14. Park JS, Lee JY, Lee YJ, et al. Serum Levels of Antituberculosis Drugs and Their Effect on Tuberculosis Treatment Outcome. Antimicrob Agents Chemother. 2015;60(1):92-98. Published 2015 Oct 12. doi:10.1128/AAC.00693-15

15. Pasipanodya JG, McIlleron H, Burger A, Wash PA, Smith P, Gumbo T. Serum drug concentrations predictive of pulmonary tuberculosis outcomes. J Infect Dis. 2013;208(9):1464-1473. doi:10.1093/infdis/jit352

16. Ramachandran G, Agibothu Kupparam HK, Vedhachalam C, et al. Factors Influencing Tuberculosis Treatment Outcome in Adult Patients Treated with Thrice-Weekly Regimens in India. Antimicrob Agents Chemother. 2017;61(5):e02464-16. Published 2017 Apr 24. doi:10.1128/AAC.02464-16

HEALTHY LIFESTYLE. PREVENTION

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STUDY OF THE MICRONUTRIENT COMPOSITION OF ACTUAL DIETS IN THE ELDERLY POPULATION OF YAKUTSK

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The data obtained allowed us to conclude that the elderly population had a deficit of vitamins, microelements in the diet of the actual consumption, especially there was a decrease with age. Gender differences in the content of some vitamins and minerals in the diet were revealed.

Keywords: nutrition, micronutrients, vitamins, minerals, old age, epidemiology.

Relevance. The most important of the national project "Demography" in the Russian Federation is to increase the healthy life expectancy of the population. There is no doubt that this task is inseparable, connected with the state of health of the elderly and senile aged population and becomes an important factor for achieving an increase in life expectancy. One of the important factors influencing both the state of health and well-being of the mentioned category of population is a balanced nutrition. It is known that a balanced diet is necessary for the physiological needs of the body in nutrients (macro- and micronutrients) and energy. Rational and balanced nutrition contributes to the body's resistance to the negative effects of environmental influences, reducing the risk of alimentary-dependent diseases and increasing life expectancy [4, 8, 12]. The elderly population is often considered to be at higher risk for a number of reasons, one of which is a decrease in food intake that can lead to the development of malnutrition (malnutritional deficiency) syndrome. Current nutritional problems in the elderly population are one of the important reasons for the formation of numerous geriatric syndromes (sarcopenia, senile asthenia, falls, bedsores, depression, cognitive decline, etc.), which worsen not only the quality of life, the functional status of the elderly person, but also worsen the forecast of morbidity and mortality indicators [5, 11, 12]. In this connection, it becomes relevant to study the actual nutritional status of this age group for the prevention and possible correction of geriatric syndromes in the elderly population living of the Republic of Sakha (Yakutia).

Aim: of this study was to study the micronutrient (vitamins and minerals) composition of the actual dietary intake in the elderly population of Yakutsk.

Materials and methods of research. This paper uses the materials of an epidemiological study conducted as part of the research work «Epidemiology of some chronic non-infectious diseases and risk-factors in the elderly population (including long-livers) of Yakutsk» by the Yakut Scientific Center of complex medical problems. The study design corresponds to a one-stage cross-sectional population study described in a previously published paper by the authors [1].

The population of the city of Yakutsk aged 60 and older was chosen for the study. The selected representative sample of the population aged 60 years and older was 5.3% of the total number of residents of the city. Data from 775 people were collected for the survey. The mean age of those surveyed was 75.7 years with a standard deviation of 9.4 years, and the response was 79.9%. Data from 244 men and 331 women were used to analyze micronutrients (vitamins and microelements) in the diet.

Validated questionnaires and questionnaires that included sociodemographic characteristics and data on actual nutrition were used for the study [1].

The method of analyzing the frequency of food consumption was used to assess actual nutrition. The database "Tables of the chemical composition of dishes and culinary products", taking into account losses during heat treatment, was used to determine the micronutrient composition of diets. Daily food rations were analyzed based on an assessment of both the quantitative content and the ratio of micronutrients. To analyze the data obtained, the norms of physiological need for nutrients and energy for different population groups were used [6].

Statistical processing and data analysis were performed using the SPSS software package (11.5 version). Values p <0,05 were considered authentic.

Results and discussion. The analyzed data assessing the average daily content of micronutrients (vitamins A, B1 and B2, β-carotene, PP, C and minerals - sodium, potassium, calcium, magnesium, phosphorus and iron) in the diet of the actual diet showed insufficient consumption at the level of the recommended physiological norms for men and women aged 65 and older.

Average levels of vitamin intake are shown in table 1. Deficiencies in dietary vitamin intake relative to recommended levels were noted in both groups. However, the average daily intake of vitamins was statistically significantly higher in the male population compared with the same

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indicators in women, except for vitamin C and β-carotene (Table 1).

As follows from the data in table 2, sodium intake in diets in the general elderly population exceeds the recommended values. The reasons for this excess may be the increased use of salt in the diet ("I always add salt" in cooking indicated by 83.3% of the respondents and "I add salt to cooked food" indicated by 25.6%). The recommended values for persons aged 60 years and older did not exceed potassium intake levels (2207.92±42.41 mg/day) in the daily diet of the actual diet.

According to the results presented, all the examined had a pronounced deficit in the intake of potassium (2207.92±42.41 mg/d), calcium (515.89±11.50 mg/d) and magnesium (255.70±3.90 mg/d) in the diet of the actual diet (Table 2). At the same time, elevated levels of phosphorus (941.80±14.73 mg/d) and iron (17.44±0.21 mg/d) were detected in the examinees, which is associated with increased consumption of meat, fish products in the daily diet (38,4%). It should be noted that the male population had significantly higher intake of sodium, magnesium, phosphorus and iron than the female population. There were no significant gender differences in potassium and calcium intake (Table 2).

Analyzing the level of average daily intake depending on age, both vitamins and minerals, it was found that in the

Table 1

The average content of vitamins (mg/day) in the diets of men and women aged 60 years and older in Yakutsk. M±m

Vitamins	Total number of respondents (n=575)	Men (n=244)	Women (n=331)	P_{m-w}	Recommended values. mg
Vitamin A. RE[Δ]	0.49±0.02	0.53±0.04	0.45±0.02	0.045	0.9
β-carotene	3.09±1.07	2.86±1.27	3.24±1.6	0.075	5.0
Vitamin B_1	0.91±0.01	0.99±0.02	0.86±0.02	0.000	1.5
Vitamin B_2	1.18±0.02	1.25±0.03	1.12±0.03	0.001	1.8
Vitamin PP	11.66±0.18	12.72±0.27	10.89±0.23	0.000	20
Vitamin C	86.13±2.42	82.49±3.36	88.81±3.41	0.198	100

Note: [Δ] vitamin A in retinol equivalent (RE)

Table 2

Average daily minerals content (mg/day) in the diets of men and women in Yakutsk aged 60 years and older, M±m

Minerals	Total number of respondents (n=575)	Men (n=244)	Women (n=331)	P_{m-w}	Recommen-ded values, mg
Na	1457.34±22.85	1632.31±38.01	1328.36±25.97	0.000	1300
K	2207.92±42.41	2251.42±59.96	2175.84±58.95	0.379	3500
Ca	515.89±11.50	530.43±19.50	505.17±13.86	0.278	1200
Mg	255.70±3.90	265.95±5.78	248.15±5.24	0.024	420
P	941.80±14.73	1015.35±24.58	887.59±17.52	0.000	700
Fe	17.44±0.21	18.33±0.32	16.78±0.28	0.000	men – 10, women – 18

Table 3

Average daily vitamins and minerals (mg/day) in the diets of men and women as a function of age in Yakutsk 60 years and older, M±m

Age groups / indicators	60-69 years (I group) (n=179)	70-79 years (II group) (n=192)	80-89 years (III group) (n=132)	90 years and older	p*
Vitamin A, RE	p*	0.46±0.03	0.52±0.06	0.52±0.06	I- III***, II-III**
β-carotene	3.88±2.47	3.19±1.62	2.49±1.76	2.15±1.67	I- III***, I-IV***, II-III***, II-IV***
Vitamin B_1	1.03±0.02	0.96±0.02	0.80±0.03	0.72±0.04	I- II*, I- III***, I-IV***, II-III***, II-IV***
Vitamin B_2	1.32±0.04	1.21±0.03	1.05±0.04	0.96±0.05	I- II*, I- III***, I-IV***, II-III***, III-IV***
Vitamin PP	13.05±0.34	11.64±0.28	10.41±0.33	10.58±0.54	I- II**, I- III***, II-III***, II-IV**
Vitamin C	102.70±4.47	92.54±4.45	68.56±4.29	60.04±4.65	I- II*, I- III***, I-IV***, II-III***, II-IV***
Sodium	1632.95±44.39	1541.80±35.90	1266.52±36.92	1145.39±62.55	I- III***, I-IV***, II-III***, II-IV**, III-IV***
Potassium	2528.16±93.10	2286.47±63.0	1934.86±71.75	1702.87±82.85	I- II*, I- III***, I-IV***, II-III***, II-IV***, III-IV*
Calcium	577.81±20.26	540.17±19.44	463.78±23.17	392.75±31.76	I- III**, I-IV***, II-III***, II-IV***, III-IV***
Magnesium	291.64±7.59	266.78±5.66	225.61±7.25	191.96±9.22	I- II*, I- III***, I-IV***, II-III***, II-IV**, III-IV***
Phosphorus	1055.04±26.67	971.33±23.22	837.66±28.44	772.49±42.55	I- II*, I- III***, I-IV***, II-III***, II-IV***
Iron	19.13±0.41	18.09±0.32	16.07±0.41	14.02±0.52	I- III***, I-IV***, II-III***, II-IV***, III-IV***

Note: *p- reliability of differences between age groups, *p<0.05; **p<0.01; ***p<0.001.

age group 60-69 years old consumption is higher, while in the diet a tendency to lower vitamins and minerals was revealed, reaching a minimum in long-livers (90 years and over).

In our study, the average micronutrient status scores based on actual dietary intake in the elderly were comparable to those of other studies [2, 3, 7, 9, 10, 13]. It should be noted that micronutrient deficiencies in the daily diet contribute to changes in the chemical composition and energy value of the diet. Such changes lead to an imbalanced diet and indicate a high risk of developing malnutrition syndrome (malnutrition) in the elderly. The main reasons are both physiological features and a decrease in the amount of food intake, restriction of food intake, decreased physical activity and the presence of chronic diseases with age.

This indicates the need for timely and regular nutritional assessment in the elderly, identification of causes, correction and treatment of identified disorders [5].

Conclusion. Analysis of the results of our study showed that in all respondents the profile of micronutrient composition of the studied vitamins and microelements in the daily diet of the actual diet was assessed as deficient. The average daily intake of vitamins in the male population was significantly higher compared to that in women, with the exception of the intake of vitamin C and β-carotene, where no significant differences were found.

The daily diets of the general elderly population revealed an increased intake of sodium, phosphorus, and iron and a deficit in calcium and magnesium intake. Men were found to have significantly higher intake of sodium, magnesium, phosphorus, and iron than the female population. No significant gender differences were found in potassium and calcium intake. It should be noted that with age there is a tendency to decrease the level of consumption of micronutrients in the diet. Such changes are associated with the physiological characteristics of the elderly, changes in eating behavior (reduction of food intake, limitation of food intake), decreased physical activity and the presence of chronic diseases with age.

Thus, the identified disorders of nutritional status in older age groups suggest the presence of manifestations of malnutrition syndrome, which worsens the health prognosis of the elderly and senile population.

Reference

1. Анализ фактического питания геронтов г. Якутска / В.Н. Неустроева, Г.И. Симонова, Е.С. Кылбанова [и др.] // Якутский медицинский журнал. – 2012. – №2 (38). – С.83-85. [Analysis of actual nutrition of heroes in Yakutsk. Neustroeva V.N., Simonova G.I., Kylbanova E.S. [et al.]. Yakutsk Medical Journal. 2012; 2(38): 83-85 (in Russ.).]

2. Витаминная обеспеченность взрослого населения Российской Федерации: 1987-2017 гг. / В.М. Коденцова, О.А. Вржесинская, Д.Б. Никитюк [и др.] // Вопросы питания. – 2018. – Т. 87, № 4. – С. 62-68. DOI: 10.24411/0042-8833-2018-10043. [Vitamin supply of the adult population of the Russian Federation: 1987-2017. Kodentsova V.M., Vrzesinskaya O.A., Nikityuk D.B. [et al.]. Voprosy Pitaniia. 2018; 87(4): 62-68 (in Russ.).] DOI: 10.24411/0042-8833-2018-10043

3. Досжанова Г.Н. Гигиеническая оценка пищевого статуса населения геронтологической службы / Г.Н. Досжанова, А.А. Абдулдаева // Гигиена и санитария. – 2017. – Т.96 (11). – С. 1084-1087. [Doszhanova G.N., Abduldaeva A.A. Hygienic assessment of the nutritional status of the population of gerontological services. Hygiene and Sanitation. 2017; 96(11): 1084-1087 (in Russ.).]

4. Манчук, В.Т. Этнические и экологические факторы в развитии патологии у коренного населения Севера и Сибири / В.Т. Манчук // Бюллетень СО РАМН. – 2012. – Т. 32, № 1. – С. 93-98. [Manchuk, V.T. Ethnic and ecological factors in the development of pathology in the indigenous population of the North and Siberia. Bulletin of the Siberian Branch of RAMS. 2012; 32 (1): 93-98 (in Russ.).]

5. Недостаточность питания у госпитализированных пациентов пожилого и старческого возраста. Клинический случай / В.С. Остапенко, М.М.-Б. Балаева, Н.К. Рунихина [и др.] // Российский журнал гериатрической медицины. – 2021. – № 01. – С. 110-115. DOI: 10.37586/2686-8636-1-2021-110-115. [Nutritional deficiencies in hospitalized elderly and senile patients. Clinical case / Ostapenko V.S., Balaeva M.-B., Runikhina N.K. [et al.]. Rus.Journ.Geriatric Medicine. 2021;01: 110-115 (in Russ.).] DOI: 10.37586/2686-8636-1-2021-110-115]

6. О новых (2021) Нормах физиологических потребностей в энергии и пищевых веществах для различных групп населения Российской Федерации / А.Ю. Попова, В.А. Тутельян, Д.Б. Никитюк // Вопросы питания. 2021. – Т. 90, № 4. С. 6-19. DOI: https://doi.org/10.33029/0042-8833-2021-90-4-6-19. [On the new (2021) Norms of physiological needs in energy and nutrients for different groups of population of the Russian Federation / Popova A.Yu., Tutelyan V.A., Nikityuk D.B. Voprosy Pitaniia. 2021; 90(4): 6-19 (in Russ.).] DOI: https://doi.org/10.33029/0042-8833-2021-90-4-6-19

7. Оценка фактического питания пожилых людей, проживающих на территории республики Башкортостан / Т.К. Ларионова, А.Б. Бакиров, Р.А. Даукаев // Вопросы питания. – 2018. – Т. 87, № 5. – С. 37-42. DOI: 10.24411/0042-8833-2018-10051. [Evaluation of the actual nutrition of the elderly living in the Republic of Bashkortostan. Larionova T.K., Bakirov A.B., Daukaev R.A. Voprosy Pitaniia. 2018; 87(5): 37-42 (in Russ.).] DOI: 10.24411/0042-8833-2018-10051

8. Питание и Север: гигиенические проблемы Арктической зоны России (обзор литературы) / А.В. Истомин, И.Н. Федина, С.В. Шкурихина [и др.] // Гигиена и санитария. – 2018. – Т.97 (6). – С. 557-563. [Nutrition and the North: Hygienic problems of the Arctic zone of Russia (literature review). Istomin A.V., Fedina I.N., Shkurikhina S.V. [et al.]. Hygiene and Sanitation. 2018; 97(6): 557-563 (in Russ.).]

9. Проблема минеральной недостаточности при хроническом панкреатите в зависимости от возраста / Л.С. Бабинец, Н.А. Шевченко, Л.С. Цибульская // Вопросы питания. – 2019. – Т. 88, № 2. – С. 58-63. DOI: 10.24411/0042-8833-2019-10018. [The problem of mineral deficiency in chronic pancreatitis depending on age. Babinets L.S., Shevchenko N.A., Tsibulskaya L.S. Voprosy Pitaniia. 2019; 88(2): 58-63 (in Russ.).] DOI: 10.24411/0042-8833-2019-10018

10. Сравнение данных оценки витаминной обеспеченности населения Арктической зоны России с помощь. Расчетных и биохимических методов / Н.А. Бекетова, О.А. Вржесинская, Э.Э. Кешабянц [и др.] // Российский медико-биологический вестник имени академика И.П. Павлова. – 2019. – Т.27, №1. – С. 41-48. [Comparison of data on vitamin availability estimation of the population of the Arctic zone of Russia with the help of. Calculated and biochemical methods. Beketova N.A., Vrzesinskaya O.A., Keshabyants E.E. [et al.]. Russian Med. and Biological Bulletin. 2019; 27(1): 41-48(in Russ.).]

11. Старческая астения: что необходимо знать о ней врачу первичного звена? О.Н. Ткачева, Ю.В.Котовская, В.С.Остапенко [и др.] // РМЖ. – 2017. – №25. – С. 1820-1822. [Asthenia gravis: what does a primary care physician need to know about it? Tkacheva O.N., Kotovskaya Yu.V., Ostapenko V.S. [et al.]. RMJ. 2017; 25: 1820-1822 (in Russ.).]

12. Структура питания населения России на рубеже XX и XXI столетий / А.К. Батурин, А.Н. Мартинчик, А.О. Камбаров // Вопросы питания. – 2020. – Т. 89, № 4. – С. 60-70. DOI: https://doi.org/10.24411/0042-8833-2020-10042. [Nutritional structure of the Russian population at the turn of the XX and XXI centuries. Baturin A.K., Martinchik A.N., Kambarov A.O. Voprosy Pitaniia. 2020; 89(4): 60-70 (in Russ.).] DOI: https://doi.org/10.24411/0042-8833-2020-10042

13. Федеральная служба государственной статистики. Выборочное наблюдение рациона питания населения 2018. URL: https://rosstat.gov.ru/free_doc/new_site/food18/index.html. [Federal State Statistics Service. Sample observation of the diet of the population 2018. URL: https://rosstat.gov.ru/free_doc/new_site/food18/index.html (in Russ.).]

14. Dynamics of the double burden of malnutrition and the changing nutrition reality. Popkin B.M., Corvalan C., Grummer-Strawn L.M. Lancet. 2020; 395(10): 65-74. DOI: https://doi.org/10.1016/S0140-6736(19)32497-3

15. Global nutrition transition and the pandemic of obesity in developing countries. Popkin B.M., Adair L.S., Ng S.W. Nutr. Rev. 2012; 70: 3-21. DOI: https://doi.org/10.1111/j.1753-4887.2011.00456.x