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The Effect of Family Participation in Nutrition Education Intervention on the Nutritional Status of Preschool Age Children *

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Abstract

To evaluate the effectiveness of family participation in nutrition education intervention on the nutritional status of preschool age children, a 10-week nutrition education program was implemented in 74 children in a public kindergarten. Children were assigned to one of three groups, namely the family participation group (FPG), the education group (EG), and the control group (CG). Interventions included school-based nutrition education, family nutrition education documents and family-child take-home activities and monthly meetings with families in the FPG, school-based nutrition education in the EG, and no intervention in the CG. Anthropometric measurements and a 3-day food record and food group consumption assessment were completed before and after intervention. Intervention led to positive changes in food availability, offering and consumption patterns in FPG and EG, with greater changes in FPG, along with lower obesity prevalence ($p < 0.05$). Our results show that family participation in a preschool nutrition education program can increase the effectiveness of nutrition education.

Keywords

Nutrition education program
Nutrition
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Introduction

Healthy physiological and psychological growth and development is primarily dependent on adequate and balanced nutrition (Sharma, Chuang, & Hedberg, 2011). Establishing a healthy eating behaviour in childhood helps preventing malnutrition, growth retardation, and acute nutrition problems, in addition to preventing chronic, long-term health problems such as cardiovascular diseases, type 2 diabetes, cancer, obesity, and osteoporosis (Nicklas & Hayes, 2008). Eating disorders in children are often attributable to the incomplete and incorrect eating habits of their families, but parents can effectively change a child's eating behaviour and preferences by increasing their knowledge and changing their attitudes and behaviours toward food to become role models for their children's diets (Campbell, Hesketh, Silverii, & Abbott, 2010; McLeod, Campbell, & Hesketh, 2011; Stage et al., 2018; Vereecken & Maes, 2010; Yabancı, Kısaç, & Karakuş, 2014). Meal time routines have been found to be associated with children's nutritional health, including the frequency with which families share meals together (Hammons & Fiese, 2011) and the ways in which family members interact with each other

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(Fiese, Hammons, & Grigsby-Toussaint, 2012; Kong et al., 2013). Thus, the family-eating environment has a significant influence on the development of a child's eating habits and can ensure the prevention of future chronic diseases (Cooke, 2007).

Children spend an important part of the day in school, and the school serves as an effective environment for learning and developing a healthy eating behaviour. Foods offered at school, its kitchen facilities, and the teachers can also affect the eating behaviour of children (Arcan et al., 2013). The school environment and the child's encounter with food, absent any force or pressure, helps a child learn about these foods. Attractive presentation, positive peer influence and food-related activities can help children learn about and taste new foods (O'Connell, Henderson, Luedicke, & Schwartz, 2012; Jansen, Mulkens & Jansen, 2010; Fisher et al., 2012).

Preschool education can positively affect the children's feeding and food consumption behaviour at home (Kobak & Pek, 2015). Children are eager to learn during the early stages of life and will emulate the behaviours of their parents, family, and teachers by observing (Contento et al., 1995). Anliker, Laus, Samonds, and Beal (1990) have shown that 3-year-olds have significant nutrition information about food groups, exchange of food, source of food, and energy balance. Tatlow-Golden, Hennessy, Dean, and Hollywood (2013) indicated that children of 4 years of age begin to understand the relationship between health and nutrition. Contento et al., (1995) reported that 3-5 year old children can recognize foods and nutrients, are able to understand concepts such as energy content, and that nutritional education improves their knowledge of concepts related to nutrition. Zarnowiecki, Dollman, and Sinn (2011) stated that is convenient for 5-6 year old children to have nutrition education, as they are able to properly identify healthy foods. Thus, interventions should focus on the parents as the "agents of change" for physical activity and nutrition while integrating behavioural therapy techniques and interactive education (Ling, Robbins, & Wen 2016).

Preschool education programs in Turkey do not aim to provide adequate and balanced eating habits. Thus, the aim of this study was to develop and test a nutrition education program that can be integrated into the current preschool education program. This improved nutrition education program and its adaptation into the existing education program is, to the best of our knowledge, a first of its kind effort in Turkey, especially regarding the inclusion of an instructional period. Additionally, to specifically evaluate the effect of family participation, the curriculum was applied in two ways, namely with and without family participation.

The first aim of this study was to assess the effectiveness of a nutrition education program developed for preschool children, and the second aim was to assess the impact of the family involvement in this program.

Method

Research Design

We used a quasi-experimental model with a non-equivalent pre-test and post-test control group. Non-equivalent pre-test and post-test control group design is preferred in studies with pre-established groups, and in such an experimental design. As groups were selected from among existing ones, the resultant potential inequality among the groups, especially in this case, was prevented by pretesting (Cook, Campbell, & Shadish, 2002). Two different experimental groups and one control group were used in the study, and the survey questionnaire developed for collecting data was used for both the pre- and post-tests.

Ethical approval was obtained from the Non-Invasive Research Ethics Committee of the Istanbul Medipol University. Then permission was obtained from the Istanbul Provincial Directorate of National Education for the implementation.

Participants

This study was carried out in a state-run preschool (educational institution) located in the province of Istanbul, Kartal. This school was chosen because of the proximity to the research group,

easy of getting permission, teachers volunteering to work, and it being an independent kindergarten with many classes. There were two mornings, two afternoons, and two all-day classes. We randomly assigned the afternoon classes to be the education group (EG), the all-day groups as the family participation group (FPG), and the morning groups as the control group (CG). We intentionally chose groups from classes with different timings to avoid potential parental interaction, which could affect the results.

Pre-test nutritional patterns among the groups of children surveyed as per the experimental design, with unequal pre- and post-test control groups, (Cook et al., 2002) were similar (see Table 1). The potential study population comprised 113 children in six classes, subject to parental consent. However, the parents of 20 children did not respond to the pre-tests even though their children agreed to participate in the education program. At the end of the education, parents of 19 of the 93 children did not answer the post-tests, thus reducing the number of children evaluated to 74 (FPG = 24; EG = 16; CG = 34). Of these, 36 (48.6%) were male and 38 (51.4%) were female. We ascertained that factors such as education level, working conditions, and economic conditions were similar among parents who did and did not participate in the final test.

The sample size of this study was calculated with 'G * Power' software (Faul, Erdfelder, Lang, & Buchner, 2007), which was designed as a general independent power analysis program. Type I and type II error rates were 0.05 and 0.20 in 90% confidence rate, respectively, and three study groups were considered. Sample size was found as 66 regarding to ANOVA (Kruskal-Wallis) test. Within the consideration of result of power analysis, sample size was taken as 113, which is over the estimated participant size (n=66). However, after the losses, 74 participants were completed the study. Thus, 74 participants who completed the study provide the required 66 participants for this study.

Data Collection

Data on the children's eating habits and anthropometric measurements were measured twice before and after the intervention. This research data was collected by assessment of food consumption and anthropometric measurements.

Dietary Assessment

The 3-day food records included one weekend day and two weekdays. Determination of weekday food consumption at home by parents and at the kindergarten by dietitian was at the same day. Parents were informed about how to keep the food consumption records by dietitian. Food consumption at home was provided by the primary parent to record food consumed at home by the child after school, and until the next day at school. At the kindergarten same-day foods were weighed before each meal, and net consumption was obtained by subtracting the weight of the leftover food on the tray for each child. The weekend food consumption was calculated using data obtained from the primary parents' record of all food consumed on one weekend day. The parents were interviewed the following Monday to review portion sizes, food types, ingredients of food preparations and recipes, and brand names of foods. Food consumption at kindergarten was then added to the child's remaining daily intake. This information was utilized to quantify energy, nutrient intake, and food consumption of children. Dietary intake and food groups' consumption data were entered and assessed the using computer software program (Ebispro, Stuttgart, Germany; Turkish version: BeBiS, Vers. 6.1). Nutrient intakes were compared with the recommended dietary allowance (RDA) by the Institute of Medicine (Institute of Medicine, 2006) and the Turkey Dietary Guidelines (Pekcan, Şanlıer, & Baş, 2016).

Anthropometric Measurements

Weight and height measurements by dietitian were acquired before and after the intervention and the body mass index (BMI; kg/m^2 as body weight [kg]/height [m^2]) was calculated. The data were evaluated using WHO Anthroplus and WHO Anthro programs. The measured values were reviewed according to the z-score values. For determination of the nutritional status of the children, weight for age, height for age, and BMI for age was used (World Health Organization, 2010).

Development of Nutrition Education Program

The instructional design used in this study was specifically developed for this study after examining existing instructional designs, and the development process was based on the five-stage ADDIE instructional design model (Morrison, Ross, Kemp, & Kalman, 2010). In the course of the model development, education curricula, goals, and achievements used in pre-primary education institutions, an exemplary one-year plan, regulations to be followed, and nutrition education modules used in different countries were also analysed. Energy and nutrient requirements of preschool children, nutrient deficiencies during the preschool period, nutritional problems, and habits were analysed based on international and Turkish children data. The selected school for the study was visited and considered the needs, opinions, and expectations of the schools' principals and teachers. Information about the school system and programs, available equipment, teacher and children's qualifications were obtained. In the design phase, the goals and contents of the module were written, the activities identified, and the measurement tools prepared. During the development phase, a nutrition education booklet, daily and week plans, course plan, education and materials to be used at home for family participation, and education materials, were prepared for the children. Also the family meeting contents were determined. During the implementation phase, the timetable was prepared, the education budget determined, the learning environment arranged according to each activity, and the education program applied. At this stage, the study researchers pre-applied a group program in a different school one week prior to the actual implementation, and during this evaluation phase, as per practice, the researchers identified the non-working aspects of the program, materials that were inappropriate for the children, and made adjustments for the main intervention.

The program included activities in accordance with the goals of the preschool education program. Therefore, every activity included various aspects of the children's psychomotor, social-emotional, language and cognitive and self-care skills.

The topics of the education program developed are as follows.

Weeks	Topic Headings	Number of Goals
1	Why are we washing our hands?	2
2	We learn to make a fruit salad	4
3	What are the differences in foods?	1
4	We learn food groups	4
5	Milk and products	5
6	Meat and meat products, egg legumes, and nuts/seeds	4
7	Vegetables	4
8	Fruits	4
9	Bread and grains	3
10	How much we should eat from each food group?	4

Intervention of Nutrition Education Program

The study had one experimental group and one control group, consisting of two classes, in which interventions were carried out with and without family participation. The intervention details are as follows:

FPG (n = 24): Family nutrition education documents and family-child take-home activities were given to the FPG to support school nutrition education after each lesson. To evaluate the effectiveness of the nutrition education program, monthly meetings with parents were held to provide information to and interact with the families.

EG (n = 16): Nutrition education was given only in the school.

CG (n = 34): This group received no intervention and continued its education as usual.

The study was conducted in three stages. In the first stage, the families' socio- demographic attributes, eating habits of the children, and overall general health were determined using a questionnaire for all groups. Three-day food records of the children were obtained from the parents and the food consumption at the kindergarten was weighed and recorded by dietitian. The dietitian measured the initial body weight and height of all groups in two-week period. Nutrition education program and research process were introduced to the teachers of the school. The second stage was the intervention period with a 3-month duration that corresponded to the spring semester of 2015, between January 9 and June 12, spanning 14 lecture weeks. During this period, the nutritional education was not included in CG's lesson plans. The nutrition education program was implemented for 10 weeks in the FPG and EG due to pre-test applications, preparatory meetings, one week of public holiday and one week of parents not sending their children to the school. Education was provided three times per week, with each session lasting 45 minutes. The topics covered during each nutrition lesson were incorporated into the school meals and snacks for that day. All education was provided by one study team member who was an expert in child nutrition, with the support of other team members. The program provided fun and interactive learning opportunities on food groups and healthy eating habits. It used colour, music, and exploration of the senses to teach children. All lessons incorporated one or more education and acquisition targets such as learning domains, including literacy, math, and science. Several of the lessons provided opportunities for children to try new foods. In the third stage (post-intervention period), assessment of the three-day food records and weighing of food consumption at the kindergarten and the anthropometric measurements of children were repeated.

Data Analysis

All analyses were conducted using the Statistical Package for Social Sciences (SPSS), ver. 15.0. Descriptive statistics, including minimum, maximum, and frequency tables, were calculated. Mean and standard deviation were used for normally distributed data; median and interquartile ranges were used for non-normally distributed data. The paired sample t-test or the Wilcoxon signed-rank test was used to assess the statistical significance based on the normality of the data distribution; a p-value < 0.05 was considered significant.

The limitations of this study were, firstly the sample size was small, so further researches are needed with larger population size. Secondly, evaluation of the dietary consumptions of the children at home was done self-reports of caregivers. Although parents have been informed by the dietitian to record the dietary consumption record, there may be deficiencies in data collection. On the other side children's food consumptions were weighed by dietitian in kindergarten to minimize misreporting. The dietary consumption evaluation methods are not similar in among groups. Thirdly the 'Nutrition Education Module'–used in this study was arranged according to Turkish particular nutritional behaviours and problems. And the third limitation of this study was the duration of the study. The short-term effect of the nutrition education was observed in the study. May be with better designed research it will be possible to reach the results of long term effects of nutrition education modules. Finally after the nutrition education intervention, it was planned to provide nutrition education to the control group. However, education could not be performed because the data collection process lasted longer than expected.

Results

This study attended 74 children (36 boys [48.6%] and 38 girls [51.4%]). The mean age of the children was 65.6 ± 6.1 months (range 53.0-76.0 months) in the FPG, 68.2 ± 2.5 months (range 64.0-72.0 months) in the EG, and 61.3 ± 6.8 months (range 50.0-73.0 months) in the CG. The anthropometric measurements of the children at baseline and after intervention are shown in Table 1. After intervention in the FPG the mean body weight and height increased, and the z-scores for weight and height for age significantly decreased, in the EG and CG only the height increased significantly ($p < 0.05$).

Table 1. Group-Wise Comparison of Anthropometric Measurements Before and After Intervention

Anthropometric Measurements	FPG				EG				CG			
	Baseline X ± SS	**Post-intervention X ± SS**	**t**	***p***	**Baseline X ± SS**	**Post-intervention X ± SS**	**t**	***p***	**Baseline X ± SS**	**Post-intervention X ± SS**	**t**	***p***
Weight (kg) Min-max	21.6 ± 3.8 15.7-29.8	22.9 ± 4.3 15.9-31.9	−3.496	**0.003***	21.7 ± 4.1 17.7-28.8	21.7 ± 4.0 18.0-30.5	0.096	0.925	20.6 ± 4.0 15.5-35.4	19.4 ± 4.7 15.6-36.1	0.834	0.411
Height (cm) Min-max	115.3 ± 4.7 102.0-123.0	117.0 ± 0.05 103.0-124.0	119.360	**0.0001***	114.4 ± 5.6 107.0-127.0	115.7 ± 5.9 108.0-129.0	81.343	**0.0001***	111.6 ± 5.3 102.0-125.0	113.0 ± 0.1 102.0-127.0	123.283	**0.0001***
BMI (kg/m²) Min-max	16.2± 2.5 13.2-22.6	16.5 ± 2.7 11.4-22.1	9.55** 10.62**	-0.402 0.687	16.5 ± 2.0 13.7-20.2	16.1 ± 2.0 12.8-19.8	7.86 9.00	−0.672 0.501	16.4 ± 2.1 12.8-22.6	16.1 ± 3.4 12.6-22.4	19.38** 13.56	−0.78 0.938
Weight for age Z-score Min-max	0.8±1.1 −1.2-2.8	0.05±0.6 −1.4-2.8	2.975	**−0.007***	0.6±1.2 −0.9-2.6	−0.04±0.08 −0.9-2.5	1.711	0.108	0.7±1.2 −2.0-3.7	0.6±1.0 −2.1-3.6	0.207	0.837
Height for age Z-score Min-max	0.7 ± 1.0 −1.7-2.7	0.06 ± 0.6 −1.8-2.7	2.696	**0.013***	0.2 ± 1.0 −1.1-2.7	−0.2 ± 0.7 −1.3-2.7	1.439	0.171	0.3 ± 1.0 −1.3-2.4	0.3 ± 0.9 −1.4-2.5	0.269	0.790
BMI for age Z-score Min-max	0.4 ± 1.5 −1.8-3.2	−0.01 ± 0.8 −3.8-2.9	1.266	0.218	0.6 ± 1.2 −1.3-2.9	0.1 ± 0.9 −2.3-2.5	1.475	0.161	0.7 ± 1.2 −1.9-3.3	0.7 ± 1.0 −2.1-3.3	−0.012	0.990

*p < 0,05

After the intervention in all groups according to the weight for age, the frequency of the children with normal body weight was increased. According to height for age in FPG the frequencies of stunted and long children were increased; in EG the frequency of children with normal in height was decreased, long children were increased, however in CG stunting, normal and long children frequencies were increased, very long children frequency was decreased. Before intervention body mass index for age, the frequencies of overweight and obese children were 29.2% in FPG 43.7% in EG and 35.2% in CG. After the intervention frequencies were increased in FPG and EG, whereas did not change in CG. Reduction of the frequency was higher in EG than in FPG (Table 2).

Table 2. Distribution of the Percentile Values of Anthropometric Measurements by Education Groups Before and After Intervention

Anthropometric Measurements	FPG				EG				CG				Total Group			
	Baseline		Post-intervention		Baseline		Post-intervention		Baseline		Post-intervention		Baseline		Post-intervention	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Weight for age																
Underweight	2	8.3	1	4.2	-	-	-	-	1	2.9	1	2.9	3	4.0	2	2.8
Normal	13	54.2	14	58.3	12	75.0	13	81.3	20	58.8	23	67.7	45	59.5	50	67.6
Overweight	3	12.5	3	12.5	-	-	-	-	8	23.5	6	17.6	11	25.7	9	12.1
Obese	6	25.0	6	25.0	4	25.0	3	18.7	5	14.7	4	11.8	15	10.8	13	17.5
Height for age																
Stunting	1	4.2	3	12.5	1	6.3	1	6.3	2	5.9	3	8.8	4	5.4	7	9.5
Normal	13	54.2	13	54.1	12	75.0	11	68.7	24	70.6	25	73.5	49	66.2	49	66.2
Long	6	25.0	7	29.2	2	12.4	3	18.7	3	8.8	4	11.8	11	17.6	14	18.9
Very long	4	16.6	1	4.2	1	6.3	1	6.3	5	14.7	2	5.9	10	10.8	4	5.4
BMI for age																
Underweight	3	12.5	5	20.8	1	6.3	3	18.7	1	2.9	2	5.9	5	6.8	10	13.5
Normal	14	58.3	13	58.2	8	50.0	8	50.0	21	61.9	20	58.8	43	58.1	41	55.4
Overweight	1	4.2	2	8.3	3	18.8	2	12.6	6	17.6	5	14.7	10	13.5	9	12.2
Obese	6	25.0	4	16.7	4	24.9	3	18.7	6	17.6	7	20.6	16	21.6	114	18.9

As shown in Table 3, after intervention, the dietary energy percentage–from proteins was significantly higher in the FPG, whereas the dietary energy, carbohydrate, and fibre intake reduced significantly in the EG ($p < 0.05$). In the CG, only the fibre intake decreased significantly ($p < 0.05$).

After intervention, only vitamin B_{12} intake increased significantly in FPG ($p < 0.05$), while there were no significant changes in the vitamin intake in EG and CG ($p > 0.05$). The mineral intake was not significantly increased among groups ($p > 0,05$).

Table 3. Group-Wise Comparison of Daily Energy, Macro- and Micro-Nutrient Intake Before and After Intervention

Energy, macro and micro nutrients	FPG					EG					CG				
	Baseline	Post-intervention	Mean rank	Z	*p*	Baseline	Post-intervention	Mean rank	Z	*p*	Baseline	Post-intervention	Mean rank	Z	*p*
Energy (kcal)															
Median	1507.6	1331.0	11.21	1.442	0.149	1619.2	1333.2	8.82	2.101	**0.036***	1519.6	1393.9	16.06	1.634	0.102
1.Quartile	1261.3	1152.1	10.57			1341.9	1132.9	5.75			1389.4	1262.1	11.00		
3.Quartile	1670.9	1700.1				1706.4	1625.3				1620.6	1543.8			
Protein (g)															
Median	51.1	61.8	9.89	0.921	0.357	57.1	55.2	8.89	1.136	0.256	50.8	55.0	14.47	0.673	0.501
1.Quartile	45.6	42.8	11.83			47.4	42.2	6.67			48.3	48.6	13.42		
3.Quartile	66.6	68.5				65.2	60.3				62.6	58.9			
Protein (%)															
Median	15.0	16.0	7.50	2.751	**0.006***	14.0	15.0	6.88	1.603	0.109	15.0	15.0	9.79	1.902	0.057
1.Quartile	13.5	15.5	8.64			13.0	14.0	7.75			13.0	14.0	12.30		
3.Quartile	15.5	18.0				16.0	16.0				17.0	17.0			
Fat (g)															
Median	65.8	60.2	12.92	1.373	0.170	73.2	65.1	10.22	1.817	0.069	70.6	64.6	16.27	1.321	0.186
1.Quartile	54.2	46.1	8.44			63.0	54.5	4.67			52.9	55.0	11.17		
3.Quartile	75.9	71.7				80.7	73.2				78.7	69.5			
Fat (%)															
Median	40.0	40.0	10.23	0.610	0.542	41.0	43.0	7.42	0.884	0.377	41.0	41.0	15.04	0.205	0.838
1.Quartile	38.0	36.5	12.25			37.0	40.0	8.39			39.0	38.0	13.17		
3.Quartile	41.0	42.0				43.0	45.0				44.0	44.0			
Carbohydrate (g)															
Median	168.3	142.6	10.38	1.755	0.079	179.8	131.1	9.50	1.988	**0.047***	162.6	159.3	14.88	1.538	0.124
1.Quartile	132.2	105.3	13.00			129.5	114.0	5.00			140.8	119.6	12.50		
3.Quartile	183.0	186.4				203.1	162.9				180.4	176.4			
Carbohydrate (%)															
Median	46.0	44.0	11.86	0.522	0.602	44.0	41.0	8.94	1.168	0.243	44.0	44.0	14.64	0.385	0.700
1.Quartile	43.0	39.0	10.05			41.0	40.0	6.58			40.0	39.0	13.31		
3.Quartile	48.0	48.0				48.0	43.0				48.0	48.0			

Fiber (g)															
Median	15.5	13.5	10.53	1.477	0.140	14.9	13.0	8.33	2.272	**0.023***	13.7	12.1	14.93	2.631	**0.009***
1.Quartile	12.4	10.1	12.17			12.5	10.4	6.67			11.8	9.7	11.36		
3.Quartile	17.7	15.9				19.2	15.3				17.5	14.8			
Vitamin A (mcg)															
Median	596.7	630.7	11.70	0.052	0.958	737.3	651.2	7.73	1.420	0.156	591.5	604.8	14.00	0.168	0.866
1.Quartile	486.2	401.1	10.36			523.8	413.1	8.75			471.1	502.6	14.00		
3.Quartile	715.6	838.8				988.9	851.3				863.4	989.1			
Vitamin E (mg)															
Median	15.6	14.6	11.23	1.060	0.289	17.5	17.6	6.89	0.114	0.910	14.7	13.7	15.10	0.913	0.361
1.Quartile	14.9	10.5	10.63			14.4	12.8	9.67			10.1	10.6	13.35		
3.Quartile	18.1	17.9				19.4	19.4				17.5	20.1			
Vitamin B1 (mg)															
Median	0.65	0.6	10.14	1.382	0.167	0.6	0.6	11.14	1.024	0.306	0.7	0.6	14.34	1.372	0.170
1.Quartile	0.56	0.5	11.33			0.5	0.5	5.25			0.5	0.5	12.15		
3.Quartile	0.83	0.8				0.8	0.7				0.8	0.7			
Vitamin B2 (mg)															
Median	1.13	1.1	11.50	0.417	0.676	1.2	1.2	8.44	0.426	0.670	1.2	1.1	13.46	0.012	0.990
1.Quartile	0.92	0.9	10.63			1.0	1.0	7.50			1.0	1.0	14.58		
3.Quartile	1.40	1.6				1.4	1.4				1.4	1.4			
Vitamin B6 (mg)															
Median	0.95	0.9	10.83	0.504	0.614	1.0	0.9	9.33	1.364	0.173	0.9	0.9	14.39	0.300	0.764
1.Quartile	0.77	0.8	11.22			0.8	0.7	6.00			0.8	0.8	13.58		
3.Quartile	1.16	1.1				1.3	1.0				1.0	1.1			
Vitamin B12 (mcg)															
Median	3.78	4.7	11.00	2.485	**0.013***	3.7	4.4	8.50	1.477	0.140	4.3	4.4	13.79	0.096	0.923
1.Quartile	3.01	3.6	11.00			2.6	3.0	7.82			2.8	3.2	14.23		
3.Quartile	4.23	5.9				4.9	5.7				5.3	5.7			
Folate (mcg)															
Median	173.5	167.8	11.36	0.330	**0.741**	178.5	171.4	10.11	1.761	0.078	165.4	160.1	15.06	1.249	0.212
1.Quartile	150.4	145.9	10.60			169.7	148.5	4.83			146.4	142.5	12.45		
3.Quartile	210.7	206.7				204.9	197.6				204.5	193.0			

Vitamin C (mg)															
Median	69.1	57.4	10.43	1.060	**0.289**	66.0	53.1	9.38	0.852	0.394	70.4	68.4	13.12	0.817	0.414
1.Quartile	42.7	38.5	12.14			41.7	45.3	6.43			43.5	41.2	15.50		
3.Quartile	90.3	77.3				98.2	63.8				97.3	93.7			
Calcium (mg)															
Median	719.3	621.8	11.30	0.087	**0.931**	731.5	755.9	7.22	0.284	0.776	745.3	734.7	12.64	0.288	0.773
1.Quartile	572.2	489.8	10.73			515.8	602.0	9.17			614.2	614.7	15.46		
3.Quartile	881.2	933.9				867.0	824.6				913.2	920.9			
Magnesium (mg)															
Median	230.2	213.6	10.00	0.852	**0.394**	222.7	210.0	9.22	1.306	0.191	209.1	207.5	14.94	1.201	0.230
1.Quartile	184.7	159.7	13.00			186.6	173.0	6.17			185.1	182.2	12.64		
3.Quartile	261.3	293.8				271.8	232.7				240.6	225.5			
Phosphor (mg)															
Median	926.3	933.5	9.60	0.678	**0.498**	976.5	930.1	8.00	1.136	0.256	974.6	942.7	14.64	0.384	0.701
1.Quartile	822.3	736.3	12.27			906.3	831.1	8.00			851.3	826.7	13.31		
3.Quartile	1070.1	1209.5				1144.3	1112.7				1110.7	1048.6			
Iron (mg)															
Median	7.5	7.8	12.10	1.191	**0.848**	8.8	7.5	8.90	1.647	0.100	7.4	7.1	16.39	0.973	0.331
1.Quartile	6.8	6.0	10.00			6.9	5.9	6.20			6.4	6.5	11.42		
3.Quartile	9.1	9.3				9.5	9.5				8.8	8.3			
Zinc (mg)															
Median	7.6	8.7	7.10	1.547	**0.122**	7.9	8.3	7.07	0.596	0.551	8.1	7.8	12.94	0.432	0.665
1.Quartile	6.9	7.0	14.55			6.6	6.9	8.81			6.9	7.0	15.55		
3.Quartile	9.1	11.2				9.7	10.1				9.5	8.6			

*$p < 0,05$

Table 4. Group-Wise Comparison of Various Food Groups Daily Consumption Before and After Intervention

Food groups	FPG					EG					CG				
	Baseline	Post-intervention	Mean rank	Z	*p*	Baseline	Post-intervention	Mean rank	Z	*p*	Baseline	Post-intervention	Mean rank	Z	*p*
Dairy group (g)															
Median	325,0	316,0	10,58	0,765	0,444	309,0	359,0	8,33	0,568	0,570	318,0	343,0	13,96	0,152	0,879
1.Quartile	259,5	194,0	11,69			220,0	211,0	7,78			258,0	199,0	13,04		
3.Quartile	489,5	476,5				412,0	436,0				481,0	481,0			
Meat, legume, and nuts group (g)															
Median	84,0	101,0	9,81	1,286	0,198	120,0	104,0	6,86	0,881	0,379	97,0	99,0	14,88	0,252	0,801
1.Quartile	73,0	87,0	11,73			75,0	75,0	11,13			68,0	75,0	13,30		
3.Quartile	108,5	141,5				154,0	136,0				134,0	128,0			
Vegetable group (g)															
Median	139,0	187,0	7,50	2,972	**0,003***	118,0	140,0	8,00	1,590	**0,009***	82,0	97,0	10,13	2,595	**0,009***
1.Quartile	85,5	145,0	11,82			70,0	96,0	8,00			54,0	73,0	15,63		
3.Quartile	157,5	254,0				176,0	231,0				146,0	201,0			
Fruit group (g)															
Median	146,0	141,0	12,31	1,547	0,122	142,0	134,0	9,10	2,419	**0,016***	207,0	175,0	15,78	1,526	0,127
1.Quartile	97,5	69,0	8,88			96,0	68,0	3,50			126,0	87,0	11,41		
3.Quartile	248,5	168,5				301,0	165,0				267,0	216,0			
Bread, cereal group (g)															
Median	228,0	245,0	11,78	0,330	0,741	227,0	220,0	11,50	0,795	0,427	228,0	212,0	17,00	1,586	0,113
1.Quartile	195,0	153,0	10,42			191,0	175,0	6,73			184,0	170,0	10,25		
3.Quartile	259,5	292,5				282,0	253,0				267,0	243,0			
Fat (g)															
Median	24,0	18,0	13,18	2,399	**0,016***	24,0	20,0	9,64	0,944	0,345	22,0	20,0	13,42	0,324	0,746
1.Quartile	20,5	10,5	6,64			19,0	18,0	5,36			18,0	16,0	12,54		
3.Quartile	26,0	22,0				28,0	30,0				27,0	27,0			
Sweets (g)															
Median	10,0	9,0	8,13	0,280	0,779	16,0	12,0	6,50	0,085	0,932	10,0	26,0	7,90	3,456	**0,001***
1.Quartile	7,0	0,5	14,06			3,0	0,0	10,25			6,0	13,0	14,83		
3.Quartile	19,5	27,0				22,0	42,0				17,0	40,0			

*$p < 0,05$

Food groups consumption patterns changed after the intervention and the consumption of vegetables significantly increased in all groups ($p < 0.05$) with higher consumption in the FPG (median 187.0 g) compared with the EG (median 140.0 g) and the CG (median 97.0 g). Fruit consumption decreased in all groups, but was significant only in the EG ($p < 0.05$). Fat and oil consumption decreased in all groups after intervention and the reduction was significant in the FPG ($p < 0.05$). Sweets consumption decreased in the FPG and EG; however, it increased significantly in the CG ($p < 0.05$; Table 4).

Discussion, Conclusion and Suggestions

In preschool age children, insufficient knowledge and non-nutritional behaviour of families have a direct influence on the feeding of children and leads to problems such as obesity, weakness, and developmental retardation (Şanlıer, 2013). In this age, most children undergo preschool education, which is an opportunity to develop age-specific nutritional behaviour. A meta-analysis of Da Silveira, Taddei, Guerra, and Nobre (2013) has concluded that school-based nutrition education interventions are effective in reducing the BMI of children and adolescents, and that repetition of a less-intensive multi-component intervention over a longer period of time is more likely to create behavioural changes and result in better anthropometric outcomes. The present study had the duration of 3 months with multiple components such as hands-on activities during education in school, family information and documents sent home to the parents, family-child nutrition activities, and education-information meetings for the family. We did not implement these activates for a longer period of time as the children were soon starting primary school; however, this multi-component approach may have increased the effectiveness of nutrition education. The content of the nutrition education program was based on the Turkey Dietary Guidelines (Pekcan et al., 2016) and American Institute of Medicine (Institute of Medicine, 2006) Dietary Reference Intakes (DRI) recommendations for energy, macro-, and micronutrients. To meet the recommended quantities, children were introduced to the concept of food groups and amount of foods. While Dubois, Farmer, Girard, Burnier, and Porcherie (2011) reported that the energy intake in 4-5 year-old girls was 1520 kcal and that of boys was 1653 kcal. The Turkey Dietary Guidelines recommend 1200-1400 kcal energy per day for 4-6 year-old children (Pekcan et al., 2016). In the present study, the energy intake in all groups, before nutrition education intervention values were above the recommendations and after nutrition education intervention values were at the recommended levels (Pekcan et al., 2016). Specifically, a significant increase was observed in the percentage of energy derived from proteins in the FPG and EG after intervention. In this study found that after the nutrition education intervention, the FPG met the recommendations whereas the EG did not. In a study conducted in children aged 2.5-6.5 years in Belgium, the average fibre intake was 13.4 g/d, and this met 70% of the national recommendations for boys and 81% for girls (Lin et al., 2011). In the USA, it has been emphasized that most preschool children do not meet the fibre intake DRIs (Kranz, Smiciklas-Wright, & Francis, 2006). Irrespective of the group and the educational interventions we found that, the fibre intake did not meet the Turkish recommendations and these results are similar to those reported by other studies (Lin et al., 2011; Kranz et al., 2006). The fibre intake decreased after the nutrition education intervention in all three groups; however, this decrease was significant in the EG and CG, and we propose that this may be due to a reduction in cereal consumption.

After the intervention, there was a significant increase in vitamin B_{12} intake in the FPG, which may be attributable to increased meat consumption. Vitamins A, E, B_2, B_6, and B_{12} intakes were above, vitamin B_1 intake was similar-and folate intake was below than the Turkey Dietary Guidelines in all groups, both before and after the intervention (Pekcan et al., 2016). Vitamin C intake in the FPG was found to be below the recommended values even after the intervention, and may have resulted from a reduction in the consumption of citrus fruits that are seasonal and preferably consumed in the winter. Except for calcium and iron, the mineral intake values were above the Turkey Dietary Guidelines recommendations in all groups after the intervention (Pekcan et al., 2016).

The Australian National Children's Nutrition and Physical Activity Study showed that 3% of children aged 4-8 did not meet the national recommended vegetable consumption levels (Coblac et al., 2008). According to the Cochrane review, in children aged 5 or under, despite promoting the importance of consuming fruits and vegetables, very few studies have tried to achieve this (Wolfenden et al., 2012). In Australia, a 10-week nutrition education program for children called "Vegie Fun for Everyone" has been developed and applied by a dietitian to increase their knowledge about vegetables, and the program was able to change the children's attitudes towards demanding, decision-making, and consuming vegetables (Whiteley & Matwiejczyk, 2015). The CATCH Early Childhood program, under the Head Start program and as part of the preschool-based nutrition and physical activity program that included 74 children and their parents, showed a trend of increase in the children's fruit and vegetable consumption at school, but the difference was not statistically significant (Sharma et al., 2011). The 6-10 weeks nutrition education program conducted by an expert dietitian in preschool children and their families had a significant and positive effect on the consumption of vegetables and low-fat/skim milk at home (Williams et al., 2014). The "Color Me Healthy" eating and physical activity in children, with an interactive program for preschool children, has reported a 33.1% increase in vegetable consumption (Witt & Dunn, 2012). After the nutrition education program we found that, the vegetable consumption increased in all groups, and especially in FPG, but that fruit consumption reduced in all groups, with a significant reduction in the EG. The interventions in our study significantly reduced fat consumption only in the FPG. Sugar consumption increased twofold in CG.

"The Snack Pack Project" nutrition education program, lasting 19 weeks, provided information on one food group each month with hands-on activities every week and food books and take-home materials (Knepple et al., 2012). It reported an increase in the knowledge about food groups and the relationship between health and nutrition. Schindler, Corbett, and Forestell (2013) demonstrated that nutrition education was effective in improving knowledge about healthy food, and children's willingness to try new healthy foods was stated to be an effective method to reduce certain neophobias. In this study, the nutrition education interventions reiterating the importance of fruits and vegetables and a low-fat diet, as well as of reducing the number of servings and consuming nutritious non-sweetened foods, may have been effective in bringing about a positive change. Parents act as models during the preschool period through their nutrition knowledge and behaviour, by introduce to new foods, enabling food purchase and availability at home, and also rules at family meal times; all these factors assume a major role in the development of a child's food preferences (McLeod et al., 2011; Ling et al., 2016; Lin et al., 2011). In the study, Hendrie, Sohonpal, Lange, and Golley (2013) provided nutrition education to the family, and were able to demonstrate an increased sense of family responsibility about food availability at home and of parents' responsibility. Similarly, Wyse, Campbell, Nathan, and Wolfenden (2011) found a positive correlation between children's fruit and vegetable consumption and various aspects of their parents' fruit and vegetable consumption such as consumption opportunities, accessibility, and meal array patterns provided to children by parents during the day. Williams et al. (2014) have determined that the nutritional education in children led to an increase in the number of days that children demanded and consumed a snack consisting of vegetables; however, this did not apply to fruits. In this study, we evaluated the changes in the foods being offered to children and their consumption after the intervention, and found that more positive changes occurred in FPG and EG than in CG. Food availability at home and children's consumption showed more positive changes in FPG, based on the statements from the families, and we think that the information documents given to the families specifically provided about this change. Contento (2007) and Williams et al. (2014) have included family nutrition education in schools and reported that despite factors such as families being busy, not being able to regularly participate in education, and insufficient information document returns, parent-child activities that involved behaviour achievement award vouchers and methods that led to the family having fun and spending time together were more successful. According to the study of Stage et al., (2018) more training and education opportunities for parents and teachers may be needed. Despite barriers, supporting parents should continue to reinforce positive nutrition messages among preschool children. In this study, with the nutritional information

documents provided, vast majority of the parents in the FPG participated in the home event along with their children and indicated that they found it useful. Furthermore, most families provided a positive feedback to nutrition education.

Our results showed that family participation in preschool nutrition education programs, as well as family awareness and knowledge, are effective in enhancing positive nutritional behaviours in children. Moreover, family participation alone had a greater positive effect on the child's nutrition behaviour compared to the nutrition education given at school.

So, nutrition education programs must be continuous and mandatory in pre-school education programs for learning healthy and well-balanced nutritional habits. Menu planning management by dietitians in kindergartens is also very essential for the children to meet their nutritional needs.

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