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The effect of healthy life approaches applied to families of children in preschool on obesity and healthy life behaviour

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Summary: *Aim:* The aim of this study was to determine the prevalence and associated factors of obesity and being overweight in 3-5 year-old children attending public kindergarten and develop healthy lifestyle behaviour by applying supportive healthy lifestyle approaches to families with overweight or obese children. *Method:* The study was composed of two parts: cross-sectional and interventional. The population for the cross-sectional part was 191 children aged between 3-5 and registered to kindergarten, along with and their families. The intervention group accounts for 23 mothers of overweight or obese children diagnosed in the cross-sectional part. Interventions contain counselling interviews, brochures, and letter deliveries showing the weights of their children. Data before and after the intervention were compared. *Results:* The prevalence of being overweight or obese was 27.2%. It was found out that being overweight or obese was associated with the children's sex (p=0.034), the mothers' educational status (p=0.043) as well as the children's breakfast habits (p=0.009). Following the intervention, positive results were acquired relating to the children's weight outcomes, their daily average TV, DVD watching duration, and parental behaviour regarding nutrition (p<0.05). *Conclusion:* It was shown that family-based approaches aiming at the development of healthy lifestyle behaviour in children are effective in preventing and treating obesity.

Key words: being overweight, obesity, preschool period, family-centered intervention

Introduction

Childhood obesity with a progressively increasing frequency in recent years is one of the most important reasons of chronic childhood disease in both developed and developing countries (1). Obesity is seen in every age group and mostly observed in the first years of life, between 5-6 years of age and puberty period due to rapid fat storage. It is known that obesity commencing before the age of 5 and after 15 has more hazardous effects up to adulthood (2). It is not possible to clarify the increase in childhood obesity seen worldwide with only alterations in the genetic structure. Therefore, it is approved that the role of environmental factors are of major priority in the formation of obesity (3).

Childhood obesity poses an important risk for adulthood obesity, on the other hand, it is also risky for many severe chronic diseases leading to early deaths and long term morbidity (1). Obesity in children also induces a substantial decrease in the quality of life, social exclusion, loss of self confidence, reduction in school success, avoidance of peer relations, and even depression and anxiety (4,5). Also, early childhood is particularly important in terms of positive life behaviour acquisition that will continue in the future. Therefore, protection from obesity should proceed from the perinatal period through the entire life span (6).

Families and especially mothers play a very important role in being an exemplar for their children in the pre-school period. Owing to cultural features in

our country, mothers are primarily responsible for the care of pre-school children. Accordingly, family support should be provided for the adoption of healthy lifestyles and effective attempts aiming at the prevention of obesity (7). While there are studies in many countries that indicate the effect of family-centered attempts intending for the acquisition of healthy lifestyle behaviour in pre-school children, there are no studies regarding the issue in question in Turkey (8–13).

The aim of this study is to determine the prevalence and associated factors of obesity and being overweight in 3-5 year-old children attending public kindergarten in 2014-2015 education period in Balçova, Izmir and develop healthy lifestyle behaviour by applying supportive healthy lifestyle approaches to the families of overweight or obese children and evaluate results of the approaches in question.

Methods

Subjects and setting

The study was composed of two parts. The first part was a cross-sectional study and the second was interventional. A total of 191 children aged 3-5 and registered to a public kindergarden in Balçova during the education term of 2014-2015, along with their families accounted for the population of the cross-sectional study. It was aimed to reach the whole population.

The interventional group was composed of 52 mothers of children aged between 3-5 who were either overweight or diagnosed as obese as a result of the cross-sectional research. No control group was involved in the study, the data before and after the intervention were compared in the same group. In overweight or obese children, one-sided decrease in BMI was predicted to be at medium-level and by taking effect-size as 0.50, it was estimated that at least 50 mothers with 80% power should be involved in the interventional group (14).

Ethics committee approval was obtained on the date of 24.07.2014 and 2014/25-15 numbered decision of Dokuz Eylul University Non-Invasive Clinical Research Ethics Committee.

Data collection

Cross-sectional part

Weight and height measurements of 191 children in kindergarden were carried out by a researcher in October and overweight and obese children were determined. In addition, data collection forms and informed consent forms were sent to the families prior to the intervention, and at first; mother, or father in the absence of mother, or in the absence of parents; the person responsible for the care of the child was asked to fill in the forms. Families who did not return the forms were called and the forms were sent again. In conclusion, data collection forms of 146 children were returned and the attainment rate was 76.4%.

Interventional part

The mothers of all overweight and obese children were called and they were informed about the interventional part of the research. As a consequence, 23 out of 52 mothers of overweight or obese children accepted to take part in the research. Every mother was interviewed 4 times in 6 months between November 2014 and April 2015. Throughout the interventions; 5 mothers withdrew from it willingly, hence the research was completed with 18 mothers (34.6%). Post-intervention data collection forms were also filled in by the mothers who took part in the last interviews in April. Weight and height measurements of all children were taken by the same researcher in the last week of April. The flow chart of the research is shown in Figure 1.

Variables of the study

Cross-sectional part

The dependent variable was the condition of a child being overweight or obese. Independent variables were age and sex of children, a chronic disease or condition of the child, mother's age, mother's BMI, parents' marital status, mother's working condition, educational level of parents, father's occupation, income perception, presence of an individual room for the child, having a personal computer/tablet pc, children's TV, DVD, and computer usage duration, nutri-

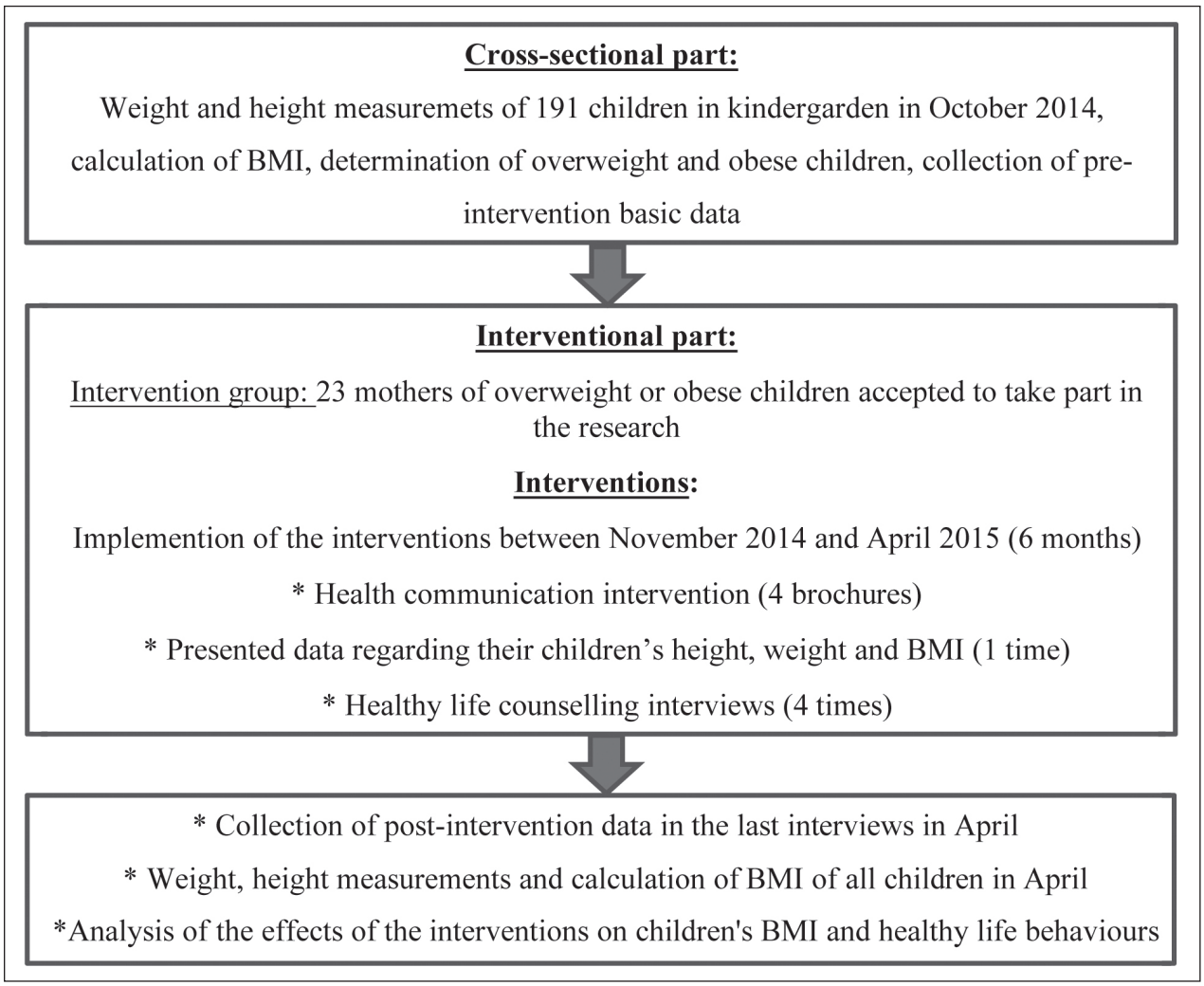

Figure 1. The flow chart of the research

tional behaviours of children, parents' behaviours related to; physical activity, screened devices, and nutrition.

Interventional part

Result variables were children's BMI percentile value and BMI z score, children's TV, DVD watching and computer using duration, their nutritional behaviours, and parents' behaviours related to physical activity, screened devices and nutrition.

Measures

Children's BMI percentile value, BMI z score and BMI of mothers

Weight and height measurements were obtained using standardised techniques before and after intervention. BMI percentile values and BMI z scores of weight and height measurements of children were calculated by using WHO Antro Version 3.2.2 programme; overweight and obese children were identified (15). While research findings were being presented, evaluations were carried out according to the BMI percentiles being utilized.

Weight and height values of mothers were registered according to their statements, and their BMI

(kg/m^2) was calculated. The BMI groups of mothers were determined based on WHO BMI categorization (16).

TV, DVD watching and computer usage durations of children

TV, DVD watching and computer usage durations of children were examined for 24 hours during weekdays and weekends before and after intervention. They were registered in the form of minutes. Duration spared for weekdays were multiplied by 5 and weekends by 2 and the obtained value was divided by 7. The acquired daily average TV, DVD watching and computer usage duration was thus determined.

Nutritional behaviours of children

Children's attitudes regarding having breakfast, lunch, dinner, the frequency of snacking and picky eating habits were collected.

Parental behaviours associated with healthy lifestyles

A total of 20 questions were compiled from the literature. Four of these questions were regarding the facilitation of physical activity of children. We examined families with various parental behaviours associated with physical activity, before and after intervention. Twelve of these questions were regarding parental behaviours concerning nutrition, while 4 questions probed parental behaviours related to screened devices (7,9,11–13).

Components of the Intervention

Health communication intervention

A total of four brochures promoting healthy diet and active life were prepared to be given at every interview. The aim of this intervention was to increase mothers' awareness of healthy life behaviours and confront the notion that fat children are healthy. Each brochure addressed a different issue: "What is obesity?", "Healthy eating and healthy diet examples", "Active life and exercise examples for little children" and "Monitoring sceen time". The focus was to create a parallel between the content of the brochures and the issue involved.

Disclosing children's height, weight and BMI

Letters dwelling on their children's percentiles were given to mothers, while discussing how weight, height and BMI measurements were going to be interpreted. The letters were presented to the mothers in the first interview and were evaluated together with the researcher.

Healthy life counselling interviews

Interviews were conducted with mothers, on a face-to-face basis, who agreed to participate in the study four times in total between November 2014 and April 2015 during 6 months. Solutions were recommended to mothers with regard to the problems determined specifically for their child, and established a set of targets to be completed prior to the next interview. In the first interview; recommendations were made on healthy diet and healthy diet preparation and healthy diet examples were presented. In the second interview; recommendations for active life and exercise for little children were provided. The third interview addressed time control issues for technological devices such as TVs, computers, tablet computers, and cell phones. In the last interview, an overall evaluation of the prior three interviews was carried out while respective feedback was recorded.

Statistical Analysis

For the cross-sectional study, chi-square and Fisher's exact tests were used for categorical variables in the comparison of overweight or obese and non-obese children. For continuous variables, independent-sample t test were utilized. Logistic regression analysis was carried out by forming a model with variables such as "child's frequency of having breakfast", "child's daily average TV, DVD watching duration" which were found significant in the univariate analyses. In addition, variables established as crucial in the literature such as

"child's sex", "mother's education level and employment status", "income perception" were also included.

In the interventional study; McNemar tests were used with the categorical variables to assess the amount of change that occurred before and after the intervention. For continuous variables, Wilcoxon signed rank test was utilized. In addition, results were re-evaluated by performing intention-to-treat analysis in order to minimize the influence of those who withdrew from the research.

Results

Cross-sectional part

Weight and height measurements of all children (n=191) in kindergarten were carried out, in order to establish the prevalence of being overweight and obese. Of the 191 families who were sent forms, 146 (76.4%) families responded, thus accounting for the sample size used in this study (n=146).There was no significant difference between the children of families responding to the questionnaire, as opposed to non-respondence in terms of the children's sex, age group and BMI group (p>0.05).

Regardless of percentile curves and z scores, the prevalence of being overweight or obese was 27.2% in total. In children whose data collection forms were returned (n=146), the prevalence of being overweight or obese was 29.5% in total regardless of their percentile curves and z score.

The average age of the children was 3.9 ± 0.8 with 56% of them being female. 87% of the children had a private room and one third of them had personal/tablet computers. Prevelance of chronic disease in the children were 4% (n=6). When families' characteristics were examined, more than one third of mothers and 80% of fathers were university graduates or had master/doctoral degrees. The percentage of mothers and fathers who were married and living together was 96%. The average age of mothers was 33.4 ±5.1, while 40% of them were employed. One in every three was overweight, obese or morbidly obese (Table 1).

The variables that were not associated to a large extent with the children being overweight or obese (p>0.05) included the children's sex, age, family features, and whether they had a private room, a computer/tablet computer, and chronic diseases.

In overweight or obese children, daily average TV, DVD watching duration was significantly higher than those without overweight or obese conditions (p=0.033), and this difference was due to a distinction in their weekday TV or DVD watching duration (p=0.029). There was no significant difference between

Table 1. Characteristics of the families

Characteristics (n=146)	**n**	**%**
Educational level of mother		
Elementary school	24	16.4
High school	67	45.9
University or master/doctorate degrees	55	37.7
Educational level of father		
Elementary school	30	20.6
High school	56	38.3
University or master/doctorate degrees	60	41.1
Marital status of parents (n=145)*		
Mothers and fathers were married and lived together	140	95.9
Mothers and fathers were divorced	6	4.1
Working condition of mother		
Employed	58	39.7
Unemployed	88	60.3
Father's job (n=145)*		
Unemployed	2	1.4
Blue-collar worker	49	33.8
White-collar worker	49	33.8
Artificer	42	28.9
Agricultural worker	2	1.4
Retired	1	0.7
Income perception		
Very good	1	0.7
Good	41	28.1
Middle	101	69.2
Bad	3	2.0
Mother's BMI group		
Weak	5	3.4
Normal	94	64.4
Overweight	37	25.3
Obese/ Morbidly obese	10	6.9

**One of the fathers was dead.*

overweight or obese children and those who were not, in terms of their daily average computer/tablet computer usage duration (p=0.805).

When nutritional behaviours were analyzed, the frequency of being overweight or obese was significantly low in children having daily breakfast, compared to those who were not (p=0.007). Having lunch, dinner, the frequency of snacking and picky eating habits were not associated with being overweight or obese (p>0.05).

Parental behaviours related to physical activity, screened devices and nutrition were not associated with being overweight or obese (p>0.05).

Logistic regression analysis was performed by forming a model with variables such as "child's frequency of having breakfast", "child's daily average TV, DVD watching duration" that were found significant in the univariate analyses. In addition, variables "child's sex", "mother's education level and employment status", "income perception" were found crucial according to the literature. The risk of being overweight or obese were 2.4 times more in boys compared to that of girls (p=0.034, 95% CI=1.1-5.3). It was discovered that the risk of being overweight or obese was 2.5 times more in children of mothers with high school or lower education level compared to those with university or master/doctorate degrees (p=0.043, 95% CI=1.1-6.1); the risk involved was 7.9 times higher in children with no breakfast habits or those with rare breakfast consumption (p=0.009, 95% CI=1.7-36.6) (Table 2).

Interventional part

18 mothers of 23 overweight or obese children agreed to participate in the interventional research. The characteristics of mothers who agreed to be involved (n=23) and who did not agree to take part in the interventional study (n=20) were compared. Obesity and unemployment frequency of mothers who agreed to join the research compared to those who did not participate were found significantly higher (respectively p=0.037, p=0.023).

Table 2. Risk factors associated with being overweight and obese in children

Characteristics (n=146)	**OR**	**%95 CI**	**p**
Sex			
Female	1.0		
Male	2.4	1.1-5.3	**0.034**
Educational level of mother			
University or master/doctorate degrees	1.0		
High school or lower education level	2.5	1.1-6.1	**0.043**
Working condition of mother			
Unemployed	1.0		
Employed	2.2	0.9-4.9	0.067
Income perception			
Very good, good	1.0		
Middle, bad	0.5	0.2-1.2	0.129
Children's frequency of having breakfast			
Every day	1.0		
Never or sometimes	7.9	1.7-36.6	**0.009**
Children's daily average TV, DVD watching duration	**1.0**	**0.9-1.0**	**0.163**
Constant: B= -2.460 p<0.001 Exp(B)=0.085			

Model: Sex, educational level of mother, working condition of mother, income perception, children's frequency of having breakfast, children's daily average TV, DVD watching duration

Table 3. Differences in children's measurements before and after the intervention

							Intention to treat		
		n	**Before**	**After**	**p***	**n**	**Before**	**After**	**p***
Weight of children	Mean ±SD	18	23.3±4.0	24.9±4.4	**0.001**	23	23.2±3.9	25.2±4.5	**0.001**
	Median	18	23.3	24.4		23	22.7	24.6	
Height of children	Mean ±SD	18	112.2±7.2	116.7±7.2	**0.001**	23	112.1±6.8	117.1±6.6	**0.001**
	Median	18	112.5	117.0		23	112.0	117.5	
BMI percentiles	Mean ±SD	18	94.3±4.7	91.4±9.8	**0.026**	23	94.2±4.8	90.9±10.1	**0.021**
	Median	18	96.5	95.1		23	96.3	95.1	
BMI z scores	Mean ±SD	18	1.9±0.9	1.8±1.0	0.061	23	1.9±0.9	1.8±1.1	0.127
	Median	18	1.8	1.7		23	1.8	1.7	

** Wilcoxon signed rank test was used.*

Of the children in the interventional group, 39% were girls, and 61% were boys. The average age of children was 3.9±0.6 and their median age was 4.0. Mean and median percentile values of children reduced significantly in the post-intervention, compared to values prior to intervention (p=0.026). When the results were re-assessed by performing intention-to-treat analysis, significance continued (p<0.05).

Children's daily TV, DVD watching duration decreased significantly in the post-intervention compared to that of pre-intervention (p=0.010), and this decrease was due to the reduction of watching duration over the weekend (p=0.002). When the results were re-assessed by performing intention-to-treat analysis, significance continued (respectively, p=0.016 and p=0.002) (Table 4).

No significant difference was determined in terms of the children's nutritional behaviours, and parental behaviours related to physical activity and screened device usage before and after the intervention (p>0.05). Among the nutritional behaviours of parents, 'giving permission to consume fast food (hamburger, pizza, fried potatoes etc)' and 'frequency of rewarding children with foods and beverages such as dessert, chocolate, coke' decreased significantly after intervention compared to pre-intervention (respectively, p=0.031 and p=0.016). When the results were re-evaluated by performing intention-to-treat analysis, significance continued (respectively, p=0.031 and p=0.016) (Table 5).

Discussion

Cross-sectional part

In all children (n=191) whose measurements were taken, the prevalence of being overweight or obese was identified as 27.2%. In boys, the risk of being overweight or obese was determined to ocur 2.4 times more frequently when compared to girls. Similar to the results of this research, Turkey Nutrition and Health Research established the prevalence of being overweight or obese as 26.4% in the 0-5 age group, boys being higher than girls (17). The higher frequency of obesity and being overweight in boys may be attributed to the differences in weight perception and intersexual care in society. In the local studies carried out in Turkey, the prevalence of being overweight or obese changed between 9-55% in pre-school children (18–29). Since the majority of these studies were conducted in very small groups, they would not be representative of the general Turkish population.

The risk of being overweight and obese was found to be 2.5 times higher in children of mothers with high school or lower education levels, compared to those with university or master/doctorate degrees. Contrary to the outcomes of the present research, obesity frequency was determined to increase in children under the age of 5, when mothers' education level and the families' income increases, according to Turkey Demographic and Health Survey (TDHS-2013) (30). In addition, global research indicates that the risk of being overweight or obese in pre-school children all over the world is more

Table 4. Differences in children's daily average TV, DVD watching and computer usage duration before and after the intervention

						Intention to treat			
		n	**Before**	**After**	**p***	**n**	**Before**	**After**	**p***
Children's daily average TV, DVD watching duration (min)	Mean±SD	18	168.2 **±72.**1	122.9 ±60.7	0.010	23	161.8 ±67.5	126.4 ±57.3	0.016
	Median	18	160.7	102.9		23	154.3	102.9	
Weekdays	Mean±SD	18	157.2 ±67.4	122.8 ±60.27	0.101	23	151.7 ±63.22	124.8 ±56.6	0.101
	Median	18	135.0	120.0		23	120.0	120.0	
Weekend	Mean±SD	18	195.6 ±114.2	123.3 ±81.6	0.002	23	186.9 ±105.8	130.4 ±78.7	0.002
	Median	18	195.0	120.0		23	180.0	120.0	
Children's daily average omputer usage duration (min)	Mean±SD	18	52.1 ±68.8	43.8 ±43.2	0.695	23	49.0 ±63.3	42.5 ±41.9	0.649
	Median	18	29.3	44.3		23	25.7	42.9	
Weekdays	Mean±SD	18	51.7 ±75.3	45.3 ±44.7	0.952	23	48.3 ±70.37	43.3 ±45.6	0.952
	Median	18	25.0	60.0		23	20.0	60.0	
Weekend	Mean±SD	18	53.3 ±62.0	40.0 ±46.9	0.282	23	50.8 ±60.1	40.4 ±48.2	0.282
	Median	18	40.0	30.0		23	20.0	30.0	

** Wilcoxon signed rank test was used.*

frequently seen in developed countries compared to developing ones (31). The discrepancy between global research and our present findings may be due to the nature of our sample with regards to income.

In the logistic regression analysis, the link between the children's average daily TV, DVD watching duration and them being overweight or obese lost its significance. In a study conducted by Demir, the frequency of being overweight or obese was determined to increase 2.2 times in children watching TV for a long duration, compared to those who were not (26). In international studies, spending time in front of devices such as TVs and computers was also indicated to have a correlation with being overweight and obese in pre-school children (32–34). Today, it has become prevalent to accept "spending time in front of a screen" as an indicator of a kind of sedentary life activity (35,36).

The risk of being overweight and obese was established to be 7.9 times more in children never or sometimes having breakfast, compared to those having breakfast regularly. International studies indicate that there was a relation between eating regularly and weight control. The risk of being overweight or obese was significantly higher especially in children missing breakfast, supporting the findings of this study (37–40). No significant relationship was found between parents' behaviours regarding physical activity, time spent with screened devices, dietary habits or the children being overweight and obese. Discrepancies between global findings and the present research may be a result of participants unable to evaluate their own behaviours objectively, which could give rise to high positive behaviour frequencies in all children. In this study, 76% of families think that they are a good role model for their children. Families' perception regarding their children's weight is mostly inadequate. This inability for objectivity may be preventing them to evaluate their own behaviours. In systematic reviews, the behaviours of families were closely related to children's healthy life behaviours and weight. It was

Table 5. Differences in parental behaviours related to nutrition before and after the intervention

	n=18					Intention to treat n=23				
	Before		After			Before		After		
	n	%	n	%	p*	n	%	n	%	p*
Parental behaviours related to nutrition										
How confident are you that you can offer enough fruit to your child?										
Not confident/No idea	7	38.9	4	22.2		8	34.8	5	21.7	
Confident/ Very confident	11	61.1	14	77.8	0.250	15	65.2	18	78.3	0.250
How confident are you that you can offer enough vegetable to your child?										
Not confident/No idea	7	38.9	4	22.2		10	43.5	7	30.4	
Confident/ Very confident	11	61.1	14	77.8	0.250	13	56.5	16	69.6	0.250
How confident are you that you can offer fat-free or low-fat foods to your child?										
Not confident/No idea	8	44.4	3	16.7		10	43.5	5	21.7	
Confident/ Very confident	10	55.6	15	83.3	0.125	13	56.5	18	78.3	0.125
How often do you offer fresh fruits and vegetables to your child at meals and for snacks?										
Less than once a day	7	38.9	5	27.8		11	47.8	9	39.1	
≥ 1 time / day	11	61.1	13	72.2	0.625	12	52.2	14	60.9	0.625
How often do you offer meat/fish/egg to your child at meals and for snacks?										
Less than once a day	13	72.2	11	61.1		18	78.3	16	69.6	
≥ 1 time / day	5	27.8	7	38.9	0.625	5	21.7	7	30.4	0.625
How often do you offer milk and milk products to your child at meals and for snacks?										
Less than once a day	5	27.8	4	22.2		7	30.4	6	26.1	
≥ 1 time / day	13	72.2	14	77.8	1.000	16	69.6	17	73.9	1.000
How often do you offer canned or frozen fruit/ vegetables to your child at meals and for snacks?										
Never	16	88.9	17	94.4		20	87.0	21	91.3	
≥ 1 time / week	2	11.1	1	5.6	1.000	3	13.0	2	8.7	1.000
How often do you give permission to consume fast food (e.g. hamburger, pizza, fried potatoes, etc) to your child?										
Never	9	50.0	15	83.3		13	56.5	19	82.6	
≥ 1 time / week	9	50.0	3	16.7	0.031	10	43.5	4	17.4	0.031
How often do you give permission to consume foods and beverages such as dessert, chips, chocolate, coke to your child?										
Never	2	11.1	5	27.8		2	8.7	5	21.7	
≥ 1 time / week	16	88.9	13	72.2	0.250	21	91.3	18	78.3	0.250
Do you reward your child with foods and beverages such as dessert, chips, chocolate, coke?										
Never	9	50.0	16	88.9		12	52.2	19	82.6	
≥ 1 time / week	9	50.0	2	11.1	0.016	11	47.8	4	17.4	0.016
How often do you eat your meals with all of your family?										
Never or Sometimes	7	38.9	9	50.0		9	39.1	11	47.8	
Every day	11	61.1	9	50.0	0.625	14	60.9	12	52.2	0.625
Do you think that you are a good role model for your children?										
Yes	11	61.1	14	77.8		16	69.6	19	82.6	
No	7	38.9	4	22.2	0.250	7	30.4	4	17.4	0.250

shown that interventions aimed at correcting family behaviours through education were effectively reducing BMI of children (40,41).

Interventional part

Obesity and unemployment frequencies were found significantly higher in mothers who agreed to participate in the study, compared to non-participant mothers. This difference may be the result of the obese mothers being more sensitive to the subject, and the unemployed mothers having the convenience to participate due to their lack of occupational time constraints.

While mean and median percentile values of children significantly decreased after intervention compared to pre-intervention, no significant reduction was determined in terms of z score mean and median. In a study carried out in 154 children and their families by Davidson et al., although there was no significant change in the z score of children after 6 months of family-centered intervention, obesity prevalence significantly reduced (13). In a family-centered interventional study performed with 85 children and their families by Bocca et al., z score means of children significantly decreased at the end of 16 weekends. The results were re-evaluated after 12 months, reduction was seen to be more distinct (8). In a systematic review where interventions aiming at preventing and treating obesity in children were analysed, family-centered and long-term follow-up programmes were indicated to be more effective (40).

Children's average daily TV, DVD watching duration decreased significantly after intervention, compared to that of pre-intervention and this decrease was due to the reduction in the weekend watching duration. According to implications obtained from interviews, the more children stay at home, the more they spend time in front of the TV. Therefore, one of the targets determined was to spend more time outdoors and actively during the weekends. Most of the families tried to implement this target and thus daily average TV, DVD watching duration was reduced significantly over the weekends. In a study carried out by Davidson et al., daily average TV watching duration decreased significantly at the end of 6 months (13). In Healthy Habits, Happy Homes study, there was no significant change in TV watching duration overall and weekdays, after 6 months of intervention. However, weekend TV watching duration significantly declined (42).

No significant difference was determined in any of the components of parental behaviour concerning physical activity before and after the intervention. In the interviews, it was established that the place of residency, the environmental planning, and the season are vital. Children living in housing complexes spend more time with activities such as riding bicycles and playing in playgrounds. Mothers also said that their financial situation was also important since many courses are so costly. In the literature, family-centered interventions have been implied to increase the frequency of physical activity, and thus account for good changes in the weight results (13,43).

In all components of parental behaviours associated with screened devices, no significant difference was identified in post-intervention when compared to pre-intervention. Although mothers stated that they limited the watching duration of TVs and computers, the rate of mothers who could set precise limitations was very low according to impressions obtained after the interviews. Differences in parental attitudes toward their children, and the inability of the parents to change their inappropriate behaviour, as well as family elders' different behaviours toward their children make obtaining positive behaviour difficult for children in general.

Of the parental behaviours regarding nutrition, the frequency with which permission was granted for fast-food consumption, as well as the frequency of rewarding children with beverages and foods such as desserts and chocolates by their mothers decreased significantly. In a study carried out by Daniels et al., the frequency of parents using foods as reward after the intervention decreased (44). During the whole intervention period, "reward concept" in terms of both nutrition and other life behaviours was particularly emphasized. It was stressed that no harmful food or behaviour should be used as a reward.

One of the most important limitations of this research was the small sample size. The fact that participant interest was very minimal, may have impacted data collection, which was largely subjective apart from the weight and height of children, which could have caused data collection bias. Only 23 mothers agreed to participate in the interventional research and 5 of them with-

drew from the study during intervention for a variety of reasons. Although appointments were given according to the mothers' schedules, there were too many cancellations. When interview rhythm was interrupted, and duration between two interviews increased, the implementation of targets was also observed to decline.

The powerful side of the research was that it was the first family-centered interventional research in Turkey aimed at development of healthy life behaviours for pre-school children. The research was novel in a sense that data collection, measurements and interventions were carried out by the same researcher, thus were standardized. Despite the restrictions, having positive healthy outcomes within such a small group and within such a short period of time, supports the idea that family-centered interventions were effective.

Conclusion

One in every three children in the research group was determined to be overweight or obese. It was found out that the risk of children being overweight or obese was associated with their sex, mother's educational status and children's breakfast habits. Following the intervention, positive results were acquired related to children's weight outcomes, their daily average TV, DVD watching duration, and some parental behaviours regarding nutrition in a short period of time. On the other hand, sustainability of these positive health results are important and merit further research and follow-up. Individual efforts do not suffice in maintaining the continuity of the research. More importantly, organizations which involve schools, families and primary healthcare institutions should be facilitated. In this context, nutrition-friendly school projects that include families should be promoted. In summary, prevention of childhood obesity should be identified as a serious social issue, and tackled at a level of domestic policy.

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