Nutritional Status, Anthropometric Measurements and Physical Activity Level in Adolescents 13-18 Years Old in Tehran, Iran, in 2019

Abstract

Background: Considering the importance of adolescent obesity on adulthood health, this cross-sectional study aimed 408 students aged 13-18 years from different socioeconomic districts through convenience sampling to investigate nutritional status and physical activity (PA) level focusing on sex and socioeconomic differences. **Methods:** Weight and height were measured to investigate prevalence of obesity and underweight based on percentile of body mass index (BMI) for age. Information on dietary intake were collected via 3-day food recalls. PA level was investigated using a valid and reliable questionnaire. **Results:** The prevalence of underweight, overweight, and obesity were 4.9%, 15.9% and 23%, respectively. Weight and height were higher in boys than girls significantly (*P*-value < 0.001). Calorie intake in prosperous districts was higher than semi-prosperous districts (*P* = 0.01). Intake of zinc and calcium in prosperous districts was higher than semi-prosperous and disadvantaged districts (*P*-value < 0.001 and 0.02, respectively). Intake of calcium and zinc in both sexes and iron in girls, was lower than recommended dietary allowances (RDA) in all districts (*P*-value < 0.001). **Conclusions:** High prevalence of obesity and low micronutrients intake, especially in disadvantaged districts, suggest an urgent need to plan many efficient programs to prevent serious problems in future.

Keywords: *Adolescents, Iran, nutrition, obesity, underweight*

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Introduction

The rapid growth of obesity has led to concerns about its consequences in the future.[1] Considering the importance of obesity in adolescents and its impacts on adulthood, preventive interventions should be a priority in health systems. Unfortunately, there are not any national success actions in the past 33 years in Iran. The Childhood and Adolescence Surveillance and Prevention of Adult Noncommunicable Disease (CASPIAN) study in Iran, investigated food habits in 7-18 years old students, while energy and micronutrient intake were not assessed in that study.[2] The other population-based study in Iran, Tehran Lipid and Glucose Study (TLGS), focused on metabolic diseases, not on micronutrients intake.[3] Micronutrients deficiencies in adolescents, can cause impaired brain development, sexual maturity, and osteoprosis.[4] Therefore, studying micronutrients status during adolescence has become an important area of concern.

Socioeconomic status may play an important role on nutrition status,[5] while there are not enough studies to investigate it in Iranian adolescents.

As there is not enough up-to-date information about the nutrition status of Iranian adolescents, the current study aimed at students 13-18 years old to assess nutritional status and physical activity (PA) level focusing on sex and socioeconomic differences.

Methods

The cross-sectional study was conducted on 408 students (1st and 2nd grades of high school) from both sexes in Tehran, Iran. The education districts were divided into prosperous, semi-prosperous, and disadvantaged categories based on socioeconomic status. We randomly selected two districts in each category (total 6 districts) and two schools in each district (total 12 schools). Information on history of being on a diet and supplements were gathered. The Ethics Committee of the National Nutrition and Food Technology Research Institute, Iran, approved this

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project with an ethical code: "IR.SBMU.nnftri.Rec. 1397.241". A signed hand-written informed consent was obtained from each student before data collection.

Anthropometric measurements

Body weight was measured by digital scale (Beurer, Germany) to the nearest 100 g, without shoes. Height was measured without shoes to the nearest 0.5 cm. Prevalence of obesity, overweight, normal and underweight was calculated based on BMI/age in order to CDC growth chart[6] through WHO AnthroPlus software, as given below:

<5th percentile BMI/Age: underweight

5-85th percentile BMI/Age: normal

85-95th percentile BMI/Age: overweight

>95th percentile BMI/Age: obese

Dietary intake

Three-day dietary recalls for non-consecutive days were filled during a week. The amount of food was converted to grams using household measures. Nutritionist IV software was used to calculate nutrient intakes.

Assessment of PA

A validated questionnaire was used to assess PA level. The questions were ranged from sleep/rest to high-intensity physical activities. The Met-time was calculated by multiplying time spent on each activity level by the MET value of each level.[7-9] Reproducibility and validity of this questionnaire were confirmed by Kelishadi *et al*. in Iran.[10]

Statistical analysis

SPSS 21 was used for statistical analysis. Parametric and nonparametric descriptive tests were used for data analysis based on their normal or abnormal distribution.

Results

Gender ratio was equal (50% of girls, 50% of boys). The mean age of girls and boys was 14.87 ± 1.8 years and 15.13 ± 1.41 years, respectively. The frequency of girls, who were on a diet currently or previously, was significantly more than boys ($P = 0.001$). Boys consumed all supplements more than girls ($P = 0.001$), except for "Ferro sulfate". Weight and height were significantly higher in boys than girls; while the percentile of BMI for the age and PA level did not have any significant difference between both sexes [Table 1].

Percentile of BMI for age of students who lived in prosperous districts was significantly higher than that of those who lived in semi-prosperous districts [Figure 1].

After removing the outlier data for energy intake (lower than 800 Kcal and higher than 4200 Kcal), intake of calorie, carbohydrates, protein, saturated fatty acids, cholesterol and zinc was higher in boys than girls, but not significantly.
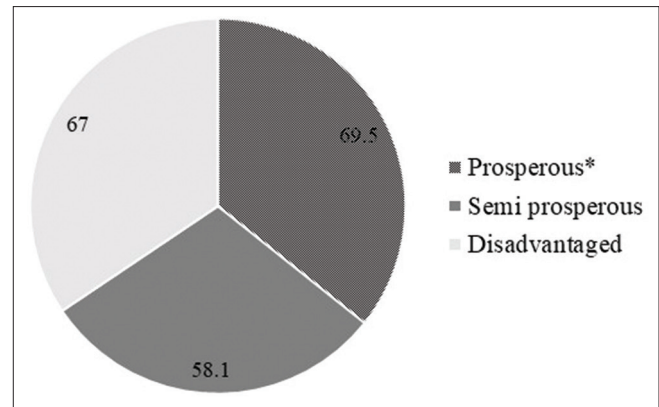

Figure 1: Mean of percentile of BMI for age among three investigated districts (including prosperous, semi-prosperous and disadvantaged)

Intake of iron and calcium in boys was more than intake in girls, significantly. Zinc intake in prosperous districts was higher than two other districts, significantly. The students in prosperous districts had higher intake of calcium than students in disadvantaged districts ($P < 0.05$) [Figure 2].

Intake of calcium and zinc was lower than RDA in both sexes. Iron intake was also lower than RDA in girls, significantly [Figure 3].

Discussion

The current study shows that 38.9% of adolescents have overweight and obesity and 4.9% of them have underweight. It means overweight and obesity is prevalent in near to half of adolescents. We also found that our participants are faced to micronutrient deficiency, especially in disadvantaged districts.

The prevalence of obesity and overweight in Iranian adolescents was 6.9% and 15.9%, respectively, in 2011-2015.[11] It is dramatically reached to 15.9% and 23% in the current study, respectively. Our results were close to Jalali-Farahani, *et al*.[12] in 2013, that showed that 38.5% of adolescents have overweight and obesity. Therefore, there is an increasing trend for overweight and obesity in Iranian adolescents. The trend of obesity is dependent on socio-demographic factors, too. In the current study, the percentile of BMI for age of students in prosperous districts, was significantly higher than students in semi-prosperous districts. Furthermore, the students in prosperous districts consumed more calorie than the students in semi-prosperous districts, significantly. The higher prevalence of obesity in those districts may be for the reason of more availability to food due to higher socioeconomic level. PA level was not differ between both sexes. Studies in the Middle East have reported that among factors affecting lifestyle, low PA have more associations with overweight and obesity.[13] So encouraging adolescents to increase PA level is suggested. A meta-analysis regarding underweight showed that the prevalence of underweight in girls and boys, decreased from 9·2% and 14.8% in 1975 to 8·4% and 12.4% in 2016, respectively.[14] According to the prevalence in the current

Table 1: Anthropometric measures and physical activity level in students by sex

	Median±IQR*			P**
	Total	**Girls**	**Boys**	
Weight (kg)	63.42±17.65	59±21	65±125.8	0.013
Height (m)	165.5±9.73	160.95±6.79	170.17±10.01	0.001
BMI percentile for age (%)***				
<5th	20 (4.9)	11 (55)	9 (45)	
5th-85th	217 (53.2)	111 (50.5)	109 (49.5)	NS
85th-95th	65 (15.9)	39 (59.1)	27 (40.9)	
>95th	94 (23)	43 (42.2)	59 (57.8)	
Physical activity level (Met/hour/day)	41.1±7.61	39.9±10.13	38.78±6.19	NS

*Based on Mann-Whitney U test. **Significant difference between girls and boys. ***The values are frequency and percent
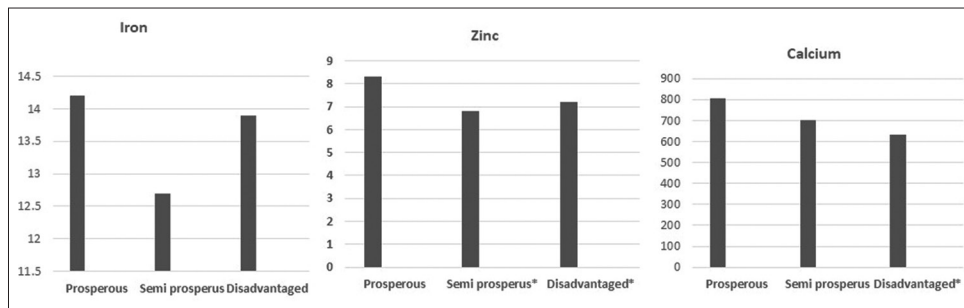
Figure 2: Micronutrients intake in different socioeconomic districts
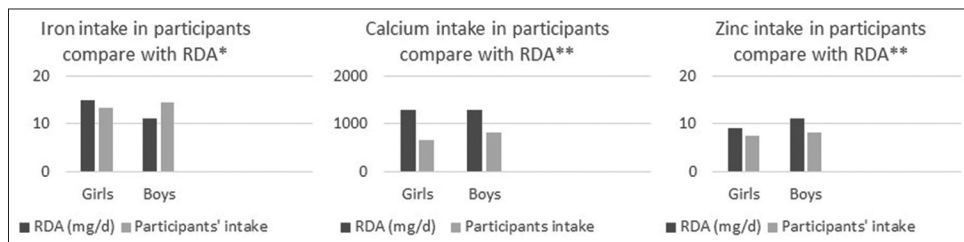
Figure 3: Micronutrients intake in students comparing with Recommended Dietary Allowances (RDA)

study (4.9%), it seems that the trend of underweight decreased from 2016 to 2019. Adolescence is an important period of nutritional vulnerability due to increased nutrients needs for growth and development.[15] Intake of calcium and zinc was lower than RDA in our participants. It was the same for iron in girls. On the other hand, the intake of zinc in adolescents living in semi-prosperous and disadvantaged districts is lower than intake of who lived in prosperous districts. Intake of calcium in adolescents living in disadvantaged districts is also lower than intake by who lived in prosperous districts. It may show the effects of socioeconomic factors on micronutrients intake. Considering the low intake of nutritional supplements in our participants, we may suggest increase in intake of appropriate nutritional supplements accompanied with a healthy dietary pattern.

Conclusion

According to high prevalence of obesity and inadequate micronutrients intake in adolescents, making appropriate action plans and strategies seems necessary.

Strengths and limitation

Considering different socioeconomic districts and investigating micronutrients intake, instead of just focusing on calorie are positive points of this study. There are some limitations, too. Using food recall may be accompanied by recall bias, especially in adolescents. Although this study was conducted on relatively a large sample size and involved different socioeconomic districts, its cross-sectional nature does not allow generalization of the findings to all Iranian adolescents.

Conflicts of interest

There are no conflicts of interest.

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