors.[29]

A limitation of this study was that it was not possible to observe nutritional behaviors, and thus nutritional behaviors were examined using a self-report questionnaire. This might result in insufficiently accurate description of some variables. The strength of this study was high participation rate of the participants in the training sessions, which can imply their consent to and support of the nutritional behavior promoting interventions.

Conclusion

The results showed that the Pender's HPM-based training can positively affect and improve the women's nutritional behaviors. Therefore, it is recommended that the nutritional behaviors should be changed through promoting people's knowledge about nutrition so that inappropriate nutritional behaviors are replaced with appropriate nutritional ones. Furthermore, it is recommended that programs should be made on the effects of mass media, especially television, and sociocultural factors on nutritional behaviors, obesity, and prevalence of chronic diseases. Considering that a major constituent of nutritional pattern in a community is the collection of nutritional habits, culture, and public knowledge, and that nutritional habits and behaviors differ from one community to another, interventions on nutritional behaviors should be adapted to the cultural context of communities.

Regarding the results of this study, health care authorities are recommended to develop training programs to promote nutritional behaviors and inform families, especially women, about healthy foods, methods of cooking healthy and diverse foods that are adaptable to taste of all family members, and appropriate lifestyle including regular exercise, reducing television viewing duration, reducing the consumption of fatty and fast foods, and increasing the consumption of fruits and vegetables to control weight and prevent all types of obesity.

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