

Prevalence of Overweight and Underweight among Iranian High-school Students

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Abstract. The purpose of this study was to determine the prevalence of obesity, overweight, desirable weight and underweight among high school students in Rasht (North Province of Iran). 1180 students (726 boys and 454 girls) were selected via cluster random sampling. Height and weight of subjects were measured by using standard apparatus. Body Mass Index (BMI) (weight/ height²) was considered as the index of adiposity and international BMI cut-off values used to categorize each subject as obese (values > 95th percentile), overweight (85th –95th percentile), desirable weight (15th – 85th percentile) and underweight (15th percentile < values). Results of this study showed that the prevalence of obesity (95% confidence interval-CI) was 6.5% among boys and girls and also the prevalence of overweight (95% CI) was 10.9% and 12.3% among boys and girls. Besides, prevalence of desirable weight (95% CI) was 52.8% and 67.6% among boys and girls and prevalence of underweight (95% CI) was 29.9% and 13.9% among boys and girls. In conclusion, a low prevalence of overweight and obesity among students but underweight rate (especially among boys) can be an important topic in weight status of students.

Keywords: Obesity; Overweight; Desirable weight; Underweight.

1. Introduction

Obesity and thinness are important public health problems. They are two of the most important nutritional disorders and a considerable number of factors, such as diet, energy expenditure, and genetic predisposition, have been postulated as pathogenic factors [1-10]. Overweight children and adolescents are more likely to become overweight adults and to experience chronic health problems associated with adult obesity [11, 12, 13-17]. The presence of obesity in the adolescence period and in very young adults is a strong predictor of chronic disease, independent of adult weight [12, 18, 19]. Individuals who are overweight have an increased risk of illness [10] premature disability [4, 20], and premature death [7, 21, 22]. Associate with obesity, there are a number of conditions, such as higher blood pressure, menstrual abnormalities, psychological dysfunction, cardiovascular disease, diabetes mellitus, arthritis, gout, gallbladder disease, digestive disease, cancer, respiratory dysfunction and various skin conditions [6, 19]. Also, underweight status may lead to several health problems [2, 5, 7, 13, 18]. The dramatic changes in the lifestyle of many Asian communities, and the resultant changes in the food and nutrition issues facing the communities in the region have been documented by various investigators [23-29]. Available data are lacking, but various estimates have indicated that the emerging problem of overweight amongst children and adolescents can not be ignored. Estimates of overweight by the World Health Organization (WHO) amongst children and adolescents are less than prevalence's ranging in several urban cities in Asia [23, 26, 28, 30-32].

So, the study was conducted to provide information on weight and height and to estimate the prevalence of overweight and underweight among high-school students in Rasht, Iran. Also, to make available baseline data for further comparison of secular trends and to present a preliminary investigation of the problem in the Iranian community where few such studies, if any, have been carried out. High-school students provided an accessible population group for this investigation.

2. Method

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2.1. Subjects

The study population consisted of high-school female students (41511) and male students (39862) that educated during 2003-2004. Out of a total of population, 382 subjects were selected according to Udinsky sample estimation table [29]. Finally, 726 boys and 454 girls participated in the study. A two stage stratified cluster sample was selected. The sample units at the first stage were the schools at the north, south, east, west and center of city. The frame for the selection of the primary sampling units was based on a list provided by educational authorities in Rasht city. In the second stage 20 students within each class in the selected schools were chosen.

2.2. Procedures

Before the study began, the school authorities met, explained the purpose of the study and sought their consent. Agreement was reached on conducting the study, with regard for national ethics, local customs and parents' expectations.

The following information was recorded from each subject: date of birth, school name, grade, hours of any exercises per week, height and weight. Height and weight were measured on subject in light clothes and without shoes using standard apparatus. The weighing scale used could be read to the nearest 1 kg. It was calibrated at the beginning of each working day and at frequent intervals throughout the day. Height was measured to the nearest 0.5 cm, using a measuring tape. To measure height, the measuring tape was fixed to the wall. Height was measured while the subject stood with heels, buttocks, shoulders and occipital touching the vertical tape. The head was held erect with the external auditory meat us and the lower border of the orbit in one horizontal plane. All measurements were taken by one observer.

Subjects were classified as underweight, desirable weight, overweight and obesity groups using the international cut-off for body mass index (BMI) as follow [20, 35].

Cut-off values: underweight (15th percentile<values), desirable weight (15th –85th percentile), overweight (85th –95th percentile), and obesity (values>95th percentile).

BMI (kg/m²) was calculated as weight (kg) divided by square of the height (m) according to following classification: underweight <20, desirable weight 20-24.9, overweight 25-29.9, and obesity ≥30. But, this classification is commonly used to classify weight classes among adults and is also recommended to identify children and adolescents weight status based on cut-off BMI [33].

2.3. Statistical analysis

For statistical analyses, chi-square test and Pearson's correlation coefficient were performed (34) using SPSS software (Version10.0). Statistical significance was set at $p < .05$.

3. Results

A total of 726 boy (age=15±2 yrs) and 456 girls (age = 14±2 yrs) were included in the study. The mean and SD of weight, height, and BMI measurements are shown in table 1.

Table 1. Mean and SD of characteristics of subjects

Measurement	Boys	Girls
Weight (kg)	53.2±11.9	50.3±11.5
Height (cm)	162.3±8.9	156.2±15.6
BMI	19.9±4.1	20.4±4.1

The mean and SD of BMI in girls (20.4±4.1) and boys (19.9±4.3) is in desirable range. However as have been shown in table 2, the range of underweight in boys (29.9%) is greater than girls (13.9%), and range of total of overweight and obesity in boys (17.4%) is very close to girls (18.7%).

The average numbers of hours spent in exercise per day by weight class have been illustrated in table 3. About 60 percent (57.6%) of the respondents did not take any regular exercise. There were no statistically significant differences between BMI in subjects who did not take any regular exercise.

Pearson's correlation coefficients were used to examine the relationships of weight and height with BMI in girls and boys. In girls BMI is strongly correlated with weight ($r=0.91$) (95% CI: 0.87-0.93), But not with height ($r=0.09$) (95%CI: 0.06-0.15). Also, in boys BMI is strongly correlated with weight ($r=0.83$) (95% CI:

0.79-0.86), But low correlated with height ($r=0.23$) (95% CI: 0.19-0.26).

Table 2. Weight classes in high-school boys and girls

Weight class	Boys		Girls	
	N	%	N	%
Underweight	217	29.9	63	13.9
Desirable weight	383	59.8	306	67.6
Overweight	79	10.9	56	12.3
Obesity	47	6.5	29	6.4
Total	726	100	454	100

Table 3. Number of hours spent in exercise per day, according to weight class

Weight class	Mean \pm SD		95%CI	
	Boys	Girls	Boys	Girls
Underweight	0.9 \pm 0.3	1.2 \pm 0.5	0.42 \pm 0.65	0.53 \pm 0.47
Desirable weight	1.1 \pm 0.7	0.6 \pm 0.4	0.34 \pm 0.66	0.51 \pm 0.39
Overweight	0.5 \pm 0.4	0.3 \pm 0.5	0.18 \pm 0.45	0.39 \pm 0.73
Obesity	0.6 \pm 0.5	0.4 \pm 0.7	0.39 \pm 0.78	0.61 \pm 1.06

When we analyzed weight classes of boys and girls in different age (11-17 years), we found out that overweight and underweight rates are lower between aged 12-14 yrs (figures 1 and 2). Our results showed that 76% of girls experienced puberty in these years (Unfortunately we could not to answer about puberty among boys). Therefore, overweight and underweight rates before and after puberty is greater than puberty stage.

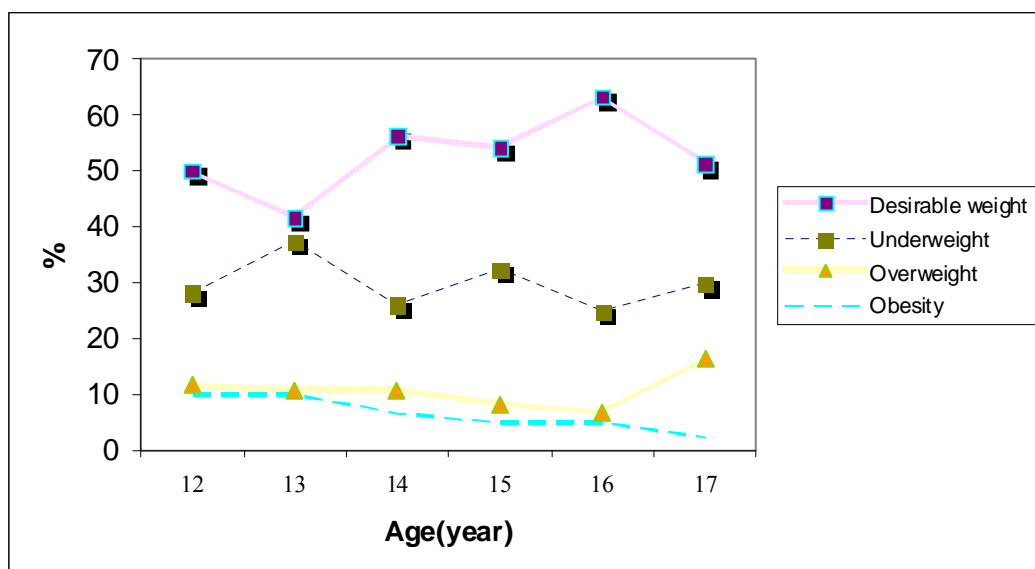


Fig.1. Weight classes in different ages of boys (12-17 years)

4. Discussions

We present results of a 2004-2005 cross sectional study of weight, height and weight classes of high-school boys and girls 11-17 yrs in Rasht city. The prevalence of underweight among boys and girls were 29.9% and 13.9% respectively; so, it seems that prevalence of underweight was notably high among high-

school boys in Rasht, where as the prevalence rate of obesity and overweight observed in boys and girls seemed to be lower than that reported in some western countries [15, 26, 35, 36].

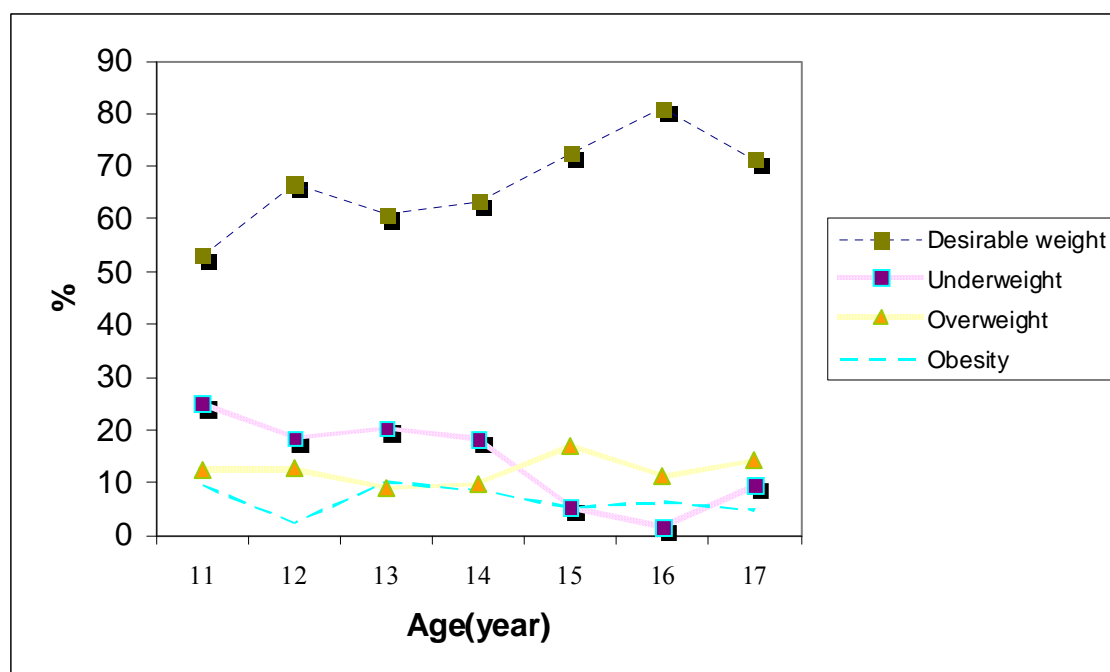


Fig.2. Weight classes in different ages of girls (11-17 years)

However prevalence of overweight in our study is greater than high school girls in Kerman (south-east province of Iran); they reported 5.3% overweight and obesity in their study [25]. Although comparison with some European studies may not be entirely justified, due to differing criteria used for body fatness, our prevalence rate for overweight was nearly the same as the reported for American high-school boys and girls and Australian girls [15, 36]. To the best of our knowledge, no studies on obesity and thinness have been conducted on adolescent and young males in Iran. We found out that the prevalence of underweight among young females in Rasht (north of Iran) is lesser than Kerman (south-east province of Iran) in similar age groups [25]. Different lifestyles, weather and socio-economic status in these regions possibly explain this finding.

The use of the BMI categories is a limitation of this study. While it is possible to calculate total body content from estimates of body density, dispersion of a labeled water-soluble substance through the fat free mass or by MRI and CT imaging, for example, is too complex and often too expensive for use in regular public health practice of individual screening [7]. For such purposes, the anthropometry (in particular BMI) is the main tool for measurement of nutritional status including obesity and thinness [20, 21, 37]. The Institute of Medicine Committee to Develop criteria for Evaluating that Outcomes of Approaches to Prevent and Treat Obesity, and the Committee on Clinical Guidelines for Overweight in Adolescent Preventive Service have recommended the use of BMI to help define childhood (6-10 yrs), adolescent and adult (11-21 yrs) obesity [16]. WHO also recommends BMI as the basis of assessment of thinness or obesity in children and adolescents, but rather than using adult cut-off, uses age specific percentile bases on NHANES [18, 33, 38]. Thus we used the international cut-off BMI the first time in our country.

Reported daily activities were related to overweight class of the high-school boys and girls. This issue was similar of some studies [7, 24, 31, 39], but there was conflicting results in Janghorbani and Parvin [1998] study.

The high prevalence of underweight high-school boys in Rasht is a situation of considerable concern. Among the varied reasons, under-nutrition in the area is possibly one of the causes. Elucidation of the relative role for various socio-economic and socio-cultural factors for overweight and underweight in the local population should be a subject for future research.

Height was not related to the BMI categories of the survey population. The justification for the use of weight for height index, such as BMI, relies on their independence from height [37]. This has been shown to be the case in the present study.

Although- this information may not be representative population groups from other areas of other circumstances in Iran. Policy makers in health, instruction and education should consider programmes for developing free nutritional supplements in schools and familiarization of student and their family with appropriate nutrition and weight control.

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