УДК 614.3(571.56)(042.3)

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# Epidemiological and Hygienic Aspects of Nutrition at Educational Institutions in Sakha Republic (Yakutia)

## Introduction

Educational institutions make the only system of public education which covers all children and adolescents of the country during a long period of time. The pupils spend the most part of a day (more than 70%) at school. The time of their education coincides with the period of physical growth and development when a child's body is most sensitive to impacts of the external environment. High growth rates and intensive metabolism demand constant and sufficient inflow of nutrients with food.

But recent research conducted by the Research Institute of Nutrition in various Russian regions show that the children and adolescent diet significantly lacks a whole range of nutrients, including vitamins A,C, B2, iron, calcium, iodine, polyunsaturated fatty acids, and dietary fiber. Resulting from dietary disorders, the health state and anthropometric characteristics of children and youths deteriorate significantly. Health indices of students start deteriorating at elementary school. Presently, less than 5% of elementary school pupils are considered absolutely healthy. In senior grades, absolutely health pupils make about 2% [1].

The Sakha Republic (Yakutia) is the largest Russian region in terms of its territory and has the lowest population density; in 2012, its population was 955.5 thousand people, including 620.5 thousand urban residents and 335.9 thousand rural residents. In 2012, the natural population increase equaled to 8.0 thousand people. The demographic indexes in the Sakha Republic (Yakutia) have increased twice as compared with those of 2000, notably, the natural population growth index (per 1000 people ) was 4.0 in 2000 and 8.5 in 2012 [2].

In 2013, common sickness rates among children aged 0 through 18 years decreased by 10.2 per 1000 children compared with rates in 2012. In 2013, the occurrence of digestive system diseases among children increased by 20.4 per 1000 children compared with the data for 2012 [3].

Feeding children and adolescents with high-quality food, especially, at educational institutions is one of the most important issues in regions under extreme climates, where many families have low income and the structure of population feeding has specific regional features.

Nutritional deficiencies and high sickness prevail among school-aged children in the Sakha Republic (Yakutia).

In the Sakha Republic (Yakutia), nutritional deficiencies and high sickness persistently prevail among school-aged children and adolescents. In this respect, epidemiological and hygienic aspects of conditions for education and feeding in educational institutions in the Sakha Republic (Yakutia) play a vital role.

**Objectives**. Assessment of feeding and food value of daily and school ration of children and adolescents studying in Sakha educational institutions.

**Research Data** An assessment of meals and eating habits was conducted based on the individual interviewing of children and adolescents in accordance with the international research standards of the WHO National Program on integrated prophylaxis of non-infectious diseases CINDI (European Regional Bureau, WHO,

Copenhagen 2003). A special questionnaire developed by the State Research Center for Applied Medicine of the Ministry of Health and of the Russian Federation and the Research Institute for Nutrition was applied in the survey, it was adapted by researchers of the Center for Nutrition, Research Institute for Health, North Eastern Federal University named after M.K.Ammosov, to children and adolescents in accordance with the local conditions. «24 h – recall» method was used to study meals patterns. Calculation of food variety and the chemical composition of food was performed in the laboratory for study of structure and planning of meals of the Research Institute of Nutrition.

The following documents were used in this research: the annual report (Form № 18) "Information on Sanitary Conditions in Russian Federation Regions" in 2011-2013; the state report "On Sanitary and Epidemiological Wellbeing of Population in Russian Federation in 2012"; the state report "On Sanitary and Epidemiological Wellbeing of Population in Russian Federation in 2013";

**Research Results**

The assessment of food intake by urban and rural schoolchildren showed that the calorie content of their daily ration was 2011 kcal and 1588 kcal, accordingly (the daily norm – 2675 kcal/ day). The survey also revealed insufficient intake of macronutrients (proteins, fats, and hydrocarbons) with food by schoolchildren. On average, urban and rural schoolchildren take in from food only 14% of the recommended doze of protein, 33% and 30% of fat, and 54% and 57% of hydrocarbons.

Thus, the protein contribution to the caloric content of the ration is lower than the recommended values which, in its turn, does not correspond to the protein intake norms recommended by the Research Institute of Nutrition for northern areas. The share of carbohydrates made more than 50% among rural and urban schoolchildren. The fat portion in urban schoolchildren's diets was higher as compared with that of rural children (Table 1).

Table 1

**Calorie value of protein, fats, and carbohydrates %, n=1569**

| Macronutrients | Recommended values | Urban area (n=958) | Rural area (n=611) |
|---|---|---|---|
| Proteins | no less than 15 | 14 | 14 |
| Fats | no more than 30 | 33 | 30 |
| Carbohydrates | less than 50 | 54 | 57 |

Average daily intake of vitamins by urban and rural schoolchildren made: $B_1$ – 61.5% and 46.1%, $B_2$ – 73.3% and 53.3%, PP – 55% и 45% of recommended values. We have also found out insufficient intake of vitamin A with food in rural schoolchildren ration (4 times less than recommended values).

An average daily intake of vitamin C by urban schoolchildren was 10 mg/day less than recommended norms, and among rural children it was 12 mg higher than the recommended norm. It should be noted here that during the survey, tea with vitamin C was included into the ration of schoolchildren in rural areas (table 2).

Table 2

**Average daily consumption of main vitamins, mg per day, n=1569**

| Vitamins | Recommended doze | Yakutsk (n=958) | Maya (n=611) |
|---|---|---|---|
| A | 0.8-1 | 0.8 | 0.2 |
| $B_{1,}$ | 1.3-1.5 | 0.8 | 0.6 |
| $B_2$ | 1.5 | 1.1 | 0.8 |
| PP | 17-20 | 11 | 9 |
| C | 70 | 60 | 82 |
| Retinolum, retinolum equivalent | 800 | 641 | 548 |

Daily Ca intake among urban and rural schoolchildren made accordingly 50.9% and 32.2%, Mg – 76.3% and 58.6%, Fe – 75.8% and 57.7%, K - 77% and 62.5% of the recommended requirements. Daily Na intake by urban and rural schoolchildren is by 1.5 and 1.3 higher than the recommended requirements (Table 3). Excessive Na intake is connected with consumption of excessive amounts of table salt.

Table 3

**Daily consumption of major minerals, mg per day, n=1569**

| Minerals | Recommended intake | Yakutsk (n=958) | Maya (n=611) |
|---|---|---|---|
| Fe | 15-18 | 13 | 13 |
| Ca | 1200 | 610 | 387 |
| Mg | 300 | 229 | 176 |
| P | 1800 | 986 | 750 |
| K | 3000 | 2311 | 1876 |
| Na | 2000 | 3037 | 2724 |

Grouping the Sakha children and adolescent institutions into divisions depending on the sanitary and epidemiological well-being indicates the tendency to improvements. For the last 3years, the portion of children and adolescent institutions with inadequate sanitary and epidemiological well-being ($3^{rd}$ group) has decreased by 3, while the portion of children and adolescent institutions of the $1^{st}$ group has increased by 3.6 (table 4) [5].

Table 4

**Division of children and adolescent institutions into groups by sanitary and epidemiological well-being (SEW), Sakha Republic (Yakutia), 2011- 2013, number / (%)**

| Groups SEW / year | 2011 | 2012 | 2013 |
|---|---|---|---|
| 1st group SEW | 481 (20%) | 505 (21%) | 569 (23.6%) |
| 2nd group SEW | 1792 (73%) | 1744 (73%) | 1711 (71%) |
| 3rd group SEW | 188 (7%) | 151 (6%) | 125 (5%) |

The improvement stated above reveals updated infrastructure, annual work on construction, re-construction, and repair of buildings. Today, 65% of schools have standard buildings, and 67% of schools are located in wood-log buildings. In this context, introduction of new federal state educational standards of general education and sanitary norms pose high demands for the content, conditions, and results of the educational process, educational specialists and authorities qualification upgrading methods.

Provision of schoolchildren with healthy and safe meals is a priority task of state sanitary and epidemiological supervision during the last years.

In 2013, the proportion of school children provided with hot meals increased from 97% to 99% (in the Russian Federation it made 85.1%) (Table 50). Hot meals provision by age groups makes: 100% (in the Russian Federation – 95.4%) –1- 4 grades; 99.2% (in the Russian Federation – 77.5%) –5-11 grades. In 2013, 58% of school children in the Sakha Republic (Yakutia) were provided with school meals twice a day (in the Russian Federation – 26.6.%), which is by 8% higher than rates in 2012 [3, 4].

Table 5

**Provision of School Children with Hot Meals, %**

| Provision of Children in Educational Institutions | 2011 | 2012 | 2013 |
|---|---|---|---|
| Total | 96.8 | 97.2 | 99 |
| 1-4 grades | 98.6 | 99.4 | 100 |
| 5- 11 grades | 95.7 | 95.8 | 99.2 |

The health index of school children serves as an index of effectiveness of school meal management. The proportion of school children of 3-5 health groups, i.e. children with chronic diseases, in schools with hot meal service makes 13% (in the Russian Federation – 21.5%), including: in secondary schools - 12% (in the Russian Federation – 31.8%), in general schools – 0.4% (in the Russian Federation - 11%), in elementary schools – 0.4% (in the Russian Federation – 7.5%); by grades – in the first grade, the proportion of children with chronic diseases makes 5% (in the Russian Federation – 16.3%), in the second grade- 7% (in the Russian Federation -24.8%), in the third grade- 1% (in the Russian Federation – 19.2%) [3].

During 2011-2013, the proportion of ready-to eat food which do not comply with the hygienic norms of sanitary – chemical and microbiological indexes decreased by 0.3% and 1.0%, respectively. The share of food samples which does not meet the norms by their calorific content and amount of Vitamin C has increased by 11.2% (Table 6) [5].

Table 6

**Hygienic Characteristics of Ready–to-Eat Food in Children and Adolescent Institutions (%)**

| Indices | Share of samples not meeting standards, % | | |
|---|---|---|---|
| | 2011 | 2012 | 2013 |
| Sanitary and Chemical | 3.5 | 3.2 | 3.2 |
| Micro-biological | 9.7 | 8.7 | 8.7 |
| Calorific and vitamin content | 12 | 13.6 | 13.6 |
| Vitamin C content | 18.7 | 29.9 | 29.9 |

Major problems in meals service in at educational institutions are:

- inadequate quality of material and technical base, and technological equipment of school kitchens at some educational institutions;
- the problem of hot and cold water supply of rural school kitchens;
- absence of school meal combine
- disparity between school meals ration and physiological demands of children;
- inadequate development of the transportation infrastructure in the Sakha Republic, food products are delivered to remote northern regions only during the short period of navigation or by air transports, which complicates food product delivery and meals service at schools;
- shortage of school kitchen and medical workers [3].

**Conclusions.** Thus, the results of the research of epidemiological and hygienic aspects of meals, carried out in the Sakha Republic (Yakutia), have defined the character and specific features of children and adolescent nutrition in general and in organized groups. In recent years, the results of the research were used to draft the Concept of State Policy on Healthy Nutrition and "The Plan of Major Events, 2020", and to establish the Sakha Republic Children Recreation and Health Center "Sosnovyi Bor' ("Piny Wood"). The Center in association with the Nutrition Center, Health Research Institute, M.K.Ammosov North-Eastern Federal University is a coordinator of activities on nutrition promotion in the Sakha Republic (Yakutia).

Results of epidemiological and hygienic research have laid the foundation for up-grading school feeding in the Sakha Republic (Yakutia) within the framework of the federal program.

***The Research has been conducted within the framework of the state task of the Education Ministry of the Russian Federation №3048.***