

## Effectiveness of a Training Program based in PRECEDE Model on Fruit and Vegetable Consumption among Female Students

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### Abstract

#### Background

Fruit and vegetable consumption increases students' health and growth and strengthens their mental activities. The present study aimed to investigate a training program based on PRECEDE model on fruit and vegetable consumption by female students in high schools of Fasa, Iran.

#### Materials and Methods

This is a quasi-experimental study. The research sample includes 100 female high school students in Fasa city, Fars Province, Iran, who were randomly assigned to two groups of control (n=50) and experimental (n=50) groups. Data collection instrument was a questionnaire that included items on demographic characteristics and the PRECEDE model components (knowledge, attitude, enabling and reinforcing factors and performance). Educational intervention for the experimental group was carried out in four sessions which each lasting 55 to 60 minutes, and subjects were followed for 2 months. The questionnaires were administered to both groups before and 3 months after the intervention. The collected data was analyzed by SPSS version 18.0 statistical software.

**Results:** The average performance score of experimental and control groups regarding fruits and vegetables consumption was  $15.15 \pm 2.44$  and  $14.96 \pm 2.12$  (before the intervention) and  $28.22 \pm 2.22$  and  $16.1 \pm 11.32$  (after the intervention). Mean scores of predisposing (knowledge and attitude), reinforcing, and enabling factors showed a significant difference in the experimental group in comparison the control group ( $P < 0.05$ ).

#### Conclusion

The significant increase in student performance scores regarding fruits and vegetables consumption at the end of the study indicates the positive effect of education on promoting knowledge and changing attitudes of individuals. Therefore, the design and implementation of the training program based on the PRECEDE-PROCEED model can promote healthy eating habits and increase fruits and vegetables consumption among students.

**Key Words:** Fruit, Precede Model, Students, Vegetable.

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## 1- INTRODUCTION

Proper nutrition is important in preventing many diseases, especially chronic diseases. It also increases mental and physical efficiency of workforce (1). The importance of nutrition during different periods of human lifetime is evident (2, 3). During late childhood and early adolescence, people must be provided enough food needed for rapid growth; therefore, it is very important to pay attention to nutrition during this period (4-7). Many food habits and patterns are formed during childhood and adolescence and remain until the end of life (8). The patterns of adolescents' health needs have changed significantly in the past three decades. In the past, infectious diseases were the leading cause of death for 13 to 19 years old people, while today, behavioral factors are among the main causes of death and disease (1).

Despite the importance of healthy eating in adolescence, studies have shown that the adolescent group have the worst eating habits and have the lowest compliance than others with nutritional recommendations made by experts (9). Review of previous studies suggests that there are some problems with adolescents' nutrition including high consumption of fatty foods, low consumption of fruits, vegetables, milk and its products, and sometimes elimination of some meals (10).

In addition, the nutritional quality gradually declines with age in adolescence. In other words, the consumption of fruits, vegetables and juice declines and consumption of sugar drinks and foods increases in late teens compared to previous years (11). Consumption of recommended amounts of fruits and vegetables can prevent the risk of some chronic diseases, including cardiovascular diseases, some cancers, obesity, diabetes and hypertension (12-14). However, several studies have shown that most people, in particular, children in many

parts of the world, do not receive the recommended amount of these foods (400 mg daily) (15). Inadequate intake of fruit and vegetables are the cause of 31 % of ischemic heart diseases and 11 percent of strokes in the world (14). Healthy eating patterns in adolescents increases health and growth, strengthens mental activities and further prevents complications and diseases such as iron deficiency anemia, obesity and gastrointestinal disorders in the short term and chronic diseases and risks in the long term. Conversely, bad nutritional habits and beliefs can cause the mentioned diseases (16). Proper performance of adolescents in relation to the principles of healthy nutrition requires their knowledge about the issue. This indicates the importance of nutrition education for this age group (17, 18).

In a study by Pour Abdollahi et al., the results indicated that 42.5 % of girls believed green vegetables contain iron, 32.6% believed they contain vitamin A and 11.2 percent believed they contain vitamin D. When asked about whether plant foods contain protein, 46.9 of the girls were uncertain, 12.2 percent agreed, and 40.2 percent disagreed. This shows that they have poor information in this regard (8). The study by Choobineh et al. showed that even after training, most students thought that an unreasonably high amount of vegetables would be good for health. They believed that fruits and vegetables are rich in micronutrients and macronutrients. This is while plant materials are rich in these nutrients, but are considered poor in this regard. These findings show that advertising was done in the field of fruit vegetables has not provided the necessary information to target groups (19). Many factors affect fruits and vegetables consumption. Identification of these factors can increase consumption of fruits and vegetables. To identify factors that affect behavior, models developed for studying behavior

are used. One of the most popular models in health education is the **P**redisposing, **R**einforcing and **E**nabling **C**onstructs in **E**ducational **D**iagnosis and **E**valuation (PRECEDE model), so that by the mid-2000s, about a thousand studies using the model was published in the healthcare field. This model has been used for 4 decades and health educators who have been trained professionally are familiar with it; PRECEDE model is very comprehensive and covers all planning areas. Initially, the model uses input and participation of the society which is a great advantage. This model was developed by Greene et al., in 8 stages and can inform any health program (20).

The educational part of PRECEDE consists of three domains of factors, i.e. predisposing factors, reinforcing factors and enabling factors. The individual's behavior is assessed in these three areas (20). Predisposing factors (such as knowledge, attitudes, beliefs, and values), precede behavior change and generate motivation for behavior. Enabling factors (such as availability and accessibility of resources, or services and regulations), are an introduction to behavioral or environmental changes that facilitate achievement of motivation for realization of an environmental policy. Reinforcing factors are factors that help keep track of behavior and provide reward for behavior (family, peers, teachers, employers, health staff, etc.) (20, 21).

Some studies showed that after the educational intervention, the students' consumption of fruits and vegetables increased significantly compared to before the intervention (22-27). This study was carried out to investigate the effect of a training program based on PRECEDE model on fruit and vegetable consumption by female students in high schools of Fasa city, Fars Province, Iran.

## 2- MATERIALS AND METHODS

### 2-1. Methods

At a semi-empirical interventional study, two Girls High School from Fasa city, South West of Iran, were randomly chosen. With regard to the study by Najimi and Ghaffari (27), the number of samples in each group was decided to be 50 people. Then from among the female students studying at these two high schools, 100 students were selected using a systematic sampling method (50 students in experimental group and 50 students in control group).

From among the two girl's high schools, they randomly selected one as the experimental group and the other as the control group. In two high schools, First, Second and Third grade students participated in the study, and their field of study of all the participants were Experimental sciences. Students who did not like to participate in the study or were under treatment for some diseases requiring a certain diet, were excluded.

### 2-3. Measuring tools: validity and reliability

Data collection instrument in this study was a questionnaire designed based on the PRECEDE model. Questions included items on demographic characteristics, predisposing factors (11 multiple choice knowledge questions and 10 attitude questions in a Likert scale from completely agree to completely disagree); enabling factors (including 9 questions with answers including yes, somewhat and no); reinforcing factors (6 questions with answers including yes, somewhat and no), and performance (10 questions on a range of choices from always to never).

To determine content validity, the questionnaire sent to health education and nutrition professionals and their comments were applied to the questionnaire. Cronbach's alpha was used to test the questionnaire reliability which was approved with coefficient of 0.71.

## 2-4. Intervention

The final version of the questionnaire was administered to the subjects in the two groups. After reviewing the data collected, students in the experimental group received educational treatment in 4 sessions, each session lasting 60-55 minutes using presentations, questions and answers, group discussions and film screenings. A training session was also held for parents and teachers as factors affecting students.

These sessions were held to teach students about the benefits of fruits and vegetables in disease prevention, proper dieting patterns and use of fruits and vegetables in daily diet and their values. Educational posters were installed in the school and pamphlets and booklets were distributed among subjects. The subjects were followed up for 2 months. Three months after the educational intervention, both groups completed the questionnaire. The

details of the training sessions are presented in **Table.1**.

## 2-5. Ethical consideration

The study objectives and procedures were explained to the subjects and their written informed consents were obtained. Data confidentiality of the individuals was observed during the study. For ethical considerations, at the end of the training program, a training session was held for the control group.

## 2-6. Data Analyses

The data were analyzed by the SPSS statistical software version 18.0. Descriptive statistics was used to describe the characteristics of the subjects and distribution of variables involved in the study. Based on the type of explanatory and outcome variables Chi-squared test, independent and paired t-tests were used for data analysis in this study.

**Table-1:** Educational content of the interventional program for the test group

Sessions	Details	Time
First session	Introduction to proper nutrition.	55 min
Second session	Types of fruit and vegetable.	55 min
Third session	The role of fruit and vegetable in preventing diseases and benefits and barriers of that.	60 min
Fourth session	The role of nutrition, and appropriate nutrition; the role and importance of fruit and vegetables; the role of reinforcing and enabling in providing fruit and vegetables.	60 min
Fifth session	The session was held with the presence of students' parents and the role of family members in making, facilitating, and providing fruit and vegetables was explained. The previous sessions were reviewed and the subjects were provided with educational pamphlets.	60 min

## 3- RESULTS

The mean age of students was  $17.11 \pm 1.14$  and  $17.35 \pm 1.08$  years old, respectively. The majority of students was second and third grade in high school. Based on the Chi-square test, there was no significant difference between the two

groups in grade students in high schools ( $P = 0.13$ ), Father's job ( $P = 0.65$ ), Mother's job ( $P = 0.24$ ), Father's education ( $P = 0.71$ ), Mother's education ( $P = 0.31$ ) (**Table.2**). The results of the study showed that based on Independent t-test, there was not a significant difference between the

mean score of knowledge (P= 0.08), attitude (P=0.40), enabling factors (P=0.54), reinforcing factors (P=0.80) and performance (P=0.60) in fruits and vegetables consumption of the experimental and control groups before the teaching interventions, but there was indeed a significant difference three months after the intervention (P<0.05). The paired t-test showed that there was a significant increase in the mean score of

knowledge, attitude, enabling factors, reinforcing factors and performance of the experimental group (P<0.05); however, no significant change was observed in the mean score of knowledge (P = 0.14), attitude (P = 0.21), enabling factors (P = 0.09), reinforcing factors (P = 0.22) and performance (P = 0.16) of the control group (**Table.3**).

**Table-1:** Distribution of relative frequency of subjects according to demographic data in both control and experimental groups

Variables		Experimental group		Control Group		P-value
		Number	Percent	Number	Percent	
Grade students in high schools	First	10	20	12	24	0.13
	Second	22	44	21	42	
	Third	18	36	17	34	
Father's job	Employed	42	84	39	78	0.65
	Unemployed	8	16	11	22	
Mother's job	Employed	24	48	25	50	0.24
	Unemployed	26	52	25	50	
Father's education	Illiterate	1	2	2	4	0.71
	Elementary	6	12	5	10	
	Guidance school	18	36	16	32	
	High school	18	36	17	34	
	Academic	7	14	10	20	
Mother's education	Illiterate	1	2	0	0	0.31
	Elementary	10	20	14	28	
	Guidance school	23	46	20	40	
	High school	12	24	10	20	
	Academic	4	8	6	12	

**Table-2:** Comparison of mean scores on knowledge, attitude, enabling factors, reinforcing factors and performance of the students before and three months after intervention in experimental and control groups

Variables	Groups	Before Intervention	Three months after intervention	t-test
Knowledge	Experimental	55.3±10.4	71.3±3.16	0.001
	Control	56.8±9.8	57.1±7.6	0.14
	Independent t-test	0.08	0.001	
Attitude	Experimental	32.3±4.25	54.14±6.32	0.001
	Control	31.1±3.29	32.7±4.12	0.21

	Independent t-test	0.40	0.001	
Enabling Factors	Experimental	28.13±2.24	49.23±1.61	0.001
	Control	26.55±3.86	28.13±1.25	0.09
	Independent t-test	0.54	0.001	
Reinforcing Factors	Experimental	23.57±11.20	61±10.45	0.001
	Control	23.02±10.76	33.87±10.67	0.22
	Independent t-test	0.80	0.001	
Performance	Experimental	15.15±2.44	28.32±2.32	0.001
	Control	14.96±2.12	16.1±0.11	0.16
	Independent t-test	0.60	0.001	

#### 4- DISCUSSION

The purpose of this study was to determine the effect of an educational program based on PRECEDE model on fruits and vegetables consumption among high school students in Fasa city, Fars province, Iran. The results showed a significant increase in the mean score of knowledge, attitude, enabling factors, reinforcing factors and performance of the experimental group and no significant change was observed in the control group.

The intervention used in the study could significantly increase mean scores of knowledge about fruits and vegetables consumption in the experimental group. This is consistent with findings from studies by Soltani (28), Sharifirad (29) and Shakouri et al. (30) that confirmed the effect of the PRECEDE model on increasing knowledge among subjects in various fields. The results of studies by Tak et al. (22), Sorensen et al. (24) and Larson (31) regarding the consumption of fruits and vegetables by students are consistent with the results of the present study. Generally, a significant increase was observed in the experimental group's mean score on attitude after the intervention, indicating the effect of the PRECEDE model on increasing positive attitude among the subjects. This is in line with the findings of studies by Shakouri et

al. (30) and Daboné et al. (25). The present study showed that the design and implementation of a PRECEDE based educational program can lead to a significant difference in knowledge and attitude indicating the necessity of using planned educational interventions to promote predisposing factors. In the PRECEDE model, predisposing factors including attitude are prime factors that motivate behavior. In this study, positive attitude facilitated the adoption of appropriate behaviors by students to use fruits and vegetables. In this study, the possibility to use educational resources on fruits and vegetables, access to educational resources through teachers, and Radio and

Television were considered as enabling factors. The results indicated a significant difference between the experimental and control groups on enabling factors. This is consistent with the findings of studies by Sharifirad (29), Zigheimat and Naderi (32), Hazavehei et al. (33), Sun et al. (34), Khani Jeihooni et al. (35), and Cuy Castellanos et al. (26) on nutrition. The results of study by Wind et al. showed that the availability of fruits and vegetables for students at home and school, and teaching them about appropriate eating patterns plays an important role in their fruits and vegetables consumption (36). In general, the results of this study showed that enabling factors could improve the

behavior in subjects. In this study, encouragement and support by family, friends, teachers and educators were considered as reinforcing factors. These factors increase the likelihood of maintaining the recommended behavior. The results of this study showed a significant difference between the experimental and control groups on reinforcing factors indicating the effect of using the PRECEDE model on promoting reinforcing factors. This is also consistent with results of Zigheimat and Naderi (32), Shakouri et al. (30), and Hazavehei et al. (33). Sorensen et al. found that social contextual factors play an important role in fruits and vegetables consumption (24). Wind et al. also pointed to the important role of parents and friends in increasing fruits and vegetables consumption and the choice of their type by students (36).

The present study showed a significant difference between the experimental and control groups on their performance in fruits and vegetables consumption indicating the effect of knowledge, attitudes, reinforcing and predisposing factors, and the performance of students. Since behavior is a complex phenomenon and programs focused on correcting health knowledge that overlook reinforcing and enabling factors often fail to change behavior, the present study used educational resources, provision of appropriate fruits and vegetables consumption patterns, and involvement of parents and school attendants as reinforcing and enabling factors that could change the students' behavior. Similarly, studies by Sorensen et al. (24), Di Noia et al. (37), Heim et al. (38), Garcia (39) and Tak et al. (22) showed that educational intervention could change behavior and increase fruits and vegetables consumption.

#### **4-1. Limitations of the study**

One limitation of this study is the limited number of participants and the self-report method of data collection in the study.

#### **5- CONCLUSION**

The findings of this study showed that the design and implementation of a PRECEDE model based education is effective in changing the predisposing factors (knowledge and attitudes); reinforcing factors, and enabling factors affecting fruits and vegetables consumption among students. Thus, the model can be used as a framework for designing interventions for students. Recommendations that can be made to improve nutritional behaviors of students, especially their fruits and vegetables consumption behavior, include plans and policies in order to increase the involvement of families and school officials; development of training programs, publication of books and pamphlets in this area, the use of educational media, and the provision of attractive and understandable programs. Since education is one of the main pillars of health care, our country needs planning for various health issues based on educational, social, and behavioral models and theories. Given the vulnerability and essential role of girls as future mothers in the family, measures such as promoting the culture and attitudes of families about fruits and vegetables and increasing their knowledge in this regard can play an effective role in changing the lifestyle of individuals and the society.

**6- CONFLICT OF INTEREST:** None.

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