

Original Article

# The Prevalence of Obesity and Dietary Habits among High School Students in Çayeli District of Rize Province

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## Abstract

**A. Background:** The incidence of obesity which has been observed since childhood and adolescence, is increasing each passing day, and it is acknowledged that those suffering from obesity during adolescence have a high risk of having obesity during adulthood. This study was conducted to determine the prevalence of obesity and dietary habits by examining the Body Mass Index of the students among entire high schools in the Çayeli District of Rize Province.

**B. Methods:** The study was a cross-sectional study conducted in December 2005 with a total of 1746 students among entire high schools in Çayeli. An applied survey including sociodemographic characteristics, physical activity, and dietary habits was executed among the students, and BMI was calculated by measuring the height and weight of the students at the same time and dietary habits.

**C. Results:** 45% of the students participating in the study are girls, and 55% are boys. In this study, it was found that the total number of students who are overweight and have an obesity rate of 15.7% may be considered high. In addition, significant differences were determined in accordance with the income level, the number of people living at home, metabolic disease diagnosed in the family, and having obesity. In general, the consumption rate is high in all food groups, but no significant difference was found between food groups and BMI.

**D. Conclusions** The issue of overweight and obesity are at higher rates similar to other studies. Adequate and balanced diet rates are low.

**Keywords** - obesity, adolescent, nutrition habits

## I. INTRODUCTION

Obesity was reported as a disease to be prevented in all countries of the world by the World Health Organization in 1997. In Milan Declaration published by 24 European

countries in 1999, joint efforts and action plans were determined [1]. Obesity, defined as an energy metabolism disorder caused by excessive fat storage in the body [1]–[5], occurs when energy intake is more than the energy consumption and energy balance is disrupted [1]–[3], [5], [6]. It is an important risk factor for chronic diseases such as obesity, diabetes, cardiovascular diseases, and cancer, according to the World Health Organization, and defined as abnormal or excessive fat accumulation that poses a risk to health [7]. The decrease in physical activities, the tendency to consume convenience food, food consumption pattern, and quick eating habits cause an increase in overweight and obesity [1].

Clinically, obesity is prevalent during adolescence [4]. The dietary habits of the family, genetic factors, daily physical activity, watching television or spending too much time in front of the computer, short sleep time, socio-economic status, place of residence, and psychological factors have an impact on the formation of obesity among adolescents [1], [2], [8], [9]. Rapid development, psychosocial problems, resistance to adulthood, hypertension, and dyslipidemia constitute the prevalent complications [10]. Among the health problems caused by obesity in young people are early puberty, orthopedic problems such as flat feet, gynecomastia, skin cracks, difficulty in breathing, respiratory ailments, the early occurrence of diseases such as cardiovascular disease and diabetes, lowered immunity. In obese children, school failure, enuresis can be seen; they show shyness and frequent tantrums [2]. It is acknowledged that 80 % of youth with obesity maintain that state during adulthood as well [11]–[13]. Obesity in adolescents is an important disease that should be prevented since it leads to many complications which are difficult to treat, and most importantly, there is a high risk of having obesity in adulthood.

According to WHO, the prevalence of obesity worldwide almost tripled between 1975 and 2016, and more than 340 million children and adolescents aged 5-19 were observed to be overweight or having obesity in 2016 [7]. When the studies conducted around the world



were examined, it was found that the prevalence of obesity is between 1.3% -15% and the rate of overweight is between 6.3% -36.2%, on the other hand, in studies examining the rate of overweight and obesity in total, it is found as 7.9% -27.3% [10], [14], [23]–[26], [15]–[22].

According to a preliminary study report of Nutrition and Health Survey-2010 of Turkey, it was reported that prevalence of obesity between the age group of 6- 18 years was found to be at a ratio of 8.2 % (9.1% in boys, 7.3% girls) [27]. The prevalence of obesity in studies conducted in Turkey was determined as 0.6 g % -14.1%, and the prevalence of overweight was reported between 2.1%- 16.7% [28], [29], [38]–[46], [30]–[37].

Diet and exercise are commonly used in the treatment of obesity among adolescents; however, medical treatment method is not recommended. As a dietary treatment, obese youth should be given a weight-appropriate and balanced diet. In heavily obese short-term energy restrictions can be made. As an exercise, it is recommended to perform physical activity at least 3 times a week or more, which should take a minimum of half an hour [2], [47], [48].

Nutrition is the intake of nutrients and its' utilization by the human body, which is required for growth and development as well as to sustain a long life in a healthy and productive state [49], [50]. Nutrients are grouped as proteins, fats, carbohydrates, minerals, vitamins, and water according to their chemical structures and activities in the body [49]–[51]. The nutrients contained in food groups, which have different functions in the body, are divided into certain groups in terms of shape and taste [52]. These groups are milk and dairy products, meat, eggs and legumes, vegetables and fruits, bread and cereals, oil and sugar [49], [50], [53]. The basic requirement of a healthy life is adequate and balanced nutrition. The adolescent period is the fastest growing and developing period following childhood. Energy and nutrient requirements increase to fulfill the development need [53]. The daily nutritional requirement of adolescents consists of 2-3 portions of milk and dairy products, 1-2 portions of meat and other protein-containing foods, 3-4 portions of vegetables and fruits, 2-3 portions of bread and cereals, 1 portion of fat-sugar [12], [50], [54].

Obesity is a disease that causes physiological, organic, systemic, hormonal, metabolic, aesthetic, psychological, and social problems not only for the individual but also for society. Since adults with obesity have this issue starting from childhood and the treatment of obesity is versatile and difficult, obesity prevention efforts should be initiated during childhood. This study was conducted to determine the prevalence of obesity by examining the Body Mass Index of the students in entire high schools in Çayeli District of Rize, to figure out the nutritional habits, to eliminate the risk factors in the current situation, and to contribute to the studies that may be carried out to regulate the dietary habits.

## II. MATERIAL AND METHODS

### A. Research design

The research is a cross-sectional study conducted in entire existing high schools in the Çayeli district of Rize province between November and December 2005.

### B. Sampling procedure

The population of the research consisted of 2026 students studying in high schools, and the study was completed with 1746 students who were present while the surveys were applied and agreed to participate. According to Çayeli 2000 General Census data, the population of the age group between 15-18 years was reported as 2077 [55]. Since the study was conducted among 1746 people in said age group, it constitutes 84.6 % of the district population and 86.1 % of the research population.

### C. Data collection tool

Data were collected under observation in a classroom environment with the questionnaire form developed by the researcher. Questionnaires were distributed to the students during the interview, they were asked to fill in at the same time, and then their height and weight were measured and written into the questionnaire forms. While taking measurements, the students were asked to take off their shoes and jackets and weighed using the same digital scale (Tefal brand). Their height measurements were performed with a single measuring tape without shoes, with the heel and occipital region leaning against the wall. In the study, a questionnaire containing information about schools, general identity information, social security status, family information, parents' education level, disease history, average monthly income, smoking status, sports activities, and dietary habits was used. BMI values were calculated after obtaining the height and weight information of the students. Afterward, they were grouped into four groups as underweight, normal, overweight, and having obesity in accordance with the BMI percentile tables for 2-20 years and gender approved by the CDC (Centers for Disease Control and Prevention). The limit values of these groups were determined as; underweight:  $<5.$ , normal:  $5. \leq - <85.$ , overweight:  $85. \leq - <95.$ , having obesity:  $95. \leq$  The amount of food consumed by the students was determined according to the portions required during adolescence for growth and development, and food consumption and characteristics were calculated as the total amount of nutrients they received per day from all nutrients. They were evaluated as "little, normal, too much" according to the daily portion amounts of nutrients they should take. The daily portion amounts that should be taken from the food groups were classified as follows [50], [54].

Milk and Dairy Products: 2-3 portions of normal, below 2 portions, little, more than 3 portions, too much

Eggs and Legumes: 1-2 portions, below 1 portion, little, more than 2 portions too much

Vegetables and Fruits: 3-4 portions normal, below 3 portions little, more than 4 portions too much

Bread and Cereals: 2-3 portions normal, below 2 portions little, more than 3 portions too much

Fat and Sugar: 1 portion normal, below 1 portion little, more than 1 portion too much

Honey, molasses (2 teaspoons): 1 portion

SPSS 11 program was used for statistical analysis of the data. Qualitative data were expressed as percentages, while measurable data were expressed as mean  $\pm$  standard deviation. The Chi-square test was used for the statistical analysis of qualitative data.

#### D. Ethically

The study was conducted after obtaining permission from the Ethics Committee of Karadeniz Technical University, the Çayeli District Governorship, and the District Directorate of National Education.

### III. RESULTS

45 % of the students participating in the study are girls, and 55 % are boys. The mean age is  $15.6 \pm 1.2$ , the mean height is  $1.65 \pm 0.1$  cm, the mean weight is  $58.4 \pm 10.9$  kg, and the mean BMI is  $21.3 \pm 3.2$ . 10 % of students have no social security. The mean number of siblings is  $3 \pm 1.9$ , and the mean number of people living at home is  $6 \pm 2.4$ . The mean monthly income was  $759 \pm 558.4$  YTL, the level of education was found to be mostly primary school among the mothers of the students and secondary school among the fathers. The classification of the students participating in the study according to their BMI percentages is shown in Table 1.

**Table 1: Classification of the Students Participating in the Research According to their Body Mass Index Percentages**

Classification of BMI According to Percentages	Number*	%
Underweight	47	2.7
Normal	1395	81.6
Overweight	202	11.8
Having Obesity	66	3.9
<b>TOTAL</b>	<b>1710</b>	<b>100.0</b>

\*Some of the students participating in the study were excluded from the assessment because information about their dates of birth could not be obtained

11.8 % of the 1710 students taken into the assessment were found to be overweight and 3.9 % of them having obesity, and 15.7 % of them in total were overweighted and having obesity. The overweight rate in girls is 12.6 %, obesity prevalence is 4.1%, the overweight rate in males is 11.8 %, the obesity rate is 3.9%. A significant relationship was found between the income levels of the students, the number of people living at home, the presence of a metabolic disease diagnosed in the family, and the presence of obesity among people in the family, and their percentile values were shown in Table 2.

**Table 2. Classification of BMI Percentages of the students participating in the Research According to the Variables Found to be Significant**

		Classification of BMI Percentages				□2	SD	P
		Normal n %	Overweight n %	Having Obesity n %	Total n %			
<b>Income Level</b>	Under 1000 TL	1018 85.6	128 10.8	43 3.6	1189 100.0	6.720	2	<b>0.04</b>
	1000 TL and over	307 80.2	55 14.4	21 5.5	383 100.0			
	Total	1325 84.3	183 11.6	64 4.1	1572 100.0			
<b>Number of People Living at Home</b>	5 and under	750 82.7	111 12.2	46 5.1	907 100.0	7.190	2	<b>0.04</b>
	6 and over	643 85.4	91 12.1	19 2.5	753 100.0			
	Total	1393 83.9	202 12.2	65 3.9	1660 100.0			
<b>Metabolic Disease Diagnosed in the Family</b>	Yes	276 76.9	67 18.7	16 4.5	359 100.0	18.957	2	<b>&lt;0.0001</b>
	No	1119 85.8	135 10.4	50 3.8	1304 100.0			
	Total	1395 83.9	202 12.1	66 4.0	1663 100.0			
<b>People with Obesity in the Family</b>	Yes	112 73.2	31 20.3	10 6.5	153 100.0	14.193	2	<b>&lt;0.01</b>
	No	1282 85.0	171 11.3	56 3.7	1509 100.0			
	Total	<b>1394 83.9</b>	<b>202 12.2</b>	<b>66 4.0</b>	<b>1662 100.0</b>			

\* Cardiac, blood pressure, kidney, and diabetes diseases are considered as diagnosed metabolic diseases.

When Table 2 is examined, it was found that there are significant differences according to income level, the number of people living at home, metabolic disease diagnosed in the family, and having obesity. Overweight and obesity were found to be significantly higher in those with high income, those with a family history of metabolic disease, and those with obesity in their family. ( $P=0.04$ ,  $P<0.0001$ ,  $P<0.01$ ). The prevalence of obesity was found to be significantly higher in those with 5 or fewer people living at home ( $P=0.03$ ). There was no significant

relationship between students' percentile values of their school, gender, social security status, number of siblings they have, education status of the mother and father, having a diagnosed metabolic disease, smoking status, and physical activity status ( $P=0.45$ ,  $P=0.84$ ,  $P=0.39$ ,  $P=0.78$ ,  $P=0.51$ ,  $P=0.09$ ,  $P=0.28$ ,  $P=0.19$ ,  $P=0.39$  respectively). Whether the students participating in the study take sufficient amounts of food groups is shown in Table 3.

**Table 3: Adequacy Status of the Daily Amounts Consumed by Students from Food Groups**

Consumption	Milk and Dairy Products		Meat-Dry Legume		Vegetables-Fruit		Bread-Cereals		Sweets-Fat	
	n	%	n	%	n	%	n	%	n	%
<b>Little</b>	537	30.8	405	23.2	391	22.4	274	15.7	<b>274</b>	<b>15.7</b>
<b>Normal</b>	260	14.9	217	12.4	79	4.5	95	5.4	<b>6</b>	<b>0.3</b>
<b>Too Much</b>	949	54.4	1124	64.4	1276	73.1	1377	78.9	<b>1466</b>	<b>84.0</b>
<b>Total</b>	<b>1746</b>	<b>100.0</b>	<b>1745</b>	<b>100.0</b>	<b>1746</b>	<b>100.0</b>	<b>1746</b>	<b>100.0</b>	<b>1746</b>	<b>100.0</b>

In general, students consume too much from five food groups. The most consumed food group is the sweet-fat group with 84 %, while they consume 54.4 % milk and dairy products, 64.4 % meat and meat products, 73.1%

vegetables and fruits, 78.9 % bread and cereals in too many amounts. The relationship between the consumption of the students from the food groups and BMI are shown in Table 4.

**Table 4: Distribution of Food Groups Consumed by Students According to their BMI**

Dietary Status		Normal		Overweight		Having Obesity		Total		P
Food Groups		n	%	n	%	n	%	n	%	
<b>Milk and Dairy Products</b>										<b>0.15</b>
	Little	431	84.2	62	12.1	19	3.7	512	100.0	
	Normal	197	78.5	40	15.9	14	5.6	251	100.0	
	Too Much	767	85.2	100	11.1	33	3.7	900	100.0	
<b>Meat and Legumes</b>										<b>0.13</b>
	Little	330	85.7	46	11.9	9	2.3	385	100.0	
	Normal	171	85.1	18	9.0	12	6.0	201	100.0	
	Too Much	893	83.0	138	12.8	45	4.2	1076	100.0	
<b>Vegetable and fruit</b>										<b>0.78</b>
	Little	310	84.0	48	13.0	11	3.0	369	100.0	
	Normal	61	83.6	8	11.0	4	5.5	73	100.0	
	Too Much	1024	83.9	146	12.0	51	4.2	1221	100.0	
<b>Bread and Cereals</b>										<b>0.49</b>
	Little	217	85.4	30	11.8	7	2.8	254	100.0	
	Normal	80	87.0	7	7.6	5	5.4	92	100.0	
	Too Much	1098	83.4	165	12.5	54	4.1	1317	100.0	
<b>Sugar and fat</b>										<b>0.68</b>
	Little	220	84.9	27	10.4	12	4.6	259	100.0	
	Normal	6	100.0	0	0.0	0	0.0	6	100.0	
	<b>Too Much</b>	<b>1169</b>	<b>83.9</b>	<b>175</b>	<b>12.5</b>	<b>54</b>	<b>4.0</b>	<b>1398</b>	<b>100.0</b>	

Among those who consume too much milk and dairy products 3.7%, those who consume too much meat and meat products 4.2%, those who consume too many vegetables and fruits 4.2%, those who consume too much bread and cereals, 4.1%, those who consume too much sugar and sweet 4.1% from food groups, 4.0% of the consumers were found to be having obesity, and there was no significant difference in terms of BMI. Overweight and obesity were not observed in those who consumed the sugar and sweets group in normal amounts. In all four groups, the rate of obesity is mostly observed in those who consume at normal levels, but the difference between them is not significant ( $P=0.15$ ,  $P=0.13$ ,  $P=0.78$ ,  $P=0.49$ ,  $P=0.68$ ).

#### IV. DISCUSSION

While 3.9 % of the students participating in the study have obesity, 11.8% are overweight (Table 1). According to a preliminary study report of Nutrition and Health Survey-2010 of Turkey, it was reported that prevalence of obesity between the age group of 6- 18 years was found to be at a ratio of 8.2 %, which is higher than the rate of the study[27].

In studies carried out in Turkey, the range of obesity is between 0.6 % and 12.5[28], [29], [43], [44], [33]–[36], [39]–[42]. In studies carried out all around the world the rates are 27.3%-1.3% [14], [23], [24],[15], [17]–[21], [25], [26]. It is found that the obesity rate obtained in the study is within this range, which is similar to some studies however our findings are either lower or higher than other studies. Overweight rates are similar with our study in 6.3%-16.7% [17], [23], [44], [24], [28], [29], [36], [39]–[41], [43], however the rates of 36.2%-18.2% [14], [16], [18], [20], [21], [25], [26], are higher than our study, and lower than our study in 7.8%-2.1% [33]–[35], [42]. In general, overweight and obesity rates are within the range determined in other studies. The reason for the difference in studies may be changes in diet and personal habits due to cultural differences.

In the study, the rate of obesity in girls was 4.1% and 3.9% in boys. Studies show that these rates range from 11.4% to 1.2% for girls and 13.4% to 1.5% for boys [20], [21], [41], [43]–[45], [56], [23], [25], [26], [28], [33], [34], [39], [40]. In the study, the rate of overweight in girls was 12.6% and 11.8% in boys. Overweight among girls was found between 42.2%- 3.82% and 37.5%-4.1% in boys when the studies are examined [14], [20], [41], [43], [44], [56], [21], [23], [25], [26], [28], [33], [34], [39]. The prevalence of obesity in girls in our study was 4.1% lower than the rate of 7.3 in the preliminary study report of Nutrition and Health Survey-2010 of Turkey [27]. The rate of obesity and overweight in girls and boys is in the same range obtained from other studies and is lower than some other studies. Being overweight and having obesity were not significantly different in terms of gender in the study. Similarly, there is no significant difference in terms of gender in the studies conducted in Elazığ, Isparta, and Kayseri [41], [43], [44]. In some studies, while it is observed more in men, in other studies, it is observed more in women [23]–[25], [28], [40], [56]–[58]. While gender

does not make a difference in overweight in Denizli [36], obesity and overweight is high in men [15], [16], [19]–[21], [26], [39], [42]. When the studies were reviewed, the rate of obesity and overweight was found to be high in different genders in different studies. It seems difficult to make a distinction in terms of gender due to the different distribution of age groups and differences in regional habits.

In the study, obesity was found to be higher in those with high-income levels ( $P=0.04$ ). Similarly, it was seen that overweight increased as the income level increased [21], [28], [33], [41], and the risk of being overweight was higher in those who attended private school [14]. The reason for this may be that the nutrient level is affected by high income, and they consume more food and junk food. In addition, the use of vehicles instead of walking in transportation is more common among people with high income, which is effective in the formation of obesity.

Similar to studies in Kayseri [44], no significant difference was found in terms of sibling numbers and BMI in the study ( $P=0.78$ ). However, a significant relationship was found between the number of people in the house and obesity. It was seen that the BMI decreased as the number of people in the household increased ( $P=0.03$ ). Similarly, obesity is high among families with 5 or fewer family members [35]; a study significantly negative relationship was found between the number of siblings and obesity and being overweight [39]. It has been studied determined that as the number of siblings increases studies, obesity decreases [28], [41]. In the North West Region of South Africa, families with fewer than five people are overweight and have obesity [23]. As a result, it may be argued that as the number of people living at home increases, the amount of food consumed decreases, and food groups change, and therefore BMI decreases.

The absence of a significant relationship between the education levels of the parents and BMI ( $P = 0.51$ ,  $P = 0.09$ ) is similar to a study [44]. Unlike the study, a significant negative relationship was found between a mother's education level and obesity and being overweight [14]; as the education level of the mother and father increased, obesity was found to increase [28], [41]. There are also differences between studies. While it had no impact in some studies, it was found to be a decreasing impact in some studies and an increasing effect in others. It is thought that the reason for this difference may be other factors, income difference, or family history.

In the study, when the BMI was compared with the presence of a diagnosed metabolic disease, no significant relationship was observed ( $P=0.28$ ). In the study, the absence of obesity in students with metabolic diseases resulted in meaningless findings. Those with metabolic diseases in their family have a high rate of obesity and overweight ( $P<0.0001$ ). In a study conducted in Germany, it was found that there is a significant relationship between obesity and Type II diabetes [59]. It is known that there is a relationship between metabolic diseases and obesity [3]. In the study, obesity was observed

with a significantly higher rate in those having a disease in line with the literature.

An increase was found in the BMI of those who have individuals with obesity in their families, and this increase was found statistically significant ( $p < 0.01$ ). It is known that genetics is effective in obesity[2]. Similar to the study, obesity was found to be high in other studies [33], [40], [41], [44], and in a different study with a family history of obesity[38]. It is seen that the results obtained in our study are similar to the other studies conducted and are compatible with the literature.

In the study, findings of no significant relationship between smoking and obesity ( $P = 0.19$ ) are similar to a study[44]. The lack of a significant difference between smoking and the prevalence of obesity can be attributed to the fact that the participants in the study are young by age and do not smoke many cigarettes.

In the study, no significant difference was found between obesity incidence and those who perform physical activity and those who do not ( $P=0.39$ ). Similar to the study findings, performing physical activity in Kayseri and Elazığ did not make a significant difference in obesity[41], [44]. Differently, it has been determined that sedentary life is effective on BMI, that weight increases due to sedentary lifestyle[18], [21], [23], [38], [40], [60], it was determined that performing regular sports prevented obesity[26]. It is acknowledged that physical activity is effective in the formation of obesity and even included in the treatment of obesity[1], [3]. The lack of significant relationships in the studies may be attributed to the responses of the participants in the research or may be due to the dietary habits of the students.

Considering the dietary habits, the rate of obesity with respect to entire food groups was mostly found in those who consume at normal levels, but the difference between them is not significant. ( $P=0.15$ ,  $P=0.13$ ,  $P=0.77$ ,  $P=0.49$ ,  $P=68$ ). Similarly, it was determined that the composition of the diets of normal weight and overweight/obese children was not significantly different, and the dietary intake in the excess fat group did not show any relationship with weight status[23].

In the study, obesity was not observed in those who consume sugar and fat group at normal levels, while those who consume little and too much obesity was observed at a rate of 4.6% and 4.0%, respectively, but this difference between them is not significant. Obesity was observed more in those who consumed 5 portions and more beverages with sugar content in Spain, which supports the previous findings[26]. Although people consume all food groups at normal levels, obesity and overweight can be attributed to sedentary life and lack of physical activity. Those who consume sugar and sweets at a normal level without having overweight and obesity show that sugar and sweets have an impact on obesity. Observing obesity and overweight in those who consume little amounts of food groups can be attributed to their inadequate and unbalanced consumption of food groups. When the studies were examined, it was observed that obesity is higher in those who skip breakfast and meals[21], [28], [33], [42], and obesity is higher among

fast-food consumers[41], [42]obesity was found to be significantly lower in those who consume snacks between meals [44] and food consumption was found to be higher in those having obesity [17], [61].

## V. CONCLUSIONS

In conclusion, the rate of overweight and obesity has been revealed as high in our study as similar to other studies conducted in Turkey. In terms of income levels, the number of people living at home, and family members suffering from a disease or obesity, a significant difference was observed in BMI. In accordance with the values obtained as a result of the study, efforts should be made in order to prevent obesity. The students should be informed about the importance of physical activity and dietary habits with respect to the issue of obesity. Since obesity is significant in those having family members suffering from obesity and disease, these students should be assessed more carefully. The increase in the rate of obesity among those with high income and the decrease in the rate of obesity as the number of people in the house increases indicates the lack of knowledge about dietary habits and the requirement for training in this direction. The importance of adequate and balanced dietary habits should be emphasized, and unnecessary and inaccurate food consumption should be avoided. Prevention of obesity and pieces of training on diets should be planned to include families.

## Limitations

It only covers the Çayeli district in Rize province.

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