



## DETERMINING THE PREVALENCE OF OBESITY AND THE EFFECTIVE RISK FACTORS IN ADOLESCENTS IN THE AGE GROUP OF 15-18 YEARS AT A SECONDARY SCHOOL

### Bir Ortaöğretim Kurumundaki 15-18 Yaş Adölesanlarda Obezite Prevelansı ve Etkileyen Faktörlerin Belirlenmesi

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#### ÖZET

**Amaç:** Araştırma, Çankırı ilinde bir ortaöğretim okulundaki 15-18 yaş grubu adölesanlarda obezite prevelansını ve etkileyen risk faktörlerini belirlemek amacıyla gerçekleştirildi. **Yöntem:** Araştırma, Şubat-Nisan 2017 tarihleri arasında Çankırı ilindeki bir ortaöğretim kurumunda öğrenim gören 15-18 yaş grubundaki toplam 402 adölesan ile tanımlayıcı ve kesitsel olarak yürütüldü. Adölesanların vücut ağırlığı, boy uzunluğu ölçüldü ve beden kitle indeksleri hesaplandı. **Bulgular:** Araştırmada öğrencilerin % 16.7'sinin obez olduğu saptanmıştır. Obezite sıklığı; yüksek sosyoekonomik düzey, televizyon ve bilgisayar karşısında uzun süreli hareketsiz kalma, azalmış fiziksel aktivite, ailede obezite öyküsünün bulunması, hızlı yemek yeme ve diyet yapma ile ilişkili bulunmuştur ( $p<0.05$ ). Öğrencilerin Beslenme Alışkanlıkları İndeksi'ne göre % 59.5'inin orta ve % 27.9'unun yüksek risk grubunda olduğu belirlenmiştir. Ayrıca öğrencilerin beden kitle indeksi değerleri ile beslenme alışkanlıkları puanları arasında ise negatif yönlü ve anlamlı bir ilişki olduğu saptanmıştır ( $r=-0.406$ ;  $p<0.001$ ). **Sonuç:** Araştırmada incelenen adölesanlarda obezite prevelansının yüksek olduğu belirlenmiştir. Adölesanlarda obezitenin önlenmesi ve yönetimi için sağlıklı beslenme ve düzenli fiziksel aktivitenin kazandırılmasına yönelik daha etkili halk sağlığı programlarının uygulanması önerilmektedir.

**Anahtar kelimeler:** Adölesan, obezite, prevelans, risk faktörleri

#### ABSTRACT

**Aim:** The study was conducted to determine the prevalence of obesity and the effective risk factors in adolescents in the age group of 15-18 years at a secondary school located in the province of Çankırı. **Methods:** This descriptive and cross-sectional study was conducted with a total of 402 adolescents in the age group of 15-18 years studying at a secondary school located in the province of Çankırı between February and April 2017. Body weights and heights of the adolescents were measured, and their body mass indexes were calculated. **Results:** It was determined in the study that 16.7% of the students were obese. The prevalence of obesity was found to be associated with a high socio-economic level, the long sedentary period in front of television and computer, decreased physical activity, family history of obesity, fast eating, and diet ( $p<0.05$ ). According to the Eating Habits Index, 59.5% of the students were determined in moderate risk group; whereas, 27.9% were determined in the high-risk group. Additionally, a negative and significant correlation was found between body mass index values and eating habits scores of the students ( $r=-0.406$ ;  $p<0.001$ ). **Conclusion:** It was determined in the study that the obesity prevalence of the adolescents was high. It is recommended to implement more effective public health programs to acquire healthy nutrition and regular physical activity for management and prevention of obesity in adolescents.

**Key words:** Adolescent, obesity, prevalence, risk factors

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## INTRODUCTION

Obesity in children and adolescents is a common worldwide problem.<sup>1,2</sup> In the developed countries, the prevalence of overweight and obesity in children and adolescents has increased 2-5 times for the last 20-30 years.<sup>3</sup> It is stated that 12.7 million children and adolescents at the ages of 2-19 years are obese and the prevalence of obesity is 17% in the United States of America.<sup>4</sup> It is reported that 23.1% of adolescents aged between 12-17 years are overweight or obese in Canada in 2014.<sup>5</sup> The problem of obesity negatively affects both the developed countries and the developing countries.<sup>6</sup> According to the results of the Turkey Nutrition and Health Survey (2010), 8.2% of the children and adolescents in the age group of 6-18 years are obese across the country.<sup>7</sup>

Childhood and adolescent obesity leads to an increase mortality and morbidity rates during adulthood period by causing diabetes and cardiovascular diseases,<sup>8</sup> musculoskeletal disorders, and social problems.<sup>9</sup> Due to the increasing prevalence of obesity in adolescents and the resulting problems, it has become a public health problem and this situation has started the efforts of fighting with obesity around the world. It is important to determine the factors associated with obesity and overweight in adolescents and to plan the necessary steps for the success of these efforts.<sup>3,10</sup>

It is determined in the literature that obesity is a multidimensional problem and is affected by genetic and environmental factors.<sup>11,12</sup> In the literature, these factors are stated as having the history of obese and overweight parents in the family,<sup>13,14</sup> high socio-economic level of the family,<sup>15</sup> inadequate physical activity and sedentary lifestyle,<sup>16</sup> watching television and playing video games for a long period,<sup>14,16,17</sup> dieting, the habit of skipping meals,<sup>13</sup> and fast-food-like unhealthy nutrition.<sup>18</sup> The prevalence of obesity in Turkey has been studied at different age groups. Although adolescent obesity leads to increase mortality and morbidity in adulthood, there is a limited number of studies determining the prevalence of obesity and the effective factors in 15-18-year-old adolescents. Therefore, the study was conducted to determine the prevalence of obesity and the effective risk factors in adolescents in the age group of 15-18 years old in Çankırı High School, Turkey.

## METHODS

### Study design

This study was conducted with descriptive and cross-sectional research design.

### Study setting

According to the data of Çankırı Provincial Directorate of National Education, it was determined that Çankırı High School was the secondary education institution having the highest population providing education at high school level where the numbers of male and female students are similar. For this reason, this descriptive and cross-sectional study was conducted at Çankırı High School between February and April 2017. A total of 426 students are studying at the school where the study was conducted.

### Study population

The population of the study consisted of all of 15-18 year-old students (N=426) studying in high school between February and April 2017. The inclusion criteria for the students were determined as follows; being voluntary to participate in the study, filling out the data collection forms completely, and not having any cardiovascular disease, diabetes, kidney disease, hypothyroidism, and mental health problem according to the students' self-report. It was planned to include 423 students meeting the inclusion criteria of the study. As a result, the study was completed with 402 students due to some reasons such as the failure of students to attend the school during the study, fill out the data collection forms completely, and be voluntary to participate in the study.

### Data collection tools

Adolescent Information Form, Eating Habits Index, and Body Mass Index (BMI) Percentile were used as the data collection tools. A scaling device and a height meter were used to take the physical measurements.

The "Adolescent Information Form" involved a total of 29 questions on age and gender of the adolescents, educational status and occupation of their parents, socio-economic status of their families, smoking- alcohol status of the adolescents, health status of their families, and eating habits and status of adolescents. The students were asked to evaluate financial situation of their families for the classification of the socio-economic status in the questionnaire. In January 2017, The Confederation of Turkish Trade Unions (Türk-İş) reported that hunger threshold and poverty threshold for a family of four persons was 1479 TL and 4818 TL, respectively. Based on this information, 0-1479 TL is classified as low socioeconomic status, 1480-4818 TL as a middle socioeconomic status and 4819 TL and higher as high socioeconomic status.<sup>19</sup> The students were asked to consider this classification while answering the question. Regular physical activity

was accepted as a moderate-intensity physical activity of 60 minutes every day (running, brisk walking, swimming, dancing, and cycling).<sup>20</sup> The students were asked to take this information into consideration while answering the question. Additionally, they were asked to evaluate and answer the eating speed on an individual basis.

The "Eating Habits Index" was developed by Demirezen (1999) and revised by Demirezen and Coşansu in 2005.<sup>21</sup> The index with six items is a five-point Likert type scale and evaluates the eating habits of children and adolescents. In the scale, there are items like "I eat fatty and sugared foods, I add salt to my food, I drink coffee, coke, and tea more than three cups a day, I eat beef, mutton, and their products; salami, sausage, soujouk, etc. I eat from the menus sold outside like hamburger, french fries and pizza, I eat fruits, vegetable dishes, and meals with dry legumes such as cracked wheat or white bean, chickpeas, lentils, etc.". Each item is scored as "never (0 point), rarely (1 point), sometimes (2 points), often (3 points), and always (4 points). However, reverse scoring is made for the last item on the scale. According to the score obtained from the scale, eating habits of the students are classified as "0 point: no risk", "1-6 points: low risk", "7-12 points: medium risk", "13-18 points: high risk" and "19-24 points: very high risk."<sup>21</sup> The Cronbach's alpha coefficient of the index in the present study was found as  $\alpha = 0.76$ .

The BMI percentile was calculated by dividing the body weight in kilograms into the height in square meter ( $BMI = \text{kg}/\text{m}^2$ )<sup>22,23</sup> BMI percentile curves that were prepared by Bundak et al. in 2006 and adapted to healthy Turkish children aged between 6 and 18 years have been used in Turkey.<sup>24</sup> According to "Body Mass Index Percentile, the Body Mass Index less than 5 percentile is considered as underweight, BMI of 5-85 percentile as normal weight; BMI of 85-95 percentile as overweight; BMI of 95 percentile and higher as obese."<sup>22,24</sup>

"Scale device and height meter: a measuring device with a sensitivity of 100 grams and 1-cm interval was used in order to measure the weight and height of the students.

### **Procedure**

In order to prevent the difference between the applications, the data were collected only by the researchers. Before the data collection, the students were informed about the study in the class and their verbal and written consents were received and the parent consent form was delivered to the students who wanted to participate in the study. Then, an appropriate date and hour were determined together with the students and school administration in order

to collect the data. After obtaining the written consents of the parents, the students were asked to fill out the "Adolescent Information Form" and "Eating Habits Index" at a predetermined date and hour. It took 20 minutes to fill the forms by using the face-to-face interview method. Then, the physical measurements were performed. Before performing the physical measurements, the adolescent was asked to take off the clothes like a thick jacket and cardigan and also shoes. The scale device was placed on a flat surface and set to zero. The adolescents were asked to square their shoulders, keep their hands on the side, and hold their legs together without bending their knees. The value of kg read on the electronic display was recorded. When measuring the height, the distance from the adolescent's head to toe was measured and recorded during their height measurement. Body mass index of each student was calculated. Each student was classified as underweight, normal, overweight and obese by evaluating the measured BMI value according to the percentile chart.

### **Data analysis**

The data were analyzed by using IBM SPSS Statistics 20 (IBM Corporation, Armonk, New York, USA). While the descriptive statistics (percentage, mean, standard deviation) were used to analyze the data, chi-square test was used to compare quantitative data. Pearson Product-Moment Correlation analysis was performed to determine the correlation between the score of eating habits and body mass index. The results were evaluated at a confidence interval of 95% and significance level of  $p < 0.05$ .<sup>25</sup>

### **Ethical considerations**

In order to conduct the study, ethics committee approval was obtained from the Ethics Committee of Çankırı Karatekin University (2016-06/22.12.2016). Afterward, written institutional permission was received from the Provincial Directorate of National Education of Çankırı Governorate in order to obtain permission from the high school where the study was conducted (25371745/300/625536). The students were informed that participation in the study was based on volunteerism and attention would be paid to the principle of confidentiality. Written consents were obtained from the parents of the students who were voluntary to participate in the study.

## RESULTS

### Results on socio-demographic characteristics and the prevalence of obesity

When the socio-demographic characteristics and eating habits of the students were evaluated, it was determined that 51.7% of them were female, 53.2% had families with moderate socioeconomic status,

17.4% had the history of obesity in their families, 14.2% were dieting, 30.8% ate their meal at fast speed and 50.7% ate their meal at normal speed, 54.0% skipped breakfast during the day, and 70.4% did not do sports regularly. The average age of the students was  $16 \pm 1$ , 64.4% had normal BMI value, 10.4% were overweight, and 16.7% were obese (Table 1).

<b>Characteristics</b>	<b>n</b>	<b>%</b>
<b>gender</b>		
Female	208	51.7
Male	194	48.3
<b>Socio-economic status of the family</b>		
High	174	43.3
Moderate	214	53.2
Low	14	3.5
<b>History of obesity in the family</b>		
Yes	70	17.4
No	332	82.6
<b>Dieting</b>		
Yes	57	14.2
No	345	85.8
<b>Eating speed</b>		
Slow	49	12.2
Normal	229	57.0
Fast	124	30.8
<b>Regular sports</b>		
Yes	119	29.6
No	283	70.4
<b>Skipping meal</b>		
Yes	217	54.0
No	185	46.0
<b>BMI percentile</b>		
Underweight	34	8.5
Normal	259	64.4
Overweight	42	10.4
Obese	67	16.7

**Table 2. Comparison of underweight, normal weight, overweight, and obese status of the students according to some socio-demographic characteristics and eating habits**

Characteristics	Underweight		Normal		Overweight		Obese		$\chi^2$	p
	n	%	n	%	n	%	n	%		
<b>Income level of the family</b>										
High	11	6.3	90	51.7	18	10.3	55	31.6	111.2	0.0001
Middle	20	9.3	61	75.2	23	0.7	10	4.7		
Low	3	21.4	8	57.1	1	7.1	2	14.3		
<b>Obese member in the family</b>										
Yes	1	1.4	16	22.9	4	5.7	49	70.0	174.1	0.0001
No	33	9.9	243	73.2	38	11.4	18	5.4		
<b>Diet</b>										
Yes	0	0.0	11	19.3	10	17.5	36	63.2	115.9	0.0001
No	34	9.9	248	71.9	32	9.3	31	9.0		
<b>Eating speed</b>										
Slow	7	14.3	35	71.4	7	14.3	0	0.0	186.1	0.0001
Normal	19	8.3	186	81.2	24	10.5	0	0.0		
Fast	8	6.5	38	30.6	11	8.9	67	54.0		
<b>Regular sports</b>										
Yes	11	9.2	102	85.7	6	5.0	0	0.0	44.9	0.0001
No	23	8.1	157	55.5	36	12.7	67	23.7		
<b>Sedentary tv/computer use</b>										
1-2 hours	23	10.7	168	78.5	22	10.3	1	0.5	68.7	0.0001
3-5 hours	10	6.3	76	47.8	19	11.9	54	34.0		
6 hours and more	1	3.4	15	51.7	1	3.4	12	41.4		

\* Chi-square test

	B	p	OR
Income level of the family (low, middle, high)	1.18	0.001	3.2
Obese member in the family (yes, no)	1.6	0.01	15.3
Eating speed (slow, normal, fast)	1.11	0.001	3.03
Regular sports (yes, no)	1.52	0.001	4.5

### **Evaluation of Body Mass Index of the Students based on their sociodemographic characteristics and eating habits**

It was determined that the prevalence of obesity was statistically significantly higher in adolescents with a high socioeconomic level in their families compared to those with low and moderate socioeconomic level ( $p<0.05$ ).

It was found that the prevalence of obesity was statistically significantly higher in adolescents spending sedentary time in front of a television or computer for 6 hours and more compared to those spending sedentary time in front of the television or computer for 1-2 hours and 3-5 hours ( $p<0.05$ ). As the time spent by the adolescents in front of a television or computer increased, the prevalence of obesity increased.

Additionally, the prevalence of obesity was statistically significantly higher in adolescents having the history of obesity in their family than those having no history of obesity ( $p<0.05$ ). There was a statistically significant relationship between body mass index and regular exercise and eating speed in adolescents ( $p<0.05$ ). While obesity was not observed in adolescents who did sports regularly, 23.7% of adolescents who did not do sports regularly were obese. While obesity was not observed in adolescents eating at slow or normal speed, 54% of the adolescents eating fast were obese (Table 2).

### **The correlation between eating habits index and body mass index**

Eating habits index mean score of the students was found to be  $11\pm 3$ . It was determined that 59.5% of the students had a medium risk level of eating habits, 27.9% had high-risk level, 9.5% had low-risk level, and 3.2% had a very high-risk level. A negative significant correlation was determined between BMI values and eating habit scores of the students ( $r = -0.406$ ;  $p<0.001$ ).

### **Body mass index values and multivariate analysis of some variables**

Values of body mass index were assessed with multiple regression analysis in terms of some

independent variables and the logistic regression analysis was implemented. Overweight and obesity were accepted as the dependent variable and the variables significantly accounting for overweight and obesity among independent variables were examined (Table 3). As the financial situation of the family progressed from low to high, the risk of obesity increased 3.2 times for the adolescent ( $p<0.05$ , OR=3.2). The risk of obesity of the adolescent increased 15.3 times with increasing prevalence of obesity in the family ( $p<0.05$ , OR=15.3). As eating speed of the adolescent increased, the risk of obesity increased 3.03 times ( $p<0.05$ , OR=3.03). As the rate of the adolescent not to do sports regularly increased, the risk of obesity increased by 4.5 times ( $p<0.05$ , OR=4.5).

### **DISCUSSION**

The obesity in children and adolescents is a common worldwide problem.<sup>2</sup> Even though childhood obesity negatively affects mostly the developed countries, it has also become a major problem for developing countries.<sup>6</sup>

Although there is no national study investigating the prevalence of obesity in adolescents in Turkey, there are various local and regional studies. It has been determined in these studies that the obesity prevalence of adolescents varies between 2-8% and differs according to the regions, but it is lower compared to other European countries and the United States of America.<sup>14,15,26</sup> The prevalence of obesity was found as 16.7% in the present study, which was high compared to prevalence rates in other regional studies, but it was similar with the prevalence of adolescent obesity in developed countries. This situation was thought to be associated with the fact that the age group of 12-18 years has been included in the sample in prevalence studies in Turkey and the age group of 15-18 years was included in the sample in the present study. In the meta-analysis study of 58 studies conducted in the age group of 5-19 years between 1990 and 2015 in Turkey, it was reported that the prevalence of obesity increased from 0.6 to 7.3%.<sup>27</sup> The results showed that obesity has become an important problem for Turkey and effective and applicable precautions should be taken.

It is stated that while low socioeconomic level causes obesity in developed and industrialized countries,<sup>28</sup> high socioeconomic level increases the prevalence of obesity in developing countries.<sup>15,29,30</sup> It was determined in the present study that the adolescents having high socioeconomic level had a higher prevalence of obesity. This result is compatible with the results reported for developing countries (Table 2; Table 3). This result has shown that obesity is not only a medical and physiological problem but also an important public health problem affected by economic, social, and cultural factors.

It is stated in the literature that a sedentary lifestyle is related to obesity.<sup>14,31</sup> In the study, the sedentary time adolescents spend in front of the television and the computer was found as  $3.0 \pm 2.0$  hour. It was found in the present study that there was a significant relationship between the obesity and the sedentary time spent in front of television and computer and the prevalence of obesity increased with increasing sedentary time spent in front of TV and computer (Table 2). This result is compatible with the literature. It was thought that remaining sedentary in front of the television and the computer and sitting or having a snack-like eating habits during this time caused obesity by leading to an increase in adipose tissue in the body.

Reduced physical activity is an important risk factor for the development of obesity in adolescents.<sup>13,32</sup> In the study conducted by Ercan et al. (2012) to investigate the prevalence of and reasons for obesity in adolescents aged 11-18 years, it was determined that 53.7% of the adolescents did not participate in any physical activity and those with normal body mass index did more regular physical activities compared to overweight and obese adolescents.<sup>14</sup> In the present study, it was also determined that 70.4% of the adolescents did not do regular physical activities and obesity prevalence of adolescents who did not do regular physical activity was significantly higher compared to the adolescents who did regular activity (Table 2; Table 3) and this result is compatible with the literature.

Genetic predisposition plays an important role in the development of obesity.<sup>33</sup> In the related studies, the presence of obesity in any of the parents increases the prevalence of obesity in children and adolescents.<sup>11,13,14</sup> Obesity prevalence of adolescents who had the history of an obese parent in their family was found to be significantly higher compared to the adolescents who did not have in the present study (Table 2; Table 3) and this result is compatible with the literature. This result was associated with the fact the role of the parents was effective in preparing foods and acquiring physical

activity habits by the adolescents in addition to the genetic predisposition.

It is stated in the literature that fast eating behavior is also effective in the development of obesity in adolescents.<sup>34</sup> It was also determined in the present study that the obesity prevalence of adolescents eating fast was significantly higher than adolescents eating at slow or normal speed (Table 2; Table 3) and this result is compatible with the literature. Rapid consumption of nutrients causes the accumulation of adipose tissue and obesity by increasing the development of adipose tissue cells in the body.<sup>35,36</sup>

In the study conducted by Aktaş et al., (2015) to investigate the prevalence and reasons of adolescent obesity in 260 students, it was determined that 56.5% of the students were in the middle risk group and 30.8% were in high-risk group in terms of the scores of the eating habits index.<sup>37</sup> In the correlation analysis, a weak and negative significant correlation was determined between scores of eating habits index and BMI values. Similarly, it was also determined in the present study that 59.5% of the students had a medium risk of eating habits and 27.9% had a high risk. A negative and significant correlation was determined between BMI values and eating habit scores of the students ( $r = -0.406$ ;  $p < 0.001$ ). Adolescents' eating habits are among the main reasons for the development of obesity. Especially sugary-fatty foods and fast-food-style nutrition increases the risk of obesity.<sup>11</sup> However, unlike the literature, it was determined in the present study that there was a negative significant correlation between obesity and score of eating habits index and the risk score of obese adolescents for the eating habits index was lower. This result was associated with the fact obese adolescents tried to gain healthy eating habits by being aware of their body mass indexes. As a matter of fact, we found in the present study that the prevalence of obesity in adolescents who dieted was higher than those who did not, so obese adolescents were thought to try to perform the weight management. Consequently, it was found that the prevalence of obesity in the present study was higher compared to the prevalence of the other regional studies in Turkey, but it was similar with the prevalence of adolescent obesity in the developed countries. It was found that the factors like high socio-economic level, a sedentary lifestyle characterized by remaining as sedentary in front of television and computer, reduced physical activity, having a history of obesity in the family, fast eating habit and dieting were risky in Turkish adolescents. It is recommended to implement more effective public health programs for adolescents to gain regular physical activity and healthy eating for the prevention and management of obesity.

### Limitation of the study

Since the study was conducted only in a high school, the results cannot be generalized to all adolescents.

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### Conflict of interest

The authors declared no potential conflicts of interest about the research, authorship, and/or publication of this article.

### REFERENCES

1. Ogden CL, Carroll MD, Kit BK, Flegal KM. Prevalence of childhood and adult obesity in the United States, 2011-2012. *JAMA* 2014; 311 (8): 806-814.
2. Biswas T, Islam A, Islam MS, Pervin S, Rawal LB. Overweight and obesity among children and adolescents in Bangladesh: a systematic review and meta-analysis. *Public Health* 2017; 142(1): 94-101.
3. Kumar S, Kelly AS. Review of childhood obesity: from epidemiology, etiology, and comorbidities to clinical assessment and treatment. *Mayo Clin Proc* 2017; 92 (2): 251-265.
4. 4. Centers for Disease Control and Prevention. Childhood obesity facts, <https://www.cdc.gov/obesity/data/childhood.html>. Date accessed: 05.01.2019.
5. Statistics Canada. Overweight and obese youth, <http://www.statcan.gc.ca/pub/82-625-x/2015001/article/14186-eng.htm>. Date accessed: 05.01.2019.
6. Rachmi CN, Li M, Alison Baur L. Overweight and obesity in Indonesia: prevalence and risk factors-a literature review. *Public Health* 2017; 147(1): 20-29.
7. Republic of Turkey Ministry of Health General Directorate for Health Research. Turkey nutrition and health survey nutrition status and habits assessment final report 2010-2014, p. 12-14.
8. Skinner AC, Perrin EM, Moss LA, Skelton JA. Cardiometabolic risks and severity of obesity in children and young adults. *N Engl J Med*. 2015;373(14):1307-1317
9. Pomerantz WJ, Timm NL, Gittelman MA. Injury patterns in obese versus nonobese children presenting to a pediatric emergency department. *Pediatrics* 2010; 125(4): 681-685.
10. Hamaideh SH, Al-Khateeb RY, Al-Rawashed AB. Overweight and obesity and their correlates among Jordanian adolescents. *J Nurs Scholarsh* 2010; 42(4): 387-394.
11. Li Y, Zhai F, Yang X, Schouten EG, Hu X, He Y, et al. Determinants of childhood overweight and obesity in China. *Br J Nutr* 2007; 97(1): 210-215.
12. Yi X, Yin C, Chang M, Xiao Y. Prevalence and risk factors of obesity among school-aged children in Xi'an, China. *Eur J Pediatr* 2011; 171(2): 389-394.
13. Andegiorgish AK, Wang J, Zhang X, Liu X, Zhu H. Prevalence of overweight, obesity, and associated risk factors among school children and adolescents in Tianjin, China. *Eur J Pediatr* 2012; 171(4): 697-703.
14. Ercan S, Dallar YB, Önen S, Engiz Ö. Prevalence of obesity and associated risk factors among adolescents in Ankara, Turkey. *J Clin Res Pediatr Endocrinol* 2012; 4(4): 204-207.
15. Dişçigil G, Tekin N, Söylemez A. Obesity in Turkish children and adolescents: prevalence and non-nutritional correlates in an urban sample. *Child Care Health Dev* 2009; 35(2): 153-158.
16. Chan JC, Malik V, Jia W, Kadowaki T, Yajnik CS, Yoon KH, et al. Diabetes in Asia, epidemiology, risk factors and pathophysiology. *JAMA* 2009; 301(20): 2129-2140.
17. Ji Cheng Y, Cheng Tusung O. Prevalence and geographic distribution of childhood obesity in China in 2005. *Int J Cardiol* 2008; 131(1): 1-8.
18. Singh A, Maheswari A, Sharma N, Anan K. Lifestyle associated risk factors in adolescents. *Indian J Pediatr* 2006; 73(10): 901-906.
19. Confederation of Turkish Trade Unions. <http://www.turkis.org.tr/ocak-2017-aclik-ve-yoksulluk-siniri-d1371>. Date accessed: 05.01.2019.
20. American College of Sports Medicine. ACSM's guidelines for exercise testing and prescription (9. Edition). Philadelphia: Lippincott Williams and Wilkins, 2013. p. 65-69.
21. Demirezen E, Coşansu G. Evaluating dietary pattern in adolescence. *Sted* 2005; 14(8): 174-178.
22. Kohn MR. Nutrition. In: Neinstein LS, editor. *Adolescent Health Care A Practical Guide*. New York: Lippincott Williams & Wilkins; 2008. P. 114-124.
23. Nihiser AJ, Lee SM, McKenna M, Odom E, Reinold C, Thompson D, et al. Body mass index measurement in schools. *J Sch Health* 2012;77(10):651-671.
24. Bundak R, Furman A, Gunoz H, Darendeliler F, Baş F, Neyzi O. Body mass index references for Turkish children. *Acta Pediatr* 2006;95(2):194-8.

25. Erol H. Analyzing data with SPSS program. Ankara, Nobel Publishing; 2010. p.45-49.
26. Arı Yuca S, Yılmaz C, Cesur Y, Doğan M, Kaya A, Başaranoğlu M. Prevalence of overweight and obesity in children and adolescents in eastern Turkey. *J Clin Res Pediatr Endocrinol* 2010; 2(4): 159-163.
27. Alper Z, Ercan İ, Uncu Y. A meta-analysis and an evaluation of trends in obesity prevalence among children and adolescents in Turkey: 1990 through 2015. *J Clin Res Pediatr Endocrinol* 2018; 10(1): 59-67.
28. Wardle J, Brodersen NH, Cole TJ, Jarvis MJ, Boniface DR. Development of adiposity in adolescence: five year longitudinal study of an ethnically and socioeconomically diverse sample of young people in Britain. *BMJ* 2006; 332(1): 1130-1135.
29. Martinez ES, Allen B, Ortega CF, Torres-Mejia G, Galal O, Lazcano-Ponce E. Overweight and obesity status among adolescents from Mexico and Egypt. *Arch Med Res* 2006; 37(4): 535-542.
30. Şimşek E, Akpınar S, Bahçebaşı T, Şenses DA, Kocabay K. The prevalence of overweight and obese children aged 6-17 years in the West Black Sea region of Turkey. *Int J Clin Pract* 2008; 62(7): 1033-1038.
31. Özmert EN, Özdemir R, Pektaş A, Uçkardeş Y, Yurdakök K. Effect of activity and television viewing on BMI z-score in early adolescents in Turkey. *World J Pediatr* 2011; 7(1): 37-40.
32. Laurson KR, Eisenmann JC, Welk GJ, Wickel EE, Gentile DA, Walsh DA. Combined influence of physical activity and screen time recommendations on childhood overweight. *J Pediatr* 2008; 153(2): 209-214.
33. Burke V, Beilin LJ, Dunbar D. Family lifestyle and parental body mass index as predictors of body mass index in Australian children: a longitudinal study. *Int J Obes Relat Metab Disord* 2001; 25(2): 147-157.
34. Süleiman A, Alboqai OK, Yasein N, El-Qudah JM, Bataineh MF, Obeidat BA. Prevalence of and factors associated with overweight and obesity among Jordan University students. *Int J Biol Sci* 2009; 9(7): 730-745.
35. Fredericka CB, Snellmana K, Putnama RD. Increasing socioeconomic disparities in adolescent obesity. *Proc Natl Acad Sci* 2013; 111(4): 1338-1342.
36. Kane JB, Frisco ML. Obesity, school obesity prevalence, and adolescent childbearing among U.S. young women. *Soc Sci Med* 2013; 88(1): 108-115.
37. Aktaş D, Öztürk FN, Kapan Y. Determination of the obesity prevalence and affecting risk factors, of eating habits among adolescents. *TAF Preventive Medicine Bulletin* 2015; 14(5): 406-412.