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Effect of an Educational Intervention on Healthy Lifestyle in Iranian Children and Adolescents: The Iran-Ending Childhood Obesity (IRAN-ECHO) Program

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A B S T R A C T

Background: This study aimed at examining the effect of an educational program on children's and adolescents' knowledge of, attitude toward, and practice of healthy lifestyle habits.

Methods: This was a quasi-experimental nationwide intervention carried out as part of the Iran-Ending Childhood Obesity (IRAN-ECHO) program. Participants were selected from six cities of Iran. The sample size was calculated to be 1264 for each city. Knowledge of, attitude toward, and practice of healthy nutritional habits were measured at baseline and following the intervention. A physician and a dietitian provided recommendations on healthy diet, screen time, physical activity, and sleep time. Behavioral therapy was given when necessary.

Results: The prevalence of overweight or obesity was 7.6%. The frequency of students with desirable knowledge was significantly greater after the intervention compared with baseline (32.5% vs 24.8%, $p = 0.02$). The mean score for attitude toward obesity complications significantly increased from 73.09 to 74.78 ($p = 0.03$). There was also a significant increase in the mean score for the practice of low consumption of unhealthy snacks after the intervention (difference = 1.63, $p = 0.03$). The mean score for participation in mild physical activity increased from 50.67 to 65 after the intervention ($p < 0.001$). However, there were no significant changes in the number of students with desirable attitude and practice following the intervention ($p > 0.05$).

Conclusion: The study shows that an educational intervention based on WHO-ECHO recommendations can be useful for improving the knowledge of a healthy lifestyle in children and adolescents. Over time, it might lead to a positive attitude and behavior toward a healthier lifestyle. Continued professional education and implementation of guidelines for the prevention and management of early childhood overweight and obesity are suggested.

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Introduction

Overweight and obesity during childhood and adolescence are emerging public health problems [1]. The worldwide prevalence of overweight among children increased from 32 million in 2000 to 42 million in 2013. It is estimated that by 2025, the prevalence of overweight in preschool children will increase to 11% worldwide [2-3]. A systematic review of studies from 1990 to 2013 showed that the prevalence of obesity was 1% to 16.1% and that of overweight was 4.4% to 42.3% in the Iranian pediatric population [4-6].

Childhood obesity causes serious clinical complications such as diabetes, cardiovascular disease, and some cancers, which affect the general health and quality of life in adulthood [7]. Unhealthy dietary habits and inactivity during childhood are associated with obesity [8-10]. Thus, educational programs to promote healthy behaviors and increase physical activity, as primary preventive measures against obesity, are necessary [11-12].

Schools provide access to a large population of students of diverse socioeconomic status [13-14]. Moreover, school-aged children spend a significant part of their time in school. Therefore, educational interventions in this environment can contribute to the prevention of obesity by increasing health knowledge and helping to establish healthy nutrition and physical activity habits [15-16,18]. School staff and students' families should be involved in these interventions, and various items such as physical activity, behavioral counseling, parents' food practice, and healthy dietary habits should be considered [19].

The World Health Organization program on Ending Childhood Obesity (WHO-ECHO) is a comprehensive program that provides policy recommendations for prevention, control, and treatment of obesity in children and adolescents. In addition, this program tries to reduce the risk of morbidity and mortality related to noncommunicable diseases (NCDs), reduce negative psychosocial effects of obesity, and decrease the prevalence of obesity in the next generation [20-21].

The present study was conducted as a part of the IRAN-ECHO program, which was designed within the framework of the WHO-ECHO program. We investigated the effect of multicomponent school-based lifestyle interventions on knowledge of, attitude toward, and practice of health behavior among Iranian children and adolescents.

Subjects and methods

This was a quasi-experimental national study with pre-post design. Details of the study protocol have been explained previously [21]. We adopted WHO's definitions of child overweight and obesity [22]. The current study, which was conducted among 7149 students aged 7–18 years. The participants were selected from six cities of Iran including Ahvaz, Ardebil, Gorgan, Isfahan, Mashhad, and Tehran using a multistage random sampling method. In each city, two elementary schools and two high schools were selected for each gender. The sample size was calculated to be 1264 for each province. Written informed consent and verbal assent were obtained from parents and their children, respectively. Participation in the study was voluntary, and all the potential participants had the right to withdraw from the study at any time. Students who had a physical disability, learning disorder, history of chronic disease, or history of chronic medication use, or were on a special diet were not included in the study. The study was approved by the Research Ethics Committee of Isfahan University of Medical Sciences (Project number: 194356).

Intervention program

Health care experts examined the participants in public health centers or schools and overweight or obese participants were referred to trained physicians and dieticians in public health centers for the evaluation of food intake, physical activity level, and medical history. The physician and dietitian provided recommendations on healthy nutrition screen time, physical activity, and sleep time. The students received behavioral therapy when necessary.

The school-based intervention included providing written educational materials, holding group learning sessions, making family lifestyle adjustments, and increasing the knowledge about childhood obesity. The students attended eight 1-h group sessions, including lectures, group discussions, presentations, and educational films. The parents and teachers received 4 and 2 educational sessions, respectively.

The duration of the intervention was six months and the participants were followed every two months over the academic year.

Outcome measurements

Knowledge of, attitude toward, and practice of healthy dietary habits were measured using a validated questionnaire before and after the intervention. The questionnaire included a demographic information section (personal and

family information and socioeconomic status) and items regarding knowledge of healthy lifestyle habits (61 items scored 1 = knows or 0 = does not know), attitude toward healthy lifestyle habits (18 items rated on a scale of 0 = strongly agree to 4 = strongly disagree), and practice of healthy lifestyle habits (28 items rated as 0 = daily, 1 = weekly, 2 = rarely, and 3 = never). Two levels of physical activity including intense (increase in breathing and heart rate) and mild (without an increase in breathing and heart rate) were considered. The students completed the questionnaire under the supervision of a health care specialist.

Statistical analysis

The scores of various scales of the questionnaire were transformed to scores on a scale of 0-100, with scores ≥ 70 being considered as desirable status and < 70 as undesirable status. The categorical variables are presented as percentages, continuous variables as mean (SD). The Kolmogorov-Smirnov test was used for assessing the normality of data distribution. Comparisons between preintervention and postintervention scores were made using paired t tests. The data were analyzed using the STATA software version 10.0 (STATA Corp, College Station, Texas, USA). P values of less than 0.05 were considered statistically significant.

Results

Overall, 7149 students completed the intervention, 49.8% of whom were male. Their mean (SD) age was 13.94 (3.40) years. The prevalence of overweight/obesity was 7.6%, and the prevalence of underweight was 3.7%. Demographic characteristics of the participants are shown in (Table 1).

Table 1. Demographic characteristics of the participants (n = 7149)

Age, year, mean (SD)	13.49 (3.40)
Gender (%)	
Male	49.8%
Female	50.2%
Father education (%)	
Illiterate	1.7%
< 12 years	26.6%
≥ 12 years	71.7%
Mather education (%)	
Illiterate	2.3%
< 12 years	27.2%
≥ 12 years	70.5%
Weight status (%)	
Underweight	3.7%
Normal weight	88.7%
Overweight/Obese	7.6%

Effect of the intervention on knowledge of healthy lifestyle

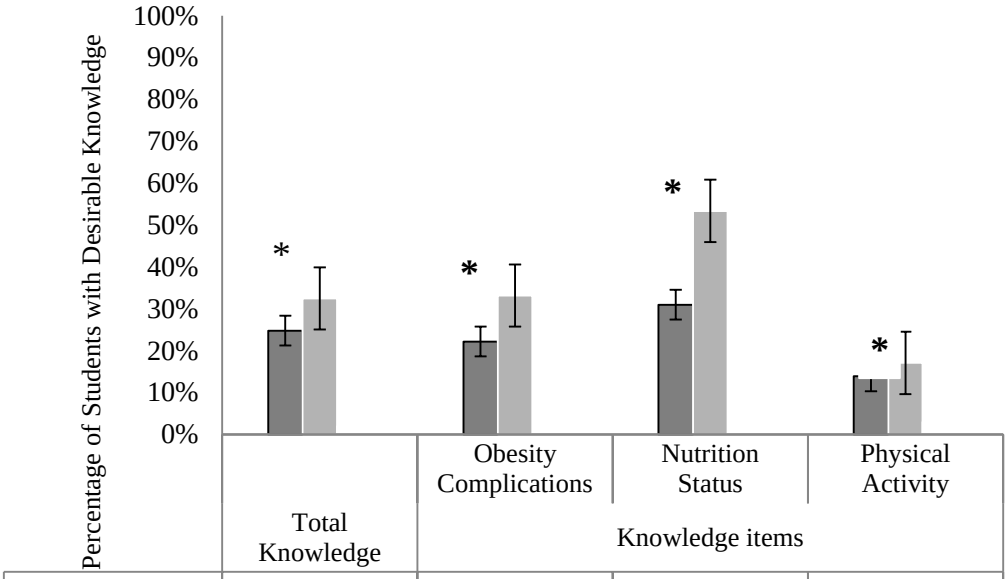
According to Figure 1, the frequency of students with a score of ≥ 70 on the total knowledge scale and its domains increased after the intervention ($p < 0.05$). At baseline, 31% of participants had desirable knowledge about nutrition, and the percentage increased to 53.4% after the intervention. The frequency of students with desirable knowledge about obesity complications and benefits of physical activity significantly improved after the intervention ($p < 0.05$).

As presented in Table 2, there was a significant increase in the mean score for total knowledge after the intervention compared with the baseline ($p < 0.001$). Likewise, significant increases were observed in the mean scores for all domains of the knowledge scale after the intervention. The highest increases were related to the knowledge about the main reasons to eat (healthy growth and energy), obesity complications, and unhealthy snacks (Table 2).

Table 2. Changes in total knowledge and its domains following the intervention

		Mean (SD)		P value
		Preintervention	Postintervention	
Total knowledge		42.05 (5.54)	60.99 (8.71)	< 0.001*
Knowledge items	Obesity complications	39.23 (16.94)	49.63 (18.36)	< 0.001*
	Causes of obesity	59.37 (15.05)	69.00 (14.47)	< 0.001*
	The main reasons to eat	57.18 (20.94)	67.80 (19.40)	< 0.001*
	Main food groups	68.13 (18.31)	73.82 (16.86)	0.002*
	Role of dietary fiber	22.51 (20.93)	26.59 (21.35)	0.045*
	Effect of unhealthy food on obesity	87.63 (8.73)	89.21 (8.47)	0.042*
	Healthy snacks	62.84 (16.00)	71.55 (15.14)	< 0.001*
	Unhealthy snacks	64.48 (18.33)	74.40 (14.55)	< 0.001*
	Disadvantages of carbonated drinks	49.48 (19.07)	59.19 (17.36)	< 0.001*
	Effect of high consumption of fast food	47.35 (18.77)	56.06 (18.33)	< 0.001*
	Physical activity	50.36 (11.7)	62.12 (16.51)	< 0.001*

*P < 0.05 considered statistically significant.

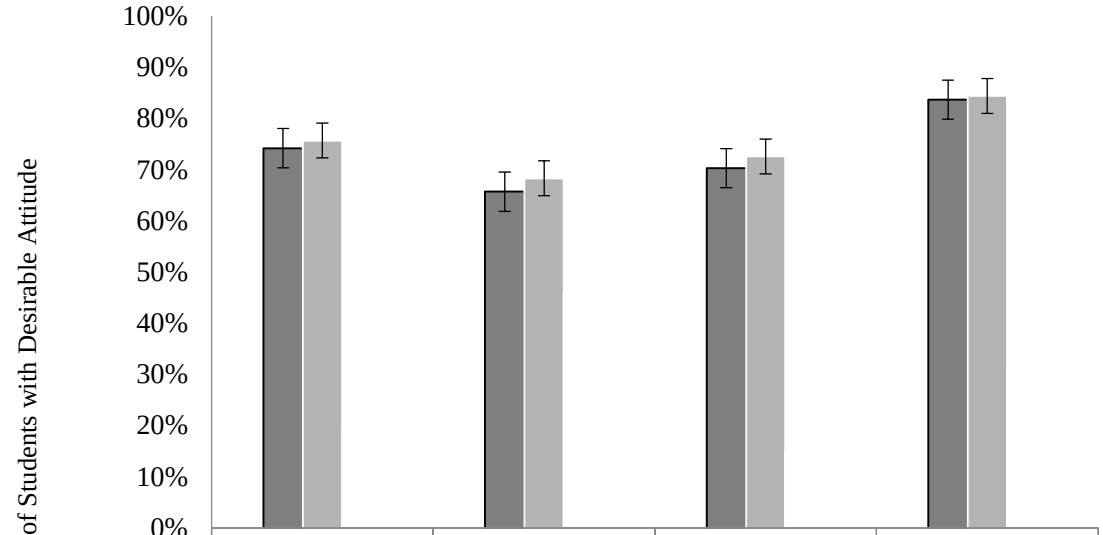


	Total Knowledge	Obesity Complications	Nutrition Status	Physical Activity
		Knowledge items		
Pre-intervention	24.80%	22.20%	31%	13.90%
Post-intervention	32.50%	33.20%	53.40%	17.10%
P-value	0.02	0.001	0.001	0.03

Figure 1. Changes in the percentage of students with desirable knowledge following the intervention

Effect of intervention on attitude toward healthy lifestyle habits

As shown in Figure 2, despite the improvement in the number of students with a desirable attitude toward a healthy lifestyle after the intervention, the difference was not significant ($p > 0.05$). The mean scores for attitude and its subscales before and after the intervention are shown in Table 3. The mean score for attitude toward obesity complications subscale was significantly increased after the intervention ($p = 0.03$).



	Total Attitude	Obesity Complications	Nutritional Status	Physical Activity
		Attitude items		
Pre-intervention	74.20%	65.70%	70.30%	83.70%
Post-intervention	75.70%	68.30%	72.60%	84.40%
P-value	0.2	0.46	0.15	0.31

Figure 2. Changes in the percentage of students with desirable attitude toward healthy lifestyle habits following the intervention

Table 3. Changes in total attitude and its domains following the intervention

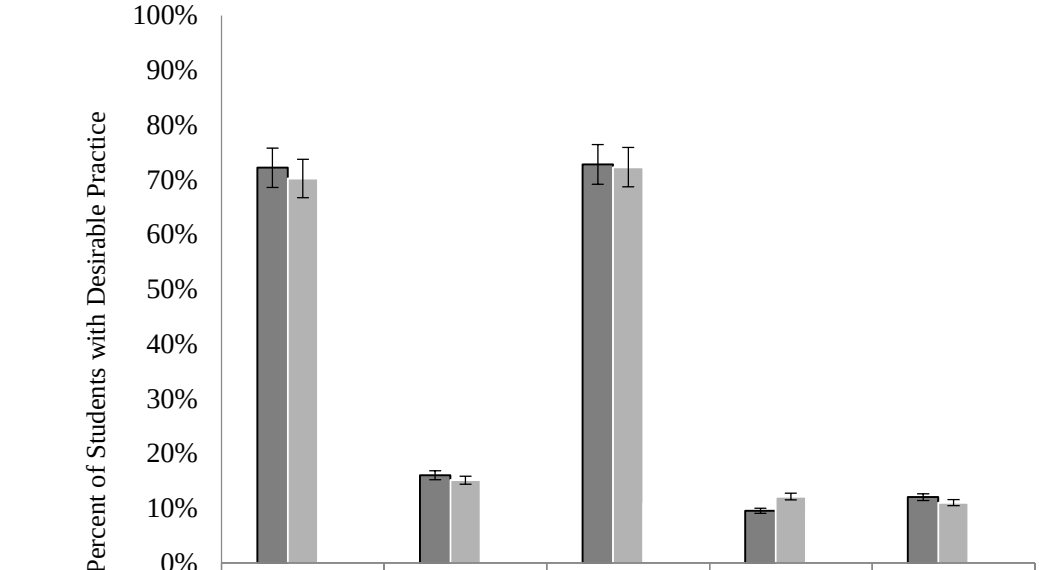
		Mean (SD)		P value
		Preintervention	Preintervention	
Total Attitude		76.16 (5.02)	76.05 (5.10)	0.78
Attitude items	Obesity complications	73.09 (7.68)	74.78 (8.32)	0.03*
	Nutritional status	75.61 (4.96)	75.28 (5.32)	0.41
	Physical activity	83.12 (6.71)	83.20 (6.24)	0.90

*P < 0.05 considered as statistically significant.

Effect of intervention on the practice of healthy lifestyle habits

Figure 3 shows the percentages of students with desirable practice in different domains of a healthy lifestyle before and after the intervention. There were no significant changes following the intervention (p > 0.05).

Table 4 compares the baseline and postintervention scores for various domains of the practice of a healthy lifestyle. The practice of consuming low amounts of unhealthy snacks significantly increased following the intervention (p = 0.03). Also, the mean score for the practice of mild physical activity significantly increased from 50.67 to 65 (p < 0.001).



	Healthy Food	Unhealthy Food	Healthy Snacke	Unhealthy Snake	Physical Activity
Pre-intervention	72.20%	16%	72.80%	9.50%	12.00%
Post-intervention	70.20%	15.10%	72.30%	12.10%	11.00%
P-value	0.73	0.43	0.11	0.09	0.4

Figure 3. Changes in the percentage of students with desirable practice of healthy lifestyle habits following the intervention

Table 4. Changes in the practice of health behaviors following the intervention

Practice items	Mean (SD)		P value
	Preintervention	Preintervention	
High consumption of healthy food	81.98 (4.24)	81.24 (4.89)	0.70
Low consumption of unhealthy food	59.64 (9.02)	59.00 (9.48)	0.27
High consumption of healthy snacks	89.18 (5.97)	88.60 (6.94)	0.12
Low consumption of unhealthy snacks	46.39 (7.69)	48.02 (9.46)	0.03*
Intense physical activity	54.44 (23.16)	53.46 (21.15)	0.55
Mild physical activity	50.67 (12.08)	65.00 (17.81)	< 0.001*

*P < 0.05 considered as statistically significant.

Discussion

This study showed that a multicomponent school-based educational intervention could improve the knowledge of a healthy lifestyle among children and adolescents. Moreover, we found a positive effect of the educational intervention on the children's attitude toward complications of obesity and the practices of low unhealthy-snack consumption and participation in mild physical activity. Various school-based studies in different age groups (from 6 to 18 years) demonstrated that lifestyle, nutrition, and physical education interventions improved students' awareness of a healthy lifestyle, with limited effect on their practice [16, 18, 23-25]. A Cochrane review of 70 behavioral, dietary, and physical activity interventional studies showed only a modest change in the practice of healthy lifestyle habits [26].

Our findings showed that the educational intervention was effective in increasing the knowledge of healthy and unhealthy food/snacks. However, the intervention did not improve the students' behavior related to high consumption of healthy food/snacks such as fruit and vegetable. Longer-term educational interventions are required for significant effects on attitude and practice. A multicomponent educational intervention was associated with lower intake of foods high in fat and salt in primary schools in Sangre Grande, northeastern Trinidad; however, it had no beneficial effects on healthy diet intake. These results showed that different mechanisms might underlie the process of changing healthy and unhealthy foods consumption [16]. Most of the previous studies had short intervention periods and reported only slight effects on fruit and vegetable consumption, caloric intake, and the use of sweetened beverages [23, 26].

School-based educational intervention can improve the level of physical activity [18,27-28]. School-aged children spend a remarkable portion of their time in school, so the design and implementation of various and interesting exercise programs in school would provide an opportunity for increased physical activity, especially for students with little or no access to extracurricular sports activities [29-31].

Educational interventions can improve attitude toward dietary habits and a healthy lifestyle [27, 32-36]. However, inadequate duration of the educational intervention can lead to the lack of effectiveness of the intervention. Studies indicated that educational interventions of more than one year were more effective [37-38] than short-term school-based interventions [39]. Knowledge can increase after education in the short term, whereas its translation into changes in attitude and practice would need more time [17, 23, 40]. Moreover, factors such as age, gender, environment, family dynamics, and parental feeding practices may have bearing on the effectiveness of the education on knowledge of, attitude toward, and practice of healthy lifestyle habits [41-42].

This was the first comprehensive program designed to prevent and control overweight and obesity among Iranian children and adolescents, following the WHO-ECHO recommendations. The short duration of intervention, lack of control group, and not making anthropometric measurements after the intervention are among the limitations of the present study. The strengths of this study include using a large sample size studied in six cities, high-quality control of data collection, and applying a multicomponent intervention.

Our findings provide evidence that schools and instructors have important roles in promoting a healthy lifestyle in children and adolescents. Changing dietary habits and increasing physical activity levels in school, especially in the form of group activity, are more interesting for children and adolescents. Thus, school-based education can improve students' awareness about a healthy lifestyle and motivate them to adopt healthy behaviors. Additionally, the involvement of parents along with school-based education can increase the effectiveness of the intervention.

Conclusion

According to the present study, the school environment and trained teachers play an important role in preventing and treating childhood obesity. Educational intervention based on the WHO-ECHO recommendations may be useful for improving the knowledge of a healthy lifestyle in children and adolescents, and over time it might lead to changes in attitude and, consequently, in their behavior. This suggests a need for both continued professional education and implementation of guidelines for the prevention and management of early childhood overweight and obesity.

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Conflict of interest

None of authors have conflict of interests.

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