Original Article

Assessing the micronutrient and macronutrient intakes in female students and comparing them with the set standard values

Soheila Mirzaeian, Reza Ghiasvand[1,2], Fatemeh Sadeghian[3], Mahdieh Sheikhi[1], Zahra S. Khosravi[1], Gholamreza Askari[1,2], Afshin Shiranian[1], Ghasem Yadegarfar[4]

Department of Nutrition, School of Nutrition and Food Industries, Shahid Beheshti University of Medical Sciences, Tehran, [1]Food Security Research Center, [2]Department of Nutrition, [3]School of Nursing and Midwifery, [4]Department of Biostatistics and Epidemiology, School of Health, Isfahan University of Medical Sciences, Isfahan, Iran

ABSTRACT

Background: Healthy nutrition particularly the energy intake and the essential nutrients in female students is very important. This study aims to assess micro- and macronutrient intakes in female students of Isfahan University of Medical Sciences, Iran. **Materials and Methods:** This cross-sectional study involved 100 female students aged between 18 and 25 years in 2008–2009. Anthropometrics measures were performed and two 24-hours food recalls were used to collect the dietary information and were analyzed using food processor 2 and compared with the dietary reference intakes (DRIs) 2008. **Findings:** As many as 61.1% of subjects resided in dormitories; 12.7% were married. Prevalence of overweight or obesity and abdominal obesity in the subjects studied were 6.9% and 46.1%, respectively. The mean (±SD) systolic blood pressure was 105.2 ± 15.6 mmHg and the diastolic was 62.2 ± 10.4 mmHg. Totally, 3.9% of the subjects had hypertension. Food intake analysis indicated that B_{12}, folate, magnesium, potassium, and calcium were below the recommended level, and vitamin C, E, pantothenic acid, B_1, B_3, phosphate, and zinc were above, and energy intake, macronutrient, vitamin A, pyridoxine, iron, and selenium were, in general, adequate. **Conclusion:** The findings of the study indicated that macronutrients intake was appropriate, but the problem mainly existed in the consumption of micronutrients. It is recommended to increase the intakes of important food groups such as dairy, vegetable, and fruit that are proper sources of micronutrients, and it is also suggested to improve strategies and the competence in this area of nutrition.

Key words: Macronutrient, micronutrient, nutrients, students, total energy

INTRODUCTION

Majority of Iran's population are youth and a high percentage

Address for correspondence: Reza Ghiasvand, Assistant Professor, Food Security Research Center, Isfahan University of Medical Sciences, Isfahan, Iran.
E-mail: ghiasvand@hlth.mui.ac.ir

of them are students. Many youths eat meals irregularly. Fear of obesity, poor fitness, and lack of an appropriate position among peers cause changes in food-intake pattern and inadequate nutrients intake. In contrast, young people tend to follow weight loss diets in order to have a good body and fitness. Lack of nutritional awareness and knowledge in this regard has caused many beneficial and necessary foods such as bread, potato, milk, and meat to be deleted from daily nutritional program. Removing these foods from the diet causes deficiency of energy intake and nutrients such as protein and iron. Studies have shown that poor diet and improper intake pattern in youth group such as university students can cause the onset of various diseases and this can be highly exacerbated by suddenly moving from high school environment to the larger environs of a university.[1] This means those who need intensive care, particularly nutrition, during this period of life when they enter

into a new environment, or a new city or country, or have new friends are at serious social, cultural, and nutritional risk.

Currently, national studies have shown that malnutrition resulted from nutritional deficiencies and is gradually being replaced with overeating or maleating, the outcomes and consequences of which are being observed in increased incidences of middle-age diseases and disorders. National studies related to family nutrition pattern showed that household food table showed different qualitative and quantitative values, that is, family tables had major deficiencies qualitatively while they were adequate quantitatively. Specifically, quantitative assessments (regarded as full abdomen) have shown, of every 10 subjects, 2 were deficient, 4 were overeating, and 4 were eating appropriately; however, qualitatively (related to cell fullness or intake of nutrients required for body), of every 10 subjects, 5 were deficient, 3 were overeaters, and only 2 ate appropriately.[2] Due to adequate physical power and adaptability as well as physiologic adaptability, symptoms of deficiency and complications are not prominent in youth population or they emerge with delayed disorders. Youths being busy due to academic concerns, do not select the appropriate food.

The Shimbo *et al.* studied students' diet in Japan and showed that in these subjects just calcium and iron were deficient, which was due to lifestyle changes or change in residences during university stay.[3] Johnston *et al.* reviewed the diet of students living in state dormitories of Arizona and showed that there was vitamin C deficiency.[4] Furthermore, it was noted that medical students had micronutrient deficiency as well. Medical students are expected to be fairly familiar with needs and importance of nutrition and therefore, these deficiencies should have been lesser in this group; however, studies have shown that these students also suffer from these deficiencies. Klosiewicz-Latoazek *et al.* studied the diet of medical students in University of Warsaw, Poland, and showed deficiencies of Vitamins E and C and folic acid.[5]

Similar studies in Iran on students of Ardabil University of Medical Sciences by Tarighat Esfanjani *et al.* also indicated deficiency of folic acid, Vitamin C and E, calcium, zinc, and magnesium.[6]

In many studies, adherence to a common diet and following a certain food pattern based on an appropriate nutritional program for students has been emphasized. This was shown in the study of Brown *et al.*[7] They emphasized that students following a common food pattern can have a major role in correcting and supplying diet and nutritional needs moderately. The present study aimed to determine nutrients intake in female students of Isfahan University of Medical Sciences in 2008–2009 academic year and to compare it with standards and assess the nutritional status indicators, such as nutrients intake. The results of this study would aid in planning to reduce cases of imbalances in daily diet.

MATERIALS AND METHODS

This cross-sectional study carried out in academic year 2008

included 100 female students. After identifying the study subjects, they were explained about the necessity of the research and their presence in the study. Informed written consent was obtained from all the students who were willing to participate.

A 24-Hour Dietary Recall Interview was used to estimate the nutrients intake. During an interview with students and demonstrating the food scale and containers they usually used, they were asked to report and recall the value they consume in a day (24 hours).[8] Accessing the food intake values, nutrients intake was determined by a software Food Processor II (FP2). Thereafter, nutrients intake were determined by dietary reference intake (DRI).

Using a portable scale, anthropometric assessment for weight up to 100 g accuracy was carried out on the study subjects, with no shoes and minimum clothing, in a standing position such that hip and shoulders touched the wall, and the head was in a horizontal position. Waist circumference was measured with minimum clothing from the narrowest area of the waist to the widest area of the hip circumference. To eliminate personal errors, all the measurements were carried out by one person.

Data analysis was done through a software SPSS version 16 and Food Processor II.

RESULTS

As many as 61.1% of students resided in dormitories; 12.7% were married. The prevalence of obesity and overweight was 6.9%. A total of 7.8% of them were thin. In total, 3.9% suffered from hypertension. The prevalence of abdominal adiposity considering the borderline values related to waist-to-hip ratio (WHR) was 46.1%. The demographic characteristics of the study subjects categorized by their educational level are listed in Table 1.

Mean energy intake of the study population was 1948.9 ± 686.5 kilocalories, and mean protein, carbohydrate, and fat intake were 73.2 ± 31.0, 243.8 ± 110.4, and 80.2 ± 36.2 g/day, respectively. Mean intake of some micronutrients and their difference with recommended values (DRI) are listed in Table 2.

In fat-soluble vitamins, vitamin E was approximately consumed 2 times more than the recommended amount. In water-soluble vitamins, there was no significant difference between mean pyridoxine intake and recommended values by DRI; while vitamin C, pantothenic acid, thiamine, and niacin were consumed greater than the recommended amounts and vitamin B_{12}, riboflavin, and folate were consumed lesser than the recommended amounts. Iron and selenium intake was balanced among the study subjects; because statistical test showed no significant difference between intake amounts with recommended values. However, in all the other minerals studied, there was an imbalance, such that magnesium,

Table 1: Frequency distribution of the measured variables in the studied students separated by their educational level

	Educational level		
	BSs or lower n = 72	PhD or MD n = 27	p©
Age (year)	20.9 ± 2.1	19.8 ± 1.5**	0.02
Systolic blood pressure (mmHg)	104.5 ± 17.1	108.1 ± 10.3	0.3
Diastolic blood pressure (mmHg)	69.7 ± 11.5	68.1 ± 7.3	0.5
WC (cm)	75.0 ± 6.4	76.2 ± 7.5	0.4
HC (cm)	94.6 ± 5.6	95.3 ± 6.7	0.6
WHR	0.79 ± 0.04	0.8 ± 0.04	0.5
Height (cm)	160.6 ± 5.9	161.2 ± 6.0	0.6
Weight (kg)	54.7 ± 7.1	54.8 ± 7.6	0.9
BMI (kg/m²)	21.2 ± 2.4	21.0 ± 2.6	0.8
Sleeping day/night (hour)	8.1 ± 1.4	7.9 ± 1.2	0.6
Dormitory resident (%)	61.1	76.7	0.1
Single (%)	87.3	96.7	0.2

*Values are as Mean ± SD unless the cases which are specified, ©Through ANOVA for quantitative variables and Fisher's exact test for qualitative variables, **Significant difference in comparison with other three groups at the same level

Table 2: Mean daily intake of vitamins and minerals in female students of Isfahan University of Medical Sciences

Studied macronutrients	Mean ± SD n = 102	Recommended values* DRI/IA
A (mcg)	601.4 ± 873.0	700
E (mg)	29.8 ± 20.3**	15
C (mg)	10.4.3 ± 76.8**	75
Pantothenic acid (mg)	2.5 ± 1.5**	1.5
B_{12} (mg)	1.5 ± 1.6**	2.4
Pyridoxine (mg)	1.2 ± 0.6	1.3
Thiamine (mg)	1.3 ± 0.7*	1.1
Riboflavin (mg)	0.97 ± 0.4*	1.1
Niacin (mg)	16.0 ± 8.2*	14
Folate (mg)	153.5 ± 129.9**	400
Iron (mg)	18.0 ± 7.9	18
Magnesium (mg)	190.2 ± 114.9**	310
Phosphorous (mg)	850.0 ± 398.4**	700
Potassium (mg)	1787.3 ± 912.2**	4700
Zinc (mg)	8.9 ± 4.0*	8
Selenium (mcg)	54.5 ± 38.7	55
Calcium (mg)	707.6 ± 454.0**	1000

* $P < 0.05$ is a significant level. ** $P < 0.01$ is a significant level

potassium, and calcium were less consumed and phosphorous and zinc were more consumed than dietary reference intake (DRI) levels by these individuals.

DISCUSSION

The present study included female students of 2008–2009 studying in Isfahan University of Medical Sciences to determine the micro- and macronutrients intake and compare

it with set standard values. The study revealed that the daily diet of students was imbalanced in terms of micronutrients; the mean energy intake and macronutrients were normal whereas in micronutrients group, only vitamin A, pyridoxine, folate, magnesium, potassium, and calcium were lower than the recommended values and vitamin E and C, pantothenic acid, and niacin were higher than the recommended values.

Currently, most students meet their nutritional requirements only through what is offered at their university cafeteria; however, they need to follow their own nutritional plan and select a balanced diet. Although academic concerns of this population group can be an understandable excuse for this negligence, in accordance with the nutritional supportive systems such as community nutrition program and cafeteria, it is necessary that students act consciously in satisfying their nutritional needs.

Nowadays, one of the factors for the prevalence and incidence of cancer and chronic diseases is attributed to nutritional imbalances. Most of vitamins and minerals acting as natural antioxidants in diet are known to prevent chronic diseases such as cardiovascular diseases and cancer. Food sources containing these vitamins and minerals are mainly vegetables, legumes, whole grains, and nuts, which are easily available.

Many studies have reviewed nutrients intake, because any planning requires basic and necessary information. Some studies have shown that a major nutritional issue is imbalance and lack of diversity and easy availability of food deficient in micronutrients and energy supply.[9] National and comprehensive research in household food consumption pattern and micronutrient intake status showed that more than 75% of households consumed calcium lower than the recommended values and 43% of them who received iron lower than the recommended values.[10] In terms of vitamins, vitamin A and C and riboflavin deficiencies are discussed in household food pattern in Iran and this means that consumption pattern in families reveal deficiencies and weaknesses. Studies on youth and student population also indicated similar issues. In the study of Tarighat *et al.*, the major problem was deficient intake of vitamin C, E, folic acid, calcium, zinc and magnesium.[11] Studies of the diet of Japanese students showed that deficiency of calcium and iron intake was much prevalent among them.[3] The study of Najmabadi *et al.* reported that vitamin C, A, and E and folic acid intake was lower than the recommended values among students of Iran University.[12] Studies conducted on Tabriz University of Medical Sciences students in two Schools of Nutrition and Health showed that although they studied courses on nutrition, their diet showed calcium deficiencies.[13] A study on 60 students from Tehran University showed that 66–86% of students ate low-value unhealthy foods and junk foods twice a day; this means that students do not act consciously in food intake selection.[14] Rezaipour *et al.* in accordance with some other studies showed that a high percentage of students had iron deficiency.[15–18] Certain studies reported a mean iron intake more than the recommended value.[19,20] Vitamin

C deficiency has also been discussed on student population in some studies.[21–22] Calcium deficiency was raised in some studies as a serious risk, which probably is mainly due to low consumption of dairy products.[23] In this study, the study subjects had normal energy intake. Some studies reported the energy intake of students was lower than the recommended daily allowance (RDA).[24-26] Contradiction between the findings of these studies seems totally logical; because, given the dietary intake, each of the nutrients can be received lower or greater than RDA. Therefore, it is normal that, for example, iron or other nutrients intake is very low in a community and maybe it is reported proper or even more in other communities, because the diet of these two regions is different.

There could be several reasons for this. Proper intake of energy and macronutrients perhaps is due to availability and low cost of nutrient-rich foods. Studies have shown that a major reason for micronutrients deficiency is high cost and its nonaffordability by certain sections of society.[27-28] In addition, the main sources of micronutrients are dairy, fruits, vegetables, and nuts, which are difficult to prepare and store especially for those residing in dormitories.

The strengths of the present study lie in the following: (1) It uses two 24-Hour Dietary Recalls for collecting food data through which more accurate assessment for nutrients intake was done in comparison with one-day recall method. (2) The validity of this method has already been shown in previous studies and its estimation was comparable with more accurate methods such as food record.[29-31]

In evaluation of the results, mentioning some limitations seems necessary. The main problem in this study was difference in required nutrients standards announced in various references of nutrition sciences and this makes it difficult to select and compare based on a specific number. Moreover, various methods have been mentioned in nutritional references books to determine micronutrients and macronutrients contained in foods; and we decided to use the most reliable one. Since the micronutrients and macronutrients groups exist in different foods, pointing out to these imbalances makes it impossible to consider which food exactly causes the mentioned deficiency.

It can be suggested that proper nutritional planning at population group level, such as self-services, and benefiting from a group dietary plan for job or academic groups can have an effective distribution in support and supply of nutritional needs and also can have long- and short-term desirable effects on individuals' health. Besides, warning and proper education on nutrition and providing free advisory programs and nutritional counseling as workshops for students, even for medical sciences students, can be effective in selecting an individual's nutrition method consistent with health needs.

The results of the present study indicated that there was sufficient macronutrients intake among students but deficient micronutrients intake. Therefore, consumption of important dietary groups that are major sources of micronutrients such as dairy, fruit, vegetable, and nuts should be increased in this group of individuals. Given the importance of proper nutrition in this age group and its impact on future health of society, it appears that more education and facilities should be provided for proper nutritional performance for students. Furthermore, it is necessary to provide more comprehensive studies in all age groups as well as standard tables that comply with standards of our community.

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