

Effects of a Health Literacy Training Program on Nutritional Behaviors of Children: An Educational Intervention

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Abstract

Background: Childhood is a sensitive and important period in life, and is a key period in the formation of people's nutritional habits throughout life. Proper nutrition in teenage students can affect the quality and quantity of their growth. The purpose of this study was to investigate the effects of a health literacy training program on nutritional behaviors among children in Iran.

Methods: In this study, carried out using an interventional method, 30 children were selected by available sampling and divided into two groups by randomized block method. The intervention group received 8 sessions of nutritional health literacy training and the control group did not receive any training. Data were collected using Children's Eating Behavior Questionnaire (CEBQ). Data analysis was performed using SPSS 25 software and analysis of covariance (ANCOVA).

Results: The implementation of the health literacy training program significantly improved the nutritional behaviors of sixth-grade male students ($P=0.001$, $F=6.57$). This improvement was associated with reducing the average scores of the negative dimensions of nutritional behaviors (response to food, complaining, emotional overeating, emotional undereating, and the desire for drinks) and increasing the average scores of the positive dimensions (enjoying food, responding to satiety and eating slowly) ($p<0.05$).

Conclusion: According to the findings, the health literacy program can be used to improve the dimensions of children's nutritional behaviors along with other treatment options. Therefore, it is recommended to implement similar educational programs for students of other grades and for female students.

Key Words: Children, Health Literacy, Nutritional Behaviors, Students.

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1- INTRODUCTION

Childhood is one of the most important and sensitive periods of human development (1). The physical and psychological changes during this time are among the nutritional factors affecting the health and behaviors of adolescents; and, if ignored, lead to unfortunate consequences such as anorexia, overeating, causing weight loss or obesity (1-5). On the other hand, major diseases have their roots in this era. For example, more than 70 to 80% of obese teenagers will remain obese adults in future (6, 7).

Nutrition plays an important and direct role in creating and maintaining people's health (8, 9). The age group of 10-19 years constitutes more than 20% of the total population of Iran (10), without a doubt their health and progress are very important for the economic and social future of the country (11).

Having sufficient knowledge in various fields, including health issues, is one of the important and basic elements of information technology, human rights system and progress in societies. What enables people to play an active role in the field of health and receive health services is a set of skills that are called health literacy today (12, 13). Health literacy is based on the view that both health and literacy are essential resources for daily life. The level of literacy not only has a direct effect on our ability to act based on health information, but also causes more control over our health as a member of family and community (14).

In general, health literacy is a tool that can enable people to better control their own health and, ultimately, leads to the development of social capital (15, 16). Health literacy education aims at influencing decisions in individuals' lifestyles, making them aware of the determinants of health, and encouraging individual and collective actions, which

lead to health literacy making individual and social abilities to achieve health goals (17, 18).

Nutritional behaviors are a complex process in which various factors play a role (19-21). The results of various research studies have indicated a low level of nutritional awareness and performance among students (22, 23). O'Brien et al. (2007) considered the lack of knowledge as the most important inhibiting factor for having a healthy diet in overweight people (24). The study by Valmórbida et al. (2017) showed a significant relationship between BMI and the level of knowledge about foods and also revealed that for better understanding about patients, there is a need for more information about non-communicable diseases related to obesity (25). Therefore, planning to change unsanitary behaviors and promote health has different models, one of which is the health literacy training program (26). Despite the implementation of numerous and diverse educational programs at different levels to improve the nutritional status of adolescents in different regions of the country, there are still unresolved problems in this field (27).

On the other hand, effective interventions to increase the capabilities and abilities of students, communities and groups in order to acquire, understand and use basic information, to maintain and promote health, is a new approach in the field of "health literacy" (28, 29). Individuals with nutrition-related literacy can obtain, process, and understand information and skills required to make appropriate nutritional decisions (30). This approach can also be used for nutritional problems of students, which is one of the major health priorities in Iran. The present study was, therefore, conducted with the aim of investigating the impact of an educational program in health literacy on nutritional behaviors of primary students in eastern Iran in the academic year of 2021-2022.

2- MATERIALS AND METHODS

2-1. Design and participants

In this pretest-posttest interventional study, the population included all male sixth grade students of Ferdows, a city in the east of Iran, in the academic year of 2021-2022. A total of 30 students were selected through available sampling and randomly divided into two groups (15 intervention and 15 control) by randomized block method.

2-2. Instruments

In this research, in order to measure the desired variables, CEBQ (2001) children's eating behavior questionnaire and health literacy training package were used.

2-2.1. Children's Eating Behavior Questionnaire (CEBQ) Wardell et al. (2001)

Children's Eating Behavior Questionnaire (CEBQ) is a 35-item parent-report questionnaire that assesses children's eating styles. Eating style is assessed in eight scales: responsiveness to food (4 questions), enjoyment of food (4 questions), emotional overeating (4 questions), desire for drinks (3 questions), satiety responsiveness (5 questions), slowness in eating (4 questions) and emotional undereating (4 questions), and fussiness (7 questions). Parents evaluate and report the frequency of their children's behaviors and experiences on a 5-point scale: 1, never; 2, rarely; 3, sometimes; 4, often; 5, always. In this questionnaire, the adjusted score of 100 and above, and 16% above the problem score are in the clinical domain (31). This means that getting a higher score indicates unfavorable nutritional behavior in children. In the initial validation of this questionnaire on a population of 325 Iranian children aged 12-9, which was conducted by Nohi et al. (2014) (32), the internal consistency coefficient of the items was equal to 0.77, the average was 100.51, and the standard

deviation was 13.281. The face validity of the questionnaire was confirmed and Cronbach's alpha reliability was estimated as 0.7.

2-2.2. Content of the health literacy training program

The training in the intervention group was conducted in 8 sessions (90 minutes each) in the form of questions-answers and lectures. The details of the intervention are given in **Table 1**.

2-3. Procedure

After holding an orientation meeting and coordinating with the school principal and the students' teachers, the link of the mentioned questionnaire was sent to the parents. After completing the pre-test questionnaire by parents, the intervention group received the necessary online training in the form of a health literacy training package using the Shad social network (an online interactive education network for schools). The control group did not receive any training during this period. After completing the training sessions and answering the students' questions; at the specified time, the link of the questionnaires for the post-test stage was again provided to the parents and the questionnaires were completed.

It should be noted that 8 training sessions were held by master's students in the field of educational sciences majoring in elementary education in a period of one month (two sessions per week). Each training session lasted 90 minutes and 4 weeks after the eighth session, the post-test questionnaires were completed.

2-4. Data analysis

Data analysis was done by SPSS 25 using frequency distribution table and central indicators (mean and standard deviation), independent samples t-test, and analysis of covariance (ANCOVA) test. The normality of data distribution was checked through Kolmogorov-Smirnov test

Table-1: Content of the health literacy training program

Session	Session title	Aim of the session
First session	Introduction and brief explanation about the training course	The purpose of this meeting was to get to know the students and establish initial communication, and the questionnaires were also distributed. In addition, a brief explanation was given about the method of teaching health literacy.
Second session	Health Cares	Some explanations were provided regarding the health of water, fruits, and vegetables; about using the available facilities to access safe drinking water, boiling water or using chlorine solution to disinfect water and vegetables; and about health facilities for students in schools and home, the necessity of washing hands and face, etc.
Third session	Personal hygiene and hygiene of raw materials	The importance of compliance with personal hygiene and the hygiene of raw materials and proper storage of food, which are necessary to prepare a healthy meal
Fourth session	Nutritional behaviors	Timely use of supplementary nutrition for students, preparation of complementary food, correct use of food groups in the preparation of student and family meals (breakfast, snack, lunch and dinner), including fruits and vegetables in the meal plan.
Fifth session	Quantity and quality of food plans	Teaching simple and cheap ways to prepare suitable food and paying attention to the methods that decrease the food preparation time, paying attention to the quantity and quality of food eaten by the student, using dairy products (milk, yogurt, cheese, etc.) in the food plan, not using fast foods frequently
Sixth session	Appropriate meal plan according to the time and place	Having patience and time when feeding the student, paying attention to the student's appetite, paying attention to the time and place of feeding the student
Seventh session	Friendly communication	Establishing a healthy and friendly emotional relationship with classmates and family while eating - using brochures for the correct ways of consuming food and sending some items to home for parents in the educational program, paying attention to objections or strictness in eating, as well as not being sensitive to the type of eating
Eighth session	Providing the students with a summary of the program and final evaluation	Giving an educational pamphlet with the content of healthy nutrition, childhood nutrition, food groups, consumption of dairy products, consumption of fruits and vegetables, and consumption of liquids, as well as not consuming harmful drinks such as soft drinks

3- RESULTS

The participants in this study were male students of the sixth grade of elementary school in Ferdows city; so, there was no difference between the intervention and control groups in terms of age and sex. The average pre-test and post-test scores of nutritional behaviors in the

intervention group were 105.73 and 97.40; and in the control group, they were 106.87 and 105.33, respectively. The average pre-test and post-test scores of nutritional behaviors by 8 dimensions and study groups as well as the results of checking the normality of data distribution are presented in **Table 2**.

Table-2: Mean (SD) of the scores and normality of their distributions in the intervention and control groups before and after the intervention and the result of checking the baseline equality of the groups

Dimension	Test time	Intervention		Control		Data normality test (Kolmogorov Smirnov)		Differences between 2 group (p-value*)
		Mean	Standard deviation	Mean	Standard deviation	Test result	p-value	
Responsiveness to food	Pre test	16.67	3.75	18.20	3.78	0.47	0.98	0.27
	Post test	12.80	3.45	18.40	4.37	0.93	0.35	
Enjoyment of food	Pre test	12.47	2.97	12.60	2.35	0.89	0.40	0.89
	Post test	15.27	2.19	13.00	2.48	0.57	0.90	
Satiety responsiveness	Pre test	10.47	2.23	10.93	3.43	0.90	0.40	0.66
	Post test	13.60	1.55	10.40	2.50	0.91	0.38	
Slowness in eating	Pre test	10.40	2.23	11.33	2.38	0.85	0.47	0.28
	Post test	13.60	2.13	12.00	1.85	0.94	0.35	
Fussiness	Pre test	17.40	3.56	16.20	2.18	0.95	0.33	0.28
	Post test	12.13	2.90	14.93	3.73	0.69	0.73	
Emotional overeating	Pre test	12.20	1.47	11.33	2.13	0.82	0.51	0.21
	Post test	9.60	2.23	10.39	1.79	0.82	0.50	
Emotional undereating	Pre test	13.40	2.67	14.53	2.10	0.66	0.77	0.21
	Post test	10.73	2.31	13.80	2.83	0.56	0.91	
Desire for drinks	Pre test	12.73	2.09	11.73	1.94	0.85	0.47	0.19
	Post test	9.67	2.66	11.87	1.96	0.75	0.63	
Eating behavior	Pre test	105.73	8.03	106.87	7.83	0.54	0.93	0.79
	Post test	97.40	8.85	105.33	7.98	0.88	0.86	

* Independent samples t-test

Considering that the significance level of all variables is higher than 0.05, in the test of the normal distribution of data, parametric tests could be used for data analysis.

As shown in **Table 1**, the average score of nutritional behaviors in the intervention group decreased from 105.73 before the intervention to 97.40 after the intervention and in the control group decreased from 106.87 in the pre-test to 105.33 in the post-test.

Based on the results of the independent t-test, the studied groups were equal in terms

Table-3: The results of univariate covariance analysis on the mean scores of post-test nutritional behaviors of the intervention and control groups

Variable	Sum of squares	df	Mean Squares	F	p-value	Impact rate	Test power
Pre test	265.16	1	265.16	4.16	0.05	0.13	0.50
Group effect	418.85	1	418.85	6.57	0.02	0.20	0.70
Error	1721.78	27	63.77	-	-	-	-
Total	2458.97	29	-	-	-	-	-

We conclude that the health literacy training program has an effect on improving the nutritional behaviors of sixth grade male students in Ferdows. In addition, the adjusted average of nutritional behaviors of the intervention

of nutritional behavior dimensions in the baseline. Also, based on the results of Levene's test, the variances of the intervention and control groups were the same.

The findings presented in **Table 3** show that there is a significant difference between the nutritional behaviors of the subjects in the intervention and control groups (P=0.001, F=6.57). Therefore, with 99% certainty, the null hypothesis is rejected and the negative hypothesis is confirmed.

group is lower compared to that of the control group; therefore, the health literacy educational program had an effect on improving the nutritional behaviors of sixth grade male students in Ferdows (**Table 4**).

Table-4: Descriptive statistics of nutritional behaviors of the two groups after pre-test adjustment

Group	Adjusted mean	Standard deviation Error	p-value
Intervention	97.62	2.06	0.02
Control	105.11	2.06	

The results of **Table 5** revealed that the pretest effect is not significant, that is, the pre-test did not affect the post-test scores (P=0.14, F=2.14). However, there is a significant difference in responsiveness to food between the intervention and control groups (P=0.001, F=12.87). Therefore,

with 99% certainty, the null hypothesis is rejected and the negative hypothesis is confirmed. So, we conclude that the health literacy training program led to reducing the responsiveness to food among the sixth-grade male students of Ferdows.

Table 5: The results of univariate analysis of covariance on the mean post-test scores of nutritional behavior dimensions in the intervention and control groups

Dimension	Variable	sum of squares	df	Mean Squares	F	p-value	Impact rate	Test power
Responsiveness to food	Pre test	33.72	1	33.72	2.27	0.14	0.08	0.31
	Group effect	190.74	1	190.74	12.87	0.00	0.32	0.93
	Error	400.28	24	14.83				
	Total	669.20	29					
Enjoyment of food	Pre test	92.05	1	92.05	40.82	0.00	0.60	1
	Group effect	41.63	1	41.63	18.46	0.00	0.41	0.99
	Error	60.89	27	2.26				
	Total	191.47	29					
Satiety responsiveness	Pre test	46.27	1	46.27	16.67	0.00	0.38	0.98
	Group effect	86.47	1	86.47	31.16	0.00	0.54	1
	Error	74.93	24	2.78				
	Total	198.00	29					
Slowness in eating	Pre test	36.17	1	36.17	12.95	0.00	0.32	0.93
	Group effect	30.49	1	30.49	10.91	0.00	0.29	0.89
	Error	75.43	27	2.79				
	Total	130.80	29					
Fussiness	Pre test	59.41	1	59.41	6.33	0.02	0.19	0.68
	Group effect	82.64	1	82.64	8.81	0.01	0.25	0.82
	Error	253.26	27	9.38				
	Total	371.47	29					
Emotional overeating	Pre test	31.73	1	31.73	10.35	0.00	0.28	0.87
	Group effect	23.89	1	23.89	7.79	0.01	0.22	0.77
	Error	82.81	27	3.07				
	Total	127.87	29					
Emotional undereating	Pre test	6.83	1	6.83	1.02	0.32	0.04	0.16
	Group effect	56.82	1	56.82	8.50	0.01	0.24	0.80
	Error	180.50	27	6.69				
	Total	257.87	29					
Desire for drinks	Pre test	5.11	1	5.11	0.93	0.34	0.03	0.15
	Group effect	40.93	1	40.93	4.47	0.01	0.22	0.75
	Error	147.95	27	5.48				
	Total	189.37	29					

4- DISCUSSION

The current study has investigated the effect of the health literacy training program on the nutritional behaviors of sixth grade male students in Ferdows. The results revealed that the implementation of the health literacy training program improved the nutritional behaviors of sixth grade male students in Ferdows. This

improvement was observed in the decrease in the average scores of the negative dimensions of nutritional behaviors (response to food, complaining, emotional overeating, emotional undereating, and the desire for drinks) and the increase in the average scores of the positive dimensions (enjoying food, responding to satiety and eating slowly).

These findings were in agreement with those of Kooshki et al. (2018) (33), Mohammadi et al. (2019) (21), Shirin et al. (2020) (34), Mohammadi Zeidiet al. (2013) (35), Saeedy Golluche et al. (2017) (36), Khakpoor et al. (37), Amini et al. (2014)(38), Pang et al.(2022)(39), Saeidi et al. (2020) (40), and Mirzaei et al. (2020) (41). Similar to our results, it was shown that education based on health literacy had a positive effect on nutritional outcomes, and after the educational intervention, the average scores of knowledge, attitude and behavior increased significantly in the intervention group with sufficient health literacy (41).

According to the findings of Vahedian et al. (2018), teaching nutritional behaviors significantly increased the average scores of knowledge, perceived benefits, sensitivity and severity of obstacles and self-efficacy among the students in the intervention group (42). Furthermore, the study by Saeedy Golluche et al. (2016) regarding the limited health literacy of adolescents, considered health education interventions necessary to improve the health literacy of adolescents (36).

Peng et al. (2019) found the implementation of educational programs in the field of nutrition effective in improving nutrition knowledge, nutritional attitudes, dietary patterns, and dietary diversity among elementary school students, especially in the dairy food group and calcium sources (39). Kooshki et al.'s findings (2018) also demonstrated that educational intervention increases health literacy and nutritional performance in students (33).

Similarly, Farahbod et al. (2021) (43) found that the average knowledge scores before the training were 38.11 ± 28.3 , which subsequently increased to 92.20 ± 42.2 after the training. In addition, the average attitude scores changed from 48.29 ± 43.5 to 79.40 ± 31.30 ; and the average

performance scores increased from 62.12 ± 31.3 to 88.17 ± 15.2 .

Children's temperament is considered as one of the characteristics influencing eating and eating quality. Children with difficult temperament usually show more avoidance behaviors during meals, create a lot of tension during meals, do not enjoy food and finish their food very slowly (44).

Implementation of combined educational programs is effective in increasing the awareness of students' nutritional behavior due to involving more senses (37). Awareness, perceived sensitivity and severity, perceived benefits and obstacles, and self-efficacy have been proposed as predictors of nutritional behaviors; and it was found effective to design educational programs based on the health belief model with an emphasis on perceived benefits of student's positive nutritional behaviors (45).

Previous studies have suggested that the implementation of educational programs in schools and the transfer of education through students to families as well as therapeutic interventions based on parents-children's relationships have many positive effects on children's eating improvement, including reducing complaints and overeating. They are also effective in emotional under-eating and increased enjoyment of food (46-48).

In general, nutrition in students is important due to providing supporting materials for growth, providing necessary energy to perform physical and intellectual activities, helping to maintain resistance to infections, and storing nutrients which are necessary for their rapid growth during puberty (49). Nutritional behaviors are a complex process in which various factors play a role, and investing in this field is cost-effective (21).

On the other hand, therefore, teenagers need useful and healthy education for better growth and development as well as

to acquire proper information and skills in choosing the right foods. Therefore, the special position of the school, which is the center of students' gathering, as well as the role of teachers and parents in nutrition-related education (50) makes schools suitable places for the implementation of nutrition education for increasing awareness and correcting incorrect nutritional attitudes and behaviors among children (51). Also, it has many positive effects on children's response to food and leads to improvements in their eating habits; they consume more and more diverse fruits and vegetables, and become curious to ask their parents more questions about healthy eating (52-54).

4-1. Limitations of the study

The limitations of this research were:

- a) Limitations in generalizing the results due to conducting the research in one grade (sixth grade) and gender (boys)
- b) Using self-report questionnaires
- c) Implementation of the educational intervention in a virtual and online form

5- CONCLUSION

According to the results, training children in the field of nutrition based on the educational program of nutritional health literacy improves nutritional behaviors in school-aged children. Therefore, it is recommended to implement similar educational programs for students of other grades and for female students.

6- ETHICAL CONSIDERATIONS

Before starting the study, written consent was obtained from all participants and they were assured that their information would be confidential and published anonymously. The study was approved by Birjand University of medical sciences with the code of: <https://ethics.research.ac.ir/IR.BUMS.REC.1402.115>.

7- REFERENCES

1. Khoshfetrat M.R., Rahmani Kh., Kalantari N., GhatTarpour M., Mchrabi Y., Esmailzadeh A. Assessment and comparison of food consumption patterns and body mass index of adolescent boys in urban and rural areas of Zarrinshahr, Isfahan. *Payesh (Health Monitor) Journal*. 2007; 6(2):0-.
2. Neumark-Sztainer D, Story M, Perry C, Casey MA. Factors influencing food choices of adolescents: findings from focus-group discussions with adolescents. *Journal of the American Dietetic Association*. 1999; 99(8):929-37.
3. Trübswasser U, Talsma EF, Ekubay S, Poelman MP, Holdsworth M, Feskens EJM, Baye K. Factors Influencing Adolescents' Dietary Behaviors in the School and Home Environment in Addis Ababa, Ethiopia. *Frontiers in Public Health*. 2022; 10.
4. Ateş ÖZcan B, Yeşilkaya B, Yaldiz N, Pehlivan M. Factors affecting diet quality in adolescents: the effect of sociodemographic characteristics and meal consumption: Factors Affecting Diet Quality In AdolescentS. *Progress in Nutrition*. 2021; 22(4):e2020094.
5. Mehrabian F, Omid S, Mahdavi Roshan M, Mirzaee M. Correlation between Nutritional Behavior, Obesity, and Overweight in Female Elementary School Students in Anzali. *Journal of Health*. 2018; 9(3):291-301.
6. Juonala M, Magnussen CG, Berenson GS, Venn A, Burns TL, Sabin MA, Srinivasan SR, Daniels SR, Davis PH, Chen W, Sun C, Cheung M, Viikari JSA, Dwyer T, Raitakari OT. Childhood adiposity, adult adiposity, and cardiovascular risk factors. *N Engl j Med*. 2011; 365:1876-85.
7. Charakida M, Khan T, Johnson W, Finer N, Woodside J, Whincup PH, Sattar N, Kuh D, Hardy R, Deanfield J. Lifelong

patterns of BMI and cardiovascular phenotype in individuals aged 60–64 years in the 1946 British birth cohort study: an epidemiological study. *The lancet Diabetes & endocrinology*. 2014; 2(8):648-54.

8. Ohlhorst SD, Russell R, Bier D, Klurfeld DM, Li Z, Mein JR, Milner J, Ross AC, Stover P, Konopka E. Nutrition research to affect food and a healthy life span. *The Journal of nutrition*. 2013; 143(8):1349-54.

9. WHO. Nutrition 2023 [Available from: https://www.who.int/health-topics/nutrition#tab=tab_1].

10. Jalalinia S, Ramezani Tehrani F, Baradaran Eftekhari M, Peykari N. Qualitative study of adolescences opinion among nutritional habits and believes. *MEDICAL SCIENCES JOURNAL*. 2011; 20(4):258-64.

11. Patton GC, Olsson CA, Skirbekk V, Saffery R, Wlodek ME, Azzopardi PS, Stonawski M, Rasmussen B, Spry E, Francis K, Bhutta ZA, Kassebaum NJ, Mokdad AH, Murray CJK, Prentice AM, Reavley N, Sheehan P, Sweeny K, Viner RM, Sawyer SM. Adolescence and the next generation. *Nature*. 2018; 554(7693):458-66.

12. Irwin LG, Siddiqi A, Hertzman G. Early child development: A powerful equalizer: Citeseer; 2007.

13. Marmot M, Friel S, Bell R, Houweling TA, Taylor S. Closing the gap in a generation: health equity through action on the social determinants of health. *The lancet*. 2008; 372(9650):1661-9.

14. Liu C, Wang D, Liu C, Jiang J, Wang X, Chen H, Ju X, Zhang X. What is the meaning of health literacy? A systematic review and qualitative synthesis. *Family medicine and community health*. 2020; 8(2).

15. Ratzan SC. Health literacy: communication for the public good. *Health*

Promotion International. 2001; 16(2):207-14.

16. Sørensen K, Van den Broucke S, Fullam J, Doyle G, Pelikan J, Slonska Z, Brand H; (HLS-EU) Consortium Health Literacy Project European. Health literacy and public health: a systematic review and integration of definitions and models. *BMC public health*. 2012; 12:80.

17. Coughlin SS, Vernon M, Hatzigeorgiou C, George V. Health Literacy, Social Determinants of Health, and Disease Prevention and Control. *Journal of environment and health sciences*. 2020; 6(1).

18. Nutbeam D. Health literacy as a public health goal: a challenge for contemporary health education and communication strategies into the 21st century. *Health Promotion International*. 2000; 15(3):259-67.

19. Hummel E, Hoffmann I. Complexity of nutritional behavior: Capturing and depicting its interrelated factors in a cause-effect model. *Ecology of Food and Nutrition*. 2016; 55(3):241-57.

20. Scaglioni S, De Cosmi V, Ciappolino V, Parazzini F, Brambilla P, Agostoni C. Factors Influencing Children's Eating Behaviours. *Nutrients*. 2018; 10(6).

21. Mohammadi N, Hooshian M, Omid A, Soltanian A. The Effect of Health Belief Model Education on Nutrition Behavior of Boys in Secondary Schools in Hamadan. *Avicenna Journal of Nursing and Midwifery Care*. 2019; 26(6):397-406.

22. Pirzadeh A, Hazavhei MM, Entezari MH, Hasanzadeh A. The Effect of Educational Program on Nutritional Knowledge and Behavior of Middle School Female Second Graders in Isfahan in 2009. *Iranian Journal of Medical Education*. 2011; 11(2):94-102.

23. musavi h, mahboobi h, khorgoei t. The effect of educational program on students'

- nutritional knowledge and practice. *Iranian Journal of Medical Education*. 2011; 11(3):306-7.
24. O'Brien G, Davies M. Nutrition knowledge and body mass index. *Health education research*. 2007; 22(4):571-5.
25. Valmórbida JL, Goulart MR, Busnello FM, Pellanda LC. Nutritional knowledge and body mass index: A cross-sectional study. *Revista da Associação Médica Brasileira* (1992). 2017; 63(9):736-40.
26. Malloy-Weir L, Cooper M. Health literacy, literacy, numeracy and nutrition label understanding and use: a scoping review of the literature. *Journal of human nutrition and dietetics: the official journal of the British Dietetic Association*. 2017; 30(3):309-25.
27. Iraj Zareban, Hossien Izadirad, Marzieh Araban. Psychometric evaluation of health literacy for adults (HELIA) in urban area of Balochistan. *Payesh (Health Monitor) Journal*. 2016; 15(6):669-76.
28. Ghaffari M, Hatami H, Rakhshanderou S, Karimi H. Effectiveness of Snack-centered Nutrition Education on Promoting Knowledge, Attitude, and Nutritional Behaviors in Elementary Students. *International Journal of Pediatrics*. 2017; 5(12):6495-502.
29. Lynch MA-M, Franklin GV. Health literacy: An intervention to improve health outcomes. *Strategies to Reduce Hospital Mortality in Lower and Middle Income Countries (LMICs) and Resource-Limited Settings: IntechOpen*; 2019.
30. Silk KJ, Sherry J, Winn B, Keesecker N, Horodynski MA, Sayir A, et al. increasing nutrition literacy: testing the effectiveness of print, web site, and game modalities. 2008; 40(1):3-10.
31. Archer LA, Rosenbaum PL, Streiner DLJJoPP. The children's eating behavior inventory: reliability and validity results. 1991; 16(5):629-42.
32. nouhi s, janbozorgi m, agah haris m, Najimi A. Standardization of children's eating behavior questionnaire (CEBQ). *Health Psychology*. 2020; 9(34):41-56.
33. Kooshki A, Mohammadi M, Rivandi M. Nutritional intake and its association with educational achievement in high-school students in Islamic Republic of Iran. *Eastern Mediterranean health journal, La revue de sante de la Mediterranee orientalen al-Majallah al-sihhiyah li-sharq al-mutawassit*. 2018; 24(6):532-7.
34. Shirin A, Joveini H, Hashemian M, Kooshki A, Rakhshani MH, Sharifi N, Rohban A. The Effects of an Educational Intervention Based on Poetry, Game, and Problem-Solving Skills on Promoting Nutritional Knowledge and Behavior in Iranian Primary School Students. *Journal of Nutrition and Food Security*. 2022; 7(4):484-95.
35. Mohammadi Zeidi A, Pakpour A. Effect of using the transtheoretical model for breakfast and healthy snacks on education for elementary students in Qazvin. *Iranian Journal of Nutrition Sciences and Food Technology*. 2013; 8(2):201-10.
36. Saeedy Golluche F, Jalili Z, Tavakoli R, ghanbari s. The Study of Relationship between Health Literacy and Nutritional Practice in High School Adolescents in Tehran. *Iranian Journal of Health Education and Health Promotion*. 2017; 5(3):224-30.
37. Khakpoor S, Niknami S, Tavafian SS, Goodarzi A. Traditional and Modern Teaching Methods in Improving Eating Behaviors of Female Elementary School Students in Chababar, Iran. *Military Caring Sciences*. 2016; 3(1):41-7.
38. Amini A, Tavousi M, Niknami S. The impact of an educational intervention on nutritional preventive behaviors in osteoporosis among adolescent girls.

Payesh (Health Monitor) Journal. 2014; 13(5):609-19.

39. Pang B, Memel Z, Diamant C, Clarke E, Chou S, Gregory H. Culinary medicine and community partnership: hands-on culinary skills training to empower medical students to provide patient-centered nutrition education. *Medical education online*. 2019; 24(1):1630238.

40. Saeidi Z, Vakili R, Ghazizadeh Hashemi A, Saeidi M. The Effect of Diet on Learning of Junior High School Students in Mashhad, North-east of Iran. *International Journal of Pediatrics*. 2015; 3(2.2):517-26.

41. Mirzaei A, Ramezankhani A, Taheri Tanjani P, Ghaffari M, Jorvand R, Bazayr M, Momeni K, Heidarianzadeh Z. The Effectiveness of Health Literacy Based Educational Intervention on Nutritional Outcomes of Elderly. *Salmand: Iranian Journal of Ageing*. 2020; 15(3):324-37.

42. Vahedian M, Tehrani H, Robat-Sarpooshi D, Aval M, Jafari A, Alizadeh-Siuki H. The impact of health education on nutritional behaviors in female students: an application of health belief model. *International Journal of Health Promotion and Education*. 2019; 59:1-13.

43. Farahbod B, Rahmati-Najarkolaei F, Balvardi M, Imanigoghary Z, Farahbod F, Zeidabadi R. The Effect of Education on Knowledge, Attitude and Practice of Sirjan School of Medical Sciences Staff Regarding the Use of Food Labels. *Iranian Journal of Health Education and Health Promotion*. 2021; 9(1):33-44.

44. Steinsbekk S, Bjørklund O, Llewellyn C, Wichstrøm L. Temperament as a predictor of eating behavior in middle childhood – A fixed effects approach. *Appetite*. 2020; 150:104640.

45. Lotfi Mainbolagh B, Rakhshani F, Zareban I, Alizadeh Sivaki H, Parvizi Z. The effect of peer education based on health belief model on nutrition behaviors

in primary school boys. *Journal of Research and Health*. 2012; 2(2):214-26.

46. Golley RK, Hendrie GA, Slater A, Corsini N. Interventions that involve parents to improve children's weight-related nutrition intake and activity patterns - what nutrition and activity targets and behaviour change techniques are associated with intervention effectiveness? *Obesity reviews: an official journal of the International Association for the Study of Obesity*. 2011; 12(2):114-30.

47. Räsänen M, Niinikoski H, Keskinen S, Helenius H, Talvia S, Rönnemaa T, Viikari J, Simell O. Parental nutrition knowledge and nutrient intake in an atherosclerosis prevention project: the impact of child-targeted nutrition counselling. *Appetite*. 2003; 41(1):69-77.

48. Adili S, Rayisi Z, Ghasemi N. The Effectiveness of online intervention of fillial therapy on preschool Children's Eating Behavior. *Journal of Educational Psychology Studies*. 2022; 19(45):54-42.

49. Kotecha PV, Patel SV, Baxi RK, Mazumdar VS, Shobha M, Mehta KG, Mansi D, Ekta M. Dietary pattern of schoolgoing adolescents in urban Baroda, India. *Journal of health, population, and nutrition*. 2013; 31(4):490-6.

50. Contento IR, Randell JS, Basch CE. Review and analysis of evaluation measures used in nutrition education intervention research. *Journal of nutrition education and behavior*. 2002; 34(1):2-25.

51. Mesías M, Seiquer I, Navarro MP. Iron nutrition in adolescence. *Critical reviews in food science and nutrition*. 2013; 53(11):1226-37.

52. Magalhães P, Vilas C, Pereira B, Silva C, Oliveira H, Aguiar C, Rosário P. Children's Perceived Barriers to a Healthy Diet: The Influence of Child and Community-Related Factors. *International journal of environmental research and public health*. 2022; 19(4).

53. DeCosta P, Møller P, Frøst MB, Olsen A. Changing children's eating behaviour - A review of experimental research. *Appetite*. 2017; 113:327-57.

54. Sharps M, Robinson E. Encouraging children to eat more fruit and vegetables: Health vs. descriptive social norm-based messages. *Appetite*. 2016; 100:18-25.