

ORIGINAL ARTICLE

# Prevalence of obesity and overweight among primary school children in a district of Istanbul, Turkey

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## ABSTRACT

**Objective:** We aimed to investigate the prevalence of obesity and overweight and their relationship with environmental factors among children aged 5-10 years at a primary school in an Istanbul district.

**Materials and Methods:** The data of this cross-sectional study were collected from a random selection of 177 students and their families. Students' heights and weights were measured in a standardized way for calculating their body mass index. The World Health Organization growth reference was used for the definition of obesity and overweight status.

**Results:** The prevalence of obesity and overweight was 12.4% and 20.9%, respectively, with no difference between girls and boys. A significant increase in the percentage of obesity and overweight was observed with increasing age ( $p = 0.001$ ). Having an obese or overweight father ( $p = 0.001$ ) and a working mother ( $p=0.003$ ) were associated with an increase in childhood obesity.

**Conclusion:** The findings of this study imply that obesity or overweight among primary school children is associated with increasing age, having an obese or overweight father and having a working mother. State organizations, schools, physicians and other healthcare professionals must work together to encourage children and their families to adopt healthy lifestyles and to improve their awareness of obesity.

**Keywords** Childhood obesity, Public health, Prevalence

## Introduction

Childhood obesity is one of the most serious health conditions affecting many countries in the World [1-5].

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Several low-and middle-income countries are currently facing a “double burden” of disease as they continue to struggle with problems of under-nutrition. They are concomitantly experiencing rapid increases in obesity and overweight.

In recent decades, the epidemic of childhood obesity has created a major public health problem, primarily as a result of consumption of energy-dense foods, large portion sizes, irregular eating patterns, dominance of a sedentary lifestyle, and low levels of physical activity. Overweight or obese children are likely to stay obese into adulthood and more likely to develop NCDs such as diabetes and cardiovascular diseases at a younger age [6-9]. Various factors may contribute to obesity in different ways depending on region-specific circumstances. It is important to create intervention plans to prevent childhood obesity, a requirement to assess true burden of childhood obesity that exists in several countries; in particular, in countries where an overweight child is often considered to be healthy, by cultural habits [10].

School-age children may be particularly at risk because they tend to be inactive for long hours during classtime and are exposed to unhealthy food. The aims of this study were to investigate the prevalence of obesity and overweight and to assess environmental factors of obesity and overweight in children aged 5-10 years in a primary school in a district of Istanbul, Turkey.

## Materials and Methods

This cross-sectional study was carried out in a primary school in an Istanbul district between October and December 2016. Eight classes were randomly selected, consisting of a total

Submitted: 27.01.2019

Accepted: 16.03.2019

of 231 students. Teachers were asked to send parents the questionnaire forms and informed consent forms in sealed envelopes. Sealed envelopes each containing both forms were prepared by the researchers. The filled forms were also returned in sealed envelopes. Data were collected from 177 returned envelopes (77%). After obtaining informed consent, students' weights and heights were measured by three trained medical students using standardized methods (with bare feet and light clothes; using glass bathroom scales and a portable rigid stadiometer). Body mass index (BMI) was calculated using a standardized method ( $\text{kg}/\text{m}^2$ ). International age and gender-specific child BMI cut-off points of World Health Organization were used for definition of obesity and overweight status [11].

The questionnaire included two main parts; the first part was focused on the child's and the parents' sociodemographic data. Self-reported weight and height of parents were obtained. The second part was focused on the child's dietary and activity-related behaviors. Type of physical activity was grouped as vigorous, moderate, and walking according to International Physical Activity Questionnaire-Short form [12]. Vigorous physical activities refer to activities that take hard physical effort and make children breathe much harder than normal (like aerobics, basketball, football or fast bicycling). Moderate activities refer to activities that take moderate physical effort and make children breathe somewhat harder than normal (like folk games, dance, light ball games, not including walking). Because of missing data at total duration of physical activity, only frequency of weekly physical activity was assessed (each physical activity should be done for at least 10 minutes at a time).

Marmara University, School of Medicine Ethics Committee approval was obtained before the commencement of the study (Date: 07.10.2016, Number: 09.2016.504).

### Statistical Analysis

Descriptive analyses were used to understand general characteristics of the study population. Mann-Whitney U Test was used to compare continuous data among groups. Continuous data were represented as median (Minimum-Maximum/ Interquartile Range) when data distribution did not fit a normal distribution. Categorical variables were represented as numbers and percentages. The chi-square test or Fisher's Exact test was used to compare categorical variables between groups. The median value was considered the cut-off point for grouping when continuous data were transformed

to categorical variables. Multivariate logistic regression was used to assess associations between overweight/obese status and each risk factor. The model included sex, age group, mother's working status, father's BMI group, amount of consumed fruit portion, and activity frequency as covariates. A p-value  $< 0.05$  was considered statistically significant.

### Results

#### *Characteristics of children including dietary and activity-related factors*

The median age of children was 8 years (range 5–10 years). More than half of the participants were girls (55.9%). Ninety-four percent of fathers and 31% of mothers have a job.

The percentage of children who had breakfast, lunch and dinner every day was 87%, 88% and 94% respectively. Eighty-one percent of children ate main meals 3 and more times in a day. Ninety-four percent of children consumed break meals, 62% was fruit and 32% was snacks. More than half of the children (59%) had out-of-home eating at least once a week.

The median value was 2 times per week (range 0–7) for vigorous physical activity, 2 times per week (range 0–7) for moderate physical activity and 7 times per week (range 0-8) for walking.

#### *Prevalence of overweight and obesity*

Prevalence of overweight and obesity in children was 12.4% and 20.9%, respectively. Table I shows overweight/obesity prevalence in children and parents.

There was no statistically significant difference in overweight/obese status between girls and boys. Boys perform vigorous physical exercise more frequently than girls. Other dietary and activity-related variables did not differ significantly.

A significant increase in obesity percentage with age was observed ( $p = 0.001$ ). Having an overweight/obese father ( $p = 0.001$ ) and a working mother ( $p = 0.003$ ) were associated with an increase in childhood obesity (Table I).

There was no significant association between overweight/obese status and breakfast, lunch, dinner or break meals. Distribution of dietary and activity-related variables with presence of overweight/obese status is summarized in Table II. There was no significant association between overweight/obese status and sitting, sleeping times.

Multivariable logistic regression models revealed that being older than 7 years of age (aOR = 3.2, 95% CI 1.4–7.2), having a working mother (aOR = 3.1, 95% CI 1.4–6.9), having an overweight/obese father (aOR = 5.2, 95% CI 2.0–13.2), or consuming more than three fruits per day (aOR = 2.5, 95% CI 1.1–5.7) were associated with overweight/obesity (Table III).

**Table I.** Demographic characteristics and weight status of the students and their parents' employment and weight status

	Underweight / Normal n (%)	Overweight / Obese n (%)	p
<b>Age Groups (Years)</b>			
5-7	61 (80.3)	15 (19.7)	<b>0.001 †</b>
8-10	57 (56.4)	44 (43.6)	
<b>Sex</b>			
Boy	60 (64.1)	28 (35.9)	0.52
Girl	68 (68.7)	31 (31.3)	
<b>Having a Working Father</b>			
Yes	110(65.9)	57(34.1)	0.49
No	8(80.0)	2(20.0)	
<b>Having a Working Mother</b>			
Yes	28 (50.9)	27 (49.1)	<b>0.003 †</b>
No	90 (73.8)	32 (26.2)	
<b>Having a Mother as</b>			
Underweight / Normal	62 (68.9)	28 (31.1)	0.52
Overweight / Obese	53 (63.9)	30 (36.1)	
<b>Having a Father as</b>			
Underweight / Normal	43 (84.3)	8 (15.7)	<b>0.001 †</b>
Overweight / Obese	75 (59.5)	51 (40.5)	

† statistically significant

**Table II.** Distribution of dietary and activity-related variables

	Underweight / Normal n (%)	Overweight / Obese n (%)	p
<b>Daily Number of Main Meals</b>			
<3	26 (78.8)	7 (21.2)	0.15
≥3	92 (63.9)	52 (36.1)	
<b>Daily Fruit Consumption</b>			
<3	93 (71.5)	37 (28.5)	<b>0.03*</b>
≥3	25 (53.2)	22 (46.8)	
<b>Physical Activity Frequency/ times per week (Median , IQR †)</b>			
Vigorous	2 (1-4)	2 (1-3)	0.20
Moderate	2 (0-4)	2 (0-3)	0.11
Walking	7 (3-7)	5 (2-7)	0.39

\*statistically significant, † Interquartile Range, Note: Each physical activity needed to last at least 10 minutes

**Table III.** Association between lifestyles, socio-demographic and parents' variables with childhood overweight/obesity

		p	aOR (95% CI †)
<b>Sex</b>	Boy		1
	Girl	0.33	1.47 (0.7-3.2)
<b>Age Groups</b>	5-7		1
	8-10	0.003*	3.2 (1.4-6.9)
<b>Mother's Employment</b>	Not Working		1
	Working	0.005*	3.1 (1.4-7.2)
<b>Having a Father as</b>	Underweight/Normal		1
	Overweight/Obese	<0.001*	5.2 (2.0-13.2)
<b>Fruit Consumption</b>	<3/ day		1
	≥3/ day	0.02*	2.5 (1.1-5.7)
<b>Vigorous Physical Activity (Frequency per week)</b>		0.15	0.8 (0.7-1.0)
<b>Moderate Physical Activity (Frequency per week)</b>		0.14	0.8 (0.7-1.0)
<b>Walking (Frequency per week)</b>		0.96	1 (0.8-1.1)

\*statistically significant, aOR:Adjusted odds ratio †CI: Confidence Interval, Note: Multivariable logistic regression included; sex, age group, working status of the mothers, BMI of the fathers, amount of consumed fruit and activity frequencies as covariates.

## Discussion

Overweight/obesity prevalence ranges from 11.7% to 20.7% in studies conducted in various regions of Turkey between 2005 and 2015 [12-15]. An increasing trend in frequency of overweight/obesity was apparent, in comparison with previous years. The frequency we found was similar to those found in researches conducted in other countries [3, 5, 7, 16] and to those in a national study by the Ministry of Health in Turkey [17].

Although, being male was reported to be associated with greater risk of childhood obesity [3, 5, 7, 18-20], there was no significant association between obesity and gender in our study. The only significant difference between genders was in the frequency of vigorous physical activity. Percentage of vigorous physical activity in boys was higher than that in girls, and this this could be due to the confounding effect of exercise on gender and BMI [3, 5, 7, 17-19].

Remarkably, the rates of overweight/obesity were significantly higher in children over 7 years of age compared to younger children (significance remained after adjustment). In contrast to our findings, some studies had reported that being younger was significantly associated with greater risk of childhood obesity [3, 15]. The difference in our study may have possibly arisen due to the content of food eaten in a school environment in addition to a

smaller breakfast and lack of physical activity in schools. Furthermore, in a study with a very large sample size ( $n = 99,482$ ), the highest prevalence of obesity was found among 11 – to 12 – year-olds [5]. In Turkey, the national board exams for entering high school (TEOG) are taken after the age of 9 years. A desire for high academic success can trigger stress and increase food consumption along with inactivity [20]. Although, we did not measure individual stress levels in our study, it is plausible that the increase in obesity at higher ages may have resulted from the above circumstances.

Unexpectedly, obesity frequency was significantly higher in the group consuming three or more fruits per day compared to the group consuming less than three fruits per day. In a study of monozygotic twin pairs, lower consumption of fruit showed an association with higher BMIs [21]. In a longitudinal study, relative risk of becoming or remaining overweight/obese compared to the normal weight status increased when fruit and vegetable consumption increased [7]. One of the limitations of the current study, similar to the above study, was the lack of information regarding total calorie intake. However, in subgroup analyses, number of main meals was significantly higher in the group consuming three or more fruit per day ( $p = 0.02$ ).

Consistent with a previous study, having a working mother was significantly associated with increase in childhood obesity (significance remained after adjustment; OR 2.9, CI 1.3–6.2) [22]. In subgroup analyses, there was no significant difference in the number of daily main meals according to mothers' working status ( $p < 0.05$ ). On the other hand, weekly number of out-of-home meals was significantly higher in children of working mothers ( $p = 0.02$ ). Out-of-home eating habits had been reported to be associated with obesity because of increased consumption of fried food, animal-origin foods, and snacks [2]. However, a limitation of this study was a lack of detailed information about out-of-home food content.

Percentage of overweight/obesity was significantly higher in children who had an overweight/obese father. In subgroup analyses, there was no significant difference in children's physical activity frequency or dietary variables between obese and non-obese fathers. Parental weight status was found to be associated with childhood obesity in several recent studies [14, 15, 22-26]. In particular, a greater obesity risk had been found in children whose father and mother were both overweight/obese [26]. We found no significant association between maternal obesity and childhood obesity.

On the other hand, there was a significant correlation between fathers' and mothers' BMI (Spearman,  $r = 0.15$ ,  $p = 0.043$ ). This finding suggested that either dietary characteristics of the parents were important in childhood obesity, or that they all shared a similar obesogenic environment [27]. However, an additional limitation of this study was a lack of detailed information about family eating attitudes, cooking patterns, and food content.

Other limitations of the study: Data was based on parents' statements except children's weight and height measurements. BMI value was used as obesity indicator, waist or arm circumference of children were not measured. This cross-sectional study analyzed the data at a specific point in time.

## Conclusion

One out of three school children was found to be overweight/obese in our study. It is, therefore, necessary to continue intensive interventions for prevention and control of overweight/obesity in children.

Significant increase in overweight/obesity percentage with age was also observed in our study. Having an overweight/obese father and a working mother were associated with an increase in childhood obesity. Studies on changing eating habits in society may be beneficial in clarifying these issues. Efforts of family, school, and healthcare workers are all essential to resolve this problem.

**Conflict of interest:** None declared by the authors.

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