Research Article

Evaluation of Childhood Obesity, Prevalence, and Related Factors in Istanbul

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Abstract

AIM: Childhood obesity has become a global public health crisis. This study aims to determine the prevalence of obesity and related factors in primary school students in Istanbul.

METHODS: This research was conducted between May 2015 and January 2018. A school was selected from each of the districts of Istanbul and research was conducted in 39 primary schools. The study was conducted with a total of 5620 students aged 8–12. The students' descriptive characteristics, eating habits, and activity levels were questioned using the Student Information Form. Subsequently, anthropometric measurements (height–weight) were performed for body mass index assessment.

RESULTS: The prevalence of childhood obesity was found to be 15.7%. This rate was 14.1% for female students and 17.3% for male students. Body mass index of students was related to durations of time spent on watching TV ($r = .064$, $p < .05$) and computer ($r = .037$, $p < .05$). In addition, the body mass index was differentiated by gender ($p = .004$); male students had a higher body mass index compared to female students, and body mass index was higher in those who skipped main meals ($p = .001$) and those who did not eat regular breakfast ($p = .001$).

CONCLUSION: The prevalence of obesity in children was found to be quite high. It may easily be stated that obesity prevalence is rapidly increasing in Turkey; therefore, it should be done through regular screening programs, and preventive interventions should be planned.

Keywords: Childhood obesity, eating habits, physical activity, Turkey

Introduction

Childhood obesity is a global health problem, which affects the quality of life besides the expected lifespan, both in developing and developed countries (Zwiauer, 2000). Although childhood obesity is common particularly in developed countries, its prevalence has gradually increased worldwide. The prevalence of being overweight and obese among children aged 5–19 has dramatically raised from 4% to 18% from 1975 to 2016. Furthermore, it was found that 38 million children under the age of 5 were overweight or obese in 2019 (World Health Organization (WHO), 2020).

The obesity prevalence was determined as 6.5% in children between the ages of 6 and 10 years in a study by the Ministry of Health in Turkey (Republic of Turkey Ministry of Health, 2011). In another study conducted by WHO, the rate of obesity was reported as 8.3% in children aged between 6 and 9 years (European Childhood Obesity Surveillance Initiative; COSI-TUR

of WHO) (Bağcı-Bosi & Hilal, 2014). Therefore, it can be stated that the prevalence of childhood obesity is increasing significantly and gradually.

Childhood obesity usually continues as adulthood obesity and leads to many physical and psychosocial problems. Cardiovascular, respiratory, orthopedic problems, diabetes, and cancer are commonly observed, and morbidity and mortality are significantly high among the obese (Armstrong et al., 2014; Biro & Wien, 2010; Han et al., 2010). The etiologic factors include genetic factors, age, gender, hormonal and metabolic factors, socio-economic status, cultural factors, eating habits, and insufficient physical activity (Gil & Takourabt, 2017; Hills et al., 2007; Maatoug et al., 2013; Preston et al., 2015; Santiago et al., 2013; Sevinç et al., 2011). Consumption of high-energy food, irregular eating habits, eating harmful snacks instead of meals, and spending long periods on the computer, TV, etc., and thereby a sedentary lifestyle are the main causes of childhood obesity (Önal & Adal, 2014; Savaşhan et al., 2015).

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Lifestyle changes are of great importance as obesity treatment is challenging and leads to permanent health problems and high expenditures. Starting with lifestyle changes and prevention strategies in childhood will reduce the prevalence of adulthood obesity. Given that school is the best place for developing skills and coping practices, for promoting healthy eating and physical activity behaviors, it may be stated that school is the best institution for reaching the target population (Eagle et al., 2013; Iversen et al., 2011; Knox et al., 2012).

A more comprehensive and routine evaluation of childhood obesity, which is rapidly increasing in Turkey as well as all over the world, is of great importance. Therefore, first, the size of the problem and related factors should be investigated. This study was carried out to determine the prevalence of childhood obesity and related factors.

Research Questions
1. What is childhood obesity prevalence?
2. What are changes in children's eating habits and lifestyle?
3. What are the factors associated with childhood obesity?

Methods

Study Design
A descriptive and correlational design was used in this study.

Sample
This research was conducted in Istanbul between May 2015 and January 2018. In the literature, it has been seen that children aged 8–12 are more conscious of their eating habits (Bağcı-Bosi & Hilal, 2014; Lu et al., 2016). Considering the reading, writing, and perception levels of the students, fourth-grade primary school students were included in the study. A primary school was randomly selected from each of the 39 districts of Istanbul, which is one of the world's leading metropolises.

The number of children (population) that can be included in the study in selected schools was determined as 9022. It was planned to include the entire population in the study without using the sample selection method. An informed consent form was sent to the parents of all students, and permission was requested for their children to participate in the study. However, 3322 parents did not give permission or did not respond to the consent form, 60 students did not come to school on the day of data collection despite their permission, 14 students refused to measure their height and weight, and 6 students did not answer all the survey questions. Therefore, the study was completed with 5620 children, which corresponds to 62% of the population. The flow diagram of the study was shown in Figure 1.

Data Collection Tools

Preview with the Student
The study was explained to the authorized people (classroom teachers and school administrators) in each school where the study will be conducted, and support was requested for informed consent from families.
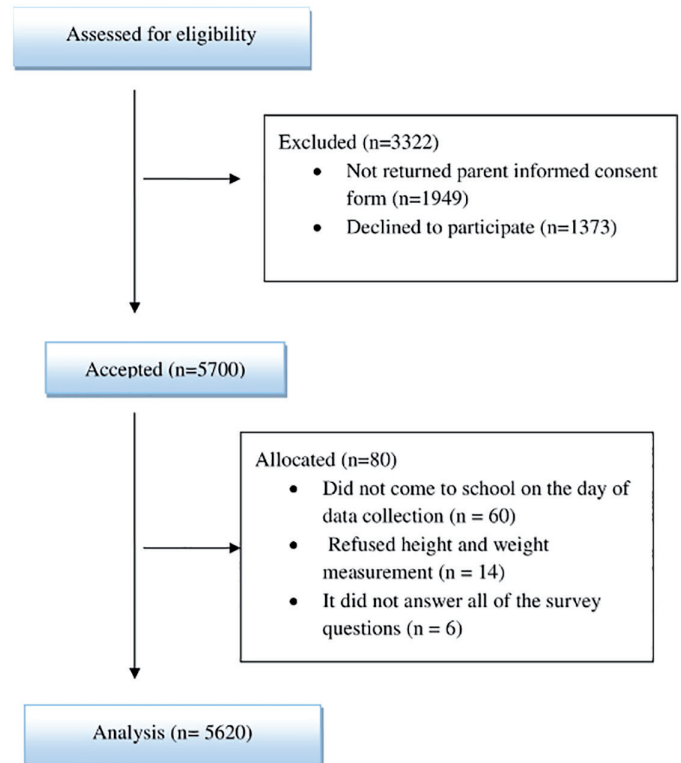

Figure 1.
The Flow Diagram of the Study

Interview with the Student
In the first interview with the students, the students' descriptive characteristics, eating habits, and activity levels were questioned using the Student Information Form. Subsequently, anthropometric measurements (height–weight) were performed for body mass index (BMI) assessment. In addition, on the same day, students were given training on healthy nutrition and exercise to protect their health.

Student Information Form
Student Information Form, prepared by the researchers in line with the literature, is a diagnostic form consisting of 22 items evaluating the students' socio-demographic characteristics, such as age, gender, height, and weight, their characteristics associated with the eating habits such as the number of main meals, skipping meals, breakfast habits, eating habits while watching TV, regular milk consumption, frequency of consumption of certain foods (grains and legumes, meat and meat products, fats (saturated and polyunsaturated), chips, french fries, etc., greasy food and ready-made cakes, biscuits, chocolate, etc., sugary food, etc.), and the characteristics associated with activity levels such as skipping rope, chasing, etc., playing games, frequency of walking, participation in sports teams, frequency of watching TV, and frequency of spending time in front of the computer (Kaya et al., 2014; Maatoug et al., 2013; Önal & Adal, 2014; Preston et al., 2015). The students were informed by the researchers about the research and the Student Information Form. After that, this form was filled in by the students in the classroom environment under the

supervision of researchers. The expressions "always," "yes," and "everyday" are used when the situation is present and continuous, while the expressions "never," "no," and "never" express the absence of action. The rest of these statements are categorized as "sometimes."

Anthropometric measurements (Height–Weight)

After completing the students' questionnaires, anthropometric measurements were started by the same people. Before weighing, the electronic scale was calibrated, and students were weighed in light clothes and shoeless. An electronic weighing device was used for weight measurement. During the height measurement, the student's shoes were removed. Portable height boards were used for height measurement. The feet are adjacent, the head is brought to the horizontal plane, and with the help of the ruler, a straight triangle is formed, and the point where the ruler and the vertical plane intersect is determined and recorded. The BMI was classified according to the reference values of the Centers for Disease Control and Prevention (CDC) as follows: BMI < 5 underweight, 5–84 normal weight, 85 ≥ BMI ≤ 94 overweight, BMI ≥ 95 obese (National Center for Health Statistics, 2000).

Statistical Analysis

Statistical analyses were carried out using the Statistical Package for Social Sciences (ver. 21.0, IBM SPSS Corp., Armonk, NY, USA) program. Normality distribution was tested using the Kolmogorov–Smirnov test. Also, kurtosis and skewness values were examined. Non-parametric tests were used for the data that were not normally distributed. Descriptive statistics of the data were given as numbers and percentages. The mean, standard deviation, and range values of the continuous variables were reported. The correlation of two continuous variables was analyzed with the Spearman correlation coefficient. Mann–Whitney *U* and the Kruskal–Wallis tests were used to compare BMI according to gender and eating habits.

Ethical Considerations

This study was approved by the ethics committee of Noninterventional Clinical Researches Ethics Committee of Istanbul Medipol University (Date: January 23, 2015, Project no: 10840098-34). Also, written consent was obtained from the parents and the İstanbul Medipol University Provincial Directorate of National Education.

Results

Of the students included in the study, 51.1% were female, and the mean age was 9.5 (±0.64). More than half of the students (68.4%) stated that they sometimes skipped meals, 36.4% did not have breakfast regularly, 50.9% sometimes ate chips, fried potatoes, and 64.6% sometimes ate packaged cake, biscuits, chocolate, dessert. Also, more than half of the children never (9.1%) or sometimes (43.3%) consumed milk. Only 8% of the children played games such as jumping rope and chasing every day and 30.5% walked for shorter than 30 minutes. The students watched TV for a mean of 1.6 hours on weekdays and 1.9 hours during the weekend, and spent time on the computer for a mean of 1 hour on weekdays and 1.2 hours during the weekend (Table 1). The obesity prevalence according to age has been presented in Table 2 and Table 3 in female and male students, respectively. Fifteen percent of female students are overweight, and 14.1% are obese (Table 2). Among the boys, 15.1% are overweight and 17.3% are obese (Table 3). When the overall obesity prevalence was analyzed, 15.3% were seen to be overweight, and 15.7% were determined to be obese (Table 4).

When the BMI-related factors were analyzed, age ($p=.001$), time spent on TV ($p=.001$), and the computer ($p=.001$) were found to be associated with BMI. Body mass index was determined to be higher among boys ($p=.004$), among the students who skipped meals ($p=.001$), and those who did not have breakfast regularly ($p=.001$) (Table 5).

Discussion

Childhood obesity increases morbidity and mortality by increasing the risk of cardiovascular diseases and impairs the quality of life by causing many physical and psychosocial problems (Armstrong et al., 2014; Basiratnia et al., 2013; Sato et al., 2010). Obesity, which is known to negatively affect the future life of children, has been increasing worldwide as an epidemic and is estimated to increase even more unless prevented (Jia et al., 2017).

While the obesity prevalence is reported as 17.2% in children between 2 and 19 years according to the 2013–2014 data in the United States, this rate has been reported to rapidly increase in recent years (Ogden et al., 2016). The obesity prevalence was reported as 6–31% among boys and 5–21% among girls in the study of WHO conducted with children among 6–9 years in Europe (Wijnhoven et al., 2014). The prevalence in our country is like that of America and Europe and has been determined as 15.7% in this study. The obesity prevalence was reported as 6.5% and 8.3% in two comprehensive studies published in 2011 and 2013 in Turkey (Bağcı-Bosi & Hilal, 2014; Republic of Turkey Ministry of Health, 2011). It may easily be stated that obesity prevalence is rapidly increasing in Turkey.

It is important to address the factors that lead to childhood obesity and to carry out interventions. Physical inactivity and unhealthy eating habits are the parameters that should be evaluated first. In our study, 30% of the children were determined to walk less than half an hour a day and 31.9% were determined to have never played games like skipping rope or the catch game. Therefore, approximately one-third of the children may be stated to be inactive. Students were determined to spend a mean of 1.6 hours on television on weekdays and 1.9 hours during the weekend. It was reported that spending more than 2 hours on television or the computer contributed to obesity, and it was emphasized to limit this duration to 2 hours (Li et al., 2010; Vandewater & Denis, 2011). In this study, the duration spent on TV was observed to reach a critical level in children, and it may be stated that the obesity risk may increase given that 70.2% of children regularly watch TV. Watching TV not only reduces physical activity but also leads to unhealthy eating via the promotion of unhealthy food through advertisements. Therefore, government policies should be developed, and children should be motivated to healthy eating by promoting healthy food.

Table 1.
Socio-demographic Characteristics, Eating Habits, and Activity Levels of the Students (n=5620)

	n	*%*		*n*	*%*
Gender			**Chips, french fries, etc., consumption of fatty food**		
Female	2870	51.1	Everyday	847	15.1
Male	2750	48.9	Sometimes	2860	50.9
Number of main meals			Always	1913	34.0
One meal	179	3.2	**Cakes, biscuits, chocolates, etc., consumption of sugary food**	*n*	*%*
Two meal	1074	19.2	Never	1298	23.1
Three meal	3756	66.8	Sometimes	3632	64.6
Four and more	611	10.8	Always	690	12.3
Skipping the main meals			**Rope skipping, chasing, etc., playing games**		
Never	1523	27.1	Everyday	501	8.9
Sometimes	3846	68.4	Sometimes	3329	59.2
Always	251	4.5	Never	1790	31.9
Skipped the main meal			**How many hours do you walk in a day?**		
Breakfast	1438	35.1	Less than half an hour	1715	30.5
Lunch	1907	46.5	Half an hour to an hour	2338	41.6
Dinner	752	18.4	More than an hour	1567	27.9
Making regular breakfast				**Mean ± SD**	**Range**
Yes	3574	63.6	**Age**	9.5± 0.64	8–12
No	275	4.9	**Watching TV – weekday (hour/day)**	1.6 ± 1.5	0–9
Sometimes	1771	31.5	**Watching TV – weekend (hour/day)**	1.9 ± 1.6	0–9
Eating something while watching TV			**Spending time on the computer – weekday (hours/day)**	1.0 ± 1.4	0–12
Never	1675	29.8	**Spending time on the computer – weekend (hours/day)**	1.2 ± 1.4	0–12
Sometimes	3069	54.6			
Always	876	15.6			
Consumption of milk regularly					
Never	509	9.1			
Sometimes	2434	43.3			
Always	2677	47.6			

Note: SD=Standard deviation.

Frequent consumption of high-energy food is one of the most important factors in obesity (Rosenheck, 2008). In this study, given that 84.9% of children were determined to consume chips and fried potatoes at some time or all the time and 76.9% were determined to consume packaged cake and biscuits, it may be stated that the rate of unhealthy food consumption is very high. Skipping meals was determined to be a severe problem for the development of obesity besides unhealthy food consumption (Nicklas et al., 2001; Santiago et al., 2013). A significant relationship was determined between skipping meals and obesity in the present study and the obesity rate was found to be higher among children who skipped meals. In addition, the obesity rate was found to be lower among students who regularly had breakfast. Given that approximately 70% of the students skip the main courses and 35% skip breakfast, it may be stated that the students should be given education about the importance of regular eating. On the other hand, one of the cornerstones of a healthy diet in childhood is daily milk consumption. However, it was determined that more than half of the children did not consume milk regularly. Studies published in recent years have reported that regular milk consumption reduces the risk of obesity in the long term (Beck et al., 2017; Lu et al., 2016). From this point of view, children should be given regular milk consumption habits and protocols should be established in schools.

In this study, age was found to be one of the factors associated with obesity. An inverse correlation was determined between age and obesity prevalence, and the rate of obesity was found to be higher in younger age groups. This result is consistent with the results of the previous studies and the obesity prevalence was seen to be higher in small age (Jia et al., 2017; Zhou et al., 2017). Therefore, small children should be known to be at higher risk compared to adolescents and required measures should be taken.

Table 2.
Prevalence of Underweight, Normal-Weight, Overweight, and Obesity of Female Students (n=2870)

Age	Underweight n	Underweight %	Normal-Weight n	Normal-Weight %	Overweight n	Overweight %	Obesity n	Obesity %
8	3	2.9	61	58.1	24	22.9	17	16.2
9	24	2.3	676	64.3	173	16.4	179	17.0
10	60	3.7	1107	69.0	238	14.8	199	12.4
11	7	7.2	72	74.2	7	7.2	11	11.3
12	1	8.3	9	75.0	2	6.7	–	–
Total	95	3.3	1925	67.1	444	15.5	406	14.1

Table 3.
Prevalence of Underweight, Normal-Weight, Overweight, and Obesity of Male Students (n=2750)

Age	Underweight n	Underweight %	Normal-Weight n	Normal-Weight %	Overweight n	Overweight %	Obese n	Obese %
8	1	1.2	43	50.0	15	17.4	27	31.4
9	21	2.5	527	62.5	134	15.9	161	19.1
10	43	2.6	1096	66.2	244	14.7	273	16.5
11	7	4.6	112	74.2	20	13.2	12	7.9
12	1	7.1	10	71.4	1	7.1	2	14.3
Total	73	2.7	1788	65.0	414	15.1	475	17.3

Table 4.
Prevalence of Obesity of Total Students (n=5620)

	n	%
BMI		
Underweight	168	3.0
Normal-weight	3713	66.1
Overweight	858	15.3
Obese	881	15.7

Note: BMI=body mass index.

This study has revealed that the obesity prevalence varies according to age and is found higher among boys, consistent with the other studies (Elkum et al., 2016; Giralt et al., 2011; Hassapidou et al., 2017; Jia et al., 2017; Preston et al., 2015). This difference was associated with boys' caring less about being obese, not spending effort on weight control, and parents' caring about the obesity of girls more than boys and warning girls more about obesity (Wang et al., 2018).

In the present study, BMI was calculated by measuring height and weight, the obesity classification was made according to the CDC data, and the obesity prevalence was estimated. In one study, when the waist circumference and the BMI were estimated for 5 years, the waist circumference was determined to significantly increase while the BMI decreased in years. This

Table 5.
Factors associated with body mass index (n=5620)

	BMI	
	r	*p*
Age	−.052	.001
Spending time watching TV	.064	.001
Spending time in front of a computer	.055	.001

	Mean ± SD	Z, χ^2	*p*
Gender			
Girls	18.35 ± 3.35	Z=−2.875	.004
Boys	18.67 ± 3.53		
Skip the main meals			
Never	18.27 ± 3.36	χ^2=15.890	.001
Sometimes	18.56 ± 3.46		
Always	19.07 ±3.63		
Making regular breakfast			
Yes	18.34 ± 3.34	χ^2=27.100	.001
No	19.33 ± 3.61		
Sometimes	18.70 ± 3.61		

Note: BMI=body mass index; SD=standard deviation; r=Spearman's rank correlation coefficient; Z, Z test (Mann–Whitney U); χ^2, Kruskall–Wallis test.

indicates the presence of obesity, and this condition leads to risk of many metabolic diseases. It was reported that central obesity could not be determined with BMI only and that estimating the waist circumference was of importance in future studies (Griffiths et al., 2013).

Given that childhood obesity usually converts to adulthood obesity, interventions should be carried out for the prevention of obesity in the early period. School programs aiming at the prevention of obesity at school should be considered, as school is the best place for reaching children and motivating them to gain knowledge, skills, and attitudes. Studies about this issue have increased in recent years, and a positive outcome could be achieved. In one study, children were given nutrition education and consultation, physical activity programs were scheduled at school, and the obesity prevalence was found to decrease (Bülbül, 2020; Santina et al., 2021; Tarro et al., 2014). In another study, a less-expensive and healthier lunch was provided for children, and positive outcomes could be achieved (Liou et al., 2015).

It can be said that obesity has become an important health problem in all societies and that prevention strategies will be more effective than treatment. As in all chronic diseases, lifestyle changes should be made permanently, and obesity should be prevented by adopting the "prevent before occurrence" principle. Families should be incorporated into prevention programs, and children should be supported to adopt a healthy lifestyle.

Study Limitations

The long duration between the beginning and the end of the study could be shown among the limitations because children in the same age range were included, but the times were different. Therefore, factors that may affect the prevalence of obesity in children (increasing technology addiction and increasing fast food consumption) may have changed in this period. Additionally, since fourth-grade students were included in our study, the age groups are mainly 9 and 10 years old. This reduced the generalizability of the study, as this age group did not represent the entire childhood. Finally, the study data obtained from children may have affected the reliability of the data relatively, and this can be shown among the limitations.

Conclusion and Recommendations

The study found that the prevalence of obesity and unhealthy eating habits of students was significantly high and obesity prevalence is increased in the presence of obesity in either parent. The present study was conducted with children only, and future studies should also include parents. It is recommended to do prevalence studies through regular screening programs and to conduct education programs aiming at the promotion of healthy eating habits and increasing physical activity.

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