

Research article

Overweight and Obesity in High School Students of 15-18 ages. A Cross-Sectional Study

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Abstract: The purpose of the study was to evaluate and identifying the level of excess weight and obesity in older students between 15 and 18 years, as important benchmarks of the level of health in order to update the recommendations regarding the promotion of an active and healthy lifestyle. A cross-sectional study was conducted on a sample of 400 subjects, (186 boys and 214 girls), aged 15 to 18. Anthropometric data including: body height, body weight, Body Mass Index (BMI). Participants' BMI was estimated using the Percentile BMI calculator for children and teenagers aged 2 to 19. Study adolescents were defined as underweight, normal (healthy) weight, overweight, and obese according to the CDC child growth characteristics for age, sex, and BMI. 350 (85.5%) subjects were healthy weight; 26 respondents (6.5%) were overweight, 17 (4.25%), were obese, while 7 (1.75%) underweight. The analysis of the individual results of male and female subjects points to increased values of the body mass of males (18.81%), compared to female pupils (3%). Out of a total of 186 male students, 10.75% were in the overweight category, and 8.06% were categorized as obese, in contrast 2.80% of the girls were overweight and (1%<), in the obese category, which is an outstanding result, where obesity practically does not exist. According to the results of this study (for both sexes), in relation to gender, there were more malnourished girls (2.33%), compared to boys (1%<). Among high school students in Bosnia and Herzegovina, the number of children with overweight and obesity is relatively low compared to data from other countries. Based on the relevant results of this study, we consider it necessary to update strategies for promoting an active and healthy lifestyle regarding physical activity and eating habits for adolescents in relation to the specifics of the countries of residence and European trends.

Keywords: BMI; students; overweight; obesity; weight status category; high school.

1. Introduction

The incidence of obesity in teenagers represents an upward trend which, combined with sedentary lifestyle, can lead to a decrease in the quality of life. In the process of preventing and combating obesity and sedentarism in adolescents, an important role is played by regular exercise and the adoption of correct eating habits, which determines the implementation of a proactive and healthy lifestyle.

In today's modern world, the era of digitalization, technological progress, the global trend of obesity among young people is increasingly noticeable in many countries [1]. Most developing countries, going, report an increase in obesity in children and adolescents, especially among the urban population. Countries where undernutrition used to be the leading health problem for children are now dominated by overweight and obesity. They appear as a consequence of an environment characterized by readily available, cheap, high-calorie food combined with a sedentary lifestyle [2]. Today, obesity is one of the most critical public health problems in most countries. The evident overweight of children and adults is a societal problem and can be called the "technological obesity pandemic". For this reason, in recent years, the scientific community has intensively focused attention on this negative phenomenon of the modern era. The results of the study by Rolland-Cacher, et al. [3]; suggest that overweight and obesity in childhood increase health risks during adulthood and throughout life. It is more likely that children with excess weight (or obesity) will have more negative consequences, in terms of impaired health during childhood and adulthood, weaker school, social and work opportunities [4].

An increasing number of obese children and adolescents show some metabolic complications and belong to high-risk groups for the development of early morbidity. Many metabolic and cardiovascular complications of obesity are already present in childhood and are closely related to insulin resistance, so often, obese children remain obese in adulthood. More than 80% of obese children became obese adults, and increased values of abdominal fat are significant determinants of the negative metabolic phenotype of obese adolescents [5]. In the period from the 80s of the 20th century to 2013, the prevalence of overweight and obesity worldwide increased by about 27% in adults and by about 47% in children [6].

However, according to the latest data [7], more than one billion people worldwide suffer from obesity, and this number has increased more than four times since 1990. In Europe we observe an upward trend in obesity, with almost 60% of adults and 1/3 of children being obese or overweight. The study estimates that there were around 226 million obese adults, adolescents and children in the world in 1990, and that this number has increased to 1.038 billion in 2022. In the past, we considered the obesity as a problem for the rich, but now as a global problem, probably due to rapid lifestyle changes in low- and middle-income countries. There are signs that female obesity is leveling off in some southern European countries (France, Spain). The leading cause of obesity is poor nutrition and a change in the way nutrition has evolved, as there has been excessive consumption of energy-rich foods, fast food, energy drinks and, sugary drinks. To fight this "health enemy", the WHO has supported taxes on sugary drinks, limiting the sale of unhealthy food to children and, increasing subsidies to countries that produce healthy food. For this reason, adequate and efficient programs and health policies are needed at the global, regional and national level to minimize or at least limit the problem among young people [8]. The regular monitoring of the level of nutrition and body composition of adolescents is defined as an essential stage of public health to reduce, at least partially, the risk factors for obesity and associated health problems. Knowing the prevalence of obesity among adolescents facilitates timely intervention in order to combat it through specific means: physical activities, nutritional and dietary.

Regular physical activity is one of the effective obesity prevention measures, available to everyone, relatively cheap and adaptable to individual characteristics and physical exercise preferences. A study suggests that children and adolescents should exercise at least 60 min. moderate to strong aerobic physical activities daily, and exercises for muscle and bone strengthening should be included at least three times a week, which is also in line with WHO recommendations [9].

Unfortunately, the results of the study [10]; indicated that only 26.7% of high school students met PA guidelines, with about 20% of adolescents (13 to 15 years old) meeting

PA guidelines, where boys were more physically active than girls. Adolescence is an optimal period for the development of habits and behavior, because the behavior established during adolescence is transferred to adulthood. Studies [11,12,13], show that the level of PA increases in early childhood and then decreases during adolescence and adulthood. These data are worrying because physical inactivity is a modifiable risk factor in children and adolescents for numerous chronic diseases, including cardiovascular diseases, obesity and diabetes [14,15,16]. People who are overweight but participate in physical activity have fewer risk factors for metabolic syndrome compared to people who are overweight but do not engage in physical activity that improves physical fitness [17,18].

Bosnia and Herzegovina is not a typical European country due to the predominance of mountainous terrain, the presence of different cultural traditions among relatively large population groups, and the consequences of the war that occurred 30 years ago and had a negative impact on the economy. Educational, cultural, traditional, financial, social, etc. factors influence human behavior in Bosnia and Herzegovina, which can impact the lifestyle aimed at practicing physical exercises and eating habits. All of this previously mentioned factors can affect the physical structure of people, especially children and young people. In this regard, by determining the number of overweight and obese children in Bosnia and Herzegovina and comparing the obtained data with similar data from other European countries, it is possible to get information about the presence or absence of physical structure characteristics of high school students in Bosnia and Herzegovina and develop recommendations for young people in Bosnia and Herzegovina, as well as for representatives of other countries on nutrition and physical behavior, to maintain healthy body weight and composition.

The purpose of the study was to evaluate and identifying the level of excess weight and obesity in older students between 15 and 18 years, as important benchmarks of the level of health in order to update the recommendations regarding the promotion of an active and healthy lifestyle.

2. Materials and Methods

2.1. Participants

400 high school subjects were included in the cross-sectional study conducted between March and May 2019. Depending on gender, the study sample included 186 boys and 214 girls. Inclusion criterias: students age between 15 and 18 years, healthy subjects, residents of Bosnia and Herzegovina, high school students, voluntarily participated in the study (Table 2).

2.2. Study design

The study was conducted in high schools in the territory of the Municipality of Pale and Municipality Sokolac (City of East Sarajevo). Pale and Sokolac municipalities are located in the southeastern part of the Republic of Srpska (BIH). It is mainly an area on the mountain relief (geographically defined as the Sarajevo-Romania region), with an altitude of 620 to 1920m.

2.3. Anthropometry

The instruments used in the study: Stadiometer for body height measurement (standing upright, standard body height measurement) (SECA 206, Germany), digital scale for body weight measurement (BEURER Typ 35, Germany). The body mass index (BMI) was calculated using the standard formula: a person's weight (kg) divided by the square of the height (m²). According with ontogenesis, BMI varies according to age and sex. The BMI of the participants in the present study was estimated using the BMI percentile calculator for adolescents aged 15 to 19 years. (<https://www.cdc.gov/healthyweight/bmi/calculator.html>). Depending on the growth

characteristics of the CDC adolescents regarding: age, sex and BMI, the subjects were divided into: underweight, normal (healthy), overweight and obese. (Table 1).

Table 1. Weight status category (Center for Disease Control and Prevention, 2000)

Weight Status Category	Percentile range
Underweight	<5 th percentile
Healthy Weight	5 th <85 th percentile
Overweight	85 th <95 th percentile
Obesity	>95 th
Severe Obesity	120% of the >95 th percentile or 35 kg/m ² or greater

2.4. Ethical consideration

The the content and stages of the study were communicated to the students, and participation was completely voluntary. All participants expressed great interest in participating in the study, and signed the form before the start of the study. The research was conducted following the professional and ethical standards of the Declaration of Helsinki (World Medical Association Declaration of Helsinki, 2013).

Age	Gender	Parameters	Mean ± SD	Min.	Max.	Rang	CI 95% difference	CV%	Skew	Kurt.
15 age	Male (n=43)	Body Height	179.00±8.53	158.00	197.00	39.00	7.03 – 10.84	4.76	-0.19	0.28
		Body Weight	66.98±10.65	48.00	90.00	42.00	8.78 -13.548	15.90	0.35	-0.27
		BMI	20.83±2.51	16.51	31.89	15.38	2.07- 3.19	12.05	2.12	8.33
	Female (n=57)	Body Height	170.49±5.98	157.00	183.00	26.00	5.05 – 7.34	3.51	0.00	-0.46
		Body Weight	58.32±7.36	47.00	82.00	35.00	6.22 – 9.03	12.63	0.81	0.56
		BMI	20.03±2.09	17.01	28.37	11.36	1.76 - 2.56	10.42	1.43	3.87
17 age	Male (n=45)	Body Height	180.49±7.57	169.00	196.00	27.00	6.26 - 9.56	4.19	0.29	-0.94
		Body Weight	72.91±11.73	52.00	104.00	52.00	9.71 - 14.81	16.08	0.97	0.87
		BMI	22.30±2.58	16.07	28.09	12.02	2.14 - 3.26	11.56	-0.08	0.54
	Female (n=55)	Body Height	169.73±5.08	157.00	181.00	24.00	4.28 -6.26	2.99	-0.26	0.16
		Body Weight	59.91±6.54	49.00	73.00	24.00	5.51 – 8.06	10.92	0.01	-0.98
		BMI	20.78±2.00	16.71	28.13	11.42	1.69 - 2.47	9.64	0.70	2.02
18 age	Male (n=50)	Body Height	183.10±8.37	163.00	198.00	35.00	6.99 - 10.43	4.57	-0.56	0.06
		Body Weight	76.26±12.48	48.00	110.00	62.00	10.43 -15.55	16.37	0.20	0.31
		BMI	22.68±2.98	17.81	31.46	13.65	2.49 - 3.72	13.16	0.74	0.45
	Female (n=50)	Body Height	171.64±5.45	160.00	190.00	30.00	4.55 -6.79	3.18	0.32	1.86
		Body Weight	61.52±8.30	47.00	90.00	43.00	6.94 – 10.35	13.50	0.78	1.70
		BMI	20.87±2.60	16.26	29.39	13.13	2.17 – 3.54	12.46	1.03	1.79
19 age	Male (n=48)	Body Height	183.15±8.40	160.00	195.00	35.00	6.99 – 10.52	4.59	-0.54	-0.25
		Body Weight	79.83±12.85	58.00	110.00	52.00	10.70 - 16.10	16.10	0.40	-0.17
		BMI	23.75±3.27	18.10	37.72	19.62	2.72 – 4.10	13.77	1.76	6.28
	Female (n=52)	Body Height	170.27±6.54	157.00	178.00	21.00	4.19 – 6.20	3.84	-0.63	-0.21
		Body Weight	60.40±4.99	45.00	80.00	35	7.68 - 11.41	8.26	0.25	-0.95
		BMI	20.85±2.15	14.69	25.54	10.85	2.21 - 3.28	10.31	-0.43	0.36

2.5. Statical analysis and software

Statical software (G*Power, v3.1.9.7, Heinrich-Heine-Universität, Düsseldorf, Germany) was used to calculate the sample [34]. The combination of tests used in the statistical software to calculate the sample size was as follows: (a) x2 tests, (b) goodness-of-fit tests: Contingency tables y (c) a priori: Compute required sample size – given α , power, and effect size. Tests considered two tails, effect size $w = 0.50$, α -error probability = 0.05, power($1-\beta$ error probability) = 0.8. Basic statistics parameters: Mean, Min., Max., Range, SD, CI 95%, CV%, Skew., Kurt. For normality, the Kolmogorov-Smirnov test was applied ($p > 0.05$). The homogeneity of variance was tested using Levene's test. Analysis of the study data were performed using the statistical package STATISTICA 10.0 for Windows (StatSoft, Inc., Tulsa).

3. Results

In this section we have presented the most relevant results and statistical analysis and their interpretation about the topic of the study. Table 2 contains statistical parameters of morphological characteristics of male and female high school students.

Table 2. Descriptive statistical of morphological characteristics of male and female high school students.

BMI –body mass index, n – number, CV- coefficient of variance, SD–standard deviation.

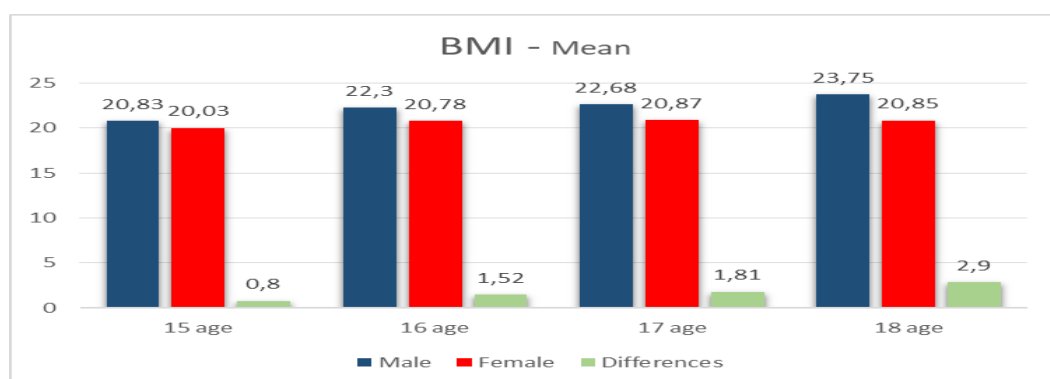


Figure 1. Distribution of BMI average by age for males and female

Table 2 contains statistical indicators of morphological characteristics of male and female high school students. Numerical parameters point to a slight but positive trend in the average results of male respondents. Males achieved an average increase in height of about 4 cm and weight of almost 13 kg, while girls in the period from 15 to 18 years recorded minimal and nearly unchanged average height values, but with different dynamics in specific periods (slight increase in height in 15 and 18 years). The average weight of the girls was around 58-60 kg, which is a relatively insignificant change in body weight considering that we are talking about 4 years. The results of the morphological characteristics of the subjects define a slight stagnation of growth and partial development of female, compared to male who have an extended phase of growth and development up to the age of 19 (Table 2, Figure 1, 2, 3). Compared to female, the male students aged 15 recorded a higher average height by 19 cm and body weight by 8 kg. This relationship is also present at the age of 16, but with a slight decrease in the average difference in height (11 cm) compared to the previous period, in contrast, the difference in body mass increased (13 kg), and it appears as a consequence of the more intensive weight gain of men (Table 2). The trend of morphological differences was present at the age of 17, where almost identical numerical differences were recorded between male and female subjects in height

as 16 years (12 cm) and somewhat more significant in body mass (about 15 kg). Men aged 18 were 13 cm taller than the female sample and about 19 kilogram heavier. This growth trend is following the natural biological laws of the organism's development in the post-puberty period. More extensive ranges of minimum, and maximum results of morphological characteristics in both sexes were expected and they defined significant gender differences in the analyzed four-year period.

The differences of height of male students in this period ranged from 27-39 cm and 42-62 kg in body weight. A slightly smaller difference in individual results in height (21-30cm) and body weight (24-43 kg) was recorded in female compared to the male group. This is one indicator that girls in this period are more susceptible to an increase in body weight about their height, probably due to their inadequate nutrition, lack of sufficient physical activity, hormonal changes etc. The results are in accordance with the subject's biological acceleration, nutritional inadequacy, genetic factors, socioeconomic factors, etc. All of this can be applied in more transparent and more detailed analysis of the health and physical status, i.e., the degree of food or obesity of the student. It is precisely the disturbed balance between height and body mass that is an indicator of the level of nutrition, health, and nutritional habits of each individual.

Table 3. Weight status category of females and males of the subject of study

Gender	Age years (number)	Underweight		Healthy Weight		Overweight		Obesity	
		< 5th		5th-85th		85 th -95th		>95th	
		N	%	N	%	N	%	N	%
Female	15 (n=57)	-		55	96.49	1	1.75	1	1.75
Male	15 (n=43)	-	-	39	90.69	2	4.65	2	4.65
Female	16 (n=55)	1	1.81	53	96.36	1	1.81	-	-
Male	16 (n=45)	2	4.44	34	75.55	5	11.11	4	8.88
Female	17 (n=50)	3	6.0	43	86	3	6.0	1	2.0
Male	17 (n=50)	-		37	74.0	8	16.0	5	10
Female	18 (n=52)	1	1.92	50	96.15	1	1.92	-	-
Male	18 (n=48)	-		39	81.25	5	10.41	4	8.33
Total group	400	7	1.75	350	87.50	26	6.50	17	4.25
Total- Female	214	5	2.34	201	93.92	6	2.80	2	0.94
Total- Male	186	2	1.07	149	80.11	20	10.76	15	8.06

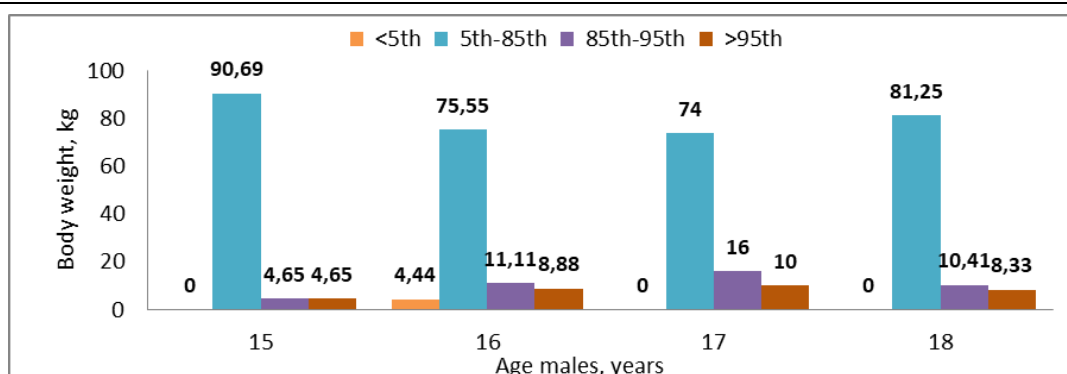


Figure 2. Distribution of weight status by age for males

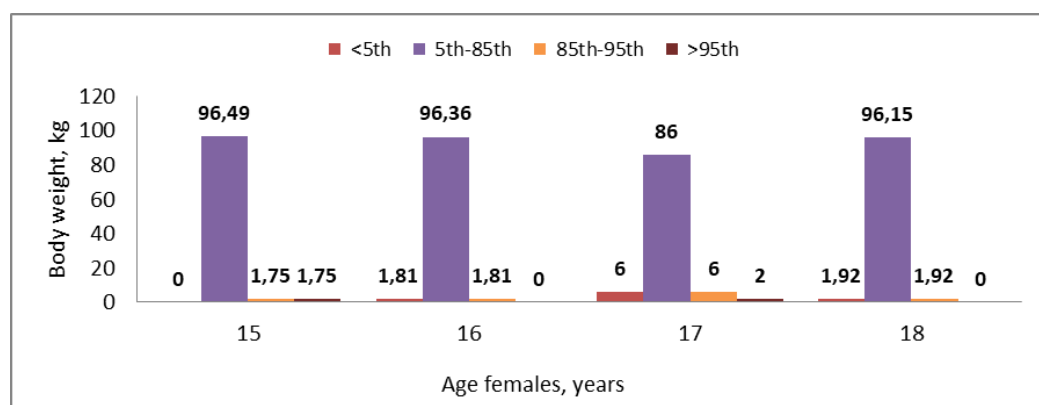


Figure 3. Distribution of weight status by age for females

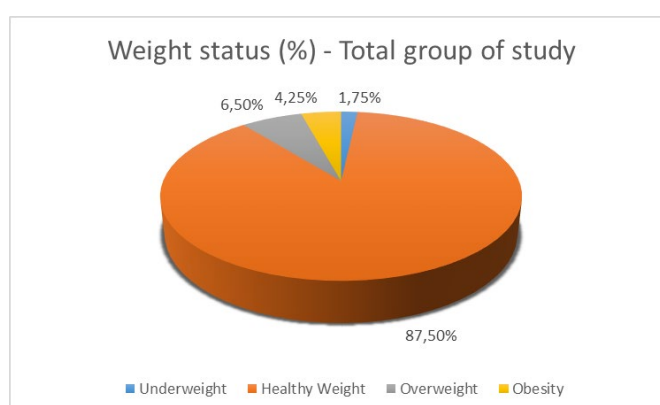


Figure 4. Distribution of weight status (percent) by total number of subject

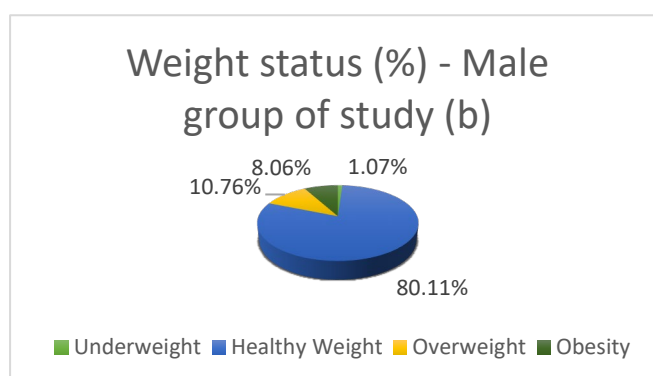
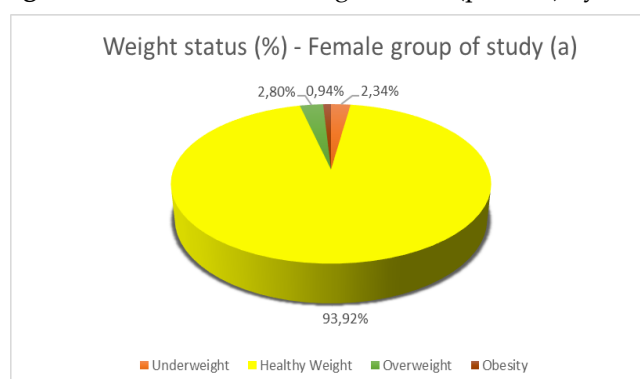


Figure 5. Distribution of weight status (percent) by female group (a) / male group (b)

The frequency of adolescents with increased body mass is a major social and health problem that requires the reaction of the entire social community due to the impact on the health of the population and also due to significant economic consequences for the gross social income of countries that allocate large sums of money to the health system. According to Pavlović et al. (2024), changes in the lifestyle and functioning of modern families, as well as the positive increase in body mass values, and therefore the body mass index (BMI), favored the increase in obesity among high school students.

Based on the results of the study of older school-aged students, from the territory of Pale and Sokolac municipalities (Table 3), 26 students (6.5%) with increased body weight were recorded, while 17 (4.25%) were obese, which defines a total of 43 (10.75 %) of this population. The analysis of the individual results of male and female subjects points to increased values of body mass in males (18.81%), compared to female students (3%). Out of a total of 186 male students, 10.75% of them were in the category of increased body mass, and 8.06% were categorized as obese, while 2.80% of girls were with increased body mass, and 1%< in the obese category, which is an extremely good result, where obesity practically does not exist.

Of the total number of subjects included in the study, as many as 350 (87.5%) students are in the healthy weight category (Figure 4). Of these, 80.10% (149) were male and 93.92% (201) were female, which is an excellent result (especially for female students) (Figure 5 a,b). Out of the total number, only 7 (2%<) students were categorized as malnourished, while about gender, there were more malnourished girls (2.33%) compared to boys (1%<).

The analysis of the results about the age of the subjects (Table 3, Figure 2, Figure 5 b), showed that the majority of males, 13 (26%) were overweight and obese at the age of 17, while 37 (74%) of them were in a healthy category. There were no malnourished people at this age. The lowest number of overweight and obese students was recorded at the age of 15 (9.3%). Also, this age recorded the most students in the healthy weight category, 39 (90.69%), while there were also no malnourished. At the age of 16, there were (5%) malnourished, while 34 (75.55%) were of average weight, and 20% were overweight and obese. Male respondents aged 18 years are largely categorized as Healthy weight (81.25%) and 18.75% with increased weight and obesity. Related to the result of study, most males were of average weight at the age of 15 compared with the age of 16, 17, 18 (74% - 81.25%). The results show negligible isolated respondents in the category of malnutrition at the age of 16, which is insignificant compared to the total number of 186 male respondents.

The female sample showed a more "health-favorable" distribution of results than the male respondents in terms of physical status (Table 3, Fig. 3, Fig 5 a). The most significant number of female students aged 17 were overweight and obese (6%<), followed by those aged 15, 16, 18 where slight overweight was recorded (2%<). This population was also characterized by an extremely high rate in the category of healthy weight, and the majority were 15-year-old subjects, 55 (96.49%), followed by 16-year-old, 53 (96.36%), and 18-year-old, 50 (96.15%) students. The normal nutrition was 17-year-old girls, 43 (86%), while malnutrition was manifested in a slightly higher percentage than among boys.

4. Discussion

The main goal of the research was to evaluate and identifying the level of excess weight and obesity in older students between 15 and 18 years, as important benchmarks of the level of health in order to update the recommendations regarding the promotion of an active and healthy lifestyle. The relevance of this study lies in the fact that this is the first significant research in Bosnia and Herzegovina (the entity Republika Srpska, municipalities Pale and Sokolac) on the population of respondents of school age 15-18 years, which was created as a result of the lack of research on the prevalence of overweight and obesity. According to the results of this study (for both sexes), it follows that every 1.14 students (87.5%) had a healthy body weight, and every 16 respondents (6.5%) were

in the overweight category, and every 24 students were obese (4.25%). while every 57 were malnourished.

The results of our study are "healthier and better" than the results of similar studies [18,19]; that is, there are fewer obese and overweight subjects among our subjects. Also, the obtained results support research [20,21,22]; which suggest that the degree of obesity in children aged 10-14 is higher than in children aged 15-18; the prevalence of overweight and obesity in boys decreases with age. However, WHO (2009) unequivocally confirmed that the primary cause of obesity is high-calorie foods, followed by physical inactivity and reduced caloric consumption [23].

Obesity is strongly associated with the main risk factors for the health of children and adolescents, and physical activity plays an essential role in its control because it changes the balance between intake and consumption of calories. Physical inactivity and overweight are the leading risk factors for other systemic diseases. Research by Phang et al. [22], confirmed the inverse relationship between obesity and TV viewing, but not in such a large percentage as expected, so objective measurements of intake and actual energy consumption should also be considered in the future. According to [24,25,26], obesity is a complex multifactorial condition that is subject to the influence of both genetic and non-genetic factors. However, in children and adolescents, obesity is probably the result of a lack of physical activity, an unhealthy lifestyle [27]. Some hormones of the gastrointestinal system are often cited as possible causes of increased food intake and energy storage. In this sense, the gastrointestinal system is the largest endocrine organ that produces hormones with an important sensor and signaling role in the regulation of energy homeostasis, in contrast some hormones increase appetite and food intake (ghrelin and leptin) and others decrease it (peptide tyrosine, amylin, glucagon, oxyntomodulin, etc.) [28].

Our results facilitate the understanding of the impact of physical activity and eating habits in adolescence. Thus, among high school students in Bosnia and Herzegovina, the number of children with overweight and obesity is relatively low than data from other countries [29]. The mountainous landscape of this country, which requires the development of aerobic capabilities of the body in combination with anaerobic glycolysis [30]. The mountain landscape has a diverse effect on the human body. First, lack of oxygen requires activation of both the anaerobic glycolytic energy supply system and the aerobic system. Every action, even the simplest, performed in mountainous areas requires a greater activation of the aerobic energy supply system than the plain. This leads to an increase in hemoglobin in the blood, the capillary network, and the functionality of mitochondria [31]. Mitochondria are the main components of the cell for using fats to provide energy to the body accordingly, the body's ability to burn fat increases. The predominance of energy supply from fat contributes forming a healthy body composition [32,33,34]. In addition, the mountainous landscape requires constant uphill and downhill. Even the most ordinary trip to the store in a mountainous area requires more energy than a similar trip in a flat area. Also, promotes greater activation of aerobic and anaerobic-glycolytic energy supply systems for muscle activity and leads to greater utilization of fats [31]. However, the presence of even a small percentage of overweight children is alarming [35]. In Bosnia and Herzegovina the influence of modern trends were reducing the physical activity of children. This context requires the development of evidence-based recommendations for physical activity and dietary habits that are most appropriate for people in this country and other countries. One such recommendation would be to take advantage of the mountainous terrain to burn fat by walking in the mountains. There is especially true for high school students [36,37], who are adventurous, have an increased interest in overcoming difficulties, and communicate in natural settings.

Obesity in children and adolescents has an upward trend influenced by multiple health factors, specific to age and gender, nutrition, education, social factors, etc. Obesity requires an interdisciplinary approach to understand the multidimensionality of this

global and current phenomenon of human life. The approach to obesity in scientific research is imperative to identify the dynamics of the factors and the impact of different preventive methods, among which physical education combined with nutritional education are essential elements of physical health [38,39,40,41,42,43,44].

The modernization of education for a proactive and healthy lifestyle requires the accountability of all those involved in the education of adolescents and the identification of ways to stimulate and motivate them to practice regular physical exercises and the formation of healthy eating habits [45,46]. Combating sedentarism and obesity is an essential goal of ensuring a healthy and active young population [47,48,49]. The relevant results of the present study are aligned with the results of previous studies aimed at the incidence of obesity among adolescents and with those that focused on combating sedentarism and obesity in adolescents [50,51,52].

The practical implications of the study require the adapted strategies to promote physical activity and healthy nutritional habits among adolescents. In this context, we consider it opportune to boost campaigns to promote an active and healthy lifestyle among teenagers, parents and all the involved and decision-making educational factors. The motivation of adolescents for the formation of the usual daily practice of physical exercises is based on the identification of the appropriate motivations in accordance with the particularities of age and the preferences of the subjects. Likewise, giving up incorrect nutritional habits that can lead to obesity should be based on relevant scientific data and the implementation of information campaigns for parents and teenagers, carried out in schools.

The limits of the study: other age categories were not included in the study, the results from only two geographical regions were quantified; cultural, ethnic, religious factors etc. were not quantified in the study.

5. Conclusions

It was found that among high school students in Bosnia and Herzegovina, the number of children with overweight and obesity is relatively low compared to data from other countries. The mountainous landscape of this country, requires the development of aerobic capacity of the body in combination with anaerobic glycolysis, which leads to the predominance of energy supply from fats, and, accordingly, contributes to the formation of a healthy body composition. However, the presence of even a small percentage of overweight children is alarming and requires the development of evidence-based recommendations for physical activity and dietary habits that are most appropriate for both this country and other countries. One such recommendation would be to take advantage of the mountainous terrain to burn fat by walking in the mountains. This is especially true for high school students who seek adventure, have an increased interest in overcoming difficulties, and communicate in natural settings. In any case, preventive measures should be implemented to prevent a further increase in overweight adolescents at school age.

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