



The Effects of an Educational Intervention Based on the Health Belief Model and Self-Regulation on Women's Eating Behaviors During Menopausal Transition

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Abstract

Background and Aim: Middle-aged females are very vulnerable in their menopausal transition and are at risk for developing chronic illnesses. Modification of eating behaviors is one of the most important strategies for the prevention and management of chronic illnesses. The aim of this study was to evaluate the effects of an educational intervention based on the health belief model and self-regulation on female's eating behaviors during menopausal transition.

Methods: As a randomized controlled field trial, this study was done in 2016 on seventy 35- to 50-year-old females recruited from primary healthcare centers in Darmian county, Iran. Females were randomly allocated to control and intervention groups. A valid and reliable researcher-made questionnaire was used to assess self-regulation and Health Belief Model constructs. Women in the intervention group received theoretical trainings about eating behaviors in six 60- to 90-minute sessions and practical training about healthy cooking in one 180-minute session. Data collection was done before, immediately after, and 3 months after the intervention. The collected data were analyzed via the SPSS software (v. 18.0) and by conducting the independent-sample t test, repeated-measures analysis of variance, and Bonferroni post hoc test at a significance level of less than 0.05.

Results: The study groups did not significantly differ from each other regarding female's demographic characteristics ($P < 0.05$). The mean scores of all constructs of the Health Belief Model and self-regulation significantly improved in the intervention group across the 3 measurement time points ($P < 0.001$). However, in the control group, significant improvements were observed only in the mean scores of knowledge and self-efficacy ($P < 0.05$).

Conclusions: The educational intervention based on the Health Belief Model and self-regulation improved women's healthy eating knowledge, attitudes, self-efficacy, self-regulation, and practice.

Keywords: Education, Health Belief Model, Self-Regulation, Eating Behavior, Menopausal Transition

1. Background

Women are at the core of most healthcare programs. They are the most principal route for healthy lifestyle education and promotion (1). Therefore, promoting their health not only improves their own quality of life, yet also has different positive outcomes for families and societies (2).

During their lives, females experience different debilitating chronic conditions, most of which are preventable. Besides, they experience more physiological problems than males. One of these problems is menopausal transition (MT) (2). During MT, a female moves from her reproductive age towards menopause (3). Menopausal Tran-

sition starts at the age of 35 to 39 and lasts 5 to 15 years. During MT, estrogen level decreases and women thus experience different health problems, such as vasomotor symptoms, excessive vaginal bleeding, severer premenstrual syndrome, mood changes, osteoporosis, cardiovascular disease, breast cancer (4), and reduced quality of life (2).

Menopausal Transition-related problems can be aggravated by different factors, including unhealthy lifestyle habits, such as unhealthy eating, stressors, and limited physical activity. On the contrary, healthy eating and effective stress management can prevent and alleviate these problems (5). Given the significant role of lifestyle in morbidity and mortality (6), lifestyle modification is consid-

ered as the cornerstone of health-related programs for middle-aged females. According to the food and agriculture organization of the United Nations, healthy eating can reduce the risk of cardiovascular disease by 25%, diabetes mellitus by 50%, and cancer, infections, and respiratory problems by 20% (2).

Despite the prominent role of eating in health and illness, most people have unhealthy eating behaviors and suffer from different eating-related problems. For instance, a study from Iran showed that 59.8% of middle-aged females suffered from overweightness and obesity (2). Another study revealed that menopausal females consumed limited amounts of calcium and dairy products (7). Moreover, a study showed that although 66.7% of females had good knowledge and attitudes about healthy eating, only 24.1% had acceptable eating behaviors, implying that knowledge and awareness cannot necessarily guarantee healthy behaviors (8). Studies from other countries also reported unhealthy lifestyle behaviors among females. For example, a study showed that around 50% of 18- to 50-year-old females had high-risk lifestyle behaviors, most of which were modifiable (9). It has been estimated that by 2020, lifestyle-related non-contagious diseases will be the cause of 70% of all deaths in developing countries (10). Moreover, lifestyle modification can reduce mortality rate among females by 18.5%. Therefore, effective lifestyle modification interventions and programs are needed to encourage females to adopt a healthy lifestyle (11).

Knowledge is an absolute prerequisite for lifestyle and behavior modifications. It could be enhanced through education (12). A study from Iran showed that education improved middle-aged female's menopause-related knowledge and attitudes. This study concluded that the implementation of educational programs is the best strategy for advancing knowledge, modifying attitudes and behaviors, and empowering individuals for lifestyle modification (13).

The effectiveness of health-related educational interventions and programs largely depends on the appropriate use of theories and models in areas of health and education. Models and theories provide useful frameworks and step-by-step directions for the implementation and evaluation of educational programs (14). One of the most useful models for behavioral modification is the health belief model (HBM) (15). The basis of HBM is the notion that an individual's engagement in a given healthy behavior depends on his/her perception of a threat to health (16).

The HBM has been used in different studies to promote female's eating behaviors. For instance, a study from Greece showed the effectiveness of the model in increasing menopausal women's intake of nutrients and improving the quality of their dietary regimens (17). Studies from Iran also indicated the positive effects of HBM on different

health-related outcomes (2, 12). However, HBM greatly focuses on personal components of behaviors, while the effectiveness of behavioral modification programs depends on their flexibility and appropriateness for the target population (18). Accordingly, the effectiveness of HBM-based interventions could be enhanced through combining HBM with other theories or models.

Self-regulation is a construct of the social cognitive theory. It is defined as the ability to modify behaviors based on personal observations. Self-regulation is an ongoing process of setting goals, pursuing goals, evaluating goal achievement, and setting new goals (19). Self-regulated individuals evaluate their own behaviors, make judgments about themselves, determine the congruence of their behaviors with their criteria and aims, and punish or reward themselves for their behaviors (20). Self-regulation has been used in some studies to promote eating behaviors among females. For instance, a local study from Iran showed the positive effects of self-regulation on osteoporosis-preventive behaviors (18).

Most previous studies in the area of menopause mainly focused on postmenopausal problems and complications and hence, there are limited studies regarding the effects of lifestyle modifications and preventive behaviors on premenopausal outcomes (21). The present study was done to evaluate the effects of an educational intervention based on HBM and self-regulation on female's eating behaviors during MT.

2. Methods

As a randomized controlled field trial, this study was done in 2016 on seventy 35- to 50-year-old females recruited from primary healthcare centers in Darmian county, Iran. Initially, among nine healthcare centers located in Darmian, the healthcare centers located in Quhistan town were randomly selected. Then, from six primary health homes in Quhistan town, Darakhsh and Asiaban homes were randomly selected. One of these two homes was allocated to the control and the other to the intervention group. The list of all females in each of these health homes was created and finally, 35 women were recruited in the study from each home. Women were included if they were in their MT (i.e. aged 35 to 50), were able to read and write in Persian, were neither pregnant nor menopausal, did not work in healthcare organizations, had not participated in educational programs on eating behaviors during the past one year, had no allergy to milk or dairy products, and were not afflicted by health problems, which necessitated following strict dietary regimens (such as diabetes mellitus, renal failure, and hypertension). Exclusion criteria were two or more absences from educational sessions

and affliction by a health problem during the study, which necessitated following strict dietary regimens.

Sample size was calculated using the formula for comparing two means and the results of an earlier study, which reported a pretest and posttest perceived susceptibility mean score of 41.17 ± 17.00 and 55.51 ± 19.16 , respectively (22). Subsequently, with type I and II errors of 0.05 and 0.1, sample size was estimated as 28 for each group. Nonetheless, sample size was increased to 35 in order to compensate potential exclusions.

Data collection tools were a demographic questionnaire, a researcher-made eating behaviors questionnaire, and a researcher-made questionnaire for the assessment of HBM and self-regulation constructs. The items of the demographic questionnaire included age, educational status, husband's educational and employment status, family size, house hold monthly income and expenses, and number of attendance to health homes.

The second tool, i.e. the eating behaviors questionnaire, was used to assess participants' eating habits. This questionnaire included thirteen items on the type and the amount of the used foods. Seven items were dichotomous questions, which were scored either 0 ("No") or 1 ("Yes"). Besides, the questionnaire included four three-option items scored 1 to 3 and two four-option questions scored 1 to 4.

The third tool was a questionnaire for the assessment of HBM and self-regulation constructs. It consisted of 8 dimensions, namely knowledge (15 items), perceived susceptibility (8 items), perceived seriousness (7 items), perceived benefits (11 items), perceived barriers (9 items), self-efficacy (8 items), and self-regulation (12 items). Knowledge items were multiple-choice questions. Right and wrong answers to these questions were scored 1 and 0, respectively. The items of the other dimensions were scored on a five-point Likert-type scale from 1 ("completely disagree") to 5 ("completely agree").

The face and content validity of the tools were assessed and confirmed by 12 experts in health education and promotion (8 individuals), epidemiology (2 individuals), and nutrition sciences and nursing (2 individuals). On the other hand, the reliability of the third questionnaire was assessed using the internal consistency assessment, in which twenty 30- to 50-year-old females completed the tool. The Cronbach's alpha values were as follows: the whole questionnaire: 0.78; perceived susceptibility dimension: 0.79; perceived seriousness dimension: 0.78; perceived benefits dimension: 0.78; perceived barriers dimension: 0.65; self-efficacy dimension: 0.89; and self-regulation dimension: 0.85.

Patients in the intervention group were provided with nutritional education based on HBM and self-regulation. Initially, all questionnaires were filled for all participants

in both groups before the intervention (T1). Based on the results of the pretest, educational needs of participants were determined. Then, an educational program was developed based on the determined needs, HBM, and self-regulation. The program included 6 theoretical training sessions and one practical training session. The sessions were held using teaching methods such as lectures, role performance, small group discussions, and question-and-answers. The length of these sessions was 60 to 90 minutes. During the 180-minute practical training sessions, 2 experienced chefs taught females about healthy cooking. The aim of this session was to improve women's self-regulation and self-efficacy. Beside verbal educations, an educational pamphlet and an educational booklet were provided to females. Written educational materials were about healthy cooking using different food groups, particularly vegetables. Women were required to cook healthy food at home based on the provided educations. In the control group, women only received education routinely provided to all those, who referred to health homes. Study questionnaires were recompleted for all participants both immediately (T2) and 3 months after educations (T3).

The collected data were analyzed via the SPSS software (v. 18.0). All variables had normal distribution and hence, independent-sample t test, repeated-measures analysis of variance, and Bonferroni post hoc test were conducted for data analysis at a significance level of less than 0.05.

The institutional review board and the ethics committee of Birjand University of Medical Sciences, Birjand, Iran, approved this study (approval codes: B.9513 and IR.BUMS.REC.1395.229, respectively). Each woman was personally informed about the study, ensured about confidential management of her personal data, and asked to provide a written informed consent. For the sake of ethical practice, a one-hour educational session was also held for females in the control group after the second posttest in order to provide them with education about healthy eating.

3. Results

This study was carried out on 70 females in their MT. Age means in the intervention and the control groups were 42.60 ± 4.80 and 40.40 ± 4.80 , respectively. Family size in these groups was 4.63 ± 1.10 and 4.09 ± 1.20 , respectively. There were no significant differences between groups concerning participants' age, family size, and educational status ($P < 0.5$).

As shown in Table 1, the mean scores of knowledge, eating behaviors, and perceived susceptibility, seriousness, barriers, benefits, self-efficacy, and self-regulation in the intervention group improved significantly across the 3 measurement time points ($P < 0.001$). However, in the con-

trol group, significant improvement was observed only in the mean scores of knowledge and self-efficacy ($P < 0.05$). Therefore, there were significant differences between the groups regarding T1 to T2 and T1 to T3 mean differences of knowledge, eating behaviors, and perceived susceptibility, seriousness, barriers, benefits, self-efficacy, and self-regulation ($P < 0.05$; Table 2).

4. Discussion

This study aimed at evaluating the effects of an educational intervention based on HBM and self-regulation on women's eating behaviors during MT. Findings showed that after the intervention, the mean score of knowledge in the intervention group increased significantly, denoting the positive effects of theory-based education on women's knowledge about eating behaviors during MT. This is in agreement with the findings of previous studies (23-25). Knowledge advancement is the first step in behavioral modification. Therefore, offering educational courses, particularly based on health models and theories, is recommended for advancing people's knowledge about healthy behaviors.

The study findings also showed that before the intervention, most participants had not perceived that they were at risk of developing health problems. However, after the intervention, the mean score of perceived susceptibility in the intervention group increased significantly. Three earlier studies also reported the same finding (25-27). Another study also showed the positive effects of nutritional education on perceived susceptibility among patients with diabetes (28). Perceived susceptibility is among the most important determining factors behind eating behaviors. Therefore, successfulness and effectiveness of preventive measures greatly depends on clients' knowledge about their susceptibility to health problems.

Findings also revealed no significant between-group differences regarding the baseline mean score of perceived seriousness. However, after the intervention, perceived seriousness significantly improved in the intervention group. This is consistent with the findings of several earlier studies (25, 28, 29). This finding implies that the study intervention was effective in expanding participants' understanding about the risks and costs associated with unhealthy eating.

Another finding of the study was the insignificant between-group difference regarding the baseline mean score of perceived barriers. After the intervention, this mean score significantly decreased in the intervention group. In other words, the educational intervention removed barriers to healthy eating and helped females engage in healthier eating behaviors, such as limited con-

sumption of salt, sugar, and oil. Two previous studies also reported the same finding (28, 30). Perceived barriers inversely correlated with engagement in healthy eating behaviors (18).

The study intervention also significantly improved the mean score of perceived benefits, so that women in the intervention group had better understanding about the effectiveness of using vegetables, fruits, milk, and dairy products in preventing cardiovascular disease, osteoporosis, and cancer, and improving their self-confidence in maintaining their own health. Previous studies also reported the positive effects of HBM-based educational interventions on perceived benefits of healthy eating (23, 27, 28). However, contrary to the current findings, a study showed that HBM-based education had no significant effect on perceived benefits of calcium intake (25). It is noteworthy to mention that perceived benefits of a given behavior facilitates engagement in that behavior.

The mean score of perceived self-efficacy also significantly increased after the study intervention. Three earlier studies also reported the effectiveness of educational interventions in improving self-efficacy (24, 30, 31). Perceived self-efficacy with respect to eating behaviors is the degree of confidence and ability to identify healthy foods, engage in healthy eating, and inform others about factors behind illnesses. People with greater self-efficacy in doing a given behavior are more likely to show that behavior.

This study also found that despite no significant between-group difference before and immediately after the intervention, the mean score of perceived self-regulation in the intervention group was significantly greater than the control group at the third measurement time point, i.e. 3 months after the intervention. Higher self-regulation is associated with better osteoporosis-preventive behaviors (18). The combination of HBM and self-regulation is also a good predictor of osteoporosis-preventive behaviors (32). Self-regulation implies that achieving important things in life necessitates goal setting and planning.

Finally, study findings indicated that after the educational intervention, the consumption of fresh fruits, vegetables, milk, and dairy products increased significantly, while the consumption of carbonated drinks, canned foods, fried foods, sausage, kielbasa, and high-fat and high-salt foods decreased significantly. In other words, the educational intervention significantly improved healthy eating among females. Two earlier studies also found that HBM-based nutritional education significantly improved knowledge and practice in the area of healthy eating (30, 32). Conversely, a study reported significant decrease in calcium intake after HBM-based education (27).

Table 1. Within- and Between-Group Comparison with Respect to Health Belief Model Constructs and Self-Regulation^a

Construct	Time	Group		P Value ^b
		Intervention	Control	
Knowledge	Before	5 ± 2.64	6.94 ± 2.58	0.003
	Immediately after	13.2 ± 2.4	6.8 ± 2.4	< 0.001
	Three months after	11.2 ± 2.4	6.3 ± 2.6	< 0.001
	P Value ^c	0.001	0.003	-
	P Value ^d	< 0.001 (T1-T2, T1-T3, and T2-T3)		
Behavior	Before	3.97 ± 1.92	5.51 ± 1.85	0.001
	Immediately after	6.51 ± 2.24	5.48 ± 1.82	0.039
	Three months after	8.74 ± 1.9	5.63 ± 1.8	< 0.001
	P Value ^c	< 0.001	0.51	-
	P Value ^d	< 0.001 (T1-T2, T1-T3, and T2-T3)		
Perceived susceptibility	Before	2.85 ± 0.65	2.8 ± 0.86	0.77
	Immediately after	4.13 ± 0.51	2.78 ± 0.84	< 0.001
	Three months after	3.86 ± 0.38	2.79 ± 0.76	< 0.001
	P Value ^c	< 0.001	0.87	-
	P Value ^d	< 0.001 (T1-T2, T1-T3, and T2-T3)		
Perceived seriousness	Before	3.56 ± 0.77	3.56 ± 0.75	0.96
	Immediately after	4.38 ± 0.51	3.56 ± 0.71	< 0.001
	Three months after	4.18 ± 0.46	3.49 ± 0.65	< 0.001
	P Value ^c	< 0.001	0.09	-
	P Value ^d	< 0.001 (T1-T2, T1-T3, and T2-T3)		
Perceived benefits	Before	3.97 ± 0.32	4.25 ± 0.37	0.001
	Immediately after	4.5 ± 0.21	4.2 ± 0.35	< 0.001
	Three months after	4.38 ± 0.2	4.11 ± 0.32	< 0.001
	P Value ^c	< 0.001	0.08	-
	P Value ^d	< 0.001 (T1-T2, T1-T3, and T2-T3)		
Perceived barriers	Before	2.72 ± 0.8	2.67 ± 0.62	0.74
	Immediately after	2.16 ± 0.49	2.69 ± 0.61	< 0.001
	Three months after	2.48 ± 0.53	2.66 ± 0.5	0.15
	P Value ^c	< 0.001	0.48	-
	P Value ^d	< 0.001 (T1-T2 and T2-T3)		
Perceived self-efficacy	Before	3.47 ± 0.52	3.47 ± 0.67	1
	Immediately after	4.16 ± 0.37	3.43 ± 0.64	< 0.001
	Three months after	4.1 ± 0.28	3.38 ± 0.57	< 0.001
	P Value ^c	< 0.001	0.02	-
	P Value ^d	< 0.001 (T1-T2 and T1-T3)		
Self-regulation	Before	3.3 ± 0.43	3.31 ± 0.29	0.95
	Immediately after	3.43 ± 0.35	3.28 ± 0.29	0.056
	Three months after	3.53 ± 0.23	3.24 ± 0.24	< 0.001
	P Value ^c	< 0.001	0.11	-
	P Value ^d	0.001 (T1-T3) and 0.041 (T2-T3)		

^a Values are expressed as mean ± SD.

^b The independent-sample t test.

^c The repeated-measures analysis of variance.

^d Bonferroni post hoc test.

4.1. Conclusions

The study findings suggest that female’s decision to change their unhealthy eating behaviors is affected by different factors, such as their personal beliefs, knowledge, and financial status. The educational intervention based

on HBM and self-regulation could improve female’s knowledge and behaviors in the area of healthy eating. Therefore, healthcare providers could combine HBM and self-regulation in order to develop effective educational programs to promote female’s knowledge, attitudes, and prac-

Table 2. Between-Group Comparisons Respecting T1 to T2 and T1 to T3 Mean Differences of Health Belief Model Constructs and Self-Regulation^a

Construct	T1-T2 Mean Differences			T1-T3 Mean Difference		
	Intervention	Control	P Value	Intervention	Control	P Value ^b
Knowledge	8.17 ± 2.63	0.14 ± 0.81	< 0.001	6.17 ± 3.2	0.63 ± 1.03	< 0.001
Behavior	2.55 ± 2.42	0.03 ± 0.57	< 0.001	4.77 ± 1.96	0.12 ± 0.72	< 0.001
Perceived susceptibility	1.28 ± 0.6	0.02 ± 0.12	< 0.001	1 ± 0.61	0.007 ± 0.22	< 0.001
Perceived seriousness	0.83 ± 0.54	0 ± 0.09	< 0.001	0.63 ± 0.59	0.069 ± 0.2	< 0.001
Perceived benefits	0.54 ± 0.28	0.03 ± 0.06	< 0.001	0.41 ± 0.3	0.14 ± 0.14	< 0.001
Perceived barriers	-0.57 ± 0.5	0.03 ± 0.13	< 0.001	-0.25 ± 0.6	0.01 ± 0.24	0.032
Perceived self-efficacy	0.69 ± 0.47	0.04 ± 0.1	< 0.001	0.61 ± 0.47	-0.09 ± 0.2	< 0.001
Self-regulation	0.13 ± 0.33	0.03 ± 0.08	< 0.008	0.23 ± 0.34	-0.06 ± 0.23	< 0.001

^aValues are expressed as mean ± SD.

^bThe independent-sample t test.

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