Obesity Awareness Among Elementary School Students: A Controlled Before – After Study

Eda Aktaş[1] [ID], Çağrı Çövener Özçelik[2] [ID]

[1] University of Health Sciences, Hamidiye Faculty of Nursing, Department of Pediatric Nursing, İstanbul, Türkiye.

[2] Marmara University, Faculty of Health Sciences, Department of Pediatric Nursing, İstanbul, Türkiye.

Correspondence Author: Çağrı Çövener Özçelik
E-mail: ccovener@gmail.com

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ABSTRACT

Objective: Obesity is a metabolic disorder that occurs due to excessive body fat accumulation and can lead to physical and emotional problems. Preventing and treating obesity in childhood and adolescence is crucial. The aim of this study was to evaluate the effectiveness of obesity awareness education provided to fourth-grade elementary school students.

Methods: An experimental study with pretest-posttest control group design was conducted. The study sample consisted of a total of 663 students, 344 students in the experimental group and 319 students in the control group, who attended the fourth grade of two elementary schools in Istanbul and met the inclusion criteria.

Results: The sample included 326 girls (49.2%) and 337 boys (50.8%). The mean (SD) BMI was 18.45 (3.49) in the experimental group and 18.04 (3.00) in the control group. 73% (n = 251) of the students in the experimental group and 77.7% (n = 248) of the students in the control group stated that obesity only made walking/running difficult. There was no difference in obesity awareness scores between the experimental and control groups before the education (p=0.92). However, at 1 week and 1 month after the education, the experimental group had significantly higher scores compared to the control group (p<0.001 for both).

Conclusion: Our results showed that fourth-grade elementary school students were aware of obesity, but their awareness increased significantly compared to the control group after receiving obesity awareness education. This study showed that raising children's awareness would help avoid factors that could lead to obesity.

Keywords: Obesity, health education, school-age children, awareness
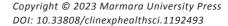
1. INTRODUCTION

The World Health Organization (WHO) defines obesity as "excessive fat accumulation that presents a risk to health" (1). Obesity is a public health problem that negatively affects both the duration and quality of life (2,3). Numerous international organizations have declared obesity an epidemic that poses a growing threat to children and adolescents worldwide, especially in developed countries (4,5). The significant increase in childhood obesity also predisposes to type 2 diabetes, asthma, sleep apnea, hypertension, cardiovascular disease, musculoskeletal system disorders, increased mortality and morbidity rates in adulthood, low self-esteem, and emotional and social problems (2-4).

The WHO reported that 39 million children under the age of 5 were overweight or obese in 2020 and over 340 million children and adolescents aged 5-19 were overweight or obese in 2016 (6). In the United States, the prevalence of obesity in children aged 2-19 years is 18.5% (7). In Türkiye, the prevalence of obesity is reported to be 8.5% in children aged 0-5 years and 8.2% among children and adolescents aged 6-18 years (8).

The literature indicates that a child's diet is shaped by their eating habits during infancy, that the dietary habits of parents can cause obesity, and that changes in the gut microbiota can also be a precipitating factor in the development of obesity (9). Moreover, obesity can also be triggered by environmental factors in children with genetic predisposition (10). With rapid urbanization, the increased consumption of ready-to-eat foods, irregular eating habits, as well as low levels of physical activity and more sedentary lifestyles increase the risk of obesity (4). For these reasons, obesity prevention and treatment in childhood and adolescence is becoming increasingly important (4,11).

Children spend the majority of their waking hours in school (12). Therefore, the school setting provides access to large numbers of children and is a critical environment for introducing health services and strategies and promoting health behaviors (12,13). The earlier in life health-promoting behaviors are learned, the more permanent and effective they will be (14). In addition, within the team that provides school health services, school nurses play a vital role in protecting student

health (15). School nurses have important responsibilities in the fight against obesity at health promotion (15,16). The aim at health promotion is to maintain a healthy weight or reduce weight to within normal limits (3). School nurses can take precautions to lower the risk of obesity or overweight, and can act as educators and role models for school children in developing healthy dietary and physical activity habits (12,16). In the management of obesity, nursing interventions such as education, care, and support are important for devising, implementing, and evaluating strategies to solve the problem of obesity in children (17).

Obesity is a serious global health problem, and its prevention, early diagnosis, and treatment is becoming increasingly urgent (3,9). We believe that this study will raise awareness about childhood obesity among school children and contribute to similar studies.

The aim of this study was to evaluate the effectiveness of obesity awareness education provided to fourth-grade elementary school students. The hypothesis was **"**obesity awareness education program is effective to achieve obesity awareness for elementary school children**"**

2. METHODS

2.1. Study Design

An experimental study with pretest-posttest control group design was conducted between February and April 2017 at two different primary state schools in Istanbul.

2.2. Participants

The study included fourth-grade students enrolled in two elementary schools in Istanbul who met the selection criteria. Sample size was determined by performing power analysis using the G*Power (v3.0.10) program. The power of the study is expressed as 1-β (β = Type II error probability) and in general, studies should have at least 80% power (20). The standard deviation of the total score of the Obesity Awareness Scale (OAS) used in this study was reported as 58.28± 8.66 in the literature (19). Using this value, the total sample size for 90% power at an alpha error level of 0.05 and effect size 0.30 was 644 subjects. The sample comprised a total of 663 students, 344 in the experimental group and 319 in the control group. 25 students in the control group did not participate in the follow-up tests because they were not at school on the day of data collection. Because of that study completed 319 students in control group. Which school will be in the experimental group and which will be in the control group was determined by drawing lots. Because the OAS is designed to measure obesity awareness in children aged 10-14 years, the study was conducted with students in the fourth grade (10 year age group). Inclusion criteria for the study were being a fourth-grade student in the participating schools and not having autism or any mental disability. Exclusion criteria were being absent from school during data collection and not consenting

to participate in the study. All the students who met the inclusion criteria participated the study.

2.3. Instruments

Data were collected using a sociodemographic information form and the OAS.

Sociodemographic information form: The form consisted of 16 questions (11 closed-ended, 5 open-ended) prepared by the researchers in line with the literature (20) to evaluate the sociodemographic characteristics of the students participating in the study.

Obesity Awareness Scale (OAS): This scale was developed by Allen (21) and adapted to Turkish by Kafkas and Özen (20). The scale measures obesity awareness in children aged 10-14 years. The Turkish version of the instrument contains a total of 20 items in 3 domains. The Obesity Awareness subscale contains 9 items, the Diet subscale contains 6 items, and the Physical Activity subscale contains 5 items. Each item is rated on a 4-point Likert scale from "strongly disagree" (1 point) to "strongly agree" (4 points). The total score ranges from 20 to 80, with higher total score indicating a higher level of obesity awareness.

2.4. Data Collection

The study was conducted in two different schools to prevent group interactions. Both schools in the study operated using a double-shift schedule (morning and afternoon). Therefore, data collection was carried out during both the morning and afternoon sessions. Data were collected from the experimental and control groups in the students' classrooms under the supervision of the researchers. First, the sociodemographic information form and OSA were administered to both groups as the pretest. Data collection lasted approximately 20 to 30 minutes. After completing the forms, the students in the experimental group received a 30-minute education on obesity awareness on the same day by researchers in their classrooms.

2.5. Intervention

The education covered topics such as the definition of obesity, the prevalence of obesity in children, problems caused by obesity, the causes of obesity, and how to recognize obesity. In the posttests, the entire experimental group completed the OSA again 1 week and 1 month after the education. The students in the control group also completed the OSA at 1 week and 1 month after the pretest, without receiving the education.

2.6. Data Analysis

Statistical analyses were performed using NCSS (Number Cruncher Statistical System) 2007 software (Kaysville, Utah, USA; License No: 167.594.8377483; Serial No: N7H5-J8E5-D4G2-H5L6-W2R7). Kolmogorov-Smirnov test was used to determine whether continuous variables were normally distributed. Data were not normally distributed.

Mann-Whitney U test was used to evaluate differences between the experimental and control groups. Friedman test was used to compare the means of multiple dependent groups, and pairwise comparisons were performed using Wilcoxon paired rank test to determine the source of significant differences. The results were evaluated within a 95% confidence interval. Statistical significance was accepted at p values less than 0.05. For categorical variables, frequency and percentage values were presented as descriptive statistics.

2.7. Ethical Considerations

Approval to conduct the study was obtained from the Marmara University Institute of Health Sciences Ethics Committee (approvel date 07.11.2016 and number 88) and written consent obtained from T. C. Istanbul Governorship Provincial Directorate of National Education (13.01.2017-493278). However, a written informed consent was obtained from all children participating in the study and their families. After completing data collection from the experimental and control groups, the students in the control group were also given the obesity awareness training.

3. RESULTS

3.1. Characteristics of the Participants About Obesity

The characteristics of the participants are shown in Table 1. The sample included 326 girls (49.2%) and 337 boys (50.8%). The mean (SD) BMI was 18.45 (3.49) in the experimental group and 18.04 (3.00) in the control group. There was no difference between experimental and control group according to pre-test results of OSA (U=54639.50; p=0.92). 73% (n = 251) of the students in the experimental group and 77.7% (n = 248) of the students in the control group stated that obesity only made walking/running difficult. However, it was found that the same group did not have sufficient information about other health problems caused by obesity (diabetes, kidney disease, circulatory disorder).

3.2. The Effect of Obesity Awareness Education

There was no difference in obesity awareness scores between the experimental and control groups before the education (p=0.92). However, at 1 week and 1 month after the education, the experimental group had significantly higher scores compared to the control group (p<0.001 for both). In within-group comparisons, the experimental group showed significant increases in OSA score at 1 week and 1 month after the education when compared to before the education (p<0.001). Pairwise comparisons showed that OSA scores at both 1 week and 1 month were higher than before the education, and that the score at 1 month was higher than at 1 week (Table 2). Comparison of the students' OSA scores based on their sociodemographic characteristics is shown in Table 3.

Table 1. *Characteristics of the participants about obesity*

Characteristic	Experimental group (n = 344)		Control group (n = 319)	
	n	%	n	%
What is obesity?				
Extremely overweight	265	77.0	267	85.9
Diabetes	46	13.4	27	8.7
Kidney disease	18	5.2	7	2.2
Circulatory disorder	15	4.4	10	3.1
How many hours a day do you watch TV or play with the computer?				
Less than 2 hours	209	60.8	219	68.7
2 hours or more	135	39.2	100	31.3
Do you eat or drink while watching television or using computers?				
Yes	147	42.7	100	31.3
No	197	57.3	219	68.7
Do you have breakfast regularly every morning?				
Yes	289	84	275	86.2
No	55	16	44	13.8
How often do you consume food/drinks like soda, chips, hamburgers, candy, etc.?				
Everyday	13	3.8	26	8.2
A few times a week	132	38.4	147	46.1
Several times a month	109	31.7	89	27.9
Never	90	26.2	56	17.6
How many hours a night do you sleep?				
Less than 8 hours	110	32.0	120	37.6
8 hours or more	234	68.0	199	62.4
Do you do sports?				
Yes	276	80.2	267	83.7
No	68	19.8	52	16.3
Do you eat before going to bed at night?				
Yes	132	38.4	107	33.5
No	212	61.6	211	66.1
Do you get junk food/drinks (soda, candy, etc.) from your friends?				
Yes	86	25.0	49	15.4
No	258	75.0	270	84.6

Table 2. *Comparison of obesity awareness scale scores of the children before and after the education*

Obesity Awareness Scale scores		Experimental group (n=344)		Control group (n=319)		Test value
		Median (Q1-Q3)	Mean rank	Median (Q1-Q3)	Mean rank	U; p
OAS total score	Pretest[a]	56 (50-63)	1.65	56 (49-62)	1.89	54639; 0.92
	Posttest (1 week)[b]	61 (55-66)	2.12	57 (49-65)	2.05	**42773; <0.001**
	Posttest (1 month)[c]	62 (57-66)	2.22	57 (50-65)	2.06	**93813; <0.001**
	χ²; p	66.967; <0.001 b>a c>a c>b		5.931; 0.06		

χ²: Friedman test   U: Mann-Whitney U test   Significant results shown in bold (p<0.05)

Tablo 3. Comparison of obesity awareness scale scores according to sociodemographic characteristics about obesity

Characteristic		Experimental group(n=344)		Control group(n=319)		Test value
		Median (Q1-Q3)	Mean rank	Median (Q1-Q3)	Mean rank	U; p
How many hours a day do you watch TV or play with the computer?						
< 2 hours	Pretest	57 (50-63)	1.62[a]	56 (49-63)	1.87	22725.50; 0.90
	Posttest (1 week)	61 (55-66)	2.17[b]	57 (50-65)	2.06	**17701; <0.001**
	Posttest (1 month)	62 (57-66)	2.20[c]	58 (50-65)	2.07	**18006; <0.001**
	Test value (χ^2; p)	**46.06; <0.001 a<b; a<c; b<c**		5.88; 0.05		
≥ 2 hours	Pretest	56 (51-63)	1.70[a]	56 (51-62)	1.94	6746.50; 0.995
	Posttest (1 week)	60 (55-65)	2.04[b]	56 (49-62.75)	2.02	**5214; 0.003**
	Posttest (1 month)	62 (56-66)	2.26[c]	56 (49.25-64.75)	2.04	**4908.50; <0.001**
	Test value (χ^2; p)	**23.02; <0.001 a<b; a<c;b<c**		0.58; 0.74		
Do you have breakfast regularly every morning?						
Yes	Pretest	57 (51-63)	1.67[a]	56 (49-62)	1.90	38327; 0.466
	Posttest (1 week)	61 (55-66)	2.12[b]	56 (49-65)	2.06	**30278.50; <0.001**
	Posttest (1 month)	62 (57-66)	2.21[c]	57 (49-65)	2.04	**29374; <0.001**
	Test value (χ^2; p)	**50.80; <0.001 a<b; a<c; b<c**		4.42; 0.10		
No	Pretest	54 (46-61)	1.57[a]	56 (52-62)	1.86	1008.50; 0.213
	Posttest (1 week)	59 (54-64)	2.13[b]	58 (49-64)	1.95	1002.50; 0.197
	Posttest (1 month)	61 (55-64)	2.30[c]	60 (52-64)	2.19	1090; 0.507
	Test value (χ^2; p)	**17.29; <0.001 a<b; a<c; b<c**		2.55; 0.27		
How many hours a night do you sleep?						
< 8 hours	Pretest	56 (49-63.25)	1.71[a]	56 (49.25-64)	1.96	6380; 0.662
	Posttest (1 week)	60 (54-66)	2.05[b]	56 (47-63.75)	1.99	**4892; 0.001**
	Posttest (1 month)	62.50 (55.75-66)	2.24[c]	55.50 (48-64)	2.05	**4797.50; <0.001**
	Test value χ^2; p)	**16.41; <0.001 a<b; a<c; b<c**		0.44; 0.79		
≥ 8 hours	Pretest	56 (51-62)	1.63[a]	56 (49-62)	1.85[a]	22755.50; 0.684
	Posttest (1 week)	61 (55-66)	2.16[b]	57 (50-65)	2.08[b]	**18778; 0.001**
	Posttest (1 month)	61 (57-66)	2.22[c]	58 (50-66)	2.07[c]	**18420; <0.001**
	Test value (χ^2; p)	**51.97; <0.001 a<b; a<c; b<c**		**7.20; 0.02 a<b; a<c; c<b**		
Do you do sports?						
Yes	Pretest	58 (51-63)	1.67[a]	56 (50-63)	1.90	35823.50; 0.576
	Posttest (1 week)	61 (55.25-6)	2.13[b]	57 (49-65)	2.03	**28263.50; <0.001**
	Posttest (1 month)	62 (56.25-66)	2.20[c]	58 (50-65)	2.07	**28770.50; <0.001**
	Test value (χ^2; p)	**48.68; <0.001 a<b; a<c; b<c**		4.31; 0.11		
No	Pretest	52.50 (47-59.75)	1.60[a]	55 (47.50-60)	1.85	1614; 0.414
	Posttest (1 week)	60 (52.25-65)	2.09[b]	57 (49-62)	2.12	1455; 0.097
	Posttest (1 month)	61.50 (57-65)	2.32[c]	54.50 (50-64)	2.04	**1238.50; 0.005**
	Test value (χ^2; p)	**19.52; <0.001 a<b; a<c; b<c**		2.08; 0.35		

χ^2: *Friedman test U: Mann-Whitney U test Significant results shown in bold (p<0.05)*

4. DISCUSSION

In this study, obesity awareness scores at 1 week and 1 month after the education were significantly increased compared to before the education (Table 2). The students included in the study were 10 years old. Raising obesity awareness may be easier in elementary school children due to their enthusiasm for and openness to learning and their high capacity for acquiring knowledge and skills. Making the education provided to children interesting and engaging may result in the correct behaviors being more memorable and easier to apply to their lives. Furthermore, the high retest results at 1 month after the education show that the education was effective and remembered by the children. We also believe that the interactions between the participating students made the education memorable.

In this study, obesity awareness scores increased significantly in all children who received the education, regardless of their daily screen time (Table 3). In a study on obesity, it was observed that students were active most of the time at school, whereas in the time they spent at home, they were mostly inactive (in front of a television or computer) and their diet changed. Healthy eating and physical activity habits that start in childhood set the stage for adulthood (11). Studies have demonstrated an increase in food intake and BMI in children who watch television for more than 2-3 hours a day (22,23). In addition, while watching television, children may be influenced by unhealthy foods seen in advertisements or programs and their consumption of these foods may increase, and peers may also influence each other (24,25). These issues were covered during the education provided in this study and it was seen that the education was effective in raising awareness of these topics.

In present study, children who ate breakfast regularly and those who did not had increased obesity awareness scores after the education (Table 3). These findings show that the education was effective. Skipping breakfast in children prevents a healthy eating schedule, which can lead to obesity. Efforts to promote a healthy eating schedule in schools should aim to establish favorable dietary behaviors throughout life (26,27). Breakfast is one of the main meals of the day and has an impact on academic success as well as physical growth and development (28).

Another factor that can contribute to obesity is sleep duration. There are many studies demonstrating the relationship between obesity and sleep (29,30). For children, sleep is as important as nutrition and growing up in a safe environment. Children with sleep problems have increased secretion of hunger hormones and decreased secretion of satiety hormones; in other words, there are also irregularities in the hormones that regulate energy balance. Children who do not sleep enough have a greater desire to eat and feel tired during the day. Therefore, they tend to eat more in order to feel more energetic. This results in the intake of more energy than the body needs, which it then stores as fat (31). All of these factors were also discussed in the obesity awareness education and it was found that the education increased awareness on this subject (Table 3).

While the median score of the students who reported not doing sport was 52.50 before the education, it increased significantly to 60 at 1 week after the education and 61 at 1 month after the education (Table 3). Chang and Kim (32) reported that children's physical activities were low due to reasons such as watching television, playing video games, and using computers, and that a low proportion of the students exercised. The results of our study showed that the education provided was effective both in students who did and did not engage in sports. In addition, the fact that the median scores of the students who did not do sport were very close to those of students who did sport suggests that these students may be ready to adopt healthy lifestyle behaviors. It is crucial that students are encouraged to do sport regularly and make it a lifestyle in order to prevent obesity.

4.1. Limitations

The terms such as body mass index (BMI), diabetes, kidney disease, and circulatory disorder in the OSA were difficult for the students to understand. The researchers explained these terms to the students during data collection.

5. CONCLUSION

Our results showed that fourth-grade elementary school students were aware of obesity, but their awareness increased after receiving obesity awareness education. The hypothesis was proved. Considering that healthy lifestyle behaviors gained during childhood will directly affect adult life, providing obesity awareness education to students in schools is imperative.

5.1. Implications of This Paper

Raising children's awareness may help avoid factors that can lead to obesity. School curricula should incorporate content related to obesity in the subject of health education. In terms of protecting and improving the health of school children, it is also important to include pediatric and school/pediatric nurses who will organize health education for family, teachers, students, and school employees. School/pediatric nurses can assume duties in the fight against obesity such as developing healthy cafeteria interventions and encouraging healthy eating habits, educating classroom teachers to be good role models for their students, and promoting physical activity. National action plans can be organized to reach communities and children collectively, such as giving obesity awareness messages in the press and media, increasing appropriate health programs on television and broadcasting attention-getting slogans during programs with large audiences, planning activities where children and families can participate together, and providing practical healthy lifestyle education.

Conflicts of interest: *The authors declare that they have no conflict of interest.*

Ethics Committee Approval: *This study was approved by Ethics Committee of Marmara University Institute of Health Sciences (approvel date 07.11.2016 and number 88)*

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