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The Prevalence of Malnutrition and Obesity in Schoolchildren in the Southeast Anatolia Region of Turkey

Güneydoğu Anadolu Bölgesinde Okul Çocuklarında Malnutrisyon ve Obezite Prevalansı

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ABSTRACT

Objective: The aim of this study was to determine the frequency of malnutrition, obesity and overweight, calculated by body mass index (BMI), in elementary school children in the Southeast Anatolia Region of Turkey.

Method: This research is a cross-sectional epidemiological study and elementary school children with aged 7-16 years were included randomly by layered random sampling method. A total of selected 20 schools and 1912 students filled the questionnaires in Diyarbakır and Mardin City Centers. A questionnaire included questions related to the educational and professional status of parents, siblings, household conditions, children's demographic characteristics and body mass indexes, body weight and heights was applied to each student. Determined BMIs were classified according to the percentile values of Center for Disease Control and Prevention (CDC-US) growth charts and International Obesity Task Force (IOTF).

Results: Mean age of 1040 boys (52,3%) and 872 girls (47,7%), totally 1912 students was 10,8±2,4 years and mean BMI was 17,6±2,8 kg/m2. According to CDC classification, 7,2% of male students were categorized as "underweight", 12,3% of them as "overweight", and 3,4% of them as "obese" whereas 5,5% of them were categorized as "overweight" and 0,6% of them as "obese" according to IOTF classification. In female students, 8,4% were categorized as "underweight", 11,1% "overweight", and 3,3% as "obese" according to CDC classification whereas 5,2% were categorized as "overweight" and 1,2% "obese" according to IOTF. The prevalences were not between boys and girls ($p>0.05$).

Conclusion: In school children in the Southeast Anatolia Region, one of the most important health problems was malnutrition; however prevalances of overweight and obesity had also nonignorable levels.

Key words: elementary schools, student, malnutrition, obesity, education.

ÖZET

Amaç: Bu çalışmada, Güneydoğu Anadolu Bölgesinde, ilköğretim okullarındaki çocuklarda, vücut kitle indeksi (VKI) ile hesaplanan malnutrisyon, kilolu olma ve obezite sıklığının belirlenmesi sosyodemografik özelliklerin belirlenmesi amaçlandı.

Yöntem: Araştırma, kesitsel tipte epidemiyolojik bir çalışma olup, "Tabakalı rasgele örnekleme yöntemi" kullanılarak belirlenen 7-16 yaş grubundaki ilköğretim okul çocuklarını kapsamaktadır. Diyarbakır ve Mardin iI merkezlerinde, toplam 20 okul ve 1912 öğrenci anket formlarını doldurdu. Vücut ağırlığı ve boy ölçümlerinden elde edilen vücut kitle indeksi (VKI), çocukların demografik özellikleri, kardeş sayısı, konut-yaşam koşulları, anne ve baba çalışma ve eğitim durumlarına ilişkin ile ilgili soruların yer aldığı bir anket uygulandı. VKI, International Obesity Task Force (IOTF) ve Center for Disease Control and Prevention (CDC-US) gelişim kartlarının persentil değerlerine göre sınıflandırıldı.

Bulgular: 1040 erkek (%52,3) ve 872 kız (%47,7), toplam 1912 öğrencinin yaş ortalaması 10,8±2,4 yıl ve VKI ortalaması 17,6±2,8 kg/m2'dir. CDC sınıflamasına göre, erkek öğrencilerin %7,2'si "düşük kilolu" %12,3'ü "aşırı kilolu ve %3,4'ü "obez" iken; IOTF sınıflamasına gore bunların %5,5'u "aşırı kilolu", %0,6'sı ise "obez" olarak sınıflandırılmıştı. Kız öğrencilerin, CDC sınıflamasına göre %8,4'ü "düşük kilolu" %11,1'i "aşırı kilolu ve %3,3'ü "obez" iken; IOTF sınıflamasına gore bunların %5,2'si "aşırı kilolu", %1,2'si ise "obez" olarak sınıflandırılmıştı. Kız ve erkek öğrenciler arasında prevalanslar açısından fark bulunmuyordu ($p>0.05$).

Sonuç: Güneydoğu Anadolu Bölgesinde, ilköğretim okullarındaki çocuklarda en önemli sağlık problemlerinden birisi malnutrisyondur; ancak aşırı kilo ve obezite prevalansı da ihmal edilmeyecek düzeylerdedir.

Anahtar kelimeler: ilköğretim okulları, öğrenci, malnutrisyon, obezite, eğitim.

INTRODUCTION

School children will be the adults of the future, and 85% of them live in developing countries (1). The main nutritional problems of the adolescency are micronutrient deficiencies, and depending on the context, undernutrition or obesity and comorbidity. Like in any other age groups, poor nutrition is usually the outcome of the dietary insufficieny which often combined with unhealthy lifestyles or infections which further compromise nutritional status. Dietary inadequacies are likely more of a threat among school children because of erratic eating patterns and specific psycho-social factors underlying these, combined with the particularly high nutritional requirements of the rapid growth. Obesity among young people is a growing problem in most countries owing to eating patterns and sedentary lifestyles (2). The rising prevalence of overweight and obesity, both in children and adults, has been termed by the World Health Organization (WHO) as a global epidemic and the least considered threat to public health (3).

As per date there is no truly appropriate anthropometric reference data set available at the international level to assess nutritional status of school children, whether undernutrition or obesity is the prevailing concern. It has been recommended that children between the 85th and 95th percentiles of BMI or weight-for-height not be labeled as overweight but rather to be at possible risk of overweight and be evaluated further (4,5). Must et al's (6) values have been recommended by a World Health Organization (WHO) Expert Committee in 1995 (7). Two more recent sets of reference values have developed. The Centers for Disease Control and Prevention growth charts for the United States (CDC-US growth charts), which are the revised version of the 1977 National Center for Health Statistics (NCHS) growth charts, include values for BMI percentiles and other anthropometric data (8).

These reference values are based on US national survey data and are intended to be used for US children and adolescents. Cole et al. (9) have developed another set of reference BMI values intended for use in international comparisons. These values will produce results different from those produced with use of the CDC-US growth charts. No single method is necessarily the appropriate method. Each method has its advantages and limitations and each should be used cautiously, with awareness of the possible limitations (10).

In our country, nutritional conditons of the elementary school age children has not been searched adequately. In order to reflect the situation of our region, it is aimed to determine the frequency of malnutrition, obesity and overweight, using by BMIs of the elemantry school students in Southeast Anatolian region of Turkey.

MATERIALS AND METHODS

This research is a cross-sectional epidemiological study. Considering the year 2000, population was 818,396 in Diyarbakır city center. According to the academic year statistics of 2000-2001, number of preliminary schools was 85 and number of students was 142,824. The population in Mardin city center was 464,153, and considering the academic year statistics of the year 2003-2004, number of preliminary schools was 35 and number of students was 47,227. Following having information from the National Education City Offices about the number of schools and elementary school students of 7-16 age group in Diyarbakir and Mardin city centers, method of layered random sampling was used. In Diyarbakır, the number of students for screening was considered as 1148 in 15 elementary schools, and 1115 questionnaire forms were filled in. In Mardin, number of the screening school students was considered as 802 and the number of schools was 5,797 of these students were filled in questionnaire forms. Total scanning student number was considered as 1950 in 20 schools, and 1912 of these students (98,1%) were filled in questionnaire forms.

The investigation was conducted in accordance with the Declaration of Helsinki II and the Guidelines of Good Clinical Practice.

In the school selection, socieconomic status of the students was considered. Questionnaire study was realized by 3 intern students, a specialist from Deparment of Pediatrics, a nurse and a fellow from Department of Family Physician, School of Medicine, between 01 and 30 of April, 2005. By the help of classroom teacher and their parents, a questionnaire including the questions about the demographic characteristics and educational and professional status of parents, and number of the household persons; students' BMI, height and body weight measures, grade, school, age and gender was applied.

Heights and body weights of children were measured by the standard scale and the height measurement device, by the same members of the team. The children removed their shoes to be weighed and weight was recorded to the nearest 0,1 kg. Children were measured without shoes, their heels together and standing with their heels, buttocks and shoulder blades in contact with the vertical rod. Heights were recorded to the nearest 0,5 cm.

Body mass index (BMI) was calculated as weight/height2 and thinness defined as BMI below the 5th percentile for that age using the CDC-US growth charts overweight defined as BMI above the 85th percentile for that age using the CDC-US growth charts (8) and using the BMI of 25 kg/m2 of Cole et al. (9) IOTF reference line, and obesity defined as BMI above the 95th percentile for that age using the CDC-US growth charts (8); and using the BMI of 30 kg/m2 of Cole et al (9) IOTF reference line, respectively. There is no IOTF classification for malnutrition (9).

Statistical analyses were performed by SPSS 10,0 programme. In categorical variable analysis Chi-square test, in correlation analysis Spearman's Rho test, in numerical variable analysis Student's t test, and in multiple group analysis one way ANOVA (Post Hoc Bonferroni) test was used. Odds ratio (OR) and Confidence Interval (95%CI) were estimated for malnutrition, overweight and obesity. $p<0,05$ was accepted as statistically significant. Data were presented as mean±SD.

RESULTS

Mean age of 1040 boys (52,3%), 872 girls (47,7%), totally 1912 students was 10,8±2,4 years, mean weight was 34,9±10,9 kg, mean height was 139,4±15,2 cm and mean BMI was 17,6±2,8 kg/m2. Mean number of rooms and living persons in the household were 7,1±2,5 and 3,5±1,0, respectively (Table 1). Mean number of rooms and living persons in the household were 7,1±2,5 and 3,5±1,0, respectively. Common profession of mothers was "housewife" (n=1610, 84,2%), ratio of the "unemployment" between fathers was high (n=404, 21,1%). Also, half of the mother was not "literate" 48,2% (n=922), and in fathers "illiterate" ratio was 10,4% (n=260) ($p<0,0001$) (Table 2).

Students were classified by two distinct indexes according to their gender and age groups as "underweight", "overweight", and "obese" in Table 3. Mean BMI of boys and girls according to age (MeanSD) values were shown in Figure 1, obesity and malnutrition prevalences according to CDC percentile values were shown in Figure 2. In CDC classification 7,7% of students were "underweight", 11,7% were "overweight", and 3,4% were "obese" whereas in IOTF classification "overweight" and "obese" ratios were 5,3% and 0,9%, respectively. According to CDC classification, no significant difference was considered both in girls and boys under and over the age of 10, according to malnutrition ($p>0,05$). But in boys malnutrition prevelance was significantly higher especially in 11 and 12 ages (12,9% and 13%; $p<0.0001$) whereas in girls malnutriton prevelance was significantly decreasing after 13 years of age, falling from 9,1% to 3% ($p<0.0001$).

Malnutrition was found to be related with the educational level of fathers. In children with less educated or never educated fathers, frequency of "underweight" ratio was 1,3 times (mean: 1,316, %95 GA: 1,006-1,723) more (7,0% versus 10,0%; $p=0.020$). Overweight and obesity were found to be related with the educational level of mothers. In children with high school and over educated mothers, overweight and obese ratio was 1,5 times (mean: 1,542, %95 Confidence Intervals (CI): 1,025-2,321) more (11,4% versus 16,6%, $p=0.028$).

In families with low socioeconomical level (father is unemployed or has a temporary job, mother is a housewife), the frequency of being "underweight" was 1,9 times (OR: 1,945, 95%CI: 1,316-2,873) more (8,3% vs. 15,0%; $p=0.001$) in children. But according to be overweight and obesity, results were not significant (14,6% vs. 11,3%; $p=0.135$).

DISCUSSION

Malnutrition is a prevailing health care problem in the developing world, especially in South-East Asia and sub-Saharan Africa (11). There is relatively little nutritional information available from school children, the age group with the highest growth velocity after infancy. Studies of Ghanaian and Tanzanian school children aged 7−18 age reported that 40−60% of girls to be stunted and 30−40% to be underweight overall prevalence of stunting and thinness was 12,1 and 15,6% in poor rural settings in western Kenya, respectively. Malnutrition is common in young adolescent schoolgirls, but the prevalence decreases with age (12-14).

According to data of developed countries (United States, Brazil, China, Russia and North India), it was reported that the prevalence of underweight as defined by a BMI <5th percentile was increased from 6,9 to 43,8%. Higher rates were reported from rural North India (15,16). These results show that malnutrition is not the problem only in developing countries, but also an ongoing problem in developed countries.

In one of the similar studies in our country, Oner et al. (17) have considered 989 school children of 12-17 years of age according to their BMIs in a western city of Turkey called Edirne. In this study, "underweight" prevalence was found 11% in girls, and 14,4% in boys (below the 5th percentiles of the American adolescents' age and gender specific BMI).

Turkey is one of the growing economies in the OECD.

Table 1. Mean BMI, weights and heights of students in both genders according to age groups.

Gender	Age	N	Weight (kg)	Height (cm)	BMI (kg/m^2)
BOYS	7	76	24,5±5,5	119,1±8,1	17,3±3,9
	8	121	25,3±4,0	123,8±6,6	16,5±2,0
	9	118	28,0±3,9	128,9±7,5	16,8±2,1
	10	115	31,5±5,6	135,1±6,7	17,4±3,2
	11	124	33,5±6,4	140,4±8,6	16,9±2,4
	12	154	37,1±7,0	145,1±7,5	17,6±2,5
	13	129	41,6±7,5	151,0±7,7	18,2±2,2
	14	126	47,4±10,0	157,6±10,2	19,0±2,4
	15	63	53,6±7,8	163,8±8,3	19,9±2,2
	16	14	56,6±8,0	165,6±6,9	20,8±2,8
	Total	*1040*	*35,8±11,1*	*140,9±15,5*	*17,7±2,7*
	p		**<0.0001**	**<0.0001**	**<0.0001**
GIRLS	7	95	24,5±6,7	119,0±8,0	17,2±3,6
	8	120	24,4±3,7	123,1±6,2	16,5±2,0
	9	107	27,2±5,2	128,5±6,6	16,4±2,7
	10	115	30,8±5,6	135,1±7,2	16,8±2,3
	11	109	33,9±7,1	140,2±8,7	17,2±2,6
	12	147	38,0±7,6	146,2±8,5	17,6±2,5
	13	90	44,8±9,5	153,8±7,9	19,0±3,2
	14	74	49,4±7,8	157,1±5,6	20,1±2,6
	15	15	52,7±7,7	158,8±5,8	21,0±3,0
	16	0	0	0	0
	Total	*872*	*33,8±10,8*	*137,6±14,7*	*17,5±2,9*
	p		**<0.0001**	**<0.0001**	**<0.0001**

Table 2. Some demographic characteristics of parents.

	Mother	**Father**
Education Level	n (%)	n (%)
Illiterate	922 (48,2)	260 (13,6)
Literate	242 (12,7)	376 (19,7)
Elementary	555 (29,0)	676 (35,3)
High school	103 (5,4)	265 (13,9)
University	90 (4,7)	335 (17,5)
Occupation		
Housewife	1610 (84,2)	0
Unemployment	0	404 (21,1)
Worker	40 (2,1)	406 (21,2)
Official	26 (1,4)	412 (21,5)
Temporary job	10 (0,5)	257 (13,5)
Tradesman	6 (0,3)	123 (6,5)
Retired	6 (0,3)	28 (1,5)
Medical Doctor, engineer etc,	3 (0,2)	10 (0,5)
Other (farmer etc.)	211 (11,0)	272 (14,2)
Total	**1912**	**1912**

Table 3. Classification of students according to genders and age groups with two distinct indexes as underweight, overweight and obese

			CDC-US growth charts (8)			*Cole et al (9)*	
			Underweight	**Overweight**	**Obese**	**Overweight**	**Obese**
Gender	**Age**	**N**	*(<5 Persentil)*	*(>85 Persentil)*	*(>95 Persentil)*	*(BMI >25 kg/m²)*	*(BMI >30 kg/m²)*
			n (%)	**n (%)**	**n (%)**	**n (%)**	**n (%)**
BOYS	7	76	3 (3,9)	27 (35,5)	9 (11,8)	7 (9,2)	1 (1,3)
	8	121	4 (3,3)	20 (16,5)	5 (4,1)	8 (6,6)	0
	9	118	8 (6,8)	14 (11,9)	4 (3,4)	3 (2,5)	1 (0,9)
	10	115	9 (7,8)	18 (15,7)	6 (5,2)	8 (7,0)	0
	11	124	16 (12,9)	11 (8,9)	2 (1,6)	3 (2,4)	1 (0,8)
	12	154	20 (13,0)	14 (9,1)	3 (1,9)	9 (5,8)	1 (0,7)
	13	129	3 (2,3)	8 (6,2)	3 (2,3)	5 (3,9)	0
	14	126	9 (7,1)	9 (7,1)	3 (2,4)	7 (5,6)	2 (1,6)
	15	63	2 (3,2)	5 (7,9)	0	4 (6,4)	0
	16	14	1 (7,1)	2 (14,3)	0	3 (21,4)	0
	Total	*1040*	**75 (7,2)**	**128 (12,3)**	**35 (3,4)**	**57 (5,5)**	**6 (0,6)**
GIRLS	7	95	6 (6,3)	29 (30,5)	13 (13,7)	13 (13,7)	3 (3,2)
	8	120	10 (8,3)	13 (10,8)	3 (2,5)	11 (9,2)	2 (1,7)
	9	107	7 (6,5)	4 (3,7)	3 (2,8)	4 (3,7)	2 (1,9)
	10	115	13 (11,3)	11 (9,6)	1 (0,9)	7 (6,1)	0
	11	109	11 (10,1)	11 (10,1)	3 (2,8)	4 (3,7)	2 (1,8)
	12	147	13 (8,8)	10 (6,8)	1 (0,7)	2 (1,4)	0
	13	90	10 (11,1)	9 (10,0)	3 (3,3)	2 (2,2)	1 (1,1)
	14	74	2 (2,7)	7 (9,5)	2 (2,7)	0	0
	15	15	1 (6,6)	3 (20,0)	0	2 (13,3)	0
	16	0	0	0	0	0	0
	Total	*872*	**73 (8,4)**	**97 (11,1)**	**29 (3,3)**	**45 (5,2)**	**10 (1,2)**

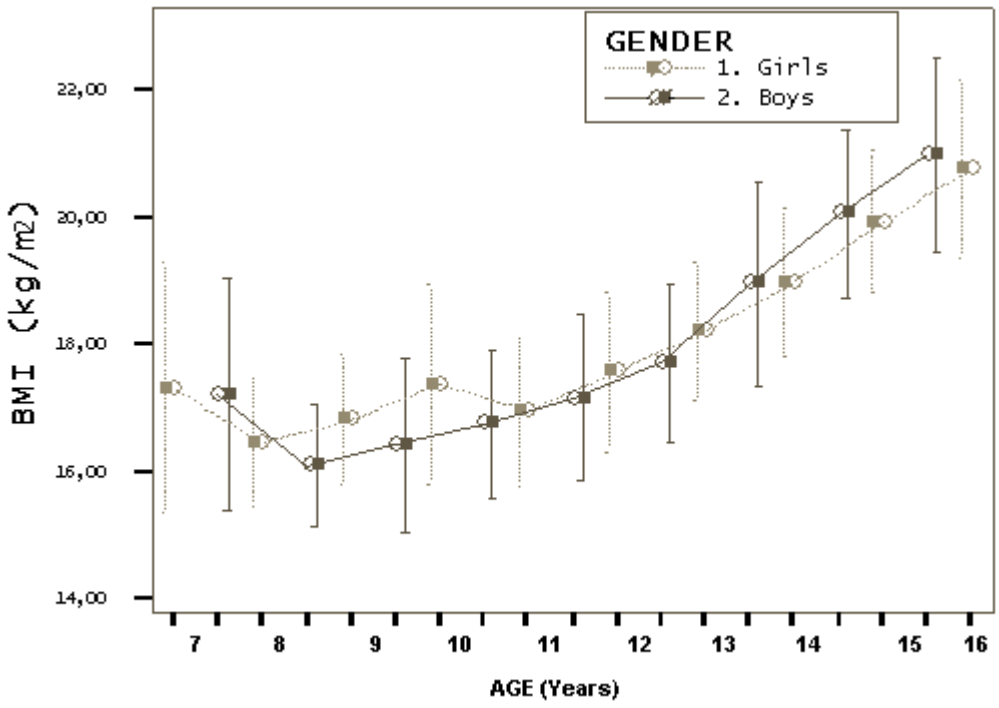

Figure 1. Comparison of body mass indexes (BMIs) of girls and boys according to the mean age values.

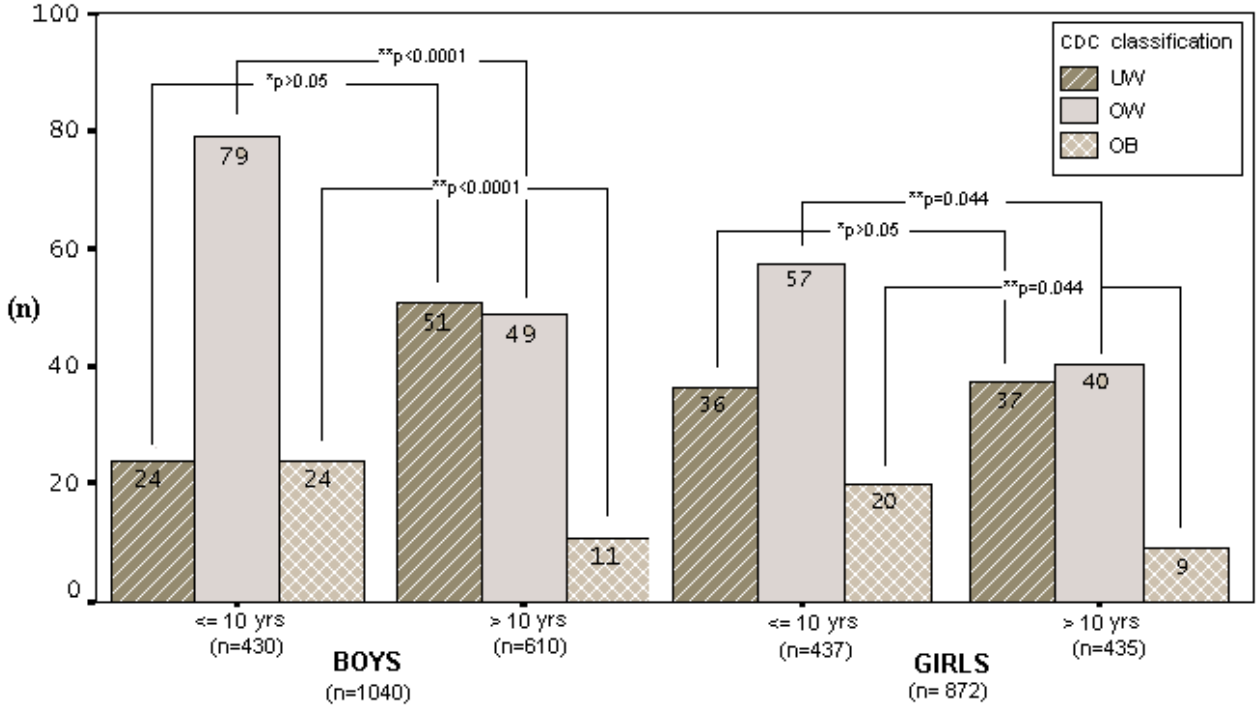

Figure 2. Prevalances of obesity (OB), and overweight (OW), underweight (UW) according to CDC percentile values in girls and boys

Following the most severe crisis of its recent history between 2000 and 2001, the economy bounced back and now is among the fastest growing economies in the OECD (18). In our country there are 67,804,000 citizens living according to the census of the year 2000 (19), and ratio of the 5-14 years of age has reached to 20,1% of the census (13,636,000). In our country, 6-14 ages involves an 8 year period of elementary school in children. In this age group, the growth and the development of children should continue regularly. In order to support this fast growth, an adequate and well-balanced nutrition is required.

Southeast Anatolian region is a region where has more population increase, has lower socioeconomic development, has dense migration from rural to center of the city, and is a region that has faster urbanization. Also when family and the household status of the children were considered, it is clear that the families are overcrowded and the number of persons per room are very high. Most of the mothers have no profession for an economical income, and unemployment ration is very high among fathers. Also it was considered that most of the mothers were non educated or low educated, and highly extensive part of the fathers were non educated or low educated (Table 2). These data may be valuable for considering the educational and socoeconomical dimensions of nutritional status of children in our region.

In our study 7,7% of students were determined as "underweight" according to CDC classification. It was determined that 7,2% of boys were "underweight" whereas 8,4% of girls were "underweight". Malnutrition prevalences were not distinct between girls and boys ($p>0.05$) (Table 3). According to CDC classification, no significant difference was determined both in girls and in boys under and over the age of 10, according to malnutrition. ($p>0.05$). But in boys malnutrition prevelance was significantly higher especially in 11 and 12 ages (12,9% and 13%; $p<0.0001$) whereas in girls malnutriton prevelance was significantly decreasing after 13 years of age, falling from 9,1% to 3% ($p<0.0001$) (Figure 1).

In a big cross sectional study (20) which has included 13 European countries, Israel and U.S.A, overweight prevalences were determined (BMI at or above the 85th centile and 95th centile (overweight) in school children) in age groups of 13 – 15, have shown that overweight prevalence was highest in USA, was lowest in Lithuania (20). In USA overweight prevalence was 10,8% in girls of 13 years of age whereas it was 12,6% in boys. Altough in Lithuania the prevalence was 2,6% in girls at the same age whereas it was 1,8% in boys at the same age. Following the U.S.A overweight prevalences were high in other countries in turn: Ireland, Greece and Portugal. Another study which has been used

international indexes is the study of Wang et al. (16). 4 different countries from distinct geographical regions, it was shown that overweight prevalence was increased from 4,1% to 13,9% and from 15,4% to 25,6 (Brasil vs. USA).

In a similar study in our country (17), it was shown that overweight (BMI 85-95th percentile) and obesity (BMI > or =95th percentile) prevalences were 10,6% and 2,1% in girls, and 11,3% and 1,6% in boys in Edirne, respectively. The results of this study showed that overweight and obesity prevalences are at much lower levels in Edirne than other countries. In an other cross sectional study Uckun-Kitapci et al. (21) have shown that in 1647 adeloscents, mean BMI was 20,25±3,31 kg/m2, whereas overweight (BMI 85-95th percentile) and obesity (BMI > or =95th percentile) prevalences were 10,7% and 3,6%, respectively.

In our study it was shown that being overweight and obese prevalences were at similar levels compared to previous studies according to two distinct indexes. In our study, 11,7% of the students that were taken part were overweight, 3,4% were obese according to CDC classification whereas overweight and obese ratios were 5,3% and 0,9% according to IOTF classification. In CDC classification it was determined that 12,3% of boys were overweight and 3,4% were obese whereas overweight and obese ratios were 5,5% and 0,6% according to IOTF classification. In CDC classification it was determined that 11,1% of girls were overweight and 3,3% were obese whereas overweight and obese ratios were 5,2% and 1,2% according to IOTF classification. Prevalences were not different between boys and girls ($p>0.05$) (Table 3).

In Greece (22), in a study involving 2,458 children from the age of 6-17 in 27 schools in Thessaloniki, overweight and obesity prevalences (based on international BMI percentile curves) were found 25,3% and 5,6% in 6-10 aged children, respectively, and were found 19,0% and 2,6% in school children (11-17 years of age), and generally were found 25,9% and 5,1% in boys, and were found 19,1% and 3,2% in girls.

According to CDC classification when compared with the age of over 10, prevalance was significantly higher in boys under the age of 10 according to be overweighted (18,4% and 8,0%) and to be obese (5,6% and 1,8%) ($p<0.0001$). In girls under the age of 10, prevalance according to be overweighted (13,% and 9,2%) and to be obese (4,6% and 2,1%) was statistically not significant but also was high ($p<0.044$). Also in girls under the age of 10, prevalance of being overweighted (8,0% and 2,3%) and of being obese (1,6% and 0,7%) were significantly high according to IOTF index ($p<0.0001$). But this situation was shown in boys according to IOTF index ($p=0.740$) (Table 3, Figure 2).

In another study (n = 1525, ages 10-17) which including a comparison of BMIs of Turkish children with the BMIs of American children, Agirbasli et al. (23) have shown that Turkish children had lower BMI than American children (19,0±3,0 kg/m2 for Turkish girls, 20±4 for white American girls; and 18,9±3 kg/m(2) for Turkish boys, 20±4 for white American boys, $p<0.01$). Another study (24) that was realized in Holland showed that overweight prevalence in Turkish children was higher than the determined values of studies which were realized in Turkey. This result might be originated because of the differences in social environment, educaiton and nutrition. Therefore it seems that it is very important to search in a more detailed manner the nutritional factors of migrated ethnic societies to different countries, to different geographical regions.

In our study, educational levels of families and socioeconomical status were very important determinative factors on growth. Malnutrition was found to be related with the education level of father. Malnutrition was found to be related with the educational level of fathers. In children with less educated or never educated fathers, frequency of "underweight" ratio was 1,3 times (OR: 1,316, 95%CI: 1,006-1,723) more (7,0% vs. 10,0%; $p=0.020$). Overweight and obesity were found to be related with the educational level of mothers. In children with high school and over educated mothers, overweight and obese ratio was 1,5 times (OR: 1,542, 95%CI: 1,025-2,321) more (11,4% vs. 16,6%, $p=0.028$). Malnutrition was found to be related with socioeconomic status. The frequency of being "underweight" ratio was 1,9 times (OR: 1,945, 95%CI: 1,316-2,873) more (8,3% vs. 15,0%; $p=0.001$) in children with low socioeconomic level families. But according to be overweight and obesity, results were not significant (14,6% vs. 11,3%; $p=0.135$).

It was declared in previous studies that the reference values of Cole et al. (9) gave lower estimates than did the CDC-US growth charts for young children but higher estimates for older children. Finally, comparisons between the 2 methods with categorical modelling procedures indicated that they classified boys and girls differently. Boys were 2,85 times more likely to be classified as obese by the CDC method as by the method of Cole and colleagues, whereas girls

were 2,20 more likely to be classified as obese by the CDC method (8,9,25). In our study in all age groups of both in boys and girls, the prevalences of being overweight and obese, according to CDC-US growth charts, were higher than the determined values of Cole and colleagues' s method.

Further studies will need to be done on the southeastern Anatolian children to track any changes in prevalence. The study did not investigate other variables such as dietary intake, physical activity or family history of obesity, making it inappropriate to discuss possible causes of overweight and obesity in this population. Further research on the impact of the dietary factors on childhood obesity prevalence would therefore be useful.

As a result, in our region one of the important problems of elementary school students is malnutrition, and the prevalence of overweight and obesity is considered to be in a non negligible ratio. In children especially during the adolescence, the most important determining factors on the growth are socioeconomic status and educational level of families. Particularly on this point, it is required to give consultancy about the effective factors on growth and precautions to families and children, to focus on nutrition education, to reorganize school health services which are accepted in the first step health services.

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