



Effect of Education Intervention on Nutrition Behaviors of High School Female Students along with Promoting Health Literacy

ARTICLE INFO

Article Type

Original Research

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How to cite this article

Vahedian Shahroodi M, Tehrani H, Esmaily H, Olyani S. Effect of Education Intervention on Nutrition Behaviors of High School Female Students along with Promoting Health Literacy. Health Education and Health Promotion. 2019;7(4):169-176.

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Article History

Received: August 26, 2018
Accepted: October 13, 2019
ePublished: December 21, 2019

ABSTRACT

Aims As adolescents constitute around 20% of the total population and near 90% of them are living in developing countries, they need much attention. Moreover, they need to meet their raised nutritional needs because of physiological and sexual growth otherwise, they will be susceptible to poor nutritional status. The ultimate goal of the present study was evaluating health literacy and eating habits of adolescent girls before and after a nutrition education program.

Materials & Methods The intervention study was implemented on 64 adolescent girls aged between 13-15 years from two governmental girls' high school in Mashhad, Iran. Questionnaires included food frequency, health belief model (HBM), and health literacy (HL) implemented in three stages, before intervention as a pretest, immediately after intervention and two months later for reassessment.

Findings Nutrition education intervention has considerably improved HL and eating habits of adolescent girls. After intervention HL of girls improved from 1.75 ± 1.07 to 4.96 ± 0.96 and their healthy nutritional behavior improved from 1.65 ± 4.92 to 20.62 ± 1.33 . After educational interventions, all HBM constructs and awareness of girls increased significantly.

Conclusion The results of the present study indicated that education based on health belief model positively affected students' health literacy and nutritional behaviors.

Keywords Nutrition Behavior; Health Belief Model; Health Literacy; Adolescent

CITATION LINKS

- [1] Food likes and their relative ...
- [2] Relationship between nutrition ...
- [3] Assessing the nutrition literacy of parents and its relationship with ...
- [4] Health literacy is associated with healthy eating index scores and ...
- [5] Health literacy and the determinants of obesity: A population-based ...
- [6] Effect of a school-based nutrition ...
- [7] Relationship between child health literacy ...
- [8] Nutritional status and anthropometric indices in high school ...
- [9] Dietary pattern, breakfast and snack ...
- [10] Effect of nutrition education on nutritional ...
- [11] Study of quality of snacking in ...
- [12] Prevalence of obesity and overweightness ...
- [13] Application of the health belief model for unhealthy ...
- [14] Nutritional and health behaviors among high school ...
- [15] Evaluating the nutritional status of dormitory resident students ...
- [16] Applying socioecological model to improve ...
- [17] Implementation of clinical supervision in ...
- [18] Nutrition education based on health belief model improves dietary ...
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- [20] Why do diabetic patients not ...
- [21] The effect of educational intervention on girl's behavior ...
- [22] Factors predicting nutrition and physical activity behaviors due to ...
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- [24] Effects of health education based on health belief ...
- [25] Reproducibility and relative validity of food ...
- [26] Quick assessment of literacy in ...
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- [29] Can the newest vital sign be ...
- [30] Nutrition education worksite intervention ...
- [31] The effect of education based on health belief ...
- [32] Effect of health belief model ...
- [33] Effect of education based on health belief model on ...
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- [36] The effect of the health belief model-based ...
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- [39] Knowledge, attitude and ...
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- [41] Osteoporosis prevention ...
- [42] Effect of community-based nutrition ...
- [43] Effectiveness of school-based interventions ...
- [44] Changes in dietary pattern in 15 year ...
- [45] Assessment of health literacy ...
- [46] Association between health literacy ...

Introduction

Diet and nutrition behaviors have the most dramatic impact on people's lives and health throughout life [1]. Nutrition knowledge is one of the essential and inseparable parts of HL [2] and HL is one of the key factors affecting differences related to nutrition habits [3]. The result of one study showed those who had a higher healthy nutrition index benefited higher HL [4]. Another study in Taiwan indicated that children with higher HL are less probable to encounter problems including overweight [5].

Globally, overweight is the fifth death risk factor. Annually, at least 2.8 million adults die due to overweight. Moreover, %44 diabetes, %23 ischemic heart diseases, and between %7 to %41 of cancer diseases are related to overweight [6], all of which are among probable results of insufficient HL and related to nutrition and lifestyles risk factors which developing in childhood and adolescence [7]. Therefore, perceiving the importance of food and healthy nutrition behaviors is undeniable in the prevention and management of any of these health dangers [6].

Adolescence is accompanied with rapid changes in behavioral patterns and these changes expose them to high-risk health behaviors including improper nutrition behaviors, the effect of which remains even up to the end of life [8]. Having awareness about proper nutrition in adolescence can prevent many nutrition-based diseases in adult age [9-11]. The prevalence of overweight in Iranian adolescents is about 11 to 5% [12]. Studies confirm that overweight teenagers will be overweight in adult age [6].

Like many under-developed countries, improper nutrition in Iranian students is increasing [13]. Adolescent's population which is currently including 16% of the total population of Iran, is moving westward very fast. The tendency of children and teenagers toward western nutrition models, the use of salty and fat snacks with no nutrition value, and the decrease in traditional foods consumption are considered as major causes of nutritional problems [11]. A study in Tehran demonstrated that more than 18% of high school students did not eat breakfast daily, more than %48 drank at least one gas coke each day, and more than 64% of them had fast food at least once a week [14].

In the new sense of health, in adolescence period, people are responsible for their nutritional habits, behaviors, and attitudes, and should select a healthy lifestyle for themselves [15].

Nutrition education can be very effective in removing unhealthy nutrition behaviors and increasing the awareness of healthy nutrition behaviors. Therefore, an intervention being effective in increasing nutrition knowledge of this group can have many health profits [2]. The value of educational programs depends on the proper application of theories and models, due to the fact that model-based educational programs are

much more effective than traditional methodology [16].

The health belief model (HBM) is one of the applicable models to understand health behavior and applying this model for increasing the effects of nutritional education programs is highly suggested [17, 18]. The most important feature of this model is to help people make the best decision for their health among the options they have including proper or improper nutrition behavior [18-20]. The effect of this model on improving health behavior has been proved in many studies [21]. Naghashpour *et al.* demonstrated the positive effect of nutrition education based on HBM on nutrition awareness, attitude, and behavior for receiving oral calcium in high school female students [18]. Rahmati-Najarkolaei *et al.* proved the power of this model in predicting high-risk nutritional behaviors and body activity [22].

For having nutrition education with the aim of better nutrition behaviors, girls are more important than boys due to the fact that in addition to be more possibly to get infected, they are mothers of tomorrow, and many of the dietary concepts that they learn will affect not only their own health but also will have constant and permanent effects on the health of their children and their family in the future. Consequently, training is very crucial in increasing the nutrition knowledge and awareness of this group [21-23].

The present study has emphasized on improving HL, investigated the effect of HBM educational intervention on improving nutritional behaviors and nutritional knowledge of first grade high school female students.

Materials and Methods

Design and study subjects

A quasi experimental-study of the pretest-posttest method was implemented at two governmental girls' high schools in Mashhad, Iran in 2017. Using a multistage random sampling method, from two girls' high school which had been selected randomly, a total of 64 girls between 13-15 years were selected and allocated.

Inclusion criteria for this study defined as followings: The participant should not suffer a specific disease following a food-restricted diet, the participant should be a first program high school student and the participant should have the required tendency and cooperation in participating the study. Lack of desire to continue cooperation in the study and being absent for more than one session of the educational course had been considered as exclusion criteria.

Sampling methods

Based on a similar study [24], a confidence level of 95% and a test power of 0.84% were considered. Mean and standard deviation for perceived benefits before- and after-intervention were 17.46 ± 1.21 and 23.04 ± 6.24 , respectively. As there was more than one

questionnaire and with considering sample decrease, the sample size was considered as 32 students. Furthermore, for comparison, there was a group with the same size as control group.

$$n = \frac{(z_{1-\alpha} + z_{1-\beta})^2(s_1^2 + s_2^2)}{(\bar{x}_1 - \bar{x}_2)^2}$$

$$n = \frac{(1.96 + 0.80)^2(6.24 + 1.21)}{(23.04 - 17.44)^2} \approx 15.65$$

Tools of data collection

The information gathering tool included five questionnaires. The first questionnaire included 5 questions on students' demographic information such as personal and family information like age, father's education, mother's education, father's job, and mother's job. The second questionnaire including 18 questions was designed to measure awareness. The scale used to analyze the information in this part was correct, incorrect, and I do not know. One score was dedicated to each correct answer. In this section, the maximum obtained score was 18. The third questionnaire was the standard HBM questionnaire including 36 questions. The questions in this questionnaire included perceived susceptibility (8 questions), perceived severity (6 questions), perceived benefits (6 questions), perceived barriers (7 questions), practice guidance (1 question), and self-efficacy (8 questions). All the questions in this section, except the question on guidance, were organized based on the Likert scale having three choices: "I disagree" which had 1 score, "I have no idea" which had 2 scores, and "I agree" which had 3 scores. In the perceived barrier section, scoring was vice versa: "I disagree" which had 3 scores, "I have no idea" which had 2 scores, and "I agree" which had 1 score. Physician, health personnel, friends and family members, teachers, as well as media such as radio, television, and the Internet, or educational tools such as books, magazines, and newspapers were useful for determining the most useful practice guidance and improving nutrition behaviors. Validity and reliability of the awareness and HBM questionnaires had been approved in another study [24].

To assess the nutrition performance of students, food frequency questionnaire of consuming 168 items which its reliability and validity were investigated in a study [25], was used. For the eating behavior analysis, each healthy daily consumption get +1 and each unhealthy daily consumption get -1 and the higher the frequency of healthy eating behaviors (consumption of healthy foods per day), the higher the score and the higher the frequency of unhealthy eating behaviors (consumption of unhealthy food per day) get lower score. The higher score means healthy behavior was more than unhealthy behavior.

The fourth questionnaire was the Newest Vital Sign (NVS) [26] which its validity and reliability Persian

sample had been analyzed in another study [27]. The capacity of this questionnaire to examine the status of HL in adolescent had been reviewed and approved in other studies [28, 29]. This questionnaire included six questions, and the students responded in self-reporting form, using ice cream labels attached to the questionnaire, without consulting others or using a calculator and any other computational tools. The average time needed to answer questions was about 3 minutes. In this study, there was no time limitation for answering the questions. One score was given to each correct answer. The score of each questionnaire was the sum of scores varied between 0-6. According to the classification of HL levels in the NVS questionnaire, three HL groups were identified. Scores between 0 and 1 were related to those who were more likely to have inadequate HL. Scores between 2 and 3 were related to those who were more likely to have border HL and scores between 4 and 6 were related to those who had adequate HL [26]. Awareness, HBM and HL questionnaires were filled out in three stages: Before, immediately, and two months after the intervention. The nutrition behaviors questionnaire was filled out only in two stages before and two months after the educational intervention.

Procedure

Collecting information and determining the students' status and their educational needs, the researcher prepared an educational program as well as training contents based on their needs. A training program was held for the intervention group in twelve 30-minute sessions for twelve weeks. The curriculum was conducted directly through lectures and active participation of the samples (ask and answer, group discussion, and brainstorming) along with educational slides as well as indirect instruction through the educational booklets and pamphlets. It should be mentioned that group discussion method was applied for teaching perceived sensitivity, perceived severity and perceived benefits of healthy nutritional behaviors to students, and the brainstorming method was applied for teaching perceived barriers of unhealthy nutrition behaviors.

Statistical methods

Data were analyzed using descriptive statistics such as mean and standard deviation (SD) and independent and paired t-test, Mann-Whitney and Wilcoxon tests by SPSS 16. For comparing the process of the effect of long time training, after the follow-up phase, repeated measure ANOVA was applied. Generally for all tests, a significant level of 0.05 was considered.

Administrative design and ethical issues

This study was a part of the results of a research project under code No. 941093, which was approved by the Research Department of Mashhad University of Medical Sciences. This survey was done in Mashhad in 2017. The researchers respectfully express their gratitude and appreciation to the vice-

chancellor of Mashhad University of Medical Sciences, Education Organization authorities, high school principals and the students without whose cooperation this study might not be conducted. Ethic code from the ethical committee for this study is IRCT20160917029843N5.

Findings

Table 1 showed that among 64 students participating in the study, the majority of students had not enough HL (89.1%). Most mothers and fathers had university degrees. Most of the participant’s mothers were a housewife and most fathers were employed (Table 1).

Table 1) Demographics characteristics (n=64)

Demographics of respondents: n (%)	
Adolescent NVS median (IQR*)	0) 11 (17.2) 1) 17 (26.6) 2) 22 (34.4) 3) 7 (10.9) 4) 5 (7.8) 5) 2 (3.1)
Level of health literacy	- Adequate health: 7 (10.9); Literacy (Scores 4-6) - Boarder health: 29 (45.3); Literacy (Scores 2-3) - Limited health: 28 (43.8); Literacy (Scores 0-1)
Parental education status (Mother)	- Elementary: 1 (1.6) - Junior high school: 9 (14.1) - High school (Diploma): 19 (29.7) - University: 35 (54.7)
Parental education status (Father)	- Elementary: 2 (3.2) - Junior high school: 4 (6.2) - High school (Diploma): 17 (26.6) - University: 41 (64.1)
Parental job status (Mother)	- Employee: 20 (31.2) - Housekeeper: 44 (68.8)
Parental job status (Father)	- Employee: 43(67.2) - Self-employed: 21(32.8)

*Interquartile range

Table 2) Comparison of mean and standard deviation of the health belief model constructs before, after and two month after intervention in the intervention and control groups

Health Belief Model constructs		Intervention group	Control group	P-value t-test
		Mean±SD	Mean±SD	
Perceived susceptibility	Before education	19.71±2.89	19.65±2.91	0.966
	After education	23.71±0.81	19.53±2.99	<0.001
	Two month after education	23.62±1.07	19.56±2.87	<0.001
*R.M. ANOVA		0.003	0.161	
Perceived severity	Before education	15.75±2.04	15.68±2.07	0.904
	After education	17.93±0.35	15.59±2.09	<0.001
	Two month after education	17.93±0.24	15.62±2.12	<0.001
R.M. ANOVA		0.003	0.083	
Perceived benefits	Before education	15.84±1.62	15.81±1.61	0.939
	After education	17.84±0.62	15.84±1.72	<0.001
	Two month after education	17.81±0.64	15.68±1.67	<0.001
R.M. ANOVA		<0.001	0.572	
Perceived barriers	Before education	18.53±2.14	18.50±2.19	0.954
	After education	20.93±0.24	18.53±2.15	<0.001
	Two month after education	20.96±0.17	18.46±2.19	<0.001
R.M. ANOVA		<0.001	0.325	
Self-efficacy	Before education	18.50±3.26	18.43±2.89	0.940
	After education	23.90±0.53	18.40±0.81	<0.001
	Two month after education	23.81±0.59	18.31±1.07	<0.001
R.M. ANOVA		0.002	0.325	
Awareness	Before education	14.28±1.50	14.15±1.39	0.753
	After education	17.84±0.57	14.12±1.45	<0.001
	Two month after education	17.78±0.75	14.00±1.56	<0.001
R.M. ANOVA		0.002	0.564	

*Repeated Measures ANOVA

Table 3) Comparison of mean and standard deviation of health literacy before, after and two month after intervention in the intervention and control groups

Health literacy	Intervention group	Control group	P-value; t-test
	Mean±SD	Mean±SD	
Before education	1.75±1.07	1.34±0.93	0.113
After education	4.96±0.96	1.43±0.91	<0.001
Paired t-test (before and after education)	<0.001	0.263	
Two month after education	5.00±0.91	1.31±0.96	<0.001
Paired t-test (before and two month after education)	<0.001	0.745	

Table 4) Comparison of mean and standard deviation of nutrition behavior before and two month after intervention in the intervention and control groups

Nutrition behavior	Intervention group	Control group	P-value; t-test
	Mean±SD	Mean±SD	
Before education	1.65±4.92	1.87±4.46	0.853
Two month after education	20.62±1.33	1.71±4.72	<0.001
Paired t-test (before and two month after education)	<0.001	0.361	

The results of Table 2 indicated that before the educational intervention, there was no significant difference between the experimental and control groups in any of the constructs. All HBM constructs significantly increased in the intervention group after the education intervention ($p<0.001$). However, the changes in the control group were not significant. The best guidance for students in the intervention and control groups before and after the education intervention was related to the mother (Table 2).

The results of Table 3 demonstrated that after the intervention the mean score of HL significantly increased in the experimental group, as compared with the control group. Accordingly, the paired t-test showed a significant difference ($p<0.05$). However, the control group had no significant change (Table 3). The results of Table 4 indicated that after the intervention the mean score of nutrition behavior significantly increased in the experimental group, as compared with the control group. Accordingly, the paired t-test showed a significant difference ($p<0.05$). However, the control group had no significant change (Table 4).

Discussion

The present study having the aim of determining the effect of education based on HBM on HL and nutrition behaviors was conducted on first-grade high school female students, in Mashhad City. The results revealed that after training, all the HBM constructs in the intervention group significantly increased. Along with the results of this study, the results of other studies also indicated an increase in the average scores of HBM constructs after education intervention [18, 30-34]. Based on the other result, students' awareness significantly increased after the implementation of education intervention, which was consistent with the results of other studies in this regard [18, 35, 36]. Along with this study results, another study investigated the effect of education based on the health belief model on reducing unhealthy snack

consumption among female students, awareness and the health belief model constructs in the intervention group were significantly increased, which was not the same in the control group. In a study, only 24% of high school girls had enough knowledge about the behavior of consuming calcium-rich foods. In another study, awareness had a significant and positive correlation with the osteoporosis prevention nutrition behavior in high school female students, which indicated that high knowledge of high school girls about healthy nutrition behavior results in these behaviors. Consequently, considering the importance of HBM constructs and the sensitivity of female adolescents to nutritional behaviors, it should put more effort in designing and implementing more effective and efficient education programs for them. What is important is student's increasing perceived susceptibility and severity toward the consequences of adopting unhealthy nutrition behaviors, better understanding and perceiving the barriers of adopting healthy nutrition behavior to eliminate for achieving the benefit from healthy nutrition behavior and increase their self-efficacy in adopting these behaviors.

Based on this study's results, education based on the health belief model could affect the students' HL to adopt healthy nutrition behaviors and improve their nutritional practice. The results of a study demonstrated that the implementation of appropriate education interventions can be effective in improving care for patients with inadequate HL [37] which is consistent with the results of this study. Implementing educational interventions increases the relationship between patients and trainers in this field [38] and in some cases increases the power of understanding in patients, as the increased HL was very effective in changing diabetic patients' behavior and improving cares. Students with sufficient HL can get nutrition information from trusted sources of information and by thoroughly understanding they can make the best decision for adopting healthy nutrition behaviors.

The results of this study indicated that the educational program based on the health belief model has a positive effect on students' performance and results in the improvement of their nutritional performance. In a study, more than 57% of high school female students did not consume enough calcium-rich foods in their daily diet^[39], because they did not have enough and required information in this field which indicates the importance of education. Along with the results of this study, other studies have also indicated that after the educational intervention, based on HBM, nutrition behaviors to prevent osteoporosis in female students of the intervention group improved compared with the control group^[18, 31, 40]. Studies in the United States^[41] and Vietnam^[42] also are along with the results of this study, confirming the effect of education on improving nutrition behavior. The results of a review study which analyzed the effect of various interventions on improving children's and adolescents' nutrition behavior in the European Union confirmed that most studies concluded that educational interventions have the greatest impact on promoting adolescents nutrition behaviors than any other interventions^[43] which this result is in line with the results of this study. In a study, 15-year-old students enjoyed four months free breakfast along with training the importance of healthy eating which resulted in changing students' nutrition performance into a healthier one and gaining less weight^[44]. Findings of the study indicate that as students' HL improves, their nutritional behaviors also get better. A study illustrated that there was a significant relationship between students' HL and their body mass index, and the overweight and obese students had lower HL^[45] which is consistent with the results of the present study. As children and teenagers spend nearly half of a day at school, they take most of their daily eating meals at school and are less under the influence of their parents. Various nutrition advertisements in the school and the media encounter them with a variety of options and they should make the best decision. Therefore, empowering adolescents to reach and get appropriate and useful information relevant to health issues and understanding and analyzing it for making the best decision is very essential in the field of HL. The results of a study that analyzed the HL of adolescents through the NVS questionnaire indicated that obesity was significantly higher in adolescents with inadequate HL^[46]. The findings of a study that examined under-16-year-old adolescents demonstrated that higher HL was significantly associated with a lower BMI^[7].

Conclusion

However this study was implemented on a small sample, the results revealed that before the

intervention, despite the importance of nutrition behaviors in girls and women, their knowledge, attitude, and performance were not at the optimal level. This fact multiplies the importance of implementing education interventions in the field of nutrition behavior. After implementing education intervention and based on the achieved results, it can be stated that the design and implementation of intervention of education in one month can make a significant difference in the level of awareness, attitude and practice of the intervention group in the field of adopting healthy nutrition behaviors, and the educational program to promote nutrition behaviors has had positive effects on and was beneficial to a small group of girls in Iran. As students' awareness, attitude and practice is too weak in the field of nutrition behaviors, and due to the positive impact that the educational programs which are based on the HBM can have, for preventing non-communicable diseases such as overweight and obesity which are the source of many diseases, it seems that education as one of the influential institutions can provide the necessary grounds for improving students' and as a result society's awareness, attitude and practice. On the other hand, considering the most important role of girls as future mothers and the low cost of preventative therapeutic activities, it seems as essential operation to generalize such educational programs and develop them.

Acknowledgments: The present study was a part of the results of a research project under code No. 941093, which was approved by the Research Department of Mashhad University of Medical Sciences. The researchers respectfully express their gratitude and appreciation to the vice-chancellor of Mashhad University of Medical Sciences, Education Organization authorities, high school principals and the students without whose cooperation this study might not be conducted. Ethic code from the ethical committee for this study is IRCT20160917029843N5.

Ethical permissions: In order to follow ethical matters in this study, data were collected after obtaining approval from the ethics committee of Mashhad University of Medical Sciences and after making coordination with authorities. Moreover, for the observance of ethical principles, before collecting the data, the goals of the study were explained to students and written informed consent was obtained. The intervention program was also administered for the control group for giving them the benefit of the educational program as well after the end of the post-test.

Conflicts of interests: The authors have no conflict of interest.

Author contribution: Mohammad Vahedian Shahroodi (First author), Original researcher (30%); Hadi Tehrani (Second author), Assistant (20%); Habibollah Esmaily (Third author), Methodologist (20%); Samira Olyani (Fourth author), Introduction author/Original researcher/Discussion author (30%).

Funding: This study was supported by Mashhad University of Medical Sciences.

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