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Short Communication

Dietary Intakes of Adolescent Girls in Relation to Weight Status

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Abstract

Background: To examine macronutrient and micronutrient intake of adolescent girls of Tehran, capital of Iran to discover any malnutrition in relation to weight status and dieting.

Methods: A cross-sectional study was conducted. Four hundred 11- to 17-year-old students were selected by multistage cluster sampling from secondary and high schools of Tehran. The information about dietary intakes was taken by food frequency questionnaire and 24-hour recall form. The students' body mass indices (BMIs) were measured and were classified according to National Center for Health Statistics /Center for Disease Control and Prevention (2000) growth charts. Participants were also questioned about body image and dieting.

Results: 6.7% of adolescent girls were classified as being obese, 14.6% overweight, 75.4% normal and 3.2% underweight. Students 11-13 year old, had mean intakes lower than estimated average requirement (EAR) for folic acid, vitamin E, calcium, magnesium, phosphorus, potassium and sodium, and 14-18 year old students had mean intakes lower than EAR for niacin, pyridoxine, folic acid, pantothenic acid, vitamin E, calcium, magnesium, phosphorus, potassium, sodium and zinc. Obese and overweight adolescents had less carbohydrate, thiamin, niacin, iron and selenium intake. The participants, who were dieting, used significantly less amounts of proteins, carbohydrates, thiamin, niacin, iron, selenium, sodium and zinc.

Conclusion: Knowing the harmful consequences of nutrient deficiency especially in adolescents, nutrition education must be emphasized in schools to promote nutritional literacy.

Keywords: *Adolescent girls, Obesity, Nutrient intake, Iran*

Introduction

Adolescence is a crucial period for major changes in human body, especially in females. To supply growth and maintain basic daily needs, adolescents need increased nutrients to provide for the accelerated growth that takes place during these years (1). On the other hand, the nutrition transition that is occurring rapidly in Iran is an important problem, particularly in urban areas and especially among women (2) and can cause disturbances in the nutritional status. It also seems that not only the prevalence of overweight has increased in adolescents (3), but also dieting for weight loss has become a common practice among adolescents, especially in girls.

Deficiency of specific nutrients can cause long-term health problems in young girls (4), and in spite of increasing prevalence of the overweight, micronutrient malnutrition is still a problem in Iran (2, 5, 6).

In the present study, Tehran, capital of Iran was chosen as an urban area with rapid nutrition transition. Micronutrient and macronutrient intake of adolescent girls as a population in risk was evaluated to discover any malnutrition in relation to weight status and dieting.

Materials and Methods

This was a cross-sectional study that was a part of other study entitled "The Tehran adolescent obesity study" conducted in school children of Tehran (7). During a multistage stratified cluster sampling, 20 secondary and high schools (6^{th} to 11^{th} grades) were randomly selected from 5 dif-

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ferent zones in Tehran (According to the information obtained from Municipality and Ministry of Education, in each area the life conditions and socioeconomic status was almost the same), to get an even distribution of children according to socio-economic status (SES). Totally, 400 students, 11-17 yr old were chosen randomly.

A questionnaire was filled by two trained physicians providing information on age, body-image (classified as obese, about normal and thin) (8) and dieting. Subjects were interviewed privately, face-to-face. Anthropometric measurements were made by the same physicians while the subjects were minimally clothed and bare foot using standard equipment (7). The body mass index (BMI) was calculated from the following equation: BMI= weight (kg)/[height $(m)^2$]. Using reference growth charts from the National Center for Health Statistics (NCHS)/Center for Disease Control and Prevention (CDC) (2000) (9), under weight, overweight and obesity were defined as $<5^{th}$, $\geq 85^{th}$ and $\geq 95^{th}$ percentiles, respectively, of age- and sex-specific BMI values.

Usual dietary intake was assessed by using a 120-item semi quantitative food-frequency questionnaire (FFQ) and 24 h dietary recalls for one day (7). The FFQ consisted of a list of foods and a standard serving size for each (Willett format). Participants were asked to report their frequency of consumption of a given serving of each food item during the previous year on a daily (e.g., bread), weekly (e.g., rice or meat), or monthly (e.g., fish) basis. 24 h recall form asked about the foods eaten in the previous 24 h in direct chronological order from the first foods in the morning to the last foods before breakfast on the day of the interview. Portion sizes of consumed foods were converted to grams by using household measures. Each food and beverage was then coded according to the prescribed protocol and was analyzed for content of energy and the other nutrients with the use of Food Processor 2 software (ESHA Research, Salem, Ore.).

The DRI (Dietary Reference Intake) (10-15) was used to assess the nutrient intake of this population. EAR (Estimated Average Requirement) values were used as the criterion for inadequate nutrient intake (16). SPSS 10.0 software (SPSS, Chicago, Ill.) was used for statistical analysis. Group means were compared using analysis of variance (ANOVA) or *t*-test.

This study was approved by the Human Research Ethics Board of Tehran University of Medical Sciences and Iranian Ministry of Education and Training.

Results

Of the 400 selected subjects from 20 schools, 358 consented to participate in the dietary survey (responded to questions). Seventeen questionnaires were discarded because of incomplete information (students not remembering exactly what they have eaten) and/or incorrect information.

Demographic information of the studied students is summarized in Table 1. According to the body mass index, 23 adolescent girls were classified as being obese (6.7%), 50 as being overweight (14.6%), 258 as being normal (75.4%), and 11 as being underweight (3.2%). The results showed that the percentage of energy distribution of subjects derived from carbohydrates, proteins, and fats was 53.08%, 12.52%, 34.40%, respectively.

To assess the micronutrient intake of students, we divided them into 2 groups of 11-13 and 14-18 yr of age (to properly compare the intakes with the DRIs). In the first group (11-13 yr), students had mean intakes lower than EAR for folic acid, vitamin E, calcium, magnesium, phosphorus, potassium and sodium. In the second group (14-18 yr), students had mean intakes lower than EAR for niacin, pyridoxine, folic acid, pantothenic acid, vitamin E, calcium, magnesium, phosphorus, potassium, sodium and zinc.

Nutritional intakes according to weight status are shown in Table 2. Comparing overweight and obese adolescent girls with others, overweight and obese adolescents had less carbohydrate, thiamin, niacin, iron and selenium intake ($P< 0.05$).

Considering the participants' body-image, the students who considered themselves as obese used significantly less amounts of carbohydrates ($P< 0.05$). The participants who were on a slimming diet, used significantly less amounts of proteins, carbohydrates, thiamin, niacin, iron, selenium, sodium and zinc compared to those who were not ($P< 0.05$).

Table 1: Demographic information of students studied

Characteristics	mean± SD	Range
Age (yr)	14 ±1.8	11-17
Weight (Kg)	52.45 ± 11.80	25-114
Height (cm)	158.97 ± 7.86	131-182
BMI (Kg/m^2)	20.61 ± 3.79	12.4-39.45

Table 2: Mean intakes of selected nutrients in relation to weight status (Mean ± SD)

Nutrient	Underweight	Normal	Overweight and obese	*P*
Energy(Kcal)	1701±958	1734±700	1519±823	0.097
Protein(g/d)	51.44±21.44	56.11±22.73	48.89±24.76	0.064
Carbohydrate(g/d)	249.45±133.24	238.65±107.31	199.41±103.09	0.023*
Fat(g/d)	59.86±46.68	66.37±37.30	62.51±49.82	0.703
Thiamin(mg/d)	1.12±0.37	1.20±0.51	0.98±0.42	0.005*
Riboflavin(mg/d)	1.31±0.48	1.52±0.95	1.21±0.70	0.185
Niacin(mg/d)	10.56±5.93	13.06±6.91	10.97±5.65	0.007*
Folic acid(µg/d)	213.1±95.0	235.4±146.6	200.6±120.8	0.176
Vitamin A	423.3±302.5	815.9±1862.6	583.9±602.9	0.463
Vitamin C(mg/d)	123.37±111.53	151.25±146.63	137.30±171.09	0.686
Calcium(mg/d)	647±395.55	715.95±465.47	710.02±470.30	0.889
Phosphorus (mg/d)	876.18±396.45	930.38±445.34	834.90±451.53	0.276
Iron (mg/d)	10.62±5.99	11.02±4.82	8.79±3.93	0.002*
Zinc (mg/d)	7.70±3.67	9.00±4.03	7.78±4.23	0.063
Sodium (mg/d)	1051±656	1214±912	1057±621	0.350
Potassium(mg/d)	2167±896	2248±1071	2001±1010	0.222
Selenium (mg/d)	81.60±28.41	99.65±51.17	83.36±50.59	0.038*
Total Fibre(g/d)	14.71±4.4	15.99±8.96	13.86±9.18	0.202

Discussion

The prevalence of overweight and obesity were 14.6% and 6.7%, respectively. In comparison to the results of Mohammadpour-Arhanjani et al. (3), the prevalence of overweight and obesity is not increasing but still should be considered as an epidemiologic health problem.

According to Acceptable Macronutrient Distribution Range (AMDR) reference for these age groups, the best total content of total daily calories should be 45-65% provided by carbohydrates, 10-30% for protein and 25-35% for fat (14). The total daily energy intake of the studied participants from carbohydrates and proteins was low-normal, but fat intake seemed to be high-normal. This is consistent with the findings of Ghasemi et al. that a nutrition transition is occurring in Iran and fat intakes are increasing (2). This may lead to increased obesity prevalence

and risk of other diet-related chronic diseases, as they are clearly emerging nowadays (2).

The micronutrient intake analysis showed that a substantial percentage of Tehran adolescent girls had not met the DRI for essential micronutrients such as folic acid, calcium, phosphorus, sodium, potassium and Magnesium. According to previous results, it seems that low intake of calcium is still a nutritional problem in Iran, but unlike the previous studies, we faced no low intake of vitamin A and riboflavin in our survey (2). Obviously, low intake of folic acid may cause problems in a female's future pregnancies, as folic acid deficiency may cause neural tube defects. In addition, low folic acid consumption is reported to be related to higher serum homocysteine concentration, which is an independent risk factor for cardiovascular disease and may cause hypertension, diabetes mellitus and other vascular diseases (17). Although reported low sodium intake has a preventive effect on hypertension, low intake of potassium may eliminate this preventive potential. Other point to mention is that the deficiency pattern is different in the 2 groups and the older group shows more deficiencies in micronutrient intakes, so different health policies for different age groups are required.

Fear of being overweight and the desire to be thinner leads to behaviors such as dieting (18). Dieting may be associated with lower nutrient intakes (19), as we see large proportion of obese students, who were on a diet, had lower intakes of many essential micronutrients. Although dieting may be associated with helpful behavioral changes, such as adopting a lower fat-eating pattern (19), our results did not show such healthful changes. Although dieting can explain low intakes of calories in obese students, under-reporting should be considered as well.

The strengths of our study include the limited number of physicians involved in the process of sampling, the precise measurements of participants' height and weight and adjustment for sex and age, and the exclusion of incomplete and incorrect questionnaires.

The limitation of our study was probable over and under reporting, although we tried to obtain the data in detail and carefully.

In conclusion, as both nutrient deficiency and obesity are major problems, basic changes in nutritional habits are mandatory. Nutrition education must be emphasized in schools to promote nutritional literacy. In addition, adolescents that are dieting to control their weight must be encouraged to have more healthful behavioral changes in their life style.

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The authors declare that they have no Conflict of Interests.

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