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Article

Provision of Select Micronutrients Among Primary School Students

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Annotation: This article examines the adequacy of selected vitamins in the diets of 7–10-year-old schoolchildren attending rural schools in the Kashkadarya region of Uzbekistan. According to the findings, an analysis of the average percentage of selected vitamins in the daily diets of children aged 7–10 years, relative to the recommended dietary allowances (RDAs), revealed inadequate intake of vitamins A, D, and B9 (43.5%, 67.5%, and 53.2% of the recommended levels, respectively). In contrast, the intake of vitamins B2 and PP exceeded the recommended levels by an average of 15–28%, while the intake of vitamins C and B12 was found to be within the recommended range. The study highlights the need to optimize schoolchildren's daily dietary patterns and develop appropriate practical interventions to prevent inadequate intake of essential vitamins.

Keywords: growth and development, retinol, riboflavin, ascorbic acid, balanced nutrition.

Introduction

Adequate and balanced nutrition is one of the most important factors ensuring the normal growth and development, healthy lifestyle, cognitive and physical performance, and overall well-being of primary school-aged children. In particular, insufficient amounts of proteins, especially vitamins, in their daily diet may adversely affect normal growth, lead to deterioration of their psychophysiological status, reduce resistance to environmental factors, and negatively influence other physiological processes [1]. Furthermore, inadequate nutrition may impair the adaptive capacity and nonspecific resistance of the growing organism, as well as disrupt certain physiological and biochemical reactions [2].

According to UNICEF's 2020–2030 Nutrition Strategy, "Nutrition, for Every Child," approximately 200 million children in low- and middle-income countries were affected by stunting in 2020, while more than half of these children had inadequate micronutrient status, particularly with regard to vitamins and certain minerals [3].

In the Republic of Uzbekistan, particular attention has been paid to the nutrition of school-aged children, especially to ensuring adequate micronutrient intake. In this regard, the relevant provisions outlined in a number of regulatory and policy documents, including Resolution No. PQ-4887 of the President of the Republic of Uzbekistan dated 10 November 2020, "On Additional Measures to Ensure Healthy Nutrition of the Population" [4]; Presidential Decree No. PF-60 dated 28 January 2022, "On the Development Strategy of New Uzbekistan for 2022–2026"; and Presidential Decree No. PF-36 dated 16 February 2024, "On Additional Measures to Ensure Food Security in the Republic," are of particular importance. The consistent and phased implementation of the measures stipulated in these documents represents one of the pressing responsibilities of specialists working in the fields of physiology and medicine.[5]

In this regard, a number of studies have been conducted in the Republic of Uzbekistan to investigate the nutritional status and physical development of various population groups, particularly children and adolescents. It should be noted that the majority of schools in the country are located in rural areas, and the government pays considerable attention to the continuous improvement of educational and upbringing conditions in these institutions. However, the daily dietary intake of pupils attending both rural and urban schools cannot yet be considered adequate in terms of essential nutrients, particularly micronutrients, including vitamins. From this perspective, investigating the adequacy of selected vitamin intake among primary school-aged children living in rural areas is of considerable theoretical and practical significance.[6]

Materials and Methods. The study was conducted in 2025 among a selected group of 7–10-year-old pupils attending several rural schools in the Kashkadarya region of Uzbekistan. Their vitamin intake was assessed using a questionnaire-based survey. The amounts of vitamins consumed in the participants' daily diets were compared with the recommended dietary allowances established for children of the corresponding age group [7]. The data obtained were subjected to statistical analysis [8].

Results and Discussion. The dietary patterns of primary school pupils attending rural schools, particularly the amounts of selected vitamins in their daily diets, were found to be inconsistent with the established recommended dietary allowances. The results obtained are presented in the table below.[9]

As can be seen from the table above, the amounts of vitamins C, B2, PP, and B12 in the daily diets of 7-year-old pupils were close to the recommended levels, whereas the intake of vitamin PP exceeded the recommended allowance by an average of 52%. In contrast, the intake of vitamins A, D, and B9 accounted for only 28–50% of the recommended levels.[10]

A different pattern was observed in the dietary intake of 8-year-old pupils with regard to their vitamin status. Specifically, the amounts of ascorbic acid, retinol, riboflavin, and cyanocobalamin in their daily diets exceeded the recommended levels by approximately 80.2%, 14%, 77.7%, and 31.6%, respectively. Particularly noteworthy was the niacin content, which was almost twice the recommended level. To explain this finding, the weekly menus of pupils in this age group were examined individually. The analysis revealed that they consumed relatively large amounts of bread

and flour-based products (such as pechak, samsa, and pastries), as well as dishes prepared with potatoes and eggs throughout the week.[11]

Among 9-year-old primary school pupils, the amounts of vitamins C, B2, PP, and B12 in their daily diets were found to be lower than the recommended levels by an average of 43.2%, 33.4%, 24.2%, and 28.9%, respectively. Furthermore, their intake of vitamins A, D, and B9 accounted for only 22–25.9% of the recommended allowances.[12]

Regarding the vitamin intake of 10-year-old pupils, the mean vitamin C content of their daily diets was 34.4 ± 3.06 mg, corresponding to approximately 98.2% of the recommended level. Meanwhile, their intake of vitamins A, D, and B9 accounted for only 38–50% of the recommended allowances. The amounts of vitamins B2, PP, and B12 in the daily diets of these pupils exceeded the recommended levels by an average of 22.2%, 28.3%, and 16.6%, respectively.[13]

A summary analysis of the findings, based on the average percentage of selected vitamins in the daily diets of 7–10-year-old pupils relative to the recommended dietary allowances, revealed insufficient intake of vitamins A, D, and B9,[14] accounting for 43.5%, 67.5%, and 53.2% of the recommended levels, respectively. In contrast, the intake of vitamins B2 and PP exceeded the recommended levels by an average of 15–28%, whereas the intake of vitamins C and B12 was generally within the recommended range.[15]

Conclusion. The findings indicate that the vitamin intake of primary school-aged children living in rural areas does not fully meet the established recommended dietary allowances. One of the main contributing factors may be the imbalance in the composition of food products included in their daily diets. Such nutritional inadequacies may adversely affect children's growth and development, academic performance, and resistance to diseases. To prevent these potential adverse effects, it is essential to strengthen educational and awareness-raising activities among pupils and their families regarding the principles of balanced nutrition, particularly the dietary sources of vitamins and the selection of appropriate food products to ensure adequate vitamin intake at home.

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