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Original Article

# Investigating the Effect of Educational Intervention Based on the Health Belief Model on Nutritional Behaviors that Prevent Cardiovascular Diseases

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**Abstract**

**Background:** Health recommendations to adopt health behaviors are implemented by the patient if they are internalized as beliefs in the patient's mind and are expressed in their actions. This study investigated the effect of educational intervention based on health beliefs on the nutritional behaviors that prevent cardiovascular diseases (CVDs) in middle-aged women of Sarbaz city in 2021.

**Methods:** This interventional research was a pretest-posttest control group design. The statistical sample was 90 people, which were randomly assigned to the intervention (n = 30) and control (n = 60) groups. Computer-generated random numbers were used for simple randomization of subjects. First, both groups were asked to answer the questionnaires, then training was provided to the intervention group, and finally, both groups were asked to answer the questionnaires again. The data was collected using the health belief, food frequency, and nutritional behavior questionnaire (FFQ). Analysis of variance, chi-square, independent t-test, and paired t-test were used to analyze the data.

**Results:** The findings showed that the educational intervention was effective in increasing the constructs of the health belief model that prevent CVDs (awareness, $P = 0.001$; susceptibility, $P = 0.014$; severity, $P = 0.005$; benefits, $P = 0.020$; barriers, $P = 0.005$; self-efficacy, $P = 0.000$). Also, the educational intervention improved nutritional behaviors that prevent CVDs (increased vegetable ($P = 0.001$), fruit ($P = 0.001$) consumption; reduced fat ($P = 0.001$), and sugar ($P = 0.001$) consumption).

**Conclusion:** According to the findings, it can be said that increasing the awareness of middle-aged women about nutritional behaviors is a necessity to reduce the incidence of CVD risk factors.

**Keywords:** Health belief, Nutritional physiology of the elderly, Behavior, Cardiovascular diseases

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## Introduction

In recent years, cardiovascular diseases (CVDs) have increased greatly and have become known as one of the most important causes of death in the world (1). In our country, half of the government's health-treatment budget is spent on the expenses caused by this disease (2) because most heart diseases cause frequent hospitalizations with high costs. This is one of the consequences of people's lack of awareness of the disease risk factors and its prevention methods. However, most cases of CVDs can be prevented, and proper health behaviors can prevent a person from developing these diseases by reducing their risk. Therefore, attention and suitable policies are necessary to reduce these diseases and costs (2,3).

Despite the unchangeable nature of some factors, such as heredity and age, it is possible to prevent, or at least delay, CVDs with a series of interventions. In addition, many factors play a role in causing and aggravating CVDs, the most important of which are improper diet, obesity, and overweight. Encouraging people to increase fruit and vegetable consumption and reduce sugar and fat consumption can be effective in controlling and preventing these diseases (2).

On the other hand, education plays a vital role in improving people's health and is one of the main measures for changing inappropriate behaviors. Proper education and regular educational programs, measuring the awareness and attitude of the target population, and explaining the effective elements in the educational process can be important factors in preventing diseases in society (3).

Nowadays, health education is one of the most effective methods of intervention to prevent diseases, because the purpose of health education is to change health behaviors

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to promote and maintain health, but changing behavior is more difficult to achieve using traditional education. It is not possible to educate adults easily if they are not willing to be educated (4). The effectiveness of health education programs depends heavily on the correct use of theories and models used in health education (5).

The health belief model is one of the effective models in health education. This model shows the relationship between health beliefs and health behavior and is based on the hypothesis that preventive behavior is based on personal beliefs. In other words, it considers behavior as a function of the individual's knowledge and frame of mind. The health belief model emphasizes that as a general rule, people show a good and appropriate reaction to health messages and disease prevention when they feel they are in danger (perceived threat) and understand the benefits of changing their behavior, easily eliminating the obstacles on the path to these changes. It is in these circumstances that interventions and educational programs will probably be effective (5).

Dealing with malnutrition is influenced by environmental and socio-cultural factors. Women, who are often in charge of managing household resources, play a crucial role in meeting the nutritional needs of the household, particularly children. To reduce malnutrition, it is important to raise women's awareness and knowledge of food processing, storage techniques, nutrition principles, and household management. Additionally, women's self-confidence, creativity, and efficiency are also important factors to consider (6).

Therefore, for the implementation of health education programs and the adoption of health behaviors by the patient and their family, the patient's belief and faith in thought and action are necessary, and their participation in caring for and maintaining healthy behaviors is needed; participation is achievable only if it is in the form of health beliefs (5).

According to the report of the American Heart Association, CVDs were considered a major health issue in men in the past, but in recent years, the importance of CVDs in women has also been recognized. Thus, CVDs such as coronary artery obstruction and heart stroke sometimes appear with different symptoms in women than in men, which may cause late diagnosis and improper treatment in the latter. Therefore, it is very important to be aware of the symptoms and risk factors of CVD in women and to provide them with proper preventive care and treatment (7).

On the other hand, nowadays, the most important health system programs are based on family health, especially women's health because of their central role in the health of the family. Despite having a longer life expectancy than men, women have a higher burden of disease and disability and a lower quality of life. Also, the physiological conditions of women can be considered an important factor in their mortality and disability (4).

Considering that most of the residents of the cities of Sistan and Baluchestan Considering that most of the residents of the cities in Sistan and Baluchestan Province have low incomes, low literacy rates, and low economic capital, they are vulnerable to health issues such as decreased life expectancy, increased diseases, and nutritional deficiencies. Women play a key role in managing the nutrition of their families, making it necessary to inform them about the importance of nutrition for good health. Many of the dietary concepts are acquired by women and can have permanent effects on the health of infants, children, and families. Therefore, this study aims to investigate the effect of education based on the health belief model on nutritional behaviors to prevent CVDs in middle-aged women living in the city of Sarbaz in 2021.

## Materials and Methods

This intervention research with a pretest-posttest control group design was conducted on all middle-aged women (30 to 60 years old) under the coverage of the Sarbaz city health base in 2021, with a total number of 131 people. First, based on the census at the beginning of the year, a complete list of women in the target group was extracted from the Sib system and coded.

The inclusion criteria for the study included living in Sarbaz, being 30 to 60 years old, being literate and willing to cooperate, not suffering from CVDs, mental disorders (Alzheimer's or dementia), and confirmed mental illnesses, and no record of participation in similar training classes. The exclusion criteria for the study included unwillingness to continue cooperation and absence of more than two sessions. The objectives of the study were explained to the participants, and informed consent was obtained from the participants before they entered the study.

The sample size was determined as 97 people using Cochran's formula for a limited population, and the samples were selected randomly. Of the 97 people, 90 people agreed to participate in the study. The participants were randomly divided into two groups of intervention (30 people) and control (60 people). Computer-generated random numbers were used for simple randomization of subjects. The groups were homogenous in terms of age, education, dietary history, and family history of CVDs.

First, all the participants completed the CVD preventive nutritional behavior questionnaire. Then, the women of the intervention group were educated for five 60-minute sessions (two sessions per week) on nutritional behaviors to prevent CVDs, including not smoking, daily exercise, taking blood pressure measurements, regular weight control, avoiding high-fat foods, adequate consumption of fruits and vegetables, using liquid oil for cooking, regular medication intake, and performing physical

relaxation exercises, based on the health belief model through lectures, group discussions, and pamphlets. Two months later, the questionnaire was completed again to check their performance and retention of the training. After the completion of the intervention, the women in the control group were also given an educational pamphlet.

In this study, health beliefs and frequency of food consumption questionnaires were used to collect information. A health belief questionnaire was used to measure nutritional behaviors related to CVDs. This questionnaire included awareness constructs (questions 1 to 6 where the lowest score was 1 and the highest score was 18), perceived sensitivity (questions 7 to 10 where the lowest score was 4 and the highest score was 20), perceived intensity (questions 11 to 14 where the lowest score was 4 and the highest score was 20), perceived obstacles (questions 15 to 17 where the lowest score was 3 and the highest score was 15), and perceived benefits (questions 18 to 24 where the lowest score was 7 and the highest score was 35). To score the questions related to awareness, a score of 1 was given for each wrong answer, a score of 2 was given for each "I don't know" answer and a score of 3 was given for each correct answer. For each person, the number of accurate responses in a particular section was taken as the final score for that section in the questionnaire. A higher score indicates better nutritional behavior concerning CVDs. Questions related to perceived sensitivity, perceived intensity, perceived benefits, and perceived obstacles were rated on a 5-point Likert scale, with 1 point for strongly disagree and 5 points for strongly agree. The validity and reliability (Cronbach's alpha 0.82) of the questionnaire have been confirmed by Tavassoli et al (8).

The Food Frequency Questionnaire (FFQ) includes a list of common foods with a standard serving size or an amount that is usually more familiar to the studied community. The FFQ contains 168 items related to all food groups, with the frequency of consumption options of daily, with a score of 4, weekly, with a score of 3, monthly with a score of 2, and never with a score of 1 (9). The questionnaire's validity and reliability (Cronbach's alpha 0.880). In this study, after omitting several questions, the researchers prepared a questionnaire of 66 questions to examine food groups, including 20 questions for the vegetable group (the lowest score was 20 and the highest score was 80), 25 questions for the fruit group (the lowest score was 25 and the highest score was 100), 8 questions for the fat group (the lowest score was 8 and the highest score was 32), and 13 questions for the sugar group (the lowest score was 13 and the highest score was 52), and they examined its validity and reliability once again. In this questionnaire, higher scores indicated better nutritional behavior regarding CVDs. To check the validity of the questions, the questionnaire was checked and approved by four health education experts and three nutritionists, and its reliability was calculated as 0.85 using Cronbach's alpha. After collecting the information, the data were entered into SPSS 22 statistical software. For statistical analysis, the paired t-test was used.

To observe ethical considerations, the questionnaires were answered anonymously, and the answers were reviewed confidentially. The consent of the participants was obtained verbally, and the completion of the questionnaire was considered a sign of consent to participate in the study.

## Results

As can be seen in Table 1, among the studied groups, the highest frequency was related to the age group of 30 to 35 years and the below diploma degree. There was no significant difference between the two groups in terms of dietary history and family history of CVDs, but there was a significant difference in terms of education level between the two groups.

Table 2 compares the average consumption of fruits, vegetables, fats, and sugars in the control and intervention groups. The results showed a significant difference between the pre-test and post-test in the intervention group. This difference was not observed in the control group.

Table 3 compares the effect of education on health belief structures about nutritional behaviors related to CVDs between the control and intervention groups. There was a significant difference in the variables of awareness, sensitivity, intensity, benefits, obstacles, and self-efficacy between the pre-test and post-test in the intervention group. In the control group, there was no significant difference in the variables between the pre-test and post-test.

## Discussion

The findings of the present study showed that educational intervention affects nutritional behaviors that prevent CVDs, i.e., the education based on the health belief model used in this study strengthened people's preventive

**Table 1**. Demographic characteristics of the control and intervention groups.

| Variable | | Control (%) | Intervention (%) | *P* value |
|---|---|---|---|---|
| Educational level | Elementary school | 19 (31.7%) | 14 (46.7%) | 0.024 |
| | Highschool | 11 (18.3%) | 8 (26.7%) | |
| | Highschool diploma | 15 (25.0%) | 6 (20.0%) | |
| | Bachelor's degree | 10 (16.7%) | 2 (6.7%) | |
| | Master's degree | 5 (8.3%) | - | |
| Dietary history | Yes | 12 (20.0%) | 8 (26.7%) | 0.473 |
| | No | 48 (80%) | 22 (73.3%) | |
| Family history of cardiovascular diseases | Yes | 19 (31.7%) | 6 (20.0%) | 0.244 |
| | No | 41 (68.3%) | 24 (80.0%) | |

**Table 2**. Frequency of food consumption of participants in the control and intervention groups before and after the intervention

| Variable | Group | Type of test | Frequency | Mean | Standard deviation | Paired t-test | *P* value |
|---|---|---|---|---|---|---|---|
| Vegetables | Control | Pre-test | 60 | 45.52 | 8.57 | -0.706 | 0.483 |
| | | Post-test | 60 | 46.37 | 8.66 | | |
| | Intervention | Pre-test | 30 | 43.63 | 6.11 | -5.498 | <0.001 |
| | | Post-test | 30 | 54.07 | 8.47 | | |
| Fruits | Control | Pre-test | 60 | 47.00 | 12.00 | -0.337 | 0.738 |
| | | Post-test | 60 | 47.48 | 13.29 | | |
| | Intervention | Pre-test | 30 | 46.53 | 7.54 | -4.55 | <0.001 |
| | | Post-test | 30 | 58.67 | 10.11 | | |
| Fat | Control | Pre-test | 60 | 16.60 | 2.72 | -1.666 | 0.101 |
| | | Post-test | 60 | 17.42 | 3.29 | | |
| | Intervention | Pre-test | 30 | 17.03 | 2.89 | 4.412 | <0.001 |
| | | Post-test | 30 | 12.73 | 5.45 | | |
| Sugar | Control | Pre-test | 60 | 27.23 | 6.80 | 0.108 | 0.914 |
| | | Post-test | 60 | 27.15 | 6.01 | | |
| | Intervention | Pre-test | 30 | 23.40 | 4.65 | 3.583 | 0.001 |
| | | Post-test | 30 | 18.13 | 5.69 | | |

**Table 3**. Health belief structures regarding nutritional behaviors related to cardiovascular diseases between the control and intervention groups

| Variable | Group | Type of test | Frequency | Mean | Standard deviation | t-test | *P* value |
|---|---|---|---|---|---|---|---|
| Awareness | Control | Pre-test | 60 | 70.20 | 8.65 | 0.235 | 0.815 |
| | | Post-test | 60 | 69.80 | 10.38 | | |
| | Intervention | Pre-test | 30 | 68.30 | 11.59 | -4.147 | <0.001 |
| | | Post-test | 30 | 78.63 | 6.06 | | |
| Sensitivity | Control | Pre-test | 60 | 13.90 | 2.72 | 0.703 | 0.485 |
| | | Post-test | 60 | 13.58 | 2.52 | | |
| | Intervention | Pre-test | 30 | 13.13 | 2.76 | -2.607 | 0.014 |
| | | Post-test | 30 | 14.43 | 1.22 | | |
| Intensity | Control | Pre-test | 60 | 14.83 | 2.52 | 0.929 | 0.357 |
| | | Post-test | 60 | 14.43 | 2.29 | | |
| | Intervention | Pre-test | 30 | 14.87 | 2.60 | -3.028 | 0.005 |
| | | Post-test | 30 | 16.57 | 1.55 | | |
| Benefits | Control | Pre-test | 60 | 11.63 | 1.86 | 1.305 | 0.197 |
| | | Post-test | 60 | 11.18 | 1.89 | | |
| | Intervention | Pre-test | 30 | 12.20 | 1.52 | -2.458 | 0.020 |
| | | Post-test | 30 | 13.20 | 1.81 | | |
| Obstacles | Control | Pre-test | 60 | 21.67 | 4.42 | -0.555 | 0.581 |
| | | Post-test | 60 | 22.08 | 5.02 | | |
| | Intervention | Pre-test | 30 | 21.43 | 4.10 | 4.143 | <0.001 |
| | | Post-test | 30 | 18.27 | 3.11 | | |
| Self-efficacy | Control | Pre-test | 60 | 26.83 | 4.48 | -0.826 | 0.412 |
| | | Post-test | 60 | 27.48 | 4.07 | | |
| | Intervention | Pre-test | 30 | 26.03 | 4.25 | -4.783 | <0.001 |
| | | Post-test | 30 | 30.77 | 3.83 | | |

nutritional behaviors towards CVDs and improved the average constructs of the health belief model that prevent people from CVDs. These results are consistent with previous studies that investigated the effect of educational intervention based on the health belief model (8,10-16). The results of research in Indonesia showed that the knowledge, frame of mind, and performance of pregnant women improved after receiving nutrition and reproductive health education in small groups (10). Saffari and colleagues' research in 2020 showed that a relatively short educational intervention based on the health belief model led to a significant improvement in CVD risk factors and reduced risk factors in police officers (11). Mohammadi and colleagues' research showed that after the educational intervention, the average scores of awareness and structures of sensitivity, benefits, self-efficacy, and performance increased significantly in the intervention group and the level of perceived obstacles in the intervention group decreased significantly (12).

The study of Sullivan et al also found that there was a significant relationship between the constructs of the health belief model and physical activity, i.e., people whose perceived benefits and self-efficacy increased as a result of education performed better and engaged in more sports activities than others (13).

In a systematic review, Ramôa Castro et al investigated the effect of educational interventions on the primary prevention of CVDs. The results of this study showed that 8 out of 15 studies showed an improvement in the level of physical activity after the intervention. Most of the studies reviewed in their study had reported significant positive effects for health education interventions on CVD risk factors, mainly on lipid profile, blood pressure, and cardiovascular risk score; and they stated that health education interventions in primary care and daily physical activity reduced CVD risk factors and improved the risk score (14).

Tavassoli et al also conducted an interventional study using a semi-experimental method to investigate the effect of education based on the health belief model and promotion of fruit and vegetable consumption to prevent CVDs. The results of this study showed that after the intervention, there was a significant difference in the mean scores of awareness, perceived sensitivity, perceived intensity, perceived benefits, perceived obstacles, and performance between the control and test groups (8).

In addition, the findings of this study showed that education based on the health belief model also improves food frequency and has a positive effect on the nutritional behaviors of the participants to prevent CVDs. The findings of this study are consistent with the findings of previous studies in this field (15,16).The results of Darafshi Ghahroudi and colleagues' study showed that older people had a higher risk perception of CVDs and the average risk perception of people had a significant relationship with the amount of intake in the fat group (17).The results obtained from the studies show that a high intake of fruits and vegetables also leads to a reduction in the risk of CVDs (18,19). In the study of Taghaddosi et al, a significant relationship was reported between ischemic heart disease and the consumption of fruits, vegetables, dairy products, and starches (20). The evidence obtained from other studies shows that a diet rich in fruits, vegetables, whole grains, and non-hydrogenated unsaturated fats along with receiving sufficient amounts of omega-3 fatty acids had a protective effect against CVDs (21). Therefore, we should think of ways to highlight the role of other food groups in preventing CVDs and provide a wider and more practical education in this field.

Overall, it can be said that as the risk perception of CVDs is known to be one of the important predictive factors in the tendency of people to adopt healthy eating behaviors, paying attention to how people understand the risk and planning to increase this understanding and lead people to better nutritional behaviors will be effective in preventing CVDs. These findings show the need to understand the risk in the field of nutrition science to develop prevention programs for CVDs as the first cause of death in Iran. Considering that healthy nutritional behaviors to prevent CVDs should be established from a young age, when people have less understanding of the risk of the disease, developing effective behavior change strategies for younger people seems necessary. Promoting healthy eating behaviors such as increasing the consumption of fruits and vegetables and low-fat dairy products and advertising against the consumption of oil and fat should be included in the agenda.

As mentioned, the results of this study confirmed the important role of education in preventing CVDs as education can increase the consumption of fruits and vegetables and also reduce the use of fat and sugar, leading to a reduction in CVDs in middle-aged women; the current results also showed that using the health belief model can be one of the effective methods in health education.

The poor cooperation of some subjects due to various reasons (impatience, indifference, and the coronavirus outbreak) was one of the limitations of this study, and efforts were made to control these issues while teaching the subjects to follow health protocols by emphasizing the benefits of the study to gain their cooperation.

## Conclusion

The present study investigated the effect of educational intervention based on the health belief model on the frequency of food consumption and nutritional behaviors that prevent CVDs. The results of the study showed that the educational intervention based on the health belief model improved the frequency of consumption of food

items and nutritional behaviors that prevent CVDs. Education can increase awareness, sensitivity, intensity, benefits, and self-efficacy, as well as reduce obstacles to CVD prevention in middle-aged women. In addition, education can play a role in preventing CVDs in society by increasing women's use of vegetables and fruits, reducing the use of fat and sugar, and, subsequently, changing the lifestyle of children and other family members. Therefore, it is suggested that to strengthen the behaviors that prevent CVDs, continuous educational courses should be held using new technologies and new educational methods, such as illustrations and creating educational brochures with pictures.


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## Author's Contribution

**Conceptualization:** Maryam Okhovati, Sabereh Seyedzadeh.
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## Competing Interests

The authors of this study have no conflict of interest.

## Ethical Approval

This study was approved by the Ethics Committee of Kerman University of Medical Sciences with the ethics code IR.KMU.REC.1401.086.


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