ARAŞTIRMA / RESEARCH

Factors affecting obesity in preadolescents: the case of Cappadocia

Preadölesanlarda obeziteyi etkileyen faktörler: Kapadokya örneği

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Cukurova Medical Journal 2021;46(3):1175-1183.

Abstract

Purpose: This cross-sectional study was conducted to determine the risk factors which affect obesity in preadolescents.

Materials and Methods: The sample of the study consisted of 500 preadolescents (girls: n=271, boys: n=229) attended in 18 secondary schools in the Cappadocia region of Turkey, and their parents. Data were collected using a questionnaire, the body weight, height, and waist circumference of the preadolescents were measured; the body mass index (BMI) and the waist-to-height ratio were calculated.

Results: Of preadolescents; 14.4% were obese, 11.4% were overweight, 35.2% had abdominal obesity, and 27% had likelihood of being at high metabolic and cardiovascular risk based on their waist/height ratio. According to the results of binary multiple logistic regression analysis (the backward stepwise procedure), the presence of an obese person in the family (boys), mother's educational level (girls), leisure time activities (girls), and an increase in eating according to mood (girls) were revealed as significant predictors of being overweight/obese, adjusted for age. Satisfied with current body weight and mother's BMI were the strongest variable to be associated with overweight/obese for both genders.

Conclusion: For early diagnosis and prevention of obesity in childhood, it is recommended to perform height-weight monitoring of students regularly, monitor risky children more frequently, provide training and consultancy for students and parents regarding balanced diets and physical activity, and provide the school-family cooperation.

Keywords:. Preadolescent, obesity, effective factors, school health

Öz

Amaç: Bu çalışma preadölesanlarda obeziteyi etkileyen risk faktörlerini belirlenmek amacıyla kesitsel olarak yapılmıştır.

Gereç ve Yöntem: Araştırmanın örneklemini, Türkiye'de Kapadokya Bölgesinde bulunan bir il merkezindeki 18 ortaokulda öğrenim gören 500 preadölesan (kız: 271, erkek: 229) ve onların ebeveyni oluşturmuştur. Veriler Anket Formu ile toplanmış, preadölesanların vücut ağırlığı, boy uzunluğu ve bel çevresi ölçülmüş, Beden Kütle İndeksi (BKİ), bel/boy oranı hesaplanmıştır.

Bulgular: Ergenlerin %14.4'ünün obez, %11.4'ünün fazla kilolu, %35.2'sinin abdominal obez, bel/boy oranına göre %27'sinin metabolik ve kardiyovasküler hastalıklara yakalanma açısından riskli grupta olduğu belirlemiştir. Çoklu logistik regresyon analizi sonuçlarına göre, ailede obez birey varlığı (erkek), annenin eğitim düzeyi (kız), boş zaman aktiviteleri (kız), duygusal duruma göre yemek yeme artışı (kız) fazla kilolu/obez olmanın anlamlı yordayıcıları olarak saptanmıştır. Mevcut vücut ağırlığından memnuniyet ve annenin BKİ'si, her iki cinsiyet için de fazla kilolu/obezite ile ilişkilendirilen en güçlü değişken olarak belirlenmiştir.

Sonuç: Çocukluk çağı obezitesinin erken belirlenmesi ve önlenmesi için düzenli aralıklarla öğrencilerin boy kilo izleminin yapılması, riskli çocukların daha sık izlenmesi, dengeli ve düzenli beslenme ile fiziksel aktiviteye ilişkin ebeveyn ve öğrencilere eğitim ve danışmanlık verilmesi, okul- aile işbirliğinin sağlanması önerilebilir.

Anahtar kelimeler: Preadölesan, obezite, etkileyen faktörler, okul sağlığı

INTRODUCTION

Obesity that starts in childhood and continues at later ages is an important health problem. It has an increasing prevalence in the world and Turkey, significantly affecting morbidity and mortality. Obesity brings with its severe physiologic problems, as well as psychological and social problems. Cardiovascular diseases, hypertension, diabetes, and respiratory problems are primary among these diseases. According to data of the World Health Organization, 3 million people lose their lives each year due to complications caused by obesity, and diseases such as ischemic heart disease, cancers, and diabetes are causes of death associated with obesity[1]. When considering that 42-63% of those who are obese at school age are also obese in adulthood, childhood obesity gains importance[2-5].

Childhood obesity has been increasing gradually in developed and developing countries in the last 20 years. The WHO 2018 report states that over the last 40 years, childhood obesity has increased ten times and 340 million children and adolescents worldwide are overweight and obese [6]. Regional studies in Turkey also revealed that obesity has increased gradually and the obesity rate varies between 1-22% [7-11].

As the physical activity and dietary habits acquired by children during school age continue into adulthood, it is important that interventions for the prevention of obesity are included in school health programs. Studies have emphasized the importance of starting the struggle against obesity in childhood[12,13]. For childhood obesity, adolescence is the last critical period in which lipidosis, which starts in childhood, increases and begins to become permanent. Due to the developmental characteristics of adolescence, this period is considered as risky because adolescent starts to adopt negative health behaviors that can lead to obesity. Unbalanced diet, skipping meals, snacking, and having high-calorie convenience foods are typical lifestyle behaviors of adolescents[14].

Nurses have important functions in activities performed to prevent obesity in school age children. Nursing activities for preventing obesity include protecting normal weight according to age and sex, determining children and adolescents at risk for obesity, observing growth and development and determining obesity at early ages, assisting children who are obese or overweight to lose weight, and forming a family and child/adolescent healthy lifestyle[13,15].

This cross-sectional study was conducted with preadolescents using a survey model in order to determine obesity in the early period and risk factors that cause obesity. The study aimed to find out the incidence of being overweight/obese in preadolescents and relevant risk factors influencing being overweight/obese in preadolescents

MATERIALS AND METHODS

A cross-sectional study was conducted with the preadolescents who attended 18 secondary schools of the Republic of Turkey Ministry of National Education in a city center of the Cappadocia region of Turkey. Ethics committee (Nevşehir Hacı Bektaş Veli University Ethics Committee 2014/84902927) and institutional (2014/1753/7997) approval was received, and the parents gave written informed consent. The aim of the study was also explained to the preadolescents and voluntary participation was ensured by obtaining their consent.

Sample

In the 2014-2015 school year, 4880 pupils were continuing their education in the city where the study was conducted. Randomly selected 500 preadolescents from the class lists stratified by gender and age and their parents were recruited to the study. In the study, parents were reached through teachers at schools. The data were collected between February and March 2015 using a questionnaire form.

Preadolescents aged 10 to 12 years who were continuing their education in the 5th, 6th or 7th grade and whose parents provided consent for voluntary participation were included in the study. The 8th grade students were not included as they were preparing for the 'High School Entrance Exams'. Preadolescents whose parents did not provide consent (n:20) were also not included.

Measure

Questionnaire

The questionnaire comprised 38 questions, on the socio-demographic characteristics of the preadolescents children and parents (10 questions), as well as the dietary habits (16 questions), physical

activity levels and sleeping habits (12 questions) of the students.

Data collection

Following ethics committee approval and written institutional permission for the study to be conducted, the data collection forms were completed by the preadolescent students themselves during the counseling class at the study school under the inspection of the researcher. After the students completed the forms, anthropometric measurements including height, weight and waist circumference were taken by the researcher to calculate the body mass index.

Anthropometric measurements: The data on the height and weight of the parents were obtained in line with their own statements. Anthropometric measurements of preadolescents were measured by researchers.

Weight measurement: The preadolescents were wighed with light clothes using an electronic scale with ±100 sensitivity; the preadolescents were positioned with both feet on the center of the platform and the value seen on the electronic display was recorded in grams (g)[16].

Height measurement: A steel strip meter was used to measure the height of the preadolescents. The measurement was performed in the vertical position with contiguous and parallel barefeet; the shoulder and gluteal region were touching the wall and the value was marked in centimeters (cm)[16].

Waist circumference measurement: The waist circumference of the preadolescents was performed over the umbilicus in the region, between the lowest costa and prosessus spina ileaca anterior superior in the waist area, using a rigid measuring tape after a slight expiration and the value was recorded in centimeters (cm)[17].

Waist-height ratio (WHR): The WHRs of the preadolescents were calculated by dividing the waist circumferences into their height[18].

Body mass index (BMI): It was calculated (body weight (kg)/height (m²) after measuring the weight and height of the preadolescents. The growth curves developed by Neyzi et al. for Turkish children were used in the assessment of BMI. BMI values in the 5-14.9th percentile were evaluated as underweight, the 15-84.9th percentile was considered as normal weight, the 85-94.9th percentile was accepted as overweight, and values over the 95th percentile were considered as obese[19]. In the BMI evaluation of the parents, the obesity classification of the WHO was taken as the basis and a BMI ≤ 18.5 kg/m² was evaluated as underweight, a BMI of 18.6-24.9 kg/m² was accepted as normal weight, a BMI ≥ 25 kg/m² was overweight, and a BMI ≥ 30 kg/m² was considered obese[20]. The BMI of parents was calculated based on their weight and height their self-reported. Waist circumference over the 90th percentile was evaluated as abdominal obesity[17]. In terms of the development of metabolic and cardiovascular diseases, a WHR over ≥ 0.5 was evaluated as risky a value <0.5 was evaluated as normal[18,21].

Statistical analysis

The data were analyzed using the IBM SPSS Statistics 20.0 (IBM SPSS Inc, Chicago, ILL, USA) software package. Descriptive statistics were shown as number, percentage, mean and standard deviation. Categorical variables were compared with the chi-square test. Univariate and Multiple (Method: Backward Wald) binary logistic regression analyses were performed to determine the risk factors influencing the possibility of becoming "owerweight/obese" in preadolescents. p values <0.05 were accepted as statistcally significant.

RESULTS

54.2% of the preadolescents were girls, mean age was 11.41±0.51 years. According to the BMI percentile values, it was determined that 15.1% of the girls and 13.5% of the boys were obese. According to the results of the waist circumference measurement, abdominal obesity was observed in 35.2% of preadolescents. With regard to the waist/height ratio, 27% of preadolescents had likehood of being at high metabolic and cardiovascular risk based on their WHR (Table 1). Preadolescents in both gender whose mother had got BMI≥25, who had 3 or more meals and no satisfied with current body weight were overweight/obese highly (p<0.05) (Table 2).

Tablo 1. The anthropometric characteristics of the preadolescents

Descriptive Characteristics	Girls n (%)	Boys n (%)	Total* n (%)
Preadolescent BMI Percentile Values			
5.0-14.9 (Underweight)	31 (11.4)	22 (9.6)	53 (10.6)
15.0-84.9 (Normalweight)	171 (63.2)	147 (64.2)	318 (63.6)
85.0-94.9 (Overweight)	28 (10.3)	29 (12.7)	57 (11.4)
≥ 95. (Obese)	41 (15.1)	31 (13.5)	72 (14.4)
Preadolescent Abdominal Obesity (Percentile)			
Yes (≥ 90)	92 (33.9)	84 (36.7)	176 (35.2)
No (< 90)	179 (66.1)	145 (63.3)	324 (64.8)
Preadolescent Waist-Height Ratio			
Risky (≥ 0.5)	56 (20.7)	79 (34.5)	135 (27.0)
Normal (< 0.5)	215 (79.3)	150 (65.5)	365 (73.0)
Total**	271 (100)	229 (100)	500 (100)

Table 2. Characteristics of preadolescents according to gender and body weight

Variables	Girls		Boys	
	Underweight - Normal	Overweight - Obese	Underweight - Normal	Overweight - Obese
	n (%)	n (%)	n (%)	n (%)
Mother's Educational Level				
Illiterate-Primary School	94 (46.5)	22 (31.9)	80 (47.6)	21 (35.0)
Secondary School	27 (13.4)	16 (23.2)	30 (17.9)	16 (26.7)
High school	56 (27.7)	14 (20.3)	42 (25.0)	13 (21.7)
University	25 (12.4)	17 (24.6)	16 (9.5)	10 (16.7)
	$\chi^2=11.795$ p=0.008		$\chi^2=5.472$ p=0.140	
Mother's Working Status				
Employed	162 (80.2)	44 (64.7)	136 (81.0)	50 (83.3)
Unemployed	40 (19.8)	24 (35.3)	32 (19.0)	10 (16.7)
	$\chi^2=6.751$ p=0.009		$\chi^2=0.167$ p=0.683	
The Presence of an Obese Individual in the Family				
No	186 (92.1)	60 (87.0)	159 (94.1)	49 (81.7)
Yes	16 (7.9)	9 (13.0)	10 (5.9)	11 (18.3)
	$\chi^2=1.612$ p=0.204		$\chi^2=8.195$ p=0.004	
Mother's BMI				
Underweight -Normalweight (≤ 18.5- 24.9)	120 (59.4)	25 (37.3)	92 (55.8)	24 (40.7)
Overweight-obese (≥25)	82 (40.6)	42 (62.7)	73 (44.2)	35 (59.3)
	$\chi^2=9.883$ p=0.002		$\chi^2=3.958$ p=0.047	
Father's BMI				
Underweight –Normalweight (≤ 18.5- 24.9)	110 (55.6)	29 (42.6)	85 (51.2)	21 (38.2)
Overweight-obese (≥25)	88 (44.4)	39 (57.4)	81 (48.8)	34 (61.8)
	$\chi^2=3.381$ p=0.066		$\chi^2=2.807$ p=0.094	
Number of meals / day				
1-2	53 (26.2)	27 (39.1)	41 (24.3)	23 (38.3)
More than 3	149 (73.8)	42 (60.9)	128(75.7)	37 (61.7)
	$\chi^2=4.109$ p=0.043		$\chi^2=4.355$ p=0.037	
Students' Satisfied with current body weight				
Satisfied	142 (70.3)	19 (27.5)	135(79.9)	25 (41.7)
Not satisfied	60 (29.7)	50 (72.5)	34 (20.1)	35 (58.3)
	$\chi^2= 38.998$ p <0.001		$\chi^2= 30.717$ p< 0.001	

Leisure time activity				
Active activities *	51 (25.2)	6 (8.7)	61 (36.1)	23 (38.3)
Passive activities**	151 (74.8)	63 (91.3)	108 (63.9)	37 (61.7)
	χ²= 8.484 p= 0.004		χ²=0.096 p= 0.757	
Increase in eating according to mood				
Happy	168 (83.2)	44 (63.8)	147 (87.0)	46 (76.7)
Sad	17 (8.4)	15 (21.7)	10 (5.9)	7 (11.7)
Angry	17 (8.4)	10 (14.5)	12 (7.1)	7 (11.7)
	χ²= 12.112 p= 0.002		χ²= 3.643 p= 0.162	

* Active Activities: playing in the park, riding a bicycle, playing outside with friends
** Passive Activities: Spending time with computer and TV, studying, reading books

Table 3. Odds ratio and 95% confidence intervals (CI) from univariate and multiple binary logistic regression of the likelihood of overweight and obese on sociodemographic and behavioral variables for preadolescents.

Variables	Girls	Boys	Girls	Boys
	Univariate Binary Logistic Regression (Adjusted Age)		Multiple Binary Logistic Regression (the backward stepwise procedure) (Adjusted Age)	
	OR (CI)	OR (CI)	OR (CI)	OR (CI)
Mother's Educational Level				
Illiterate-Primary School	1.0	1.0	1	-
Secondary School	2.608 (1.198- 5.675) p=0.016	2.089 (0.958- 4.555) p=0.064	2.761 (1.012-7.531) p=0.047	-
High school	1.051 (0.497- 2.223) P=0.897	1.180 (0.536-2.600) P=0.681	0.722 (0.263-1.985) P=0.528	-
University	2.871 (1.325-6.219) p=0.007	2.494 (0.981- 6.343) p=0.055	3.896 (1.001-15.208) p=0.049	-
Mother's Working Status				
Employed (have a regular job)	1	1	-	-
Unemployed (housewife)	2.190 (1.194-4.017) p=0.011	0.836 (0.382-1.833) p=0.655	-	-
The Presence of an Obese Individual in the Family				
No	1	1	-	1
Yes	1.701 (0.712-4.060) p=0.232	3.536 (0.410-8.869) p=0.007	-	3.443 (1.239-9.569) p=0.018
Mother's BMI				
Underweight -Normalweight (≤ 18.5- 24.9)	1	1	1	1
Overweight-obese (≥25)	2.471 (1.397- 4.370) p=0.002	1.878 (1.023-3.446) p=0.042	4.886 (2.264-10.548) p<0.001	2.076 (1.063-4.053) p=0.032
Father's BMI				
Underweight Normalweight (≤ 18.5- 24.9)	1	1	-	-
Overweight-obese (≥25)	1.717 (0.981- 3.003) p=0.058	1.689 (0.902- 3.163) p=0.101	-	-
Number of meals / day				
1-2	1	1	-	-

More than 3	0.557 (0.313- 0.992) p=0.047	0.540 (0.286-1.019) p=0.057	-	-
Students' Satisfied with current body weight				
Satisfied	1	1	1	1
Not satisfied	6.252 (3.398-11.502) p<0.001	5.527 (2.918-10.467) p<0.001	6.956 (3.268-14.807) p<0.001	5.919 (3.028-11.571) p<0.001
Leisure time activity				
Active activities *	1	1	1	-
Passive activities**	3.495 (1.426-8.567) p=0.006	0.925 (0.502-1.704) p=0.803	3.159 (1.072-9.304) p=0.037	-
Increase in eating according to mood				
Happy	1	1	1	-
Sad	2.335 (0.993-5.489) p=0.052	1.857 (0.688-5.009) p=0.222	1.809 (0.613-5.334) p=0.283	-
Angry	3.469 (1.600-7.523) p=0.002	2.244 (0.805-6.258) p=0.122	2.734 (1.033-7.232) p=0.044	-

* Active Activities: playing in the park, riding a bicycle, playing outside with friends
** Passive Activities: Spending time with computer and TV, studying, reading books

According to the results of binary multiple logistic regression analysis (the backward stepwise procedure), the presence of an obese person in the family (boys), mother's educational level (girls), leisure time activities (girls), and an increase in eating according to mood (girls) were revealed as significant predictors of being overweight/obese, adjusted for age. Satisfied with current body weight and mother's BMI were the strongest variable to be associated with overweight/obese for both genders (Table 3).

DISCUSSION

Childhood obesity is increasing in developed and developing countries[22]. According to data of the WHO (2018), child and adolescent obesity has increased ten times in the last 40 years all over the world[23]. In regional studies conducted in Turkey, it was observed that childhood obesity had increased gradually over the last twenty years[8,24-26]. The obesity rate was determined as 14.4% (n=72) in the present study. This rate is similar to the prevalence of obesity in the study results across Turkey[27,28]. There are also studies that determined lower values compared with the the present study[4,11]. It has been reported that 19% of the adolescents in the United States of America were obese and this rate had increased to 30% in Spain, Italy, and Portugal[29]. These differences in study results may be associated with the fact that

socioeconomic and sociocultural factors that cause obesity vary between countries and regions.

In recent studies, it has been stated that the WHR gives more accurate results in determining the risk of chronic diseases (especially metabolic and cardiovascular diseases) that may develop due to regional lipidosis, compared with other anthropometric parameters, and this measurement is an important measurement in the screening for childhood obesity because it is practical and it gives a better idea of body composition than BMI[18,21,30]. In the present study, it was determined that 27% of the preadolescents had likehood of being at high metabolic and cardiovascular risk based on their waist/height ratio, and this rate was significant[31].

It has been stated that the most important factors that cause obesity during adolescence are metabolic and hormonal factors, and the lipidosis susceptibility of adolescents, who are in a rapid growth period, increases the obesity risk[31]. Other important factors that cause the obesity increase in adolescents are the presence of an obese family member, socio-economic status and the educational level, and the diet and physical activity characteristics of the adolescent[12,32]. In this study, it was determined that female students whose mothers were university graduates were 3.8-times obese or more likely to be overweight/obese compared with those whose

mothers were illiterate and primary school graduates. There are studies in the literature supporting this result[33,34]. It may be said that this situation is caused by the fact that income levels increase with increased educational levels, and this facilitates access to foods rich in carbohydrates, calories, and fat.

Obesity among parents is an important risk factor for childhood obesity[27]. In the present study, it was found that 20.7% of the mothers and 16.2% of the fathers were obese. According to the multiple logistic regression analysis, preadolescents whose mothers had a BMI of ≥25 kg/m² were of 4.8 times more likely to be obese or more likely to be overweight/obese among female preadolescents, and 2-times more likely among male preadolescents compared those whose mother's BMI was <25 kg/m². Also, in the present study, it was determined that the presence of an obese family member was among the most important factors that affected the status of the male preadolescents regarding being overweight and obese. Previous studies showed that the possibility of being obese for children whose parents were obese was higher compared with children whose parents were not obese[16,25,35]. It has been reported that 240 genes in humans determine body weight and fat distribution, and these genes affect the individual's dietary characteristics[36]. In the development of obesity, it is thought that the dietary habits of parents affect the dietary style of the child, as well as the genes.

Adolescents are extremely interested in the changes in their bodies. The thought of how others, especially their peer group, see them occupies their mind negatively. Deformations of the body image cause the self-esteem of the adolescent to decrease, which causes eating disorders[37]. In the present study, it was determined that preadolescents who were not satisfied with current body weight were obese or more likely to be overweight/obese compared those who were satisfied with current body weights (6.9 times more likely in female preadolescents and 5.9 times more in male preadolescents). It has been stated that there is a strong correlation between BMI and body dissatisfaction; body satisfaction decreases as BMI increases. It is not known whether body dissatisfaction is a result of obesity or a cause of obesity. It has been reported that adolescents with low self-esteem and body satisfaction spend less time in social environments. This leads to a decrease in physical activity[38]. Low physical activity is an important risk factor because it causes weight gain

due to the decrease of calories burnt throughout the day[31]. In the present study, it was found that female students who performed passive activities (e.g., computer use and watching television, studying, reading) in their leisure time were 3.1-times obese or more likely to be overweight/obese compared with those who were more active. In a previous study, it was determined that a daily moderate activity increase of 1 hour decreased the obesity risk at the rate of 10%[4]. It is known that a sedentary lifestyle causes obesity, but it should be considered that obesity may also cause a decrease in activities[16].

Adolescence is a period in which many methods of coping with stress experienced in life develop together with the physical, social, and psychological development. However, the coping methods of adolescents are not mature and this causes many negative situations such as eating disorders[39]. In a study conducted with school-age children, it was determined that there was an increase in food consumption in male and female students when they felt distress. In the present study, female students who ate more when they felt angry had 2.7-times greater risk obese or more likely to be overweight/obese, which supports this result. Unlike our study, a study determined a significant correlation between food consumption and obesity in joyful and happy conditions[25]. It has been stated that individuals may feel fullness after negative feelings and stress, but such feelings may also cause an increase in eating[40].

The fact that the sample size was limited and the study was only conducted in schools located in a city center in the Cappadocia region in Turkey decreased the generalizability of the results.

Despite these limitations, the strengths of the study were that other anthropometric measurements such as waist circumference measurements and the waist-height ratio were involved in determining preadolescent obesity along with BMI percentile values were evaluated together with the BMI values of the parents, and a comparison was made with the sex in determining the risk factors. The study is thought to contribute to the literature in terms of determining risk factors that cause preadolescent obesity.

In conclusion, obesity is a multifactorial disease. In this study, it was determined that the most important factors leading to preadolescent obesity were maternal obesity, satisfied with current body weight, the presence of an obese family member, the

educational level of the mother, leisure time activities and an increase in eating according to modd. Pediatric nurses have important roles in preventive health services and determining obese children and children at risk for obesity. Monitoring growth is important for determining overweightness and obesity. It is recommended to perform screening in schools and to monitor and evaluate BMI, support the children's participation in physical/sports activities after school, and provide consultancy to families on the importance of establishing a healthy lifestyle in order to determine and prevent the aberration in the early period. Also, conducting multi-centered and longitudinal studies with large samples may be recommended for determining risk factors that cause obesity.

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