

Original Article

The Effect of a Nutrition Education Program on Nutrition Behavior and Body Mass Index of Secondary School Students

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Abstract

Objective: To examine the effects that nutrition education given to primary school-age children has on their nutrition behaviors, nutrition knowledge and body mass index.

Methods: The study was conducted with 173 students, who were enrolled in the 1st, 2nd, 3rd, and 4th grades of a private school, and their parents. The research data were collected using a Survey Form, the Food Consumption Frequency Form, the Child Nutrition Knowledge Form, and the Body Mass Index Values Form. Children and parents were given trainings that involved introducing food items and explaining healthy nutrition habits.

Results: After undergoing the education program on nutrition, the children's junk food consumption rates decreased ($p < 0.05$) and their water consumption increased significantly ($p < .001$). Following the completion of the program, it was found that the obese and overweight children ate meat and milk more frequently, but consumed cereal products, like pasta and rice, as well as sugar and chocolate, less frequently ($p < .001$). Before undergoing the education program, 61.3% of the children were overweight and 20.8% were obese, however, after completing the program, the ratio of normal weight students increased to 67.6% while that of obese children decreased to 11.6% ($p < .001$).

Conclusion: The provision of nutrition education in primary school had a positive effect on the children's nutritional behaviors, increased their nutritional knowledge and reduced their body mass index. This study therefore serves to demonstrate the importance of instituting such educational practices to prevent overweight or obesity in childhood.

Key words: Nutrition, nutrition education program, body mass index, primary school-age children

Introduction

The concept of nutrition involves making the conscious effort to consume sufficient nutrients for the body at appropriate times to protect and develop health and to improve quality of life (Kutlu & Civi, 2009). An adequate and balanced nutrition at every stage of growth (infancy, childhood and adolescence) is essential for healthy development, as well as for ensuring normal pubertal maturation (Soliman et al., 2014). The primary education period covering children between the ages 7 and 14 is a period

wherein healthy nutritional habits are formed, lifetime behavioral practices are developed, and rapid growth and maturation are experienced. To achieve this rapid growth in children, the necessary nutrients must be consumed as part of an adequate and balanced diet plan (Buchanan & Marquez, 2015). A healthy lifestyle and proper nutritional habits contribute to the development and maintenance of children's health. An adequate and balanced nutrition prevents diseases, enriches quality of life, improves children's physical and mental health, and

increases levels of success in school (Martin et al., 2014; Haghani et al., 2017). On the other hand, it would be difficult to correct wrong nutrition and lifestyle behaviors adopted during this period. An inadequate and unbalanced nutrition prevents children from undergoing a proper maturation process and can cause diseases and disorders, such as obesity, cardiovascular diseases, diabetes, hypertension and cancer (Ulas & Gunay, 2014, Crowe et al., 2017). The prevalence of obesity has increased in recent years and is now considered a worldwide epidemic and is viewed as a disease, especially in developed countries (Kovesdy et al., 2017). Childhood obesity is one of the most serious global public health issues of the 21st century. The International Association for the Study of Obesity estimates that approximately 200 million school-age children are either overweight or obese, with 40-50 million being classified as obese (Antwi et al., 2012). As part of the "Project for Monitoring Growth of School-Age Children in Turkey", anthropometric measurements of 11,387 primary school children between the ages of 6 and 10 were taken. The research conducted in relation to this project reported that 6.5% of children were obese, and 14.3% were slightly obese (Irmak et al., 2011). Considering these figures, obesity is clearly a health problem that should be taken seriously, especially in light of the increasing prevalence of it seen in childhood in recent years. Genetic factors, such as inheritance and ethnicity, have been identified to be among the causes of obesity, in addition to the role of environmental factors, like nutritional habits and the lack of physical activity stemming from spending excessive amounts of time watching television and playing on the computer (Taveras et al., 2015). Moreover, advertisements that promote fast food-style nutrition, sugary drinks and unhealthy nutritional behaviors have been shown to have quite an influence on obesity (Rosenheck, 2008; Kaushik et al., 2011; Folkvord et al., 2016; Rauba et al., 2017). The education given during childhood on adopting healthy nutritional behaviors is of great value in fostering long-term healthy lifestyles. Family and school are two important social environments where nutrition habits are formed. The Nutrition and Dietetic Academy, in cooperation with the School Nutrition Society and the Nutrition Education Society, recognizes that nutrition education is a key contributing component to promoting the health of school-age children

(Price et al., 2017). The provision of nutrition education at schools ensures that children receive proper, balanced nutritional habits. This study aims to examine the effects that nutrition education given to primary school-age children has on their nutrition behaviors, nutrition knowledge and body mass index.

Methods

The study was conducted between November 2014 and May 2015 with 182 students who were enrolled in the 1st, 2nd, 3rd, and 4th grades of a private school affiliated with the Istanbul Provincial Directorate of National Education, and their parents. Ethical approval to conduct the study was obtained by the Ethics Committee of Haliç University with the letter dated 17.08.2014 and numbered 318. The research was carried out as a pre-test, post-test patterned intervention research in one group. The study population consisted of the students enrolled in the 1st, 2nd, 3rd, and 4th grades of a private school affiliated with the Istanbul Provincial Directorate of National Education, and their parents. The study sample consisted of the students and their parents who were available at the time the survey was conducted and who had agreed to participate in the survey. Simple random sample was used. One branch was selected with simple random sample. 1st, 2nd, 3rd and 4th grade students of selected branch were taken into the sample. The research data were collected using a survey form, the Food Consumption Frequency Form, the Child Nutrition Knowledge Form, and the BMI Values Form.

Survey form; The survey form prepared by the researchers consists of a total of 23 questions on the socio-demographic characteristics of the participant parents and children and on the children's nutrition habits.

Food Consumption Frequency Form; This form consists of questions on food groups (dairy products, meat products, vegetables, fruits, cereals, oils and fats, sugar and sweets and beverages) to identify children's food consumption habits. Expert opinions were taken for the review of this form.

Child Nutrition Knowledge Form: The "Eat Smart with My Pyramid for Kids" child nutrition information form was used to assess children's nutritional knowledge. This form includes 30 food images from five food groups. For the scoring, 1 point is given for each correct answer and 0 for each incorrect answer. The minimum

and maximum scores possible on the scale are 0 and 20, respectively, with higher scores indicating higher nutritional knowledge.

BMI Values Form: The electronic Seca 767 digital weighing instrument present in the polyclinic was used to perform the weight measurements. The child's outer garments and shoes were removed before performing weight and height measurements. These measurements were then applied to calculate the BMI, using the following formula: body weight (kg)/Height (m²). The BMI cut-off points for children between 2-18 years of age, as developed by Cole et al. (2000) and accepted by the World Health Organization (WHO), were used to evaluate BMI.

Data Collection: After the research ethics committee approvals, the school principal was interviewed. The contact information of the parents was received who would be involved in the study. The information about the study was given to the parents by reaching them and the participation to the study was provided. 182 parents were participated from Branch A and 1st, 2nd, 3rd and 4th grade classes. 9 of these parents were not able to participate to the study because of the health problems, their workload and school transfer. The study was conducted with 173 parents and their children. Before data collection, the purpose of the study was explained to the participant children and parents. Written consents were obtained from the parents using volunteer-informed consent forms, and verbal consents were obtained from the children. Parents were asked to respond to the "Survey Form" and "Food Consumption Frequency Form", while the children were asked to respond to the "Child Nutrition Knowledge Form". Parents and children were both given educational training on nutrition. These trainings were planned separately for parents and children. First, the parents were given a 2-hour training program, after which they were asked to observe their children's nutrition habits and which foods they most consumed. The height and weight of the children were measured before training. The children were trained at four different times. These trainings were conducted at 6-week intervals. Children were followed for six months. In this training program, it was aimed to inform children, to develop attitudes about the subject and to put these attitudes into behavior. The content of each training program was different (Figure 1). School visits and the phone calls with

the parents were performed in order to provide the behaviours to the students by the education. By reason of the fact that the school year was completed, one month after the last training, the children were asked to respond to the "Child Nutrition Knowledge Form", while the parents were requested to fill out once again the "Survey Form" and "Food Consumption Frequency Form". After these forms were collected, the height and weight of the children were measured again, and their BMI values were calculated.

Data Analysis: SPSS 22.0 and PAST 3 programs were used to analyze the variables. The McNemar Test was used to identify the relationship between the children's nutrition habits before and after the nutrition education program. The Chi-square test was used to analyze the comparisons of food consumption frequency in obese and overweight children and their BMI values, before and after the nutrition education program. The paired t-test was used to compare the nutritional knowledge mean scores of the children before and after the nutrition education program. A p value <0.05 was considered significant.

Results

In the study, 70.5% of the mothers (n=122) and 75.1% of the fathers (n=130) were university graduates; 48.6% of the parents (n=84) had only one child and 53.2% (n=92) had a moderate-income level; 51.4% of the children (n = 89) were between the ages of 8-9, 54.3% (n = 94) were male and 34.7% (n = 60) were first-grade students (Table 1). Before the nutrition education program, it was found that 97.1% of the children had 3 main meals per day, 94.2% had breakfast, and 63% had 2-3 meals per day. However, these percentages remained generally the same after the nutrition education program, with no statistically significant difference being found between them (p>0.05, Table 2). The percentage of the students consuming 5-8 glasses of water a day was found to increase from 38.2% to 42.8% after the nutrition education program. A statistically significant difference was determined between students' water consumption quantities before and after the nutrition education program (p<0.01, Table 2). The percentage of the students consuming junk food, such as chocolate or cake, between meals decreased from 72.3% to 68.8% after the nutrition education program, and a statistically significant difference was found between these values (p<0.05, Table 2).

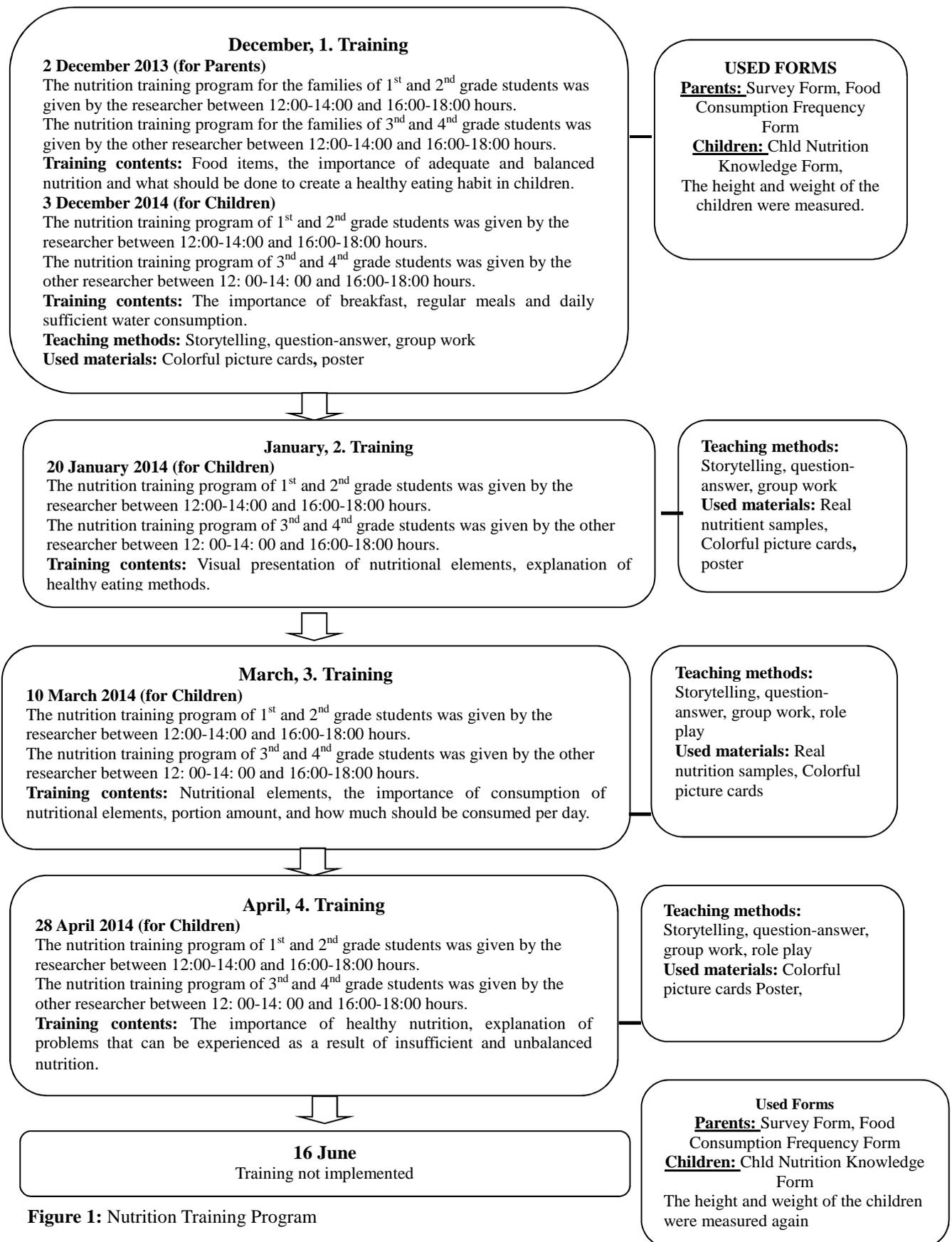


Figure 1: Nutrition Training Program

Table 1. Descriptive Characteristics of the Parents and Children (N=173)

Descriptive characteristics of the parents		N	%
Educational level of mothers	Primary school	2	1.2
	Secondary school	5	2.9
	High school	44	25.4
	University	122	70.5
Educational level of fathers	Primary school	3	1.7
	Secondary school	4	2.3
	High school	36	20.8
	University	130	75.1
Number of children	1	84	48.6
	2	78	45.1
	3	9	5.2
	4	2	1.2
Economic status	Moderate	92	53.2
	Good	81	46.8
Descriptive characteristics of the children			
Age	6-7 years	57	32.9
	8-9 years	89	51.4
	10 years	27	15.7
Gender	Female	79	45.7
	Male	94	54.3
Grade	1st grade	52	30.1
	2nd grade	60	34.7
	3rd grade	34	19.6
	4th grade	27	15.6
Total		173	100

Table 2. Relationship Between Primary School-Age Children's Nutritional Habits Before and After the Nutrition Education

Nutritional Habits	Before the Nutrition Education		After the Nutrition Education		p
	n (%)	n (%)	n (%)	n (%)	
Number of main meals	2 meals	3 meals	2 meals	3 meals	.250
	5 (2.9)	168 (97.1)	2 (1.2)	171 (98.8)	
Breakfast consumption frequency	Everyday/ usually	Sometime s/never	Everyday/ usually	Sometimes/ never	>.999
	163 (94.2)	10 (5.8)	163 (94.2)	10 (5.8)	
Lunch consumption frequency	166 (96)	7 (4)	168 (97.1)	5 (2.9)	.500
Dinner consumption frequency	172 (99.4)	1 (0.6)	171 (98.8)	2 (1.2)	>.999
Amount of junk food	1 meal	2-3 meals	1 meal	2-3 meals	>.999
	64 (37)	109 (63)	64 (37)	109 (63)	
Water consumption	2-4 glasses	5-8 glasses	2-4 glasses	5-8 glasses	.008**
	107 (61.8)	66 (38.2)	99 (57.2)	74 (42.8)	
	Yes	No	Yes	No	

Night consumption habits	44 (25.4)	129 (74.6)	40 (23.1)	133 (76.9)	.125
Junk food consumption habits between meals (chocolate, cakes etc.)	125 (72.3)	48 (27.7)	119 (68.8)	54 (31.2)	.031*
	Once a month	1-2 times a week	Once a month	1-2 times a week	
Fast-food consumption frequency	134 (77.5)	39 (22.5)	137 (79.2)	36 (20.8)	.250

* $p < .05$, ** $p < .01$ McNemar Test

Table 3. Comparison of the Child Nutrition Knowledge Mean Scores of Primary School-Age Children Before and After the Nutrition Education

	Before the Nutrition Education (n=173)	After the Nutrition Education (n=173)	t	p
	Mean±SD	Mean±SD		
Child nutrition knowledge	12.81 ±0.64	18.92 ±0.73	340.20	<.001***

*** $p < .001$ Student t testi

Table 4. Comparison of the Body Mass Indexes of Primary School-Age Children before and after the Nutrition Education

	Before the Nutrition Education				After the Nutrition Education				X ²	p
	n (%)				n (%)					
	Weak	Normal weight	Overweight	Obese	Weak	Normal weight	Overweight	Obese		
Body Mass Index	2 (1.1)	106 (61.3)	29 (16.8)	36 (20.8)	1 (0.6)	117 (67.6)	35 (20.2)	20 (11.6)	260.73	<.001***

*** $p < .001$ Chi-square Test

After the nutrition education program, it was found that in overweight and obese children, the frequency of meat and milk consumption increased, whereas the frequency of consumption of cereal products, such as pasta and rice, and sweets, such as sugar and chocolate, decreased, with there being a statistically significant difference between them ($p < 0.001$).

High scores on the child nutrition knowledge form indicate that the child's nutritional knowledge has increased. The children's mean

score on the child nutrition knowledge form after the nutrition education program was higher than the mean score before the education ($p < 0.001$, Table 3).

Before the nutrition education program, 61.3% of the children were overweight and 20.8% were obese; however, after the education, the ratio of normal weight students increased to 67.6% and the ratio of obese children decreased to 11.6% ($p < 0.001$, Table 4).

Discussion

Healthy nutrition habits in children protect them from encountering potential health problems. Some of the more important healthy nutrition habits include not skipping meals, eating breakfast regularly, drinking enough water, consuming less or no fast food, and engaging in physical activities regularly. Family and school function as the two main social environments in which healthy nutrition habits develop during childhood. This study has aimed to examine the effects that nutrition education program given to primary school-age children in a school environment has on their nutrition behaviors, nutrition knowledge and BMI.

The present study found that 94.2% of the students had breakfast every day/usually, 97.1% ate 3 main meals per day, and 63% ate 2-3 meals per day. This indicates that the population being studied did practice some correct nutrition habits. Moreover, it is believed that since the majority of the children's parents were university graduates, the parents were more knowledgeable about how to instill in their children the right nutrition habits. Qian et al. (2018) in their study stated that the level of parental education had an impact on primary school-age children's nutrition knowledge, that is, as the level of parental education increased, the student's nutrition behavior scores increased. Qian reported that parental education levels must be taken into account in the initiatives designed to improve primary school-age students' nutrition knowledge and behaviors. Similarly, Nilsen et al. (2017) reported that low parental education levels were associated with the risk of children becoming overweight. The present study observed that the students' daily water consumption amount increased after the nutrition education program ($p < 0.01$). There are studies in the literature indicating that adequate daily water consumption is necessary for healthy nutrition and reduces the risk of chronic disease (Drewnowski et al., 2013). Elder et al. (2014) implemented a training program for primary school-age children where water consumption was encouraged and found positive changes in their water consumption behaviors after they had completed the program. Mantziki et al. (2017) observed that excessive consumption of certain beverages, like cola and soda, by children led to a decrease in their water

consumption, and emphasized that parenting practices and behaviors may be effective in shaping healthy nutrition behaviors in children.

Students' habits of snacking between meals were observed in the present study to have decreased after the nutrition education program ($p < 0.05$). The literature includes some studies about the negative effects of consumption of junk food on children. For example, a study conducted with middle school students in England reported that children with daily junk food consumption habits were at a greater risk of having weaker mental and physical health (Zahra et al., 2013). Similarly, a positive correlation was found between junk food consumption and the development of depression in children (Sheroze et al., 2017).

The education given to overweight and obese children as part of the present study was shown to significantly increase the frequency of their milk consumption ($p < 0.001$). The intracellular calcium level is known to promote weight loss by increasing lipolytic activity (Zemel et al., 2000; Xue et al., 2001). An inverse relationship has been reported between the percentage of dietary calcium and body fat in preschool children (Carruth & Skinner, 2001; Booth et al., 2015). Similarly, Barba et al. (2005) found a statistically significant inverse relationship between milk consumption and BMI and Ahadi et al. (2015) reported that children and adolescents between the ages of 6 and 18 who do not eat regularly and who consume sodas or ready-made juice instead of milk are more likely to be overweight or obese than those who eat breakfast regularly. Koca et al. (2017) conducted a study with school-aged and adolescent children and showed that an increase in milk consumption reduces the BMI.

The present study found that after the nutrition education program, the frequency of meat and milk consumption significantly increased ($p < 0.001$), whereas the frequency of consumption of cereal products, such as pasta and rice, and sweets, such as sugar and chocolate, significantly decreased in overweight and obese children ($p < 0.001$). Weker (2006) showed that a diet with low glycemic index and fat and recommended daily protein significantly reduced obesity in obese children aged 3-15 and normalized their lipid profile. In another study,

conducted with 4th and 6th grade students who were at risk of obesity, it was reported that physical activity combined with a nutrition program resulted in an increase in the students' vegetable-fruit consumption and physical activity levels (Iversan et al., 2011; Rito et al., 2013). Another finding from the present study showed that the nutrition education program improved the children's knowledge of recognizing nutritional groups ($p < 0.001$). After the nutrition education program, the proportion of normal overweight children increased, while the number of obese children decreased ($p < 0.001$). The results of a study conducted by Rito et al. (2013) involving 266 overweight ($BDI \geq 85\%$) children between the ages of 6 and 10 are consistent with the present study results. In their study, children and their parents were given four sessions of counseling on individual nutrition and physical activity programs, a program on healthy cooking methods, and two non-school nutrition training sessions. After 6 months of follow-up, the children's BMI and waistline were observed to have significantly decreased. Similarly, Jester et al. (2017) implemented an education program on overweight and obese children that involved nutritional and physical activity-related wellness methods. In this study, the results of the "National Institute for Children's Health Quality (2015)" survey administered to the children before the program, one month after the program and two months after the program were compared, and it was found that overall, the children had adopted better diet and physical activity habits. However, they also emphasized that a 3-month program was not enough to reduce children's BMIs. Many studies emphasize that nutrition education programs given during school age periods are useful and effective for children (Matsumoto & Ikemoto, 2017; Cown et al., 2017; Zhou et al., 2014).

Conclusions

The result of this study revealed that the nutrition education program given to primary school-age children to introduce them to nutritious food items and provide them with information on healthy nutrition habits affected their nutritional behaviors positively, improved their nutritional knowledge and reduced their body mass index. The study results also demonstrated the

importance of such educational practices in preventing overweight or obesity in childhood.

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