Original Article

Obesity among university students, Tehran, Iran

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Evaluating the nutritional status of individuals and population groups is an important tool in public health and a feasible indicator of standards of living. The objective of this study was to determine the frequency of obesity and present nutritional status of university students of Iran University of Medical Sciences in Tehran. The survey was conducted between Oct 2004 and June 2005. The statistical population included all students from School of medicine, nursing and midwifery, health services, management, science, and rehabilitation. The method of sampling was multistage random. The sample size for the survey was 1150 students. We used a self-administered 24h food recall questionnaire. We categorized BMI to two groups in bivariate analysis (BMI $\geq$ 25 kg m^{-2} as obese and less than 25 kg m^{-2} as non-obese). Mean BMI for all subjects was 21.7 $\pm$ 2.9 kg m^{-2}. Almost 88% of the subjects were classified into a non-obese group (BMI <25 kg m^{-2}). About 10% were underweight and 12.4% of the students had a BMI more than 25 kg m^{-2}. A significant difference was observed for BMI between males and females; 7.9% of males versus 22.5% of females had BMIs over 25. About 18% of students aged 23 years and over had BMIs over 25 versus 7.7% of students aged under 18. Intakes of fiber, pre-vitamin A, folacin and iron were significantly different between BMI groups. Intakes of these nutrients were higher in the obese students than the students with BMIs less than 25 kg m^{-2}. Our results indicate that about 12.4% of the students had a BMI more than 25 kg m^{-2}. There was a significant association between BMI, and smoking habits, age, sex, place of resident and having specific dietary regimen.

Key Words: obesity , BMI, University students, nutrients intakes, Iran

Introduction

Nutrition is an important factor in health and disease. High risk groups in most populations are known to be children, pregnant women, infants and breast feeding mothers. These groups are the first priority in many public health programs. However, the role of nutrition in young adults is under less consideration. Evaluating the nutritional status of individuals and population groups is a vital tool in public health initiatives and a feasible indicator of standards of living.[1] An unvaried diet with macronutrient excess and inadequate micronutrient density is closely related to a higher prevalence of overweight, obesity, cardiovascular illness and cancer [2]. A nutritious diet, especially in young adulthood can affect health status in later life. A divergance between energy intake and total energy expenditure can lead to either over or underweight.[3]

Malnutrition is frequently diagnosed in adults by means of anthropometric variables, such as body weight, height or body composition. Height is a useful indicator of chronic malnutrition in developing countries.[4] However, body weight, as an indicator of nutritional status, reveals more accurately short-term effects and alterations in body composition. Thus, establishing a range of body mass indices (BMI) in order to diagnose malnutrition is important when analysing the prevalence of malnutrition in a certain population.[5]

In Iran, such as other developing countries, studies on nutritional status have mainly focused on the most vulnerable population groups (e.g elderly, children). The university population was of particular interest because it was a convenient sample for the study of the health of a sub-group of young adults. Students usually have undesirable food habits which could result in a different frequency of obesity and malnutrition when compared with the average young adult Iranian. The object of the present study was to determine the frequency of obesity and current nutritional status of university students of Iran University of Medical Sciences in Tehran .

Methods and Materials

The survey was conducted between Oct 2004 and June 2005 at Iran University of Medical Sciences located in Tehran, Iran. The statistical population included all students from several schools i.e School of Medicine, Nursing and Midwifery, Health Services management, Science and Rehabilitation. The method of sampling was multistage random. Iran university of Medical Sciences (IUMS) is a government university with six schools, all of which were included in the study. The sample size for the survey was 1150 students . The total number of students sampled from each school was based on the proportion of students in each school out of the total number of students. For example, there were

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Accepted 22 February 2006

Table 1. Characteristics of the subjects (n = 1000). Values are expressed as mean ± standard deviation, unless specified otherwise

Age(years)	22.3 ± 3.5
Body weight (kg)	60.4 ± 11.1
Body height (cm)	166.7 ± 8.9
BMI(kgm^{-2})	21.7 ± 2.9
<18.5(%)	10.3
19-24.9(%)	77.3
25-29.9(%)	10.8
30-39.9(%)	1.6
+40 (%)	0
Smoking habits (%)	
Yes	5.6
No	94.4
Supplement use (%)*	
Yes	26.6
No	73.4
Place of residence (%)	
Home	53.3
Dorm	46.7
Sex (%)	
Male	69.3
Female	30.7
Disease history (%)*	
Yes	3.4
No	96.6
Having specific regimen (%)*	
Yes	10.4
No	89.6
Sports activity (%)*	
Sedentary	23.7
Moderate	68.9
High	7.4

* Definition is in the methods and materials part

250 students from the school of medicine, 200 from nursing and midwifery, 200 from the school of health services, 150 from the school of management, 150 from the school of science and 200 from the school of rehabilitation. Students were excluded from the survey if they refused to participate and if they handed in incomplete questionnaires. A total of 1000 questionnaires from 1150 were selected for final analysis. The response rate was 86%.

A self-administered 24 hour food recall questionnaire was used as a method of data collection. The students completed questionnaires in the presence of a member of the research team. It consisted of two parts. The first section of the questionnaire included the items related to personality characteristics (age, sex , self reported height and weight to the nearest kg and cm, respectively, most permanent place of residence, participation in sport, supplement use, smoking habits, history of chronic diseases, having specific dietary regimen). Place of residence was divided into two categories: home and dorm. Supplement use, history of chronic diseases, and smoking habits were divided into two categories: " yes" and "no". For smoking habits, "yes" was defined as current smoker. Supplement use was defined as, consumption of vitamin, or mineral, or a combination, and or body building supplements. Using one of these once or more per week was categorized as "yes", and the others as "no". Only 5 students were recorded to be using body building supplements, and were excluded in the final analyses. There were 3 pregnant students who were also excluded from analysis. The participation in sports was assessed by the monthly frequency of sports club activity, without inquiring into the types of sports, their intensity or duration. The subjects who engaged in sports club activities at least once per week in the previous month were defined as "high physical activity", those with once per month, as "low physical activity", and the others as "sedentary". Subjects who were on long-term medications for their disorders, were defined as having a history of chronic diseases such as diabetes, heart and renal diseases. Some students were on vegetarian diets, or on weight loss diets, or some other special diet. These students were categorized as "specific regimen", and the others as "not having specific regimens".

We calculated the body mass index (BMI) and classified it into five categories according to the BMI classification of NIH (National Institutes of Health): 1) underweight <18.5 kgm^{-2}; 2) normal 19-24.9 kgm^{-2}; 3) overweight 25-29.9 kgm^{-2}; 4) obese 30-39.9 kgm^{-2} and 5) extreme obesity +40 kgm^{-2}.[6] There were no students in the fifth group. We categorized BMIs into two groups for the bivariate analysis: BMI ≥ 25 kg m^{-2} as "obese" and less than 25 kg m^{-2} as "non-obese".

The second part of the questionnaire included 24 hours of recall of foods based on a sample 24-Hour recall Form.[7] The 24-hour recall method requires individuals to remember the specific foods and amounts of foods they consumed in the past 24 hours. Energy, protein, fat, carbohydrate, vitamin and mineral intakes were calculated using the locally developed Dorosty Food Processor (DFP) software. This software is based on Iranian food habits and used for the assessment of macronutrient and micronutrient intakes by 24-hour recall food questionnaire. For the purpose of statistical analysis we used SPSS (version 13, SPSS Inc., Chicago, Illinois). Frequency, mean, and standard deviation (SD) were calculated. T-test and Mann-whitney U-test were used to compare means and mean ranks of nutritional intakes between dichotomous variables. ANOVA was used to test categorical variables. Chi-square examined the relationship between general characteristics. The statistical significance was considered at $P \leq 0.05$.

Results

The characteristics of the subjects are shown in Table 1. Mean BMI was 21.7 ± 2.9 kg m^{-2}. Almost 88% of the subjects were classified into a non-obese group (BMI <25 kg m^{-2}). About 10% were underweight of which the majority were male (69.3%). Regarding smoking habits, most of the subjects (94.4%) were current non-smokers. The frequency of moderate participation in sports (at least once per month engaged in sports club activity) was 68.9%. About 27% of students reported that they used supplements (multivitamins) at least once or more per week. Males were found to be significantly taller and heavier than females (175 ± 0.42 cm versus 161.9 ± 0.21 cm) (P = 0.000). The correlation coefficient between weight and height displayed low values for both sexes and was statistically significant in the both (P = 0.000). The

Table 2. Frequency distribution of subjects' characteristics based on BMI categories (n = 1000)

Variables	BMI < 25 kg m^{-2} n (%) 876 (87.6)	BMI +25 kg m^{-2} n (%) 124 (12.4)	Total n (%) 1000 (100.0)	*P* value
Sex				0.000
Male	638 (92.1)	55 (7.9)	693 (69.3)	
Female	238 (77.5)	69 (22.5)	307 (3.7)	
Age				0.000
≤ 18	60(92.3)	5 (7.7)	65 (6.5)	
19-20	243 (91.0)	24 (9.0)	267 (26.7)	
21-22	266 (90.8)	27 (9.2)	293 (29.3)	
≥ 23	307 (81.9)	68 (18.1)	375 (37.5)	
Sports activity				ns
Sedentary	209 (88.2)	28 (11.8)	237 (23.7)	
Moderate	606 (88.0)	83 (12.0)	689 (68.9)	
High	61 (82.4)	13 (17.6)	74 (7.4)	
Smoking habits				0.000
Yes	36 (64.3)	20 (35.7)	56 (5.6)	
No	840 (89.0)	104 (11.0)	944 (94.40	
Supplement use				ns
Yes	236 (88.7)	30 (11.3)	266 (26.6)	
No	640 (87.2)	94 (12.8)	734 (73.4)	
Place of residence				0.057
Home	457 (85.7)	76 (14.3)	533 (53.3)	
Dorm	419 (89.7)	48 (10.3)	467 (46.7)	
Specific regimen				0.000
Yes	80 (76.9)	24 (23.1)	104 (10.4)	
No	796 (88.8)	100 (11.2)	896 (89.6)	

correlation value between BMI and weight were high and identical for both sexes (r = 0.80, *P* = 0.000).

Table 2 shows BMI categories based on some demographic and other measured variables. A significant difference was observed for BMI between males and females; 7.9% of males versus 22.5% of females had BMIs 25 and over (*P* = 0.000). A significant increasing trend from lowest to highest age groups was observed for BMIs 25 and over. About 18% of students aged 23 years and older had BMIs 25 and over, versus 7.7% for stuents aged under 18. As for sporting activity, the proportion of the physically active group increased with increasing BMI (non significant). Between smokers, 35.7% had a BMI 25 and over versus 11% of nonsmokers (*P*=0.000). Students who were living with family were more obese than dorm's students (slightly significant, 14.3% versus 10.3 respectively) (*P* = 0.057). Table 3 presents the mean energy and nutrient intakes by BMI groups. Intake of fibre, previtamin A, folacin and iron were significantly different between BMI groups. There was a higher intake of these nutrients in the obese students than the students with BMIs less than 25 kgm^{-2}. For other nutrients there were no significant difference BMI groups.

Discussion

This survey allowed the assessment of the prevalence of obesity in a sample of university students from different departments. Our results indicate that about 12.4% of the students have a BMI more than 25 kg m^{-2}. While our findings are compatible with some other study results, it is not with others: Bellisle *et al.*,[8] found that about 9% of university students were overweight and obese. A survey of 842 Kuwait university students by al-Isa *et al.*,[9] reported obesity rates as high as 32% and Stefanska *et al.*,[10] reported a prevalence of 17% in their study population. In this survey, 22.5% of females were overweight and obese. Amine *et al.*,[11] reported 10.8% overweight and 3.6% obesity in female university students. Musaiger *et al.*,[12] reported that out of 215 university female students, 19% were overweight and 9.8% were obese. One explanation for these differences in obesity prevalence between university students could be the variation in how height and weight were measured. A more important possibility could be due to the individual's socioeconomic characteristics, such as race or ethnicity, education, income, culture, food habits and lifestyle variables such as exercising

We found that 5.6% of university students were current smokers. We observed a significant association between BMI and current smoking habits with 35.7% of smokers being obese compared with 11% of nonsmokers. One explanation for this result could be the desire of obese students to smoke due to belief that smoking has an negative effect on appetite. In this survey, a positive association was seen to exist between age and obesity. These findings show increasing trends in the BMI with a corresponding increase in age (7.7% in ≤18 to 18.1 in ≥23 year old students). This result is obvious and compatible with some other studies.[7,13]

There was a slight non-significant association between physical activity and BMI. The proportion of obese students increased slightly (not significant), with the increase in physical activity. This result is not compatible with other studies.[11,14] One explanation for this finding could be the preference of obese students to exercise more for weight management. The other possibility is the way in

Table 3 . Intakes of energy and nutrients by BMI categories. Values are expressed as mean ± standard deviation, unless specified otherwise (n = 10000)

Variables	BMI < 25 kg m^{-2} n = 876	BMI +25 kg m^{-2} n = 124	*P* value
Calorie (Kcal)	1810 ± 646.4	1814 ± 639.0	Ns
Protein (gr)	60.5 ± 0.86	63.2 ± 2.4	ns
Carbohydrate(gr)	226.5 ± 3.3	230.5 ± 8.6	ns
Fiber (gr)	13.9 ± 0.27	15.8 ± 0.83	0.02
Fat total (gr)	76.7 ± 0.95	73.9 ± 2.4	ns
Fat saturated (gr)	26.0 ± 0.38	24.7 ± 0.93	ns
MUF* (gr)	28.9 ± 0.34	27.8 ± 0.85	ns
PUFA** (gr)	17.2 ± 0.38	16.0 ± 0.70	ns
Cholesterol (mg)	215.4 ± 6.6	216.7 ± 19.2	ns
Vit. A total (μg)	607 ± 49.0	795 ± 238.3	ns
Vit.B1 (mg)	1.2 ± 0.1	1.3 ± 0.05	ns
Pre-vitamin A(μg)†	281.6 ± 44.5	378.1 ± 232.0	0.01
Vit. B2 (mg)	1.5 ± 0.2	1.6 ± 0.09	ns
Vit. B3 (mg)	14.5 ± 0.23	15.6 ± 0.72	ns
Vit. B6 (mg)	1.1 ± 0.01	1.1 ± 0.04	ns
Vit. B12 (μg)	3.7 ± 0.26	4.2 ± 1.2	ns
Folacin (μg)	177.8 ± 3.9	198.4 ± 12.0	0.05
Pantothenic (mg)	3.9 ± 0.06	4.0 ± 0.19	ns
Vit. C (mg)	68.8 ± 3.2	78.9 ± 12.6	ns
Vit. E (mg)	6.0 ± 0.14	5.9 ± 0.33	ns
Calcium (mg)	642.7 ± 13.3	632.8 ± 30.8	ns
Copper (mg)	1.2 ± 0.03	1.3 ± 0.16	ns
Iron (mg)	12.0 ± 0.15	13.1 ± 0.46	0.01
Magnesium (mg)	210.4 ± 3.2	214.3 ± 7.8	ns
Phosphorus (mg)	936.1 ± 14.7	934.7 ± 35.1	ns
Selenium (mg)	128.5 ± 4.3	133.4 ± 6.3	ns
Potassium (mg)	1808.6 ± 34.1	1808.2 ± 88.7	ns
Zinc (mg)	9.3 ± 0.13	9.8 ± 0.36	ns
Sodium (mg)	1438.5 ± 29.8	1495.3 ± 81.5	ns

* Monounsaturated fat ; ** Polyunsaturated fat; † Beta carotene

which physical activity was categorised or the errors involved in self-assessment of physical activity. We found that 10.3% of dorm students versus 14.3% of students who lived with their family had BMIs greater than 25 kg m^{-2}. Even though students in dorms have a regular food program, food and nutrient intakes may not be ideal. For example, home students had a higher calorie intake which may be due to the family support in feeding them foods they like and enjoy.

In this survey, we showed that 23.1% of students with a specific dietary regimen (e.g vegetarian, weight loss diet) were obese versus 11.2% of students with ordinary regimens. However, the explanation could be due to the preference of obese students to have a specific diet for weight management. The current survey found that out of 1000 students, 26.6% reported past or current use of vitamin supplements. The high rate of supplement usage may be due to media reports or advertisements in some newspapers or television about provision of vitality, the retarding of aging and the reduction of the risk of chronic diseases such as osteoporosis and cancer.

Intakes of folacin, iron, previtamin A, and fiber were significantly different between the two BMI groups. We could not find any reasonable interpretation for this finding. The thinner students had a lower intake of these nutrients than the heavier students. One explanation could be the way in which BMI was classified into two groups. To understand these findings, we re-classified BMI into four groups (as mentioned in the methods), and performed the statistical analyses again. There were no significant differences between the four BMI groups and intakes of these nutrients. In conclusion, we found a moderate prevalence of obesity in this population of university students. The older students, males, smokers, students following a specific dietary regimen and students living with family were more likely to be overweight.

References

1. Nube M, Asenso-Okyere WK, Van den Boom G.J.M. Body mass index as indicator of standard of living in developing countries . Eur J Clin Nutr 1998;52:136-44 .
2. Rebato E, Rosique J, Vinagre A, Salces I, San Martin L, Susanne C. Nutritional status by socioeconomic level in a urban sample from Bilbao (Basque Country). Am J Hum Biol 2001; 13: 668-78 .
3. Herrera H, Rebato E, Arechabaleta G, Lagrange H, Salces I, Susanne C. Body mass index and energy intake in Venezuelan University students. Nutrition Research 2003; 3: 389-400.

4. Gopalan C . Heighst of population . an index of their nutrition and socio-economic development. Bull Nutr Found Ind 1987; 8:1-5.
5. Norgan NG. Body mass index and body energy stores in developing countries . Eur J Clin Nutr 1990; 44: supply 1: 79-84 .
6. National Institutes of Health/ National Heart, Lung, and Blood Institute, Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report. NIH, June 1998 .
7. Grounder M, Anderson SL, DeYoung S. foundations and Clinical Applications of Nutrition; A Nursing Approach. Second edition . Mosbey Inc. USA. 2000, 775.
8. BEllisle F, Monneuse MO, Stepoe A, Wardle J. Weight Concerns and eating patterns: a survey of university students in Europe. Int J obes Relat Metab Disord 1995; 10: 723-30.
9. Al- Isa AN. Obesity among Kuwait university students : an explorative study . J R Soc Heath 1999; 4: 223-7.
10. Stefaska E, Ostrowska L, Czapska D, Karczewski J, Goldwska E. Qualitative evaluation of the diet with normal body mass and overweight at the Medical University in Bialystok . Prezegl Lek 2033; 60 (Supp 6): 31-5.
11. Amine EK, Samy M. Obesity among female university students in the United Arab Emirates. J R Soc Health 1996; 2: 91-6.
12. Musaiger AO, Radwan HM. Social and dietary factors associated with obesity in university female students in United Arab Emirates. J R Soc Health 1995; 2: 96-99.
13. Lissau I, Overpeck MD, Ruan WJ, Due P, Holestin BE, Hediger ML; Health Behaviour in School-aged Children Obesity Working Group. Body mass index and overweight in adolescents European countries, Israel, and the United States. Arch Pediatr Adolesc Med 2004; 1: 27-33.
14. Butler SM, Black DR, Blue CI, Gretebeck RJ. Change in diet, physical activity, and body weight in female college freshman. Am J Heath Behav 2004; 1: 24-32.

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伊朗德黑蘭大學生之肥胖狀況

評估個體及族群的營養狀況是公共衛生的重要的工具，也是可行的生活條件標指標。本研究目的為評估德黑蘭伊朗大學醫學科學系的大學生肥胖的盛行率及目前的營養狀況。此調查是在 2004 年 10 月到 2005 年 6 月進行。統計的族群包括所有來自醫學、護理暨助產、衛生服務、管理、科學及復健等系的學生，採多步驟隨機抽樣，共 1150 名學生。我們採用自填式 24 小時回憶問卷。在雙變項分析中將 BMI 分成兩組(BMI≧ 25 kg/m^2 為肥胖組，BMI<25 kg/m^2 為非肥胖組)。所有學生之平均 BMI 值為 21.7±2.9 kg/m^2。大約有 88%的研究對象為非肥胖(BMI>25 kg/m^2)。大約有 10%的學生體重過輕，12.4%的學生 BMI 超過 25 kg/m^2。男女性的 BMI 有顯著的差異；其中 BMIs 大於 25 者，女性為 7.9%，男性則為 22.5%。大約有 18%年齡在 23 歲及以上的學生 BMI 大於 25，年齡在 18 歲以下則為 7.7%。不同的 BMI 組別其纖維、維生素 A、葉酸及鐵的攝取有顯著的差異。肥胖的學生的這些營養素攝取量顯著較 BMI<25 kg/m^2 的學生多。我們得研究結果指出約有 12.4%的學生 BMI 大於 25 kg/m^2；BMI 與抽菸習慣、年齡、性別、居住地及使用特殊飲食療法有顯著相關。

關鍵字：肥胖、身體質量指數、大學生、營養素攝取、伊朗。