

## *Underweight, Overweight, and Obesity among High School Students in the City of Golpayegan in 2015*

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### ABSTRACT

**Background:** Obesity is considered as one of the most important nutrition and health issues among adolescents in the developing countries. In this respect, risks and problems associated with obesity can put a huge burden on the health care system of a society. Moreover, underweight and malnutrition are also prevalent in developing countries and impose enormous health care expenditures on individuals and societies. Thus, this study was conducted to investigate the weight status among 10<sup>th</sup>-grade high school students residing in the city of Golpayegan, Iran. **Methods:** A total number of 800 students including 396 boys and 404 girls studying at the 10th grade of high school were included in this cross-sectional research with a descriptive design. The participants were selected using a random cluster sampling method. Moreover, the demographic characteristic information and the anthropometric status (based on the US CDC criteria, 2000) questionnaires were completed for each participant and the data were analyzed using SPSS (Version 16). **Results:** The mean age of the students was  $15.6 \pm 6.6$  years. The total prevalence rate of underweight was 11.4% (91 individuals) including 14.2% in boys and 8.7% in girls. The overweight rate was equal to 10.85% including 10.4% in boys and 11.1% in girls. Furthermore, the rate of obesity was 6.3% including 7.3% and 5.2% in boys and girls, respectively. **Conclusion:** Following the specification of the rates of underweight, overweight, and obesity among students, the authorities are recommended to provide proper nutrition programs, good lifestyle, and educational courses for individuals in this domain.

**Keywords:** Obesity; Underweight; Overweight; Body mass index; Students

### Introduction

The prevalence of obesity and overweight in children and adults has been recently considered as an important health problem in the developing countries (De Onis and Blössner, 2000). In this regard, adolescents' overweight can

be taken into account as a significant determinant of obesity and overweight in adulthood. Furthermore, a direct correlation was observed between childhood obesity and obesity in adolescence and adulthood. According to the

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related studies, 70-80% of overweight adolescents become obese adults and the rate of future obesity in obese children can be 2-3 times more than that in other children (Barsh *et al.*, 2000).

Besides, overweight and obese children are more likely to be exposed to cardiovascular diseases, type II diabetes, hypertension, as well as metabolic syndromes in adulthood (Eisenmann, 2004, Golestan *et al.*, 2008). Moreover, it seems that obesity is the result of environmental and genetic factors including bad diet, reduction of physical activities, as well as wrong lifestyles and behaviors (Garrow *et al.*, 2000, Kral, 2001).

In this regard, Iran is known as one of the first seven countries with the highest prevalence rate of obesity and overweight, which was twice higher during 1993-1999 (Kelishadi *et al.*, 2003). It was also reported that 8.82% of Iranian children suffered from overweight and 4.5% of them were obese. These rates were estimated to raise to 10.7% for overweight and 4.5% for obesity (Kelishadi *et al.*, 2007, Kelishadi *et al.*, 2014).

A research conducted among teenagers residing in the city of Tehran revealed that 10.7% of the individuals were overweight, 6.3% were fat, and 72.6% were normal (Weigley *et al.*, 1997). According to other research in Iran, 3.4% of obesity and 11% of overweight were observed in individuals within the age range of 6-18 years. Moreover, differences among the cities were significant. Generally, obesity was reported to be more common in northern and southern provinces of Iran, whereas, it was less common in some other geographic regions such as Sistan and Bluchestan Province (Mirzazadeh *et al.*, 2009, Mozaffari-Khosravi *et al.*, 2004, Shahgholian *et al.*, 2004, Soheilifar and Emdadi, 2005).

On the other hand, malnutrition and weight loss in developing countries, including Iran, has been recognized as one of the most important health-related issues in children and adolescents. Accordingly, malnutrition was assumed to increase the incidence of infectious and chronic diseases. It was also found to damage the body functions, cause disorders, and hinder growth in adolescents;

which consequently can reduce their efficiency in the domain of education (Nowrozi *et al.*, 2011).

In a survey conducted in Birjand in 2001, the prevalence rate of malnutrition was 73.7% based on the criteria for underweight (according to Gomez criteria), was 36.5% based on the criteria for weight loss (in accordance with Waterloo criteria), and was 48.6% based on the criteria for short stature (according to Waterloo criteria) (Taheri *et al.*, 2001). Percentiles of body mass index (BMI) were also one of the indicators used to measure overweight and obesity in adolescents (Cole *et al.*, 2000). In this respect, percentiles smaller than five indicate malnutrition, values lower than 85-95 represent overweight, and those greater than 95 show obesity (WHO, 2000). In general, the purpose of this study was to investigate the prevalence rates of obesity, overweight, and malnutrition in 10th-grade high school students residing in Golpayegan city using the Third National Health and Nutrition Examination Survey (NHANES III) criteria published by the US Centers for Disease Control and Prevention (CDC).

### Materials and Methods

In this cross-sectional study, a random cluster sampling method was performed and the sample size was obtained using the Cochran formula. This study was conducted on 800 high school students including 396 boys and 404 girls in the age range of 14-19 years, who were selected from eight schools.

Written consent forms were obtained from all the participants and the required information about their height and BMI were collected. The exclusion criteria included individuals suffering from cancer, hemophilia, thalassemia, and other disabilities. All measurements were done by the same person; the participants' age in this study was also calculated according to their identification card. Moreover, a digital scale was used for recording their weights without shoes and clothes. It should be noted that the accuracy of the given scale was calculated using a 5-kilogram weight for 10 times weighting. The BMI was similarly calculated based on the

individuals' height and weight in kilograms per square meter ( $\text{kg}/\text{m}^2$ ). Later, the participants were divided into four groups of underweight (less than percentile 5), normal (5-50 percentiles), overweight (85-95 percentiles), and obese (more than percentile 95) (based on the Centers for Disease Control and Prevention criteria, 2000). Finally, the data were analyzed using the SPSS (Version 16).

### Results

The total number of the high school students was 800 including 396 boys and 404 girls in the age range of 14-19 years with the mean age of  $15.6 \pm 6.6$  years. The lowest weight reported was 30 and the highest one was 121 kg, the mean weight was  $56.64 \pm 13.34$  kg. Among the students, the lowest height was 136 cm and the highest one was

198 cm. The mean height was also equal to  $164.7 \pm 8.12$  cm. The BMI was at least  $12.5 \text{ kg}/\text{m}^2$ , while the highest BMI was  $38.6 \text{ kg}/\text{m}^2$  and the BMI mean was equal to  $20.11 \pm 4.08 \text{ kg}/\text{m}^2$ . Other demographic characteristics of the participants are also listed in **Table 1**. Moreover, the students' anthropometric characteristics including age and gender are presented in **Table 2**.

The prevalence of underweight and obesity in boys was significantly higher than girls (**Table 3**). The risks of obesity and overweight were also reported higher in students whose parents were illiterate; although, no relationship was found between the risks of underweight and the levels of parental literacy (**Table 4**).

**Table 1.** Demographic characteristics of the participants

Variables	Mean $\pm$ SD
Age (year)	$15.60 \pm 6.60$
Weight (kg)	$56.64 \pm 13.34$
Height (cm)	$164.70 \pm 8.12$
Body mass index ( $\text{kg}/\text{m}^2$ )	$20.11 \pm 4.08$
<b>Paternal literacy</b>	<b>N (%)</b>
Illiterate	198 (24.7)
Lower than high school diploma	313 (39.2)
High school diploma and higher	289 (36.1)
<b>Maternal literacy</b>	
Illiterate	230 (28.7)
Lower than high school diploma	261 (45.1)
High school diploma and higher	209 (26.1)

**Table 2.** Mean  $\pm$  SD of the measured variables based on gender

Variables	Gender		P-value
	Girls	Boys	
Age (year)	$15.63 \pm 0.64$	$15.64 \pm 0.67$	0.30
Height (cm)	$160.9 \pm 6.10$	$168.53 \pm 8.21$	0.06
Weight (kg)	$54.26 \pm 11.31$	$59.077 \pm 14.76$	0.07
Body mass index ( $\text{kg}/\text{m}^2$ )	$20.93 \pm 3.90$	$20.59 \pm 4.26$	0.08

Table 3. Prevalence of weight status in terms of gender

Weight status	Total	Boys	Girls	P-value
Underweight	91 (11.4)	56 (14.2)	35 (8.7)	0.03
Overweight	86 (10.8)	41 (10.4)	45 (11.1)	0.09
Obesity	50 (6.3)	29 (7.3)	(5.2)21	0.04

Table 4. Prevalence of a weigh according to the parental and maternal literacy

Parent literacy	Underweight	Overweight	Obesity	P-value
Parental Literacy				
Illiterate	31 (34.0)	34 (40.0)	22 (45.8)	0.04
Lower than high school diploma	30 (33.0)	28 (32.0)	15 (30.0)	
High school diploma and higher	30 (33.0)	24 (28.0)	13 (25.2)	
Maternal Literacy				
Illiterate	27 (29.9)	34 (39.5)	23 (46.0)	0.04
Lower than high school diploma	31 (34.1)	28 (32.5)	15 (30.0)	
High school diploma and higher	33 (36.0)	24 (28.0)	12 (24.0)	

## Discussion

The present study investigated the rate of overweight, obesity, as well as underweight among teenagers residing in the city of Golpayegan. Compared to other investigations, the results of this study underscored the effects of nutrition in different parts of Iran. It was observed that underweight, overweight, and obesity were prevalent among people in different parts of the country (Sokhandani and Vizesfar, 2013). The prevalence rate of obesity among teenagers living in the city of Golpayegan was reported as 6.3%, which was similar to the obesity rate found in teenagers residing in the city of Yazd (Mozaffari-Khosravi *et al.*, 2004). However, this value was reported lower and higher than those of adolescents in Tehran (9%) (Esmailzadeh *et al.*, 2006) and Ahvaz (2.3%) (Assar and Asghari, 2005), respectively. The prevalence rate of overweight in adolescents residing in the city of Golpayegan was 10.85 that was lower than the rates of teenagers in Yazd (Mozaffari-Khosravi *et al.*, 2004) and Lar (Sokhandani and Vizesfar, 2013). The prevalence rate of overweight in boys was also equal to 10.4 that was lower than the value observed among male teenagers in Yazd (17%) (Mozaffari-Khosravi *et al.*, 2004).

The prevalence rate of overweight among girls in Golpayeganin was 11.1, which is similar to the overweight rate of female adolescents in Rafsanjan (11.2%). However, it was higher than the value observed in girls residing in the city of Yazd (8.7%) (Mozaffari-Khosravi *et al.*, 2004). A comparison between the results of this study and the mean prevalence of overweight and obesity rates in Iranian teenagers (10.7% of overweight and 5.1% of obesity) indicated that the prevalence rates of overweight and obesity in this city were more than the rates of overweight and obesity reported in Iran (Kelishadi *et al.*, 2007, Kelishadi *et al.*, 2014). This can be related to differences in individuals' lifestyle as well as socioeconomic, cultural, and genetic factors (Crawford *et al.*, 2001). Since the amount of micronutrients was not measured in this study, overweight and obesity could not be interpreted as the results of the sufficiency of micronutrients.

After analyzing the related studies conducted in Iran, it was concluded that the prevalence rate of underweight and growth reduction decreased to a large extent; from 27% to 11% in a 15-year period. However, the protein-energy malnutrition still had a high rate in rural and urban areas (Mahjob *et al.*, 2004). The prevalence rate of malnutrition and underweight was also reported as 11.4 in

Golpayegan; this rate was in agreement with the rate attributed to the whole country, but lower than the value reported in cities of Yazd and Tehran (Esmailzadeh *et al.*, 2006, Mozaffari-Khosravi *et al.*, 2004). The reasons behind this discrepancy can be related to climatic conditions, consumption of traditional and natural foods, as well as parents' insistence on consumption of such foods (Nowrozi *et al.*, 2011).

### Conclusion

Following the specifications of the underweight, overweight, and obesity rates, the authorities are recommended to provide proper nutrition programs and good lifestyle as well as educational courses for individuals, particularly students, in this domain.

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### Authors' Contribution

Lotfi-Foroshani MP contributed to the development of the study design, management of the project, and composition of the manuscript. Fallahi M and Mozaffari-Khosravi H also helped in data collection, data analysis, as well as selection of the participants and composition of the manuscript. All the authors read the paper and verified it.

### Conflict of Interest

No conflict of interest was declared in this study.

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