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The effect of education on improvement of intake of fruits and vegetables aiming at preventing cardiovascular diseases

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Abstract

Background: Cardiovascular diseases refer to a group of diseases that affect the cardiovascular system; principally cardiac diseases, vascular diseases of the brain and kidney and peripheral arterial diseases which are caused by various factors. Considering the importance of nutrition education, especially the intake of fruits and vegetables, this study was performed to determine the effect of health education, Based on the Health Belief Model, on the improvement of intake of fruits and vegetables aiming at preventing cardiovascular diseases among high school girls in the city of Shahr-e-Kord, Iran.

Methods: This was a quasi-experimental intervention study, in which 120 female students of high schools in Isfahan were selected through convenient sampling and were divided into two groups of experimental (60) and control (60). The instruments for data collection were the Health Belief Model and FFQ questionnaires. The HBM questionnaire was completed three times (before, immediately and two months after the intervention) and the FFQ questionnaire was completed two times (before and two months after the intervention) by the students. After the pre-test, six educational sessions were provided for the experimental group. Finally, data were collected and analyzed by SPSS 16 (t-test, paired t-test and repeated measure ANOVA).

Results: There were no differences between the two groups in terms of demographic variables. Before the intervention, there were not any significant differences between the scores of different structures of this model between the two groups ($p>0.05$); however, after the intervention, significant differences were found between the experimental and control groups in the levels of knowledge, perceived susceptibility, perceived severity, perceived benefits, perceived barriers, perceived efficacy and performance ($p<0.001$).

Conclusion: According to the results, the intervention had a positive impact on the improvement of intake of fruits and vegetables among the students.

Keywords: Education, Health Belief Model, Heart Diseases, Intake of Fruits, Vegetables.

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Introduction

The second half of the 20th century observed major health changes in the world, propelled by socio-economic and technological changes that deeply altered life expectancy and ways of living, while making an unprecedented human capacity to use science to extend and increase life. The

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most globally pervasive change among these health transitions has been the rising burden of non-communicable diseases (NCDs). Epidemics of NCDs are presently emerging or accelerating in most developing countries (1, 2). Cardiovascular diseases (CVD), cancers, diabetes, neuropsychiatric ailments and other chronic diseases are becoming major contributors to the burden of disease, even as infections and nutritional deficiencies are receding as leading contributors to death and incapacity. Food offers not only essential nutrients needed for life but also other bioactive compounds for health promotion and disease prevention (3, 4). Intake of fruits and vegetables, as well as grains, has been powerfully related with reduced risk of cardiovascular diseases, cancer, diabetes, Alzheimer disease, cataracts and age-related functional decline (3). Phytochemicals—the bioactive non nutrient - plants compounds in fruits, vegetables, grains, and other plant foods- have been linked to reductions in the risk of major chronic diseases. It is estimated that more than 5000 phytochemicals have been identified, but a large percentage still remain unknown (4) and need to be identified before their health benefits are fully understood. However, more and more convincing evidence suggests that the benefits of phytochemicals in fruits and vegetables may be even greater than it is currently understood because oxidative stress induced by the free radicals is involved in the etiology of a wide range of chronic diseases (4).

The Health Belief Model (HBM) is presented as the organizing theoretical outline for this study, and it is also one of the most widely used frameworks for understanding health behavior (5). Despite the recommendations for providing education for preventive purposes and training throughout the life span, many programs only emphasis on individuals who are at a higher risk for cardiovascular diseases. Thus, despite the existence of widespread literature on the treatment and diagnosis of cardiovascular diseases, the number of studies which have geared towards primary or secondary prevention is limited (6, 7), particularly those including younger adult women. This paper describes the results of a study that examines whether the application of the HBM can be used effectively to change the perception of high school girls about the risk for developing cardiovascular diseases and whether it can lead to a change in their behavior for the prevention of this disease later in life.

Methods

This was an experimental interventional study in which 120 high school female students were randomly selected and divided into experimental (n= 60) and control (n= 60) groups. The method of sampling was convenient sampling as follows: two high schools were selected from two educational districts of Isfahan. The participants were recruited randomly from these high schools, meaning that using an attendance list, each student was given a code; then, the participants were randomly selected using the codes. After obtaining permission from the Isfahan University of Medical Sciences and from the Provincial Education Department, the researcher entered the schools.

To begin with, explanation was provided to the participants about the research goals, its advantages and completion of the questionnaires. The students were informed of the confidentiality of the information and consented to participate in the study.

The data collection instrument was a 3-part questionnaire; the first part was used to obtain the demographic characteristics of the participants and the second part was a Standard Health Belief Model-Based Questionnaire (8) that included knowledge (α= 0.65), perceived susceptibility (α= 0.88), perceived severity (α= 0.80), perceived benefits (α= 0.79), perceived barriers (α= 0.72) and healthy behavior action for prevention of cardiovascular diseases, and the third part included the FFQ questionnaire. The Food Frequency Questionnaire is the most common dietary assessment tool used in large epidemiologic studies of diet and

health.

The FFQ included 168 items, with proven validity in previous studies about information on fruits, vegetables, grains and dairy products (9, 10). The above mentioned questionnaire included a comprehensive list of different kinds of fruits and vegetables (Apples, oranges, lettuce, cucumbers, tomatoes, eggplant, carrots, cabbage, spinach, turnip greens, cantaloupe, watermelon, melon, pears, cherries, peaches, grapes, figs, dates, strawberries and bananas).

To ensure the clarity of the questionnaire, pilot testing was also performed on 30 students who were not included in the survey. Then, the questionnaire was modified based on their feedback. After completion of the questionnaire by both groups, the educational program was designed based on the pre-test results and structures of the health belief model. In the experimental group, educational intervention was directly conducted through lecture, collaborative methods combined with questioning and answering, group discussion and brain storming in six sessions (45-60 minutes per session). HBM constructs (perceived susceptibility, perceived severity, perceived benefits and perceived barriers) were utilized to formulate the strategies for the education.

To evaluate the effectiveness of the educational interventional program, the data related to the subjects' knowledge and attitudes (Health Belief Model structures) were collected by the same questionnaire immediately and two months after the program. This was carried out just one time (two months follow-up) for intake of fruits and vegetables. The students were informed that all the obtained data were used without personal identifiers and were, therefore, confidential. SPSS 16 software was used to analyze the data executing repeated measured ANOVA, paired and independent sample t-test (95% confidence interval).

Results

In this study, 120 high school female students from Shahr-E-Kord fully cooperated with the researchers.

Table 1 demonstrates the frequency distribution of the demographic characteristics of the two groups.

There was no significant statistical relationship between parents' age (father= 0.351, mother= 0.154) and parents' occupation (father= 0.176, mother= 0.431) with the improvement of intake of fruits and vegetables. However, there was a significant statistical relationship between parents' education levels (father= 0.031, mother= 0.004) and the improvement of intake of fruits and vegetables.

Table 2 compares the two groups' mean scores of knowledge and HBM constructs of perceived susceptibility, severity, barriers and benefits in three phases of before intervention, immediately and two months after the intervention.

After the educational intervention, a significant increase was found in the mean score of each of HBM constructs of students in the intervention group compared with the pre-intervention time, while there were no significant changes in the mean score of the mentioned variables before, immediately and after the intervention in the control group. Furthermore, in the pre-intervention time, there was no significant differences between knowledge, attitude of the students in the intervention and control groups; however, in the post-intervention time, R.M.ANOVA showed a significant difference between the intervention and control groups in terms of the mean score of each of HBM constructs ($p<0.001$). Table 3 shows the health behavior (intake of fruits and vegetables) of the two groups before and two months after the intervention. There were no significant differences between the two groups in Practice (Intake of Fruits and Vegetables) before the intervention, but it was significant two months later.

Discussion

Increasing the intake of fruits and vegetables is a practical strategy for consumers to optimize their health and reduce the risk of

Table 1. Frequency Distribution of the Demographic Characteristics of Students in Isfahan 2014

	Experimental group		Control group		F&V
	No	%	No	%	
fathers Age					
<40	26	43.3	19	31.66	0.351
40-50	30	50.0	35	58.33	
>50	4	6.7	6	10.00	
mothers Age					
<30	3	5.0	4	6.7	0.154
30-40	41	68.3	41	68.3	
>40	16	26.7	15	25.0	
Education of Father					
Illiterate	1	1.7	0	0	0.031
Primary	2	3.3	0	0	
Middle	5	8.3	4	6.7	
Diploma	33	55.0	34	56.7	
Academic	19	31.7	22	36.6	
Education of Mother					
Illiterate	1	1.7	0	0	0.004
Primary	1	1.7	2	3.3	
Middle	4	6.6	5	8.3	
Diploma	36	60.0	38	63.4	
Academic	18	30.0	15	25.0	
Father's Occupation					
Employee	38	63.3	36	60.0	0.176
Self-employed	18	30.0	20	33.3	
Worker	2	3.3	3	5.0	
Unemployed	1	1.7	0	0	
Other	1	1.7	1	1.7	
Mother Occupation					
Employee	14	23.3	11	18.3	0.431
Self-employed	2	3.3	0	0	
Housewife	44	73.4	49	81.7	

chronic diseases. The most effective cardiovascular diseases reduction strategies include prev ention through health education and health promotion. The results of the present study revealed that prior to the intervention, all the elements of HBM (perceived susceptibility, perceived severity, perceived benefits and perceived barriers) were below average in the two groups. After the intervention, a significant improvement was found in the behavior of the participants of the experimental group, while only a slight change was observed in the behavior of the participants of the control group. This finding supports our hypothesis that health education programs based on HBM can be effective in improving the health behaviors of girls to prevent cardiovascular diseases.

Several studies have identified some basic educational needs of the individuals, which increase their knowledge and lead to promoting preventive behaviors about cardiovascular diseases. Knowledge of individuals about cardiovascular diseases significantly increased after the intervention in the experimental group. The findings of this study are consistent with the results of Amodeo et al. (11).

Other findings of the present study indicated that perceived susceptibility, severity, barriers and benefits scores of the participants were significantly enhanced after the intervention in the experimental group. These results are similar and consistent with the findings of the study conducted by Abood et al. (12).Given the prevalence of cardiovascular diseases and the associated morbidity and mortality, it is important to increase the knowledge of cardiovascular diseases and encourage the adoption of behaviors that help prevent this condition as opposed to waiting until the onset of the disease. The results of this study revealed that those educational interventions which are focused on prevention of cardiovascular diseases are ideally suited to reach the goals of increased knowledge, perceived

Table 2. Comparison of the Mean Scorers of Knowledge and Perceived Susceptibility, Severity, Barriers and Benefits about cardiovascular diseases in the 2 groups in the Pre, Post and Follow Up Intervention

Health Belief Model (HBM) Components Variables	Experimental Group (N = 60)			Control group (N = 60)			R.M.ANOVA Test Results		
	Pre-test Mean (SD)	Post- test Mean (SD)	Follow up Test Mean (SD)	Pre- test Mean (SD)	Post- test Mean (SD)	Follow up Test Mean (SD)	Pre- test Pv	Post- test Pv	Follow up Test Pv
Knowledge	42.4 (14.47)	79.2 (7.89)	70.8 (9.54)	43.2 (12.10)	51.3 (45.61)	44.8 (16.09)	0.847	<0.001*	v*
Perceived Susceptibility	39.3 (27.34)	64.2 (16.72)	59.8 (21.29)	40.3 (40.18)	35.3 (30.38)	39.9 (28.16)	0.717	<0.001*	<0.001*
Perceived Severity	40.39 (21.45)	82.3 (13.54)	77.1 (15.42)	34.2 (24.52)	36.4 (19.81)	31.2 (14.61)	0.248	<0.001*	v*
Perceived benefits	47.2 (14.28)	78.3 (14.23)	69.1 (21.46)	49.1 (23.41)	51.2 (23.26)	48.3 (24.05)	0.592	<0.001*	<0.001*
Perceived Barriers	38.9 (25.42)	78.7 (25.21)	71.3 (21.71)	39.2 (16.29)	42.5 (21.42)	38.2 (11.63)	0.672	<0.001*	<0.001*

*= Repeated Measured ANOVA test result: significant difference between the groups.

Table 3. Comparison of the Intake of Fruits and Vegetables for Prevention of Cardiovascular Diseases in the 2 Groups in the Pre and Follow up Intervention

Health Belief Model (HBM) Components Variables		Experimental group (N = 60)	Control group (N = 60)	T Test Results
Vegetables (grams)	Pre- test Mean (SD)	194.2 (125.71)	193.3 (102.67)	0.982
	Follow up Test Mean (SD)	401.3 (63.86)	209.6 (98.38)	<0.001*
T- Paired		<0.001*	0.069	
Fruits (grams)	Pre- test Mean (SD)	104.4 (87.68)	100.4 (66.28)	0.498
	Follow up Test Mean (SD)	253.8 (53.26)	126.4 (43.61)	<0.001*
T- Paired		<0.001*	0.065	

* Significant difference between the groups

susceptibility, severity, barriers and benefits and adoption of prevention-oriented behavior. The differences between the mean scores of the experimental group on the intake of fruits and vegetables were significant before and after the intervention ($p< 0.001$). The increase in the performance of the participants in this study is also consistent with the findings of Amodeo et al. study on the increased knowledge of the patients' coronary heart disease (11), and with the findings of Abood et al. study on the nutrition education worksite intervention for university staff: application of the health belief model (12).

The results of Kipping et al. study have revealed similar findings (13). In another study by Wilson et al. with the title "Fruit and Vegetable Intake among Rural Youths" in a school-based randomized controlled trial, Increased consumption of fruits and vegetables (14). The results of another study were also consistent with the findings of the present study. Foster et al. study (15), Wang et al. study on exposure to a comprehensive school intervention increases vegetable consumption (16). Childhood and adolescence are critical periods for intake of fruits and vegetables.

The results of this study showed that applying constructs of the Health Belief Model can be of value to improve the effectiveness of educational programs on cardiovascular diseases, It is paradoxical that as health researchers and educators become increasingly aware of the importance of developing good nutrition habits for the prevention of a variety of chronic diseases, children and adolescents are adopting lifestyles that counteract this knowledge. With

regards to the important role of girls and women in the foundation of families and the cost effectiveness of educational programs compared to treatment services (17), utilizing health education theories and models by the experts in schools is highly recommended to promote public health and well-being.

Fruits and vegetables are important elements of a healthy, balanced diet either as part of a main meal or as a snack. They provide us with vitamins, minerals and fiber, some energy (mainly in the form of sugar), as well as certain minor components - often referred to as phytochemicals or secondary plant products - which are potentially beneficial for our health. Epidemiological studies have shown that high intakes of fruits and vegetables are associated with a lower risk of chronic diseases, particularly cardiovascular diseases (18-20), type 2 diabetes (21) and certain cancers (i.e., mouth, pharynx, larynx, esophageal, stomach and lungs) (22).

Conclusion

Considering the poor knowledge, attitude and performance of the students about the intake of fruits and vegetables and the positive effect of education on this matter, it seems that education as one of the most important influencing factor, can supply the necessary grounds for increasing the knowledge, attitude and performance of the students and the society. Besides, considering the important role of girls as the future mothers and the low cost of preventive measures such as nutrition education as compared with the treatment measures, it seems necessary to generalize such educational programs to all other related groups and populations.

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