The obesity prevalence among students between the ages of 5 and 19 in Kütahya

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Aim: To determine the prevalence of obesity among students between the ages of 5 and 19 in Kütahya, and to determine the factors associated with obesity prevalence.

Materials and methods: The population in the survey was formed of students between the ages of 5 and 19 in the schools of Kütahya. Within the scope of this survey, obesity was evaluated in accordance with the percentile values indicated in a study on the body weight and height, head circumference, and body mass index reference values of Turkish children that was published in 2008.

Results: It was determined that 6.5% of the students were obese, 7.8% of them were overweight, and 7.8% of them were underweight. When the variables of age, sex, and school district were controlled, it was seen that obesity prevalence among students studying at private schools was 2.03 times higher than among students studying at public schools (P < 0.001).

Conclusion: It is seen that, in the efforts to reduce childhood obesity, private schools should be considered as a risk factor and the obesity prevalence at private schools should be analyzed in further studies.

Key words: Body mass index, obesity, overweight, student, cross-sectional study

1. Introduction

Obesity is considered to be a major public health concern, both in developed and developing countries (1,2). The annual increment in childhood obesity has been growing in recent years and it is noted that the number is now 10 times greater than the rate in the 1970s. It is stated that in the World Health Organization (WHO) European Region, nearly 20% of children and adults are overweight and one-third of them are obese (3).

Obesity, which turns out to be a global epidemic, is described by the WHO as "abnormal or excessive fat accumulation that presents a risk to an individual's health" (4,5). Although some factors like nutrition, genetics, and physical activity are known to have a role in obesity, the real cause is not fully known (1,6). Nowadays obesity is accepted to be one of the most widely seen chronic illnesses in childhood. Childhood obesity leads to adulthood obesity and forms the basis for most chronic illnesses (7,8). Childhood obesity is associated with many health problems like cardiovascular illnesses, metabolic syndrome, psychosocial illnesses, type 2 diabetes mellitus, hypertension, asthma, and some cancers (9–11).

In terms of nutrition, Turkey appears to demonstrate the problems faced by both the developed and the developing countries. The nutritional status of the people in Turkey displays significant variety with respect to regions, climates, socioeconomic status, and urban–rural areas. The inequality in income distribution has an effect not only on the character of the problems related with nutrition but also on the prevalence of these problems (7). In Turkey, obesity has been dramatically on the rise among adults and children in recent years. The prevalence of obesity in adults, which had been 18.6% in 1990, was 21.9% in 2000. Despite not having enough systematic surveys related to the prevalence of obesity among children, in a study conducted in İstanbul in which girls at the ages of 6–16 were subjects, the percentage of subjects who were obese and overweight was found as 17.9% in 2001, and this rate rose to 23.4% in 2009 (12,13). This survey was carried out to determine the prevalence of obesity among students between the ages of 5 and 19 in Kütahya and to determine the factors associated with obesity prevalence.

2. Materials and methods

The population in this survey was formed of students between the ages of 5 and 19 in the schools of Kütahya. The goal in this cross-sectional type study was to reach all of the target population. A total of 92,933 students (95.1%)

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out of 97,720 studying in the schools connected with the Directorate of National Education in Kütahya were reached.

Within the scope of the survey, in order to have efficient coordination, one teacher (preferably a physical education teacher) was chosen from every school. On 16, 17, and 18 February 2011, a 3-session education program was organized for these teachers. This education program covered some subjects like the method of the survey, equipment to be used in measuring height and weight, and the height and weight measuring methods. Following the education program, the teachers responsible for the coordination of the survey were expected to carry out the measuring activities together with the classroom teachers. The height and weight measurements of the students were saved on a webpage prepared by the Directorate of National Education of Kütahya.

Body mass index (BMI) is an indicator evaluating the weight of the body in relation to height and it does not give any information about the distribution of fat in the body. BMI is a value calculated by taking a person's weight (kg) and dividing by their height (m) squared (BMI = kg/m^2). In children and adolescents, there is no classification scheme as there is in adults and various approaches are used to define being overweight and obese. One of the most common used methods is the z-score value and/or applying percentiles, both at individual and social levels. Within the scope of this survey, obesity is evaluated in accordance with the percentile values indicated in a previous study on the body weight and height, head circumference, and body mass index reference values of Turkish children, published in Turkish by Neyzi et al. in 2008 (14). Within this framework, the criteria for evaluating the percentage values of BMI in relation to age are stated in Table 1 (15). Statistical analyses were performed using SPSS 15.0. $P < 0.05$ was considered statistically significant. The relations among the variables were evaluated by the chi-square test and logistic regression analysis.

3. Results

There were a total of 92,933 students, between the ages of 5 and 19, studying in the schools of Kütahya. Of these, 52.5% were boys and 47.5% were girls. The average age of these

students was 11.3 ± 3.6 and 4.1% of them were 5 years old, 8.8% were 11 years old, and 0.3% were 19 years old. Of the students, 71.5% were studying in primary schools and 3.1% of them were studying in private schools (Table 2).

When evaluated in accordance with the BMI reference values of Neyzi et al. for Turkish children (14), it was noted that 6.5% of the students were obese, 7.8% of them were overweight, and 7.8% of them were underweight. It is to be emphasized that the overweight prevalence was higher in girls in comparison with boys and the underweight prevalence was higher in boys in comparison with girls. No statistically significant relation was found between being overweight and sex ($P = 0.943$) (Table 3).

Table 2. Distribution of school types and some sociodemographic characteristics of students aged 5–19 who study in the schools in Kütahya.

	n	%
Sex		
Male	48,807	52.5
Female	44,126	47.5
Age		
5	3838	4.1
6	6611	7.1
7	6990	7.5
8	6912	7.4
9	7783	8.4
10	7818	8.4
11	8205	8.8
12	7913	8.5
13	8019	8.6
14	7349	7.9
15	6566	7.1
16	6385	6.9
17	5760	6.2
18	2485	2.7
19	299	0.3
Mean ± SD: 11.3 ± 3.6; Min–Max: 5–19		
School type		
Nursery school	712	0.8
Private nursery school	125	0.1
Primary school	64,493	69.4
Private primary school	1929	2.1
High school	9584	10.3
Vocational and technical high school	15,274	16.4
Private high school	816	0.9
Total	92,933	100.0

Table 1. The evaluation percentage values of BMI related to age (15).

Result of BMI	Evaluation criteria
Low weight	BMI by age <5%
Normal	BMI by age between 5% and 85%
Overweight	BMI by age between 85% and 95%
Obese	BMI by age ≥95%

Table 3. Distribution of the results of BMI according to the sex of the students aged 5–19 who study in the schools in Kütahya.

	Boy		Girl		Total		P**
	n	%*	n	%*	n	%*	
BMI							
Low weight	3064	6.3	4162	9.4	7226	7.8	0.943
Normal	38,400	78.7	33,217	75.3	71,617	77.1	
Overweight	4172	8.5	3875	8.8	8047	8.7	
Obese	3171	6.5	2872	6.5	6043	6.5	
Total	48,807	100.0	44,126	100.0	92,933	100.0	

*: The percentage of column.

**: Chi-square test analyses were grouped for BMI as obese and not obese.

It was seen that the obesity prevalence was highest in 5-year-olds, both in girls and boys. The obesity prevalence of boys in childhood (9.8%) was greater than the prevalence in the adolescence period (4.8%), and this difference was statistically significant (P < 0.001). Although the childhood obesity prevalence (6.8%) in girls was higher than the prevalence in the adolescence period (6.3%), the difference was not statistically significant (P = 0.055) (Table 4).

Both in boys and girls, the obesity prevalence in the districts with a population of above 50,000 was higher when compared with the districts with a population of below 50,000, but the difference was not statistically significant (P = 0.072 and P = 0.104, respectively). However, when the whole research group is evaluated, the obesity prevalence in the districts with a population of above 50,000 (6.6%) was higher in comparison with the districts with a population of below 50,000 (6.2%) and the difference between them was statistically significant (P = 0.015). When evaluated in terms of school types, it was seen that the obesity prevalence in private primary schools was 1.7 times higher in both boys and girls in comparison with the public primary schools, and the obesity prevalence in private high schools was 3.0 times higher in boys and 2.9 times higher in girls in comparison with the public high schools. It was detected that the obesity prevalence of both boys and girls studying in private schools was higher than that of the students studying in public schools, and the difference was statistically significant (P < 0.001 and P < 0.001) (Table 4).

When the variables of sex, school districts, and school type are controlled, it can be seen that the prevalence of obesity grows 1.06 times higher for each year by which the age of the students decreases (P < 0.001). When the variables of age, sex, and school types are controlled, it is noted that the obesity prevalence of the students studying in the school districts with a higher population is 1.10 times higher in comparison to the students studying in the school districts with a lower population (P = 0.010). When the variables of age, sex, and school districts are controlled, it is seen that the obesity prevalence of the students studying in private schools is 2.03 times higher than that of the students studying in public schools (P < 0.001) (Table 5).

4. Discussion

The frequency of obesity among a total of 92,933 students between the ages of 5 and 19, studying in the schools of Kütahya, was analyzed in accordance with the BMI reference values in Turkish children of Neyzi et al. (14). It was seen that 6.5% of the students were obese and 8.7% of them were overweight. Obesity in Turkey is following a rising trend. Hence, in comparison with the developed countries, the frequency of obesity is lower (12). In a study carried out by Singh et al. in the United States, among 46,707 adolescents between the ages of 10 and 17, the obesity prevalence was 14.8% (16). Moreover, in the study conducted by Itagi and Patil in India among 19,263 children and adolescents, it was seen that the obesity prevalence was 1.89% (17). In the studies carried out in Turkey, obesity prevalence ranged between 1.6% and 10.3% (1,13,18–29). This study's results fall among the obesity frequency range of the prior studies carried out in Turkey. In some studies carried out specifically in cities neighboring Kütahya, the frequency of obesity was very similar to that detected here in Kütahya. It was noted in a study performed in Bolu among 6924 children and adolescents between the ages of 6 and 17 that the obesity prevalence was 6.1%; in İzmir among 11,629 children and adolescents between the ages of 2 and 15 the obesity prevalence was 6.3%; in Muğla among 4260 children and adolescents between the ages of 6 and 15 the obesity prevalence was 6.3%; and in Kocaeli among 2491 children and adolescents between the ages of 10 and 19 the obesity prevalence was 6.8% (13,19,25,29).

Table 4. Distribution of the results of BMI according to the district where the school is, located, the type of the school, and the sex and age of the students aged 5–19 who study in the schools in Kütahya.

	Boy			Girl		
	Overweight	Obese	P*	Overweight	Obese	P*
Age						
5	13.9	11.5	<0.001	11.5	8.1	0.055
6	12.3	10.0		9.7	6.6	
7	9.6	9.8		10.6	5.9	
8	10.1	9.4		10.3	7.2	
9	10.2	9.0		9.8	6.8	
10	9.6	8.4		9.7	6.2	
11	8.5	5.1		9.5	6.1	
12	7.2	3.1		8.4	5.9	
13	7.7	4.6		8.4	7.0	
14	6.7	4.2		7.4	6.3	
15	6.7	6.8		6.7	6.3	
16	6.7	3.4		7.1	7.0	
17	5.8	3.0		5.9	6.8	
18	4.8	4.0		5.4	4.8	
19	9.9	2.3		11.7	1.3	
District**						
Population ≥50,000	8.6	6.6	0.072	8.7	6.6	0.104
Population <50,000	8.3	6.1		9.0	6.2	
School type						
Nursery school	9.8	13.9	<0.001	9.6	8.7	<0.001
Private nursery school	19.7	10.6		15.3	11.9	
Primary school	9.2	7.1		9.4	6.4	
Private primary school	13.6	12.3		13.4	10.7	
High school	7.1	3.6		6.5	5.7	
Vocational and technical high school	6.0	4.5		6.6	6.3	
Private high school	9.6	10.9		9.2	16.4	

*: Chi-square test analyses for the BMI results were completed through grouping as not obese and obese, as child age group (9 and below) and adolescent age group (10 and above) for the age group, and as private school and public school for the school type.

**: The districts with populations of 50,000 and above were evaluated as populous districts, and the districts with populations under 50,000 were evaluated as underpopulated.

The obesity prevalence of boys and girls in Kütahya was 6.5%, an amount that is very similar to the neighboring cities mentioned above (P = 0.943). When the studies performed are analyzed, the obesity prevalence of boys in some of them, and girls in others, is higher, whereas there are some other studies in which the obesity prevalence in relation to sex does not indicate any difference. Since the year 2000 there have been 10 obesity studies carried out in Turkey; the obesity prevalence of boys was higher in 5 of these studies and the obesity prevalence of girls was higher in 3 of these studies. In 2 of these studies the obesity prevalence of boys and girls was quite similar (1,18–21,23–27).

When the variables of age, sex, and school districts are controlled, it is seen that the obesity prevalence of the students studying in private schools was 2.03 times higher than the prevalence of the students studying in public schools (P < 0.001). The obesity prevalence of both boys and girls studying in private primary schools was higher in comparison with the students studying in public primary schools and the obesity prevalence of the students studying in private high schools was higher when compared with the students in public high schools and public vocational technical high schools. The private primary and high schools in Turkey are fee-paying schools, whereas public

Table 5. The results of logistic regression analysis among the students aged 5–19 studying in the schools in Kütahya according to whether they are obese or not.

	n	Obesity prevalence	Odds ratio*	95% Confidence interval	P
Age	-	-	1.06	1.05–1.08	<0.001
Sex					
Boy	48,807	6.5	1.00 (reference)		
Girl	44,126	6.5	0.99	0.95–1.05	0.908
District**					
Population ≥50,000	14,347	6.0	1.00 (reference)		
Population <50,000	78,586	6.6	1.10	1.02–1.20	0.010
School type***					
Public school	90,063	6.3	1.00 (reference)		
Private school	2870	12.0	2.03	1.81–2.28	<0.001

*: BMI result based on logistic regression analysis was grouped in the form of obese and not obese.

**: The districts with populations of 50,000 and above were evaluated as populous districts, and the districts with populations under 50,000 were evaluated as underpopulated.

***: Nursery school, primary school, high school, and vocational and technical high schools were grouped as public schools and private nursery schools, private primary schools, and private high schools were grouped as private schools.

primary and high schools are free. For this reason, it is seen that the obesity prevalence is higher among students with a better socioeconomic status. Similarly, in a study carried out in Samsun among 2477 adolescents between the ages of 11 and 14, the obesity prevalence of students studying in private schools was 16.8% and the obesity prevalence of the students in public schools was 10.0% (1). In efforts to decrease the rates of obesity in children and adolescents, planning interventions in private schools is of utmost importance.

This survey is a cross-sectional prevalence study representing all the students between the ages 5 and 19 studying in Kütahya. A total of 92,933 students (95.1%) out of 97,720 studying in the schools connected with the Directorate of National Education in Kütahya were reached. One of the most important strengths of this survey is that the number of students who participated in the survey was notably high. When most of the studies carried out in Turkey about childhood obesity after the year 2000 are analyzed, the earlier numbers of participants are much lower than the number of participants in this study. For example, 9048 children and adolescents between the ages of 6 and 18 participated in the study carried out by Yuca et al. in Van (1,18–21,23–27). Other strengths of the present survey are that it was carried out among a wide age group, between 5 and 19, and it was performed in a city where no previous study about obesity prevalence in childhood existed. Nevertheless, the possibility of deficient measuring standardization is the weakness of the survey, although one teacher from every school was given information about the method of the survey, equipment to be used in measuring height and weight, and about the height and weight measuring methods.

In conclusion, the obesity prevalence of the students between the ages of 5 and 19 studying in the schools of Kütahya was noted as 6.5%. This rate is similar to most of the other studies performed in Turkey, and it is lower than the obesity frequencies of developed countries. The obesity prevalence of the students studying in the private schools is higher when compared with the students studying in the public schools. It is seen that, in efforts to reduce childhood obesity, private schools should be considered as a risk factor and the obesity prevalence in the private schools should be analyzed with further studies.

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