

On the Nutrition of the Students in the Southern Regions of the Republic of Uzbekistan

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Abstract: This article is devoted to the study of factual nutrition of 17-18-year-old academic lyceum students and secondary school students in the southern regions of the Republic of Uzbekistan – Kashkadarya and Surkhandarya regions. According to the results obtained the nutrition of the observed adolescents in many respects does not meet the established food intake requirements

Keywords: healthy eating, nutrition, macronutrients, micronutrients, energy value of nutrients.

The relevance of the topic: According to the Food and Agriculture Organization of the United Nations and the World Health Organization, more than 840 million people worldwide are currently malnourished, and more than 30 percent of the world's population suffers from malnutrition [1, 1-2].

Indeed, the intellectual potential of an organism, especially of growing one, depends primarily on his nutrition, and normal growth and development, as well as resistance and adaptability to environmental factors depend largely on consumption of sufficient amounts of macro-and micronutrients.

Accordingly, the diet of growing organism should be sufficient to meet its daily needs [2, 7-8; 5, 86-102; 7, 205-242; 8, 5-6;10, 15-16].

Object and subject of research: The observations were carried out in secondary schools No. 5, 29 and 34 in Karshi (Kashkadarya region), academic lyceums of Karshi State University and of Karshi Institute of Engineering Economics, secondary schools No. 8, 14 in Termez (Surkhandarya region), and academic lyceums of Termez State University and of Termez branch of Tashkent State Technical University named after Islam Karimov. The studies were conducted in winter, spring and autumn seasons of 2019 on the urban resident students of two age groups – 17-year-old (group 1) and 18-year-old (group 2) 430 boys and 338 girls. The nutrition of the students was studied using questionnaire-based method. The amounts of macro- and micronutrients in daily diet were determined using special tables of food chemical composition [4, 112-114; 6, 186-195].

Research methods: Nutrition of students participated in the research was studied using questionnaire-based method by Zaychenko [3, 25-62]. Static analysis of data was performed using the program features Origine 7.5 (Microcal Software Inc., Northampton MA). The data were expressed as means \pm S.E.M. Paired Student's t-test was used for estimation of significance; minimum accepted level of significance was $p < 0.05$.

The purpose of the study: To study the nutrition of adolescents for developing their healthy eating habits by promoting sound nutrition principles.

In the study for the first time the degree of satisfaction of physiological needs in macro- and micronutrients of schoolchildren of schools in Karshi and Termez was determined by studying their actual nutrition

The obtained results and their analysis: The results obtained were compared with the norms of physiological demand for nutrients and energy of different groups of the population of the Republic of Uzbekistan [8, 10-12].

The following tables provide information on the provision of academic lyceums and senior students in Karshi and Termez with macro- and micronutrients and the energy value of the main nutrients (proteins, fats, carbohydrates) in the food which was consumed during winter, spring, and autumn seasons.

Table 1
The main nutrients in the daily diet of students and their energy value
(M ± m, n = 768)

| Indicators | Group 1 (17 years old) | | Group 2 (18 years old) | |
|------------------------|------------------------|---------------|------------------------|---------------|
| | Boys | Girls | Boys | Girls |
| Total protein (g) | 88.0 ± 2.1 | 80.7 ± 1.2 | 86.2 ± 2.6 | 74.6 ± 2.2 |
| The norm (g) | 104 | 90 | 86 | 80 |
| Animal protein (g) | 22.8 ± 0.8 | 22.4 ± 0.4 | 32.8 ± 1.1 | 24.1 ± 0.9 |
| The norm (g) | 63 | 58 | 43 | 40 |
| Total fat (g) | 105.6 ± 3.3 | 93.8 ± 1.1 | 100.8 ± 3.0 | 83.3 ± 2.8 |
| The norm (g) | 104 | 90 | 96 | 82 |
| Vegetable oil (g) | 30.4 ± 2.1 | 27.8 ± 1.2 | 35.1 ± 1.9 | 29.6 ± 1.8 |
| The norm (g) | 20 | 18 | 25 | 20 |
| Total carbohydrate (g) | 365.7 ± 9.7 | 322.4 ± 3.5 | 383.3 ± 10.7 | 310.5 ± 10.4 |
| The norm(g) | 450 | 380 | 380 | 330 |
| Total calories (kcal) | 2843.3 ± 75.2 | 2526.5 ± 52.6 | 2862.3 ± 79.4 | 2354.4 ± 54.9 |
| The norm (kcal) | 3100 | 2750 | 2730 | 2500 |

Note: In compiling the table the daily needs of organism for nutrients and energy suggested by SNHS №0250-08 [8, 4-5) and Bakhritdinov Sh. S. and Khudoyberganov A.S. [9, 113].

Table 1 provides information on the total amount of macronutrients in the nutrition of 17-18-year-old students during winter, spring, and autumn. As can be seen, the daily protein needs of 17-year-old boys were met at 88 ± 2.1 g (less than 15%) instead of 104 g, while the daily needs of girls of the same age were met at 80.7 ± 1.2 g instead of 90 g. (less than 10%). In contrast to group 1 respondents, protein intake of group 2 was 86.2 ± 2.6 g (86 g) in boys, while in girls it was 7% higher than the normal level of 74.6 ± 2.2 g. Consumption of animal protein by the students was significantly lower than the norm. As noted in Table 1, the amount of animal protein was 17.8 ± 0.8 g in nutrition of 17-year-old boys and 22.4 ± 0.4 g of girls of the same age. These figures are respectively 64% and 67% lower than the normal levels adopted. The protein intake of boys and girls from group 2 was 32.8 ± 1.1 and 24.1 ± 0.9 g, respectively, which is respectively 76% and 60% percent of the normal values.

In contrast to proteins, the total amount of fat in the food intake of both groups of respondents were at normal levels. In particular, fat intake of 17-year-old boys was 105.6 ± 3.3 g instead of the normal level of 104 g, and in girls of the same age it was 93.8 ± 1.1 g (4% more) instead of 90 g. In 18-year-old boys, the figure was 98.8 g, which is 5% higher than the recommended norm (norm 96 g), and in schoolgirls, the amount of fat taken was 83.3 g, which is 2% higher than the norm (norm 82 g). The above mentioned situation can be explained by the following:

1. The fat consumed by the respondents in the fall was significantly higher than the norm, with fruits and vegetables being consumed in excess this season compared to other seasons.

2. Excessive consumption of vegetable fats in the diet of students resulted in the consumption of excessive total fat.

We can clearly see that vegetable oil was consumed by the students above normal levels in the following figures. For example, 17-year-old boys consumed 30.4 g (52% more) instead of 20 g, while girls consumed 27.8 g (52% more) instead of 18 g. Approximately the same results were obtained in boys and girls in the 2nd age group, i.e. in 18-year-old boys the consumption of vegetable oil was 35.1 g (40% more) instead of the recommended 25 g, and in girls, this figure is 29.6 g (48% more) instead of 20 g was noted.

In contrast to fats, carbohydrate intake was within the normal levels in boys and girls in the 2nd group of respondents. In group 1, carbohydrates were received less than normal levels. 17-year-old boys consumed 365.7 ± 9.7 g carbohydrates per day instead of the 450 g they should have taken (19 % less), while girls consumed 322.4 ± 3.5 g instead of 380 g. (15% less). When the total energy content of macronutrients was calculated, the daily energy intake of 17-year-old boys and girls were 2843.3 ± 75.2 and 2526.5 ± 52 kcal, respectively, which is 8 % less than the normal value 3100 and 2750 kcal. Unlike group 1 respondents, daily energy intake of group 2 can be considered to be at normal level. The daily energy intake of boys was 2,862 kcal, while in girls the figure is $2,354.4 \pm 54.9$ kcal.

Table 2
Amounts of vitamins in the daily diet of students ($M \pm m$, $n = 768$)

| Vitamins | Group 1 (17 years old) | | Group 2 (18 years old) | |
|----------------------|------------------------|-----------------|------------------------|-----------------|
| | Boys | Girls | Boys | Girls |
| C (mg) | 59.5 ± 2.1 | 61.2 ± 1.3 | 62.7 ± 2.2 | 61.9 ± 2.0 |
| The norm (mg) | 70 | 70 | 70 | 70 |
| A (mg) | 0.8 ± 0.01 | 0.67 ± 0.02 | 0.6 ± 0.02 | 0.7 ± 0.02 |
| The norm (mg) | 1 | 0.8 | 1 | 0.8 |
| D (mg) | 2.22 ± 0.07 | 2.16 ± 0.01 | 2.18 ± 0.01 | 2.1 ± 0.04 |
| The norm (mcg) | 2.5 | 2.5 | 2.5 | 2.5 |
| B ₁ (mg) | 2.5 ± 0.06 | 2.29 ± 0.06 | 1.81 ± 0.04 | 1.76 ± 0.03 |
| The norm (mg) | 1.5 | 1.3 | 1.2 | 1.1 |
| B ₂ (mg) | 1.63 ± 0.02 | 1.31 ± 0.09 | 1.33 ± 0.06 | 1.15 ± 0.02 |
| The norm (mg) | 1.8 | 1.5 | 1.5 | 1.3 |
| B ₆ (mg) | 2.6 ± 0.06 | 2.3 ± 0.06 | 2.5 ± 0.1 | 2.4 ± 0.08 |
| The norm (mg) | 2.0 | 1.6 | 2 | 1.8 |
| PP mg | 19.6 ± 1.0 | 16.5 ± 0.7 | 16.2 ± 0.18 | 13.7 ± 0.9 |
| The norm (mg) | 20 | 17 | 16 | 14 |
| B ₉ (mcg) | 174.0 ± 4.2 | 153.3 ± 1.4 | 175.3 ± 4.9 | 158.2 ± 5.7 |
| The norm (mcg) | 200 | 200 | 200 | 200 |
| B ₁₂ (mg) | 2.3 ± 0.04 | 2.0 ± 0.08 | 1.9 ± 0.01 | 2.0 ± 0.4 |
| The norm (mg) | 3.0 | 3.0 | 3.0 | 3.0 |

Note: In compiling the table the daily needs of organism for nutrients and energy suggested by SNHS №0250-08 [8, 4-5) and Bakhritdinov Sh. S. and Khudoyberganov A.S. [9, 113].

The table 2 provides information on the total amount of vitamins in the diet of 17-18-year-old students in the winter, spring, and fall. It shows that almost all the vitamins in daily diet of the students were deficient compared to normal values. For example, the content of vitamin C in the diet of 17-year-old boys and girls was 59.5 ± 2.1 mg (15 % less) and 61.2 ± 1.3 mg (13 % less), respectively. In 18-year-old boys and girls, this figure was 62.7 ± 2.2 mg (10 % less) and 61.9 ± 2.0 mg (13 % less), respectively, relative to the normal values. 17-year-old boys were provided with vitamin A at the level of 0.8 ± 0.01 (20% less), and in girls the figure was 0.67 ± 0.02 mg, 16% less than required (norm is 0.8 mg). In 18-year-old boys, this figure was significantly lower than the norm, i.e. 0.6 ± 0.02 mg (40 % less) instead of 1 mg, while in girls the figure was 0.7 ± 0 instead of 0.8 mg.

The dissatisfaction with the requirement of vitamin A in both male groups of respondents can be explained by the following reasons. The main part of the study was conducted in the winter and spring. The reason is that students consume less animal products, i.e. animal fats, liver, especially fish and fish products. Another possibility is that some fruits, vegetables, and melons consumed by the students may be GMO products.

The provision of vitamin D to students was significantly lower than the in norm, 2.2 ± 0.07 mcg (11% less) and 2.16 ± 0.01 mcg (14 % less) in 17-year-old boys and girls instead of 2.5 mcg, in 18-year-old boys and girls, this figure was 2.18 ± 0.01 mcg (13 % less) and 2.1 ± 0.04 mcg (16 % less). Intake of vitamins B, B₁ and B₆ by respondents in both groups was significantly higher than normal values, which can be explained by the fact that students consumed more bread and flour products than required. It should be noted that in both groups of respondents, only niacin (vitamin PP) was taken at normal levels. Significant deficiencies of vitamins B₉ and B₁₂ were noted as followed. In particular, intake of folate by 17-year-old boys and girls was 174.0 ± 4.2 mcg (13 % less) and 153.3 ± 1.4 mcg (33 % less), while in group 2 of the respondents the figure was $175, 3 \pm 4.9$ mcg (37 % less) and 158.2 ± 5.7 mcg (33 % less).

Table 3
Amounts of minerals in the daily diet of students (M ± m, n = 768)

| Minerals | Group 1 (17 years old) | | Group 2 (18 years old) | |
|-----------------|------------------------|-------------------|------------------------|-------------------|
| | Boys | Girls | Boys | Girls |
| Calcium (mg) | 468.7 ± 18 | 565.6 ± 10.1 | 550.1 ± 20.8 | 553.7 ± 20.6 |
| The norm (mg) | 1200 | 1200 | 800 | 800 |
| Phosphorus (mg) | 1699.8 ± 50.8 | 1591.8 ± 24.2 | 1628.4 ± 58.7 | 1140.8 ± 38.4 |
| The norm (mg) | 1800 | 1800 | 1200 | 1200 |
| Magnesium (mg) | 400.3 ± 14.3 | 420.8 ± 5.5 | 479.4 ± 18.9 | 478.5 ± 16.1 |
| The norm (mg) | 300 | 300 | 400 | 400 |
| Iron (mg) | 18.2 ± 0.5 | 18.6 ± 0.2 | 10.5 ± 0.3 | 18.5 ± 0.6 |
| The norm (mg) | 15 | 18 | 10 | 18 |
| Iodine (mcg) | 62.9 ± 1.5 | 62 ± 1.9 | 71.2 ± 1.6 | 60.9 ± 1.3 |
| The norm (mcg) | 150 | 150 | 150 | 150 |

Note: In compiling the table the daily needs of organism for nutrients and energy suggested by SNHS №0250-08 [8, 4-5) and Bakhritdinov Sh. S. and Khudoyberganov A.S. [9, 112].

Table 3 provides information on the provision of pupils with minerals. As can be seen, a daily intake of calcium was lower than normal levels in both age groups, i.e., 17-year-old boys and girls received 468.7 ± 18 and 565.6 ± 10.1 mg instead of 1200 mg, while 18-year-old boys and girls got 550.1 ± 20.8 and 553.7 ± 20.6 mg (the norm is 800 mg). The daily intake of

element P by the respondents was 1800 mg. If 17-year-old boys consumed 1699.8 ± 50.8 mg of phosphorus per day (5.6% less), girls' normative phosphorus needs were met at 1591.8 ± 24.2 mg (12% less). In contrast to group 1, phosphorus intake in group 2 can be considered to be at normal range, i.e. 1228.4 ± 58.7 mg (2.4% more) instead of 1200 mg in boys, and 1140.8 ± 38.4 mg (4.9 % less) in girls. In all observed subjects, magnesium intake with food was characterized to be excessive compared to normal values. For example, 17-year-old boys and girls received 400.3 ± 14.3 (33.4% more) and 420.8 ± 5.5 mg, respectively (normal level is 300 mg). Approximately the same results were observed in 18-year-old boys and girls, which can be explained by the fact that students consume a lot of bread and flour products in their daily diet. Daily intake of iron by adolescents was higher than normal level in 17-year-old boys, i.e. 18.2 ± 0.5 mg (21.3% more) instead of 15 mg, while in the other subjects the intake of this mineral can be considered to around the normal level.

Iodine intake was significantly lower compared to normal levels in both groups, i.e. 17-year-old boys consumed 62.9 mcg (58.1 % less) and in girls – 62 mcg (59 % less). Similar results were observed in group 2, 71.2 mcg (52.5 % less) was taken by 18-year-old boys and 60.9 mcg (59.4 % less) – by schoolgirls (the normal level is 150 mcg for both groups).

Macro- and micronutrients deficiencies in the diet of the observed adolescents, as noted above, may affect their growth, development, health, and mastering study subjects. Because in the body of boys and girls of this age the processes of metabolism and energy are much more intensive, this situation increases their needs for nutrients. In order to prevent it, it is necessary, first of all, to carry out large-scale promotion work on proper and healthy nutrition among adolescents.

CONCLUSION:

Deficiencies of macro- and micronutrients content in the daily diet of the adolescents, as mentioned above, naturally have a negative impact on their growth, development, health, and mastering study subjects. To prevent this, primarily it is advisable to have nutrition inspected by special commissions that control the quality of products in school kitchens and formation of healthy eating skills of students. Furthermore, roundtables among students should be held by relevant professionals and biologists with participation of parents for further development their knowledge and skills on how to follow the rules of healthy eating. If we pay special attention to the principles of healthy nutrition in the formation of a healthy lifestyle in children as noted above, we will contribute to the worthy work of our independent Uzbekistan to bring up a physically strong, mentally fit generation that will serve our country.

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