

Determination of the Obesity Prevalence and Risk Factors in School Children in Duzce

Düzce'deki Okul Çocuklarında Obezite Yaygınlığı ve Risk Faktörlerinin Belirlenmesi

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ABSTRACT

Aim: In this study, it was aimed to determine the childhood obesity prevalence and the factors playing a part in the development of obesity in the central province of Duzce.

Material and Methods: This study is cross-sectional and case control study. Anthropometric measurements were conducted on 1245 second graders in the central province of Duzce. A questionnaire was applied to the students' families with BMI-for-age Z-score (BAZ) +2 and over (case group) and between -2 and +2 (control group).

Results: The found obesity frequency was 10.1%. In the development of child obesity, those who generally (four-six days a week) have breakfast (OR=3.67, p=0.006) (compared to those who have breakfast regularly (seven days a week)), regularly have lunch (OR=3.52, p=0.001), eat fast (OR=2.38, p=0.016), whose parents are moderately satisfied with their weight (OR=24.13, p<0.001), are not satisfied (OR=47.11, p<0.001), not satisfied at all (OR=39.38, p=0.001) risky (compared to satisfied parents) whose birth weight was over 4000 gr. (OR=12.02, p=0.002) (compared to birth weight under 2500 gr.) were found to be risky. The higher the number of obese relatives, the higher the risk of obesity was (OR=1.38, p=0.008).

Conclusion: The birth weight of the child, number of obese relatives, nutritional habits, dissatisfaction of the parents with the child's weight are effective in the development of obesity.

Keywords: Childhood obesity; students; overweight; prevalence; risk factors.

ÖZ

Amaç: Bu çalışmada, Düzce İl merkezinde çocukluk çağı obezite prevalansı ve çocukluk çağı obezitesinin gelişmesinde rol oynayan faktörlerin belirlenmesi amaçlandı.

Gereç ve Yöntemler: Bu çalışma bir kesitsel ve vaka kontrol çalışmadır. Düzce merkezinde 1245 ilkököl ikinci sınıf öğrencisine antropometrik ölçümler yapıldı. Yaşa göre vücut kütle indeksi z skoru (BAZ) +2 ve üzeri (vaka grubu) ile -2 ile +2 (kontrol grubu) arasında olan öğrencilerin ailelerine anket uygulandı.

Bulgular: Bulunan obezite sıklığı %10,1 idi. Çocuklukta obezitenin gelişmesinde; yemeğini hızlı yemek (OR=2,38; p=0,016), düzenli olarak öğle yemeği yemek (OR=3,52; p=0,001), düzenli (haftanın yedi günü) olarak kahvaltı yapanlarla karşılaştırıldığında genellikle (haftanın 4-6 günü) kahvaltı yapmak (OR=3,67; p=0,006), doğum ağırlığı 2500 gr'ın altında olanlar ile karşılaştırıldığında doğum ağırlığı 4000 gr'ın üzerinde olmak (OR=12,02; p=0,002), çocuğunun kilosundan memnun ebeveynlerle karşılaştırıldığında orta düzeyde memnun olmak (OR=24,13; p<0,001), memnun olmamak (OR=47,11; p<0,001), hiç memnun olmamak (OR=39,38; p=0,001) riskli bulundu. Obez akrabaların sayısı ne kadar fazla olursa, obezite riski o kadar yüksekti (OR=1,38; p=0,008).

Sonuç: Çocuğun doğum ağırlığı, obez akrabalarının sayısı, beslenme alışkanlıkları, ebeveynlerin çocuğun kilosundan duydukları memnuniyetsizlikler obezitenin gelişmesinde etkilidir.

Anahtar kelimeler: Çocukluk çağı obezitesi; öğrenci; fazla kiloluluk; prevalans; risk faktörleri.

INTRODUCTION

The children who have a significant place in the risk groups of society encounter seriously with the risk of obesity which is a global public health problem today. Nowadays, childhood obesity and diseases associated with it are accepted as a certain health problem (1,2). The half of the adults and one fifth of the children in the Europe area of World Health Organization (WHO) are overweight (1,3,4). Obesity has been

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one of the most significant public health problems of the last century (1,3). Obesity which occurs in childhood is also a risk factor for adult obesity (5). Obese children can be related to diseases such as coronary heart disease, hyperinsulinemia, hypertension, hyperlipidemia, diabetes, gallbladder diseases, osteoarthritis and cancer in adulthood beginning from their childhood because of usually being obese adults (1,6). Besides the medical impacts of it, obesity is known to affect the children's self-respect, academic achievements, social relations, the chance of having good marriages, and even the opportunity of finding a good job negatively (7).

The purpose of this study was to determine the obesity and overweight prevalence in primary school second grade students in Duzce and revealing the risk factors that have a role in the development of obesity.

MATERIAL AND METHODS

The research was carried out two phases; initially as cross-sectional and later as case-control. A total of 3131 students who study on the second grade at 81 primary schools (PS) in the center of Duzce and in the centralized villages and towns of Duzce comprise the universe of the research. With the prediction that the obesity prevalence would be 8.4% (8), the sample size to be taken was calculated as at least 552 participants with 95% confidence interval and with ±2.1% deviance. Due to the cluster design impact, the number 552 was multiplied by 2 and 1104 people were found (9). However, 10% of them were taken as substitute and it was aimed to reach 1214 people. PS were stratified as urban and rural based on the region they were in. Thirty one schools were taken as rural and 50 schools were taken as urban. Each classroom was accepted as a cluster. A total of 51 classrooms were identified by the simple randomly method, 43 of them being from the urban area and 8 of them being from the rural area. Even though the research was planned to be carried out with 1214 students, more participation occurred as a cluster sampling method was applied and each student from the chosen cluster was included in the research.

Obesity was decided depending on body-mass index (BMI) for adults and depending on their BMI-for-age Z-score (BAZ) for students. BAZ was determined for all children according to age (day, month and year), length, weight and gender variables (1,10). WHO accepts that the Z-score cut-off point <-2 SD is low "length-for-age", low "weight-for-age" and low "BMI -for-age". Z-score cut-off point being >+1 SD was accepted as overweight and its being >+2 was accepted as obesity (11). The parents' body-mass index were calculated with the formula of weight(kg)/height(m²) and the classification which was suggested by WHO was used. <18.50 kg/m² was accepted as thin, 18.50-24.99 kg/m² was accepted as ideal weight, 25.00-29.99 kg/m² was accepted as overweight and ≥30.00 kg/m² as obese (6).

For the second stage of the research, 126 students, who were accepted as obese with the analysis of the measurements carried out on the sample in the first stage with body mass index Z score +2 or over were taken as case group. In return for case group including 126 students accepted as obese, the same number of students were chosen randomly as control group from the same class and gender with BAZ between -2 and +1.

The questionnaire which was prepared by the researchers was intended for the families of students. The questionnaire consists of 50 questions. It is a questionnaire which includes questions about the students' nutritional habits, physical activity habits, infancy and families. "Does your child have a regular breakfast" the answers given to the questions were regarded as those who make breakfast seven days a week are "regularly", those who do breakfast four-six days a week "usually do", those who do breakfast one-three days a week "usually do not". A weighing scale branded Seca 769 and wooden tape measure fixed on the wall were used for the height measurement and weight measurements.

In the research, height measurement and body weight measurements were administered between September-October 2014 in the primary schools chosen as sample in Duzce city center. Between February-March 2015, data were collected using data collection form in the case group's families and the control group's families.

Ethic committee approval was obtained from Duzce University (Dated 20.05.2014 and numbered 2014/27). Permission was obtained from the Duzce Provincial Directorate of National Education for the implementation of the research.

Statistical Analysis

The data were collected in the research were evaluated with WHO AntroPlus v1.0.4 and SPSS Version 18.0 for Windows. Body weight, height and body mass index values were evaluated based on "WHO-2007 age group 5-19 reference values for children." (12). The Mann-Whitney U test (not conforming to normal distribution) were used to evaluate the intergroup differences. The chi-square test and Fisher's exact test was used for categorical variables. Logistic regression analysis was performed to assess the relationship between the characteristics of participants and obesity. Hosmer-Lemeshow goodness-of-fit test were used to assess model fit. p-values of <0.05 were considered statistically significant.

RESULTS

47.5% (n=645) of the 1245 students who participated in the study were male and 52.5% (n=591) were female. 87.0% (n=1083) of the students were studying at rural area PS and 13.0% (n=162) of them were studying at urban area PS. The rate of obese students were found out as 10.1% (n=126) among a total of 1245 students. (Figure 1; Table 1).

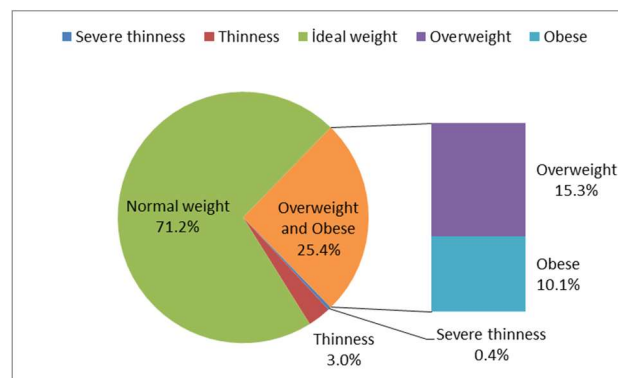


Figure 1. Distribution of Duzce central primary school 2nd grade students' status of being severe thinness, thinness, normal weight, overweight and obese

Table 1. Distribution of Duzce central primary school 2nd grade students' status of being severely thin, thin, at ideal weight, overweight and obese according to gender and residential areas (n (%))

	Severely Thin	Thin	Normal	Over weight	Obese
Male	2 (0.3)	22 (3.4)	459 (70.2)	97 (14.8)	74 (11.3)
Female	3 (0.5)	15 (2.5)	427 (72.3)	94 (15.9)	52 (8.8)
$\chi^2=3.389, p=0.495$					
Rural	1 (0.6)	2 (1.2)	115 (71.0)	27 (16.7)	17 (10.5)
Urban	4 (0.4)	35 (3.2)	771 (71.2)	164 (15.1)	109 (10.1)
$\chi^2=2.698, p=0.573^*$					
Total	5 (0.4)	37 (3.0)	886 (71.2)	191 (15.3)	126 (10.1)

*Exact test

Namık Kemal (12.8%) and Uzun Mustafa (12.7%) PS from the urban area and Boğaziçi (12.2%) and Gölormanı (12.0%) PS from the rural area were the schools with the highest obesity rates. The schools with the lowest obesity rates were Azmimilli PS (2.6%) and TOKİ Mehmet Akif Ersoy PS (4.5%) from the urban area and Musababa PS located in the rural area (8.0%).

250 student's families participated in the second stage of the study-126 of whom were from the control and 124 of whom were from the case group. The whole control group was reached whereas 98.4% of the case group was reached. The total participation was 99.2%. The mean age of the students was 85±4.52 months, the youngest being 73 months old and the oldest being 105 months old. A significant difference was not found between the ages of students from the case and control groups ($p=0.397$). 74 males and 52 females participated in control group and 73 males and 51 females participated in case group. A significant difference was not found between the genders of the students from case and control groups ($p=0.982$).

Whereas no significant difference was determined between the case and control groups in terms of the mothers' educational status, the mothers' job, the fathers' educational status, the fathers' job, monthly income and weekly allowance; living in an extended family was determined to be more common among the obese students in the case group than the students without obesity ($p=0.025$; Table 2). Table 3 shows the distribution of the answers given to the questions about the infancy periods of the students. Table 4 shows the age of the students, the number of obesity in their families, the age of the parents, weight of the parents, height of the parents, BMI of the parents.

Logistic regression model was conducted to analyze the existence of obesity and the risk factors (Table 5). The model was put breakfast, lunch, the place where they have lunch, eating fast, using stairs-elevator or not, the satisfaction of the parent from the child's body weight, the child's birth weight, family structure, the number of obese people in relatives, the mother's body mass index and the father's body mass index. The model was added breakfast, lunch, the place to have lunch, eating fast or not, using the stairs-elevator or not, the satisfaction of the parent from the child's body weight, the child's birth weight, family structure, the number of obese people in relatives, the child's mother's and father's body mass indexes. The model was significantly ($\chi^2=99.3$; $p<0.001$). According to the Hosmer-Lemeshow test, the fit of the model was evaluated as good ($p=0.595$) and model explains 46.6% of the variance ($R^2=0.466$). The place where they have lunch, using the stairs-elevator or not, the family structure, the body mass index of the mother and the father, which were determined to be risk increasing factors in univariate analysis, were determined not to be risky when analyzed with a multivariate method. As a result of the logistic regression analysis, it was identified that those who usually (four-six days a week) have breakfast have 3.67 times ($p=0.006$), regularly have lunch have 3.52 times ($p=0.001$), eat fast have 2.38 times ($p=0.016$) higher risk, when compared to those who regularly (seven days a week) have breakfast. When compared to parents satisfied with their child's body weight, the risk was revealed to be 24.13 times ($p<0.001$) higher for those who were moderately satisfied, 47.11 times ($p<0.001$) higher for those who were not satisfied, 39.38 times ($p=0.001$) higher for those who were not satisfied at all. When compared to the students whose birth weight was below 2500 gr, those who were born heavier than 4000 gr were determined to be 12.02 times ($p=0.002$) more risky. The higher the number of obese people in the student's first degree relatives, the higher the risk of obesity ($OR=1.38$; $p=0.008$).

DISCUSSION

In Turkey, School Age Children's Growth Monitoring Research Report in Turkey (TOÇBİ) project was carried out in 2010 and the study Childhood Obesity Surveillance Initiative-Turkey (COSİ-TUR) was carried out in 2013 (4,13). In the study COSİ-

Table 2. Distribution of case and control groups based on some characteristics (n (%))

	Control (n=126)	Case (n=124)	Total (n=250)	χ^2 , p
Does s/he have breakfast regularly?				
Yes, s/he does. (Seven days a week)	95 (75.4)	87 (70.2)	182 (72.8)	9.424 0.024
S/he usually does. (Four-six days a week)	13 (10.3)	28 (22.6)	41 (16.4)	
S/he usually doesn't. (One-three days a week)	7 (5.6)	5 (4.0)	12 (4.8)	
No, s/he doesn't.	11 (8.7)	4 (3.2)	15 (6.0)	
Does s/he have lunch regularly?				
Yes	77 (61.1)	93 (75.0)	170 (68.0)	5.540
No	49 (38.9)	31 (25.0)	80 (32.0)	0.019
Where does s/he have breakfast? (n=249)				
At the school cafeteria	20 (16.0)	17 (13.7)	37 (14.9)	9.286 0.026
At the school canteen	28 (22.4)	24 (19.4)	52 (20.9)	
At home	52 (41.6)	37 (29.8)	89 (35.7)	
Homemade food at school	25 (20.0)	46 (37.1)	71 (28.5)	
Does s/he eat fast?				
Yes	26 (20.6)	56 (41.2)	82 (32.8)	17.056
No	100 (79.4)	68 (54.8)	168 (67.2)	<0.001
Family structure				
Nuclear family	107 (84.9)	91 (73.4)	198 (79.2)	5.046
Extended family	19 (15.1)	33 (26.6)	52 (20.8)	0.025

Table 3. Distribution of the answers given to the questions about the infancy periods of the students (n (%))

	Control (n=126)	Case (n=124)	Total (n=250)	χ^2 , p
How do you evaluate your child's body weight?				
Severely thin	1 (0.8)	0 (0.0)	1 (0.4)	113.045 <0.001*
Thin	29 (23.0)	3 (2.4)	32 (12.8)	
Normal	94 (74.6)	52 (41.9)	146 (58.4)	
Overweight	2 (1.6)	65 (52.4)	67 (26.8)	
Obese	0 (0.0)	4 (3.2)	4 (1.6)	
Are you satisfied with your child's body weight?				
I am very satisfied	21 (16.7)	2 (1.6)	23 (9.2)	52.726 <0.001
I am satisfied	63 (50.0)	26 (21.0)	89 (35.6)	
Moderate	23 (18.3)	46 (37.1)	69 (27.6)	
I am not satisfied	15 (11.9)	41 (33.1)	56 (22.4)	
I am not satisfied at all	4 (3.2)	9 (7.3)	13 (5.2)	
How many grams were his/her birth weight? (n=231)				
1500-2499	10 (8.6)	10 (8.7)	20 (8.7)	8.676 0.013
2500-3999	98 (84.5)	82 (71.3)	180 (77.9)	
4000-5500	8 (6.9)	23 (20.0)	31 (13.4)	

*Exact test

Table 4. Age of Duzce 2nd grade student's, the number of obesity in their families, the age of the parents, weight of the parents, height of the parents, BMI of the parents (Mean±SD)

	Control (n=126)	Case (n=124)	Z, p*
Mother's age (year)	35.67±5.28	35.40±5.01	-0.446, 0.656
Father's age (year)	39.51±5.51	39.51±6.16	-0.408, 0.683
Mother's weight (kg)	66.19±12.44	72.22±13.50	-3.826, <0.001
Father's weight (kg)	82.94±11.78	88.65±14.05	-3.450, 0.001
Mother's length (cm)	163.12±5.83	163.78±6.00	-0.545, 0.585
Father's length (cm)	175.39±6.82	175.80±7.00	-0.737, 0.461
Mother's body mass index	24.923±4.77	26.98±5.17	-3.314, 0.001
Father's body mass index	26.95±3.55	28.72±4.53	-3.214, 0.001
Number of obese people in family	0.93±1.50	1.69±1.71	-4.596, <0.001
Number of siblings	2.21±0.924	2.12 ±0.90	-0.688, 0.491
Age of the student (months)	85.32±4.39	84.68±4.65	-0.847, 0.397

*Mann Whitney U test

TUR, in the East Marmara, which is a The Nomenclature of Territorial Units for Statistics (NUTS) region including Duzce, obesity and overweight rate was 22%, obesity rate being 8.4% and overweight rate being 13.6%. The 14.3% of the children were overweight and 6.5% of them were obese in the TOÇBİ study (13). The proportion of both overweight children and obese children were determined to be higher than TOÇBİ in 2010 and COSİ-TUR in 2013. It is widely known that the frequency of obesity among children is increasing in the world day by day like it is among adults (1,10). The studies make us consider that there may be regional differences in overweight and obesity and obesity ratio has a tendency to increase. When the 6.17% obesity

rate which was found as a result of the study carried out in Duzce in 2005 is compared to the ratio of 10.1% found in our study, the tendency of increase in the childhood obesity in Duzce is supported (14). In Duzce 2005, TOÇBİ and COSİ-TUR researches, the obesity and overweight rates were discovered to be high among the students who study in urban areas. It was seen as a result of the studies conducted in the USA, Japan and India that obesity prevalence is high in urban areas in developing countries, it is high in rural areas in developed countries (15-17). In our study it was found that the rates of the overweight and obese were determined to be higher in rural area than in urban areas, which were similar to the findings in the developed countries. However, both the highest and the lowest obesity rates belonged to two different urban area schools. Whereas the highest rate of the overweight was in two rural primary schools, on the third place comes an urban area school. In terms of childhood obesity, the features of both developed and developing countries can appear at the same time (4). It can be seen that the urban and rural areas of Duzce is not homogenous in terms of residential areas and they carry different features.

In our study, the risk factors related to obesity were revealed to be irregular breakfast, regular lunch, eating fast, the parents' satisfaction with the child's body weight, the child's birth weight and the number of obese people among relatives. No significant relationship was found between the places where the students have lunch, their using the stairs or elevators, their family structures, their mother's body mass index and their fathers' body mass index and obesity. In a study conducted in İzmir, gender, the mothers' education and the level of income were found out to be risk factors (18). In a study carried out in Kayseri, the existence of an overweight sibling in the family, the lack of activity during the day, fast consumption of the foods and having breakfast were determined to be risk factors (19). The presence of different risk factors when studied in different regions and samples suggests that in different regions and different societies, risk factors do not affect obesity equally and some risk factors affect more than others. According to this, it can be influential to carry out local researches, initially determine the obesity risk factors of the region, and identify the intervention methods depending on the determined risk factors in order to prevent obesity.

Table 5. The analysis of the factors related to obesity with logistic regression analysis

	β	Std. Error	p	Odds Ratio	95% CI
Does your child have breakfast regularly?					
Yes, s/he does (Seven days a week)			0.026	1	
S/he usually does (Four-six days a week)	1.308	0.475	0.006	3.67	1.46-9.38
S/he usually doesn't (One-three days a week)	0.259	0.849	0.761	1.23	0.25-6.85
No, s/he doesn't	-0.994	0.899	0.269	0.37	0.06-2.16
Does your child have lunch regularly?					
No				1	
Yes	1.385	0.416	0.001	3.52	1.68-7.36
Does your child eat fast?					
No				1	
Yes	0.868	0.360	0.016	2.38	1.18-4.82
Are you satisfied with your child's body weight?					
I am very satisfied			<0.001	1	
I am satisfied	1.605	0.847	0.058	4.98	0.95-26.21
Moderate	3.184	0.862	<0.001	24.13	4.46-130.65
I am not satisfied	3.852	0.908	<0.001	47.11	7.95-279.07
I am not satisfied at all	3.673	1.079	0.001	39.38	4.75-326.48
How many grams were his/her birth weight?					
Below 2500			0.004	1	
2500-4000	0.726	0.594	0.222	2.07	0.65-6.62
Over 4000	2.486	0.806	0.002	12.02	2.48-58.31
How many people are there in your first degree relatives who are overweight according to you?					
	0.322	0.121	0.008	1.38	1.09-1.75

β : Standardized regression coefficient, Std. Error: Standard error, CI: Confidence interval, model significance: $\chi^2=99.3$, $p<0.001$

Those who had lunch regularly were found out to be more in the obese group. When they were asked where they had lunch, the responses as school cafeteria and school canteen were found to be similar. On the other hand, in the study conducted in İzmir, it was found that the students had their meals at the school cafeteria rather than the school canteen. The rates of having meal at the school cafeteria were found to be higher in the study in İzmir than in our study. According to the same research, 42.8% of the students brought their meal from their houses (18). 37% of the obese students stated to bring their lunch from their houses and eat it at school while 41% of the students with normal body weight stated that they had their lunch in their houses. In the study, the claim that the foods prepared at home are healthier was questioned with its ingredients. Nevertheless, this result makes us think that the unhealthy foods prepared at home may contribute to obesity.

Among the families whose children were evaluated as “normal” when calculated according to BAZ, one of them thought their child was thin and 29 of them thought that their children were very thin. From the families of the children who were considered as “obese” when calculated according to BAZ, 3 of them thought that their children were thin and 52 of them thought that their children’s weight were normal. These findings demonstrate that the fact that the families cannot evaluate the children’s weight may cause those at ideal weight to malnourish and leads to obesity and obese students’ obesity to increase and become permanent. Although the belief dating back to ancient times in the East societies that “upstanding” and “overweight” children are healthy has been declining, the number of the parents who have this perception is too high to be underestimated (3). In a study carried out in Ankara 75.1% of the parents whose children were overweight, 64.9% of the parents whose children were obese stated that they were satisfied with their children’s body weight and they did not consider that their children are overweight (20). 2 of the families whose children were regarded as “obese” in our study when calculated according to BAZ stated that they were very satisfied and 26 of them stated that they were satisfied with their children’s body weight. 15 of the families whose children were regarded as “normal” in terms of their body weight stated that they were not satisfied and 4 of them stated they were not satisfied with their children’s body weight. The results make us think that over one out of five families were not aware of their children’s obesity or they misevaluated their children’s body weight. The fact that families and children are not aware of obesity can be regarded as the biggest obstacle for fighting obesity. This situation can be considered as a risk factor for obesity in the families of the children at ideal weight as well. It was figured out that obese students ate faster than the student group at ideal weight. It was stated in some studies that eating fast is a risk factor for obesity (17,21,22). It takes normally 20 minutes for the feeling of saturation to reach the brain after starting eating. If eaten fast, a large amount of calories will be gained before the feeling of saturation is reached. Therefore, eating fast and chewing insufficiently are simplifying factors for obesity (6,23,24).

The parent-child relationship in the childhood age group was revealed with several studies (23,25). In the study in Isparta it was revealed that the frequency of obese people in family does not affect the obesity status of the child (7). However, in our study, the obesity in children with high number of obese people in the family was found out to be high. It is considered that genetic factors are responsible for 10% of childhood obesity (16). Family relationship affects the child both genetically and environmentally (26). A relationship exists between the nutritional habits and physical habits of the parents and the nutritional and physical habits of children. The mothers’ and fathers’ nutritional habits become a role model for the child. In addition, parents are responsible for the foods available at home and accessible. The opportunities of excessive eating and the foods available at home may affect a child’s nutritional choices

(26). For children, eating is generally a social issue. They form their own eating behaviors and choices by observing the family, peers and other people.

It can be seen that overweight and obesity are significant problems in Duzce and there is a tendency of increase in the frequency of childhood obesity when compared to other studies. The factors related to obesity were found out to be not having breakfast regularly, having lunch regularly, eating fast, the parents’ dissatisfaction with the child’s body weight, the child’s birth weight’s being 4000 gr and over and the number of obese people’s being great in relatives.

It should be realized that childhood obesity is a growing public health problem in Duzce. For the solution of this problem, institutions like Directorate of National Education, Public Health Authority and Duzce University Medical Faculty put forth an action plan and it should be put into practice.

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