



## The Relationship between the Body Mass Index and Different Education Times in Secondary Schools

Soner Karadeniz<sup>1</sup>

Sema Can<sup>2</sup>

<sup>1</sup>Fatih Sultan Mehmet Secondary School, Sivas, Turkey

Email: [karadenizsoner@msn.com](mailto:karadenizsoner@msn.com) Tel: 03462114732

<sup>2</sup>Hitit University, Faculty of Sports Science, Çorum, Turkey

Email: [semacan@hitit.edu.tr](mailto:semacan@hitit.edu.tr) Tel: 03642277923



(✉ Corresponding Author)

### Abstract

The aim of this study was to investigate the relationship between body mass index (BMI) and educational periods in secondary school students. The study was conducted on 832 students, 418 girls ( $M_{age}: 12.99 \pm 0.83$ ) and 414 boys ( $M_{age}: 12.92 \pm 0.85$ ), who received dual and full-time education in the centre of Sivas Province. As data collection tool, BMI was calculated by measuring weight and height, and the percentile curve developed by Neyzi *et al.* (2008) in the classification of obesity and underweight was used. As the statistical analysis, the mean, standard deviation, frequency, percent values were used for descriptive statistics of all variables and Pearson Chi Square test. According to findings of the research, the underweight student rate was 11.9% (girls: 6.1%; boys: 5.8%), overweight student rate was 9.1% (girls: 5%; boys: 4.1%) and obese student rate was 8.6% (girls: 5.2%; boys: 3.4%). According to their BMI, 33.3% of underweight students receive dual education, 66.7% full-time education; 47.1% of normal weight students dual education, 52.9% full-time education; 61.8% of overweight students dual education, 38.2% of obese students full-time education; 59.2% of obese students dual education, 40.8% full-time education. A statistically significant relationship was found between the type of education and BMI ( $p < 0.05$ ). As a result, it can be said that the dual education system has increased the rate of obesity. However, the fact that the number of underweight students is higher than the number of overweight and obese students is important for introducing the habits of healthy eating.

**Keywords:** Body-Mass index, Dual education, Education times, Full-time education, Obesity, Secondary school students.

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## 1. Introduction

According to the World Health Organization (WHO), obesity is defined as abnormal or excessive fat accumulation that presents a risk to health (WHO, 2000). According to the WHO 2016 data, the number of overweight and obese children under 5 is over 41 million. Over 340 million children and adolescents aged 5-19 were overweight or obese in 2016 (WHO, 2018). The childhood obesity has been considered as one of the most important social health problems of the 21<sup>st</sup> century in developed and developing countries. Obesity causes, Type 2 diabetes, cardiovascular diseases, and the social and psychological problems (Nuttall, 2015; Tarakçı *et al.*, 2016; Sakarya *et al.*, 2017; Glinkowska and Glinkowski, 2018). For this reason, it is seen as a public health issue requiring the measures to be taken. Among the factors that cause obesity in children, genetic and environmental factors are foremost. There are many reasons such as passive life style owing to the technology, boost of urbanization, drop in play areas, and excessive and unbalanced eating (Tarakçı *et al.*, 2016; NCD Risk Factor Collaboration (NCD-RisC), 2017). On the other hand, the fact that little time is spared for the physical education and sports classes in our country may be a risk factor. In our country, the education system is carried out in two ways which are full-time and dual educations. Full-time education and dual education systems can vary according to the number of student, classroom, and school. The courses are given between 08:30 - 15:20 in full-time education and it is between 07:00 - 12:45 in the morning and 13:00 - 18:45 in the afternoon in dual education in Sivas. In this regard, there are many studies in our country to determine the prevalence of obesity seen in childhood (Öner *et al.*, 2004; Semiz *et al.*, 2008; Özcebe *et al.*, 2015). However, in our country, no study was found the relationship between the obesity with dual and full-time education. In this regard, the aim of this study is to examine the relationships between the different education time and BMI in 6,7,8<sup>th</sup> classes students in secondary schools.

## 2. Material and Method

### 2.1. Research Group

A total of 832 secondary school students (girls: n=418; boys: n=414) who were educated in Sivas in 6,7,8<sup>th</sup> grades in full-time and dual education, voluntarily participated in the study. Among 47 secondary schools in Sivas, 11 of them without an indoor sport facility were randomly selected. Acknowledging that each school is a layer, the number of boys and girls students was determined by the proportional selection method. Acknowledging the branches of each class in the schools as a cluster, students were selected by sampling method from each class and branch and the research was conducted in May 2015-2016 educational year. Before the research, the official permission from the Sivas Provincial Directorate of National Education, dated 30.04.2015 and 92255297-605.01-E.4542785, and the committee approval from the OMU Clinical Research Ethics Committee, dated 10.12.2015 and B.30.2.ODM were taken.

### 2.2. Data Collection

The length measurements of the participants included in the study were carried out with the Seca brand tape measure and body weights were carried out using the Tefal brand portable measurement tool, in compliance with the protocol (Gordon *et al.*, 1988). The BMI (kg/m<sup>2</sup>) of all students was calculated using height and weight measurements. The BMI values obtained were classified according to the reference BMI values that were adapted to the age and gender specific to children of our country. According to this, below the 5<sup>th</sup> percentile was classified as underweight, 5<sup>th</sup> to 85<sup>th</sup> percentile normal, and 85<sup>th</sup> to 95<sup>th</sup> percentile overweight, whereas over 95<sup>th</sup> percentile was classified as obesity (Neyzi *et al.*, 2008).

### 2.3. Statistical Method

As part of the descriptive statistics of all variables, the mean, standard deviation, frequency (f), percent (%) values were given. Pearson Chi Square test was used to analyse the relationship between the categorical variables. All statistical procedures were performed in SPSS 20.0 package program under Windows and error level was taken as 0.05.

## 3. Findings

Table-1. Descriptive characteristics of the students.

Variables	Girls	Boys	Total
	n = 418	n = 414	n = 832
	Mean ± SD	Mean ± SD	Mean ± SD
Age (years)	12.99 ± .83	12.92 ± .85	12.95 ± .84
Height (cm)	156.19 ± 7.53	156.29 ± 10.44	156.24 ± 9.09
Weight (kg)	49.27 ± 7.53	48.66 ± 13.64	48.97 ± 12.59

Source: This table is result of our research

According to the Table 1, the mean and standard deviation values of the age, height, weight of the students included in the study, respectively were calculated as 12.95±.84; 156.24±9.09; 48.97±12.59.

According to the Table 2, 33.5% of the students are in the 6<sup>th</sup> class; 34.5% 7<sup>th</sup> class; 32% 8<sup>th</sup> class student. 47.8% of the students receive dual education and 52.2% receive full-time education.

According to the Table 3, 6.1% of underweight students were girls, 5.8% were boys; 33.9% of normal weight students were girls, 36.5% were boys; 5.0% of overweight students were girls, 4.1% were boys; 5.2% of obese students were girls, 3.4% were boys. No statistically significant correlation between gender and BMI was found (p>0.05).

**Table-2.** Frequency (f) and percentage (%) distribution of variables.

Gender	f	%
Girls	418	50.2
Boys	414	49.8
Total	832	100.0
Education level		
6.	279	33.5
7.	287	34.5
8.	266	32.0
Total	832	100.0
Education times		
Dual education	398	47.8
Full-time education	434	52.2
Total	832	100.0

Source: This table is result of our research

**Table-3.** Frequency (f) and percentage (%) distribution of gender, education level, and education times according to BMI.

Variables	Underweight (<5)		Normal (5-8.5)		Overweight (8.5-9.5)		Obese (>9.5)		X <sup>2</sup> , p
	f	%	f	%	f	%	f	%	
Gender									
Girls	51	6.1	282	33.9	42	5.0	43	5.2	X <sup>2</sup> =4.909 p= 0.179
Boys	48	5.8	304	36.5	34	4.1	28	3.4	
Total	99	11.9	586	70.4	76	9.1	71	8.6	
Education level									
6.	38	38.4	197	33.6	27	35.5	17	23.9	X <sup>2</sup> =8.711 p= 0.190
7.	39	39.4	200	34.1	22	28.9	26	36.6	
8.	22	22.2	189	32.3	27	35.6	28	39.5	
Education times									
Dual education	33	33.3	276	47.1	47	61.8	42	59.2	X <sup>2</sup> =18.092 p= .001
Full-time education	66	66.7	310	52.9	29	38.2	29	40.8	
Total	99	100.0	586	100.0	76	100.0	71	100.0	

Source: This table is result of our research

According to the Table 3, 38.4% of the underweight students were in 6<sup>th</sup> class, 39.4% were in 7<sup>th</sup> class, 22.2% were in 8<sup>th</sup> class; 33.6% of students with ideal weight were in 6<sup>th</sup> class, 34.1% were in 7<sup>th</sup> class, 32.3% were in 8<sup>th</sup> class; 35.5% of the overweight students were in 6<sup>th</sup> class, 28.9% were in 7<sup>th</sup> class, 35.6% were in 8<sup>th</sup> class; 23.9% of obese students were in 6<sup>th</sup> class, 36.6% were in 7<sup>th</sup> class, 39.5% were in 8<sup>th</sup> class according to BMI. A statistically significant relationship between educational levels and BMI was not found ( $p>0.05$ ).

According to the Table 3, 33.3% of the underweight students compared with their BMI were at dual education, 66.7% of the students at full-time education; whereas, 47.1% of the students with normal weight with at dual education and 52.9% at full-time education; 61.8% of the overweight students were at dual education and 38.2% of them were at full-time education, 59.2% of the obese students were at dual education and 40.8% at full-time education. A statistically significant correlation between education and BMI was found ( $p<0.05$ ).

#### 4. Discussion

The aim of this study is to examine the relationship between education times and BMI in secondary school students who receive education in 6<sup>th</sup>, 7<sup>th</sup> and 8<sup>th</sup> grades. In the present study, the rate of underweight was 11.9%, overweight rate was 9.1%, and the obesity rate was 8.6% Table 3. When the literature studies are examined, similar results are given by the data of Turkey Nutrition and Health Survey (TBSA, 2010, 2014) that indicates 14.9% of children aged 6-18 years are underweight, 14.3% are overweight and 8.2% are obese. Dündar and Öz (2012) found the obesity frequency as 10.3% in their research on secondary school students with an average age of 12.8 in Samsun. Barbiero *et al.* (2009) reported that the prevalence of overweight as 17.8%, and the rate of obesity as 9.8% among students aged 10-18 years in Brazil. Amin *et al.* (2008) reported that the prevalence of overweight in children between 10-14 years of age as 14.2% and 9.7% of obesity rate in Saudi Arabia. Ozturk and Akturk (2011) found the overweight as 12.4% and the prevalence of obesity as 6.5%. The findings of this study and the literature demonstrate that the rate of overweight in children is higher than the obesity. In addition, it has been observed that the obesity prevalence rates were similar to our results. According to these results, being overweight is considered a major problem and will form a risk factor for obesity in the future. In addition, it has been seen that the rate of the underweight is also a major problem in the study, and it shows parallelism with the data of the most comprehensive study (TBSA, 2010, 2014). In this study, when the BMI was examined by gender, 6.1% of the underweight students were girls, 5.8% were boys; 5.0% of the overweight students were girls, 4.1% were boys, and 5.2% of obese students were girls and 3.4% were boys. It is observed that being underweight and excessive weight/obesity are higher in girls Table 3. Simsek *et al.* (2005) reported that 55.6% of the obese children which is a higher percentage than the boys were girls, and Korkmaz (2008) stated that 66.0% of the obese students were girls. When we look at the gender distribution percentages, it is observed that it shows similarities with the results of our research Table 3. In contrast to these results, some studies (Tremblay *et al.*, 2002) observed that the rate of being underweight and overweight in boys is higher as well. Öner *et al.* (2004) reported in the study conducted in Edirne between 12 to 17 years olds that reported that the prevalence of underweight, overweight and obesity among young girls between the ages of 12 and 17, was 11.1%, 10.6%, 2.1%, and the rates were 14.4%, 11.3%, and 1.6%, respectively, in boys. According to Barbiero *et al.* (2009) the prevalence of overweight was 19.9% in girls and 15.3% in boys, and the obesity was 8.2% in girls and 11.8% in boys. Dündar and Öz (2012) stated that the frequency of overweight and obesity in boys is higher than girls. Variables such as physical, physiological,

metabolic rapid changes due to gender and age, biological differences in energy requirements in both sexes regarding growth and timing during sexual maturity period, and regional and social gender differences may be factors in obesity or overweight rates between genders (Al-Rethaiaa *et al.*, 2010; Goyal *et al.*, 2010; Biswas *et al.*, 2017; Gebrie *et al.*, 2018). In addition, it has been stated in a wide range of previous studies that the rates of obesity vary according to socio-economic level and region as well (The TOÇB, 2011; COSI-TUR, 2013). In this respect, the fact that Sivas is a city located in the Central Anatolian region may have affected the results.

In the study, according to the class levels, it is seen that the overweight rate of 35.6% and obesity rate of 39.5% are seen in 8<sup>th</sup> grade; however, no statistically significant difference between the grade and the BMI was found Table 3. In our country, hours of education might vary from one region to another according to the number of schools, classrooms and students in our country. There are efforts for changing the timing of education which is seen as a major problem in the education system of our country and endeavours for full-time education continues. In line with this, this study in which the relationship between the times of education and BMI was examined, indicates that 33.3% of underweight students are at dual education, approximately 66.7% are at full-time education; 61.8% of overweight students are at dual education and 38.2% are at full-time education; it was observed that 59.2% of obese students were at dual education, 40.8% were at full-time, and there was a significant correlation between these rates and education times Table 3. In the light of these findings, it can be said that dual education increases the rate of underweight, overweight and obesity. In addition, in the formation of this situation, breakfast /eating habits and many factors such as sleep time is thought to be effective.

## 5. Conclusion

In this study, the fact that underweight, overweight, and obesity rates are high especially in the dual education system, measures to be taken for the health of future generations. First of all, it is recommended to gain adequate-balanced eating habits for a healthy lifestyle, increase physical education and sports course hours, and establish the necessary physical environment for game and sports activities. In this respect, the high prevalence of obesity in the students who are studying in the “dual education” system shows the importance of the “full-time education” system. Besides, being the first study that examines the relationship between the time of education and BMI is the strong side of this study. A more comprehensive research might be made for different region and age groups across the country.

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