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CURRENT HEALTH ISSUES IN THE ARCTIC ZONE OF THE REPUBLIC OF SAKHA (YAKUTIA)

DOI 10.25789/YMJ.2024.87.19

UDC 614.2(571.56-17)

Introduction. Despite the important strategic importance of the Arctic zone of the Republic of Sakha (Yakutia), it has been experiencing negative population dynamics for more than a quarter of a century. This fact has increased the costs of social and medical services, education, and has threatened the traditional economic activities of indigenous peoples. Moreover, there is a widespread shortage of highly qualified personnel, including medical personnel, in the Arctic, which is an additional trigger for population outflow.

Objective. To analyze the problems of modern health care in the Arctic zone of RS(Ya) as a territory with extremely specific socio-ecological conditions.

Methods. The research methodology was based on the data of the State Statistics Committee, reporting materials of district and seconded medical workers, as well as the educational and methodological department of the Medical Institute of the North-Eastern Federal University.

Results. A comprehensive analysis of the problems of modern healthcare in the region with specific socio-ecological conditions is presented, and practical recommendations for their resolution to improve medical services for the population of the Arctic zone of Yakutia are proposed. Much attention is paid to the problem of shortage of qualified personnel, material and technical provision of health care. The work of the Ministry of Health of the Republic of Sakha (Yakutia) to resolve some of the most pressing issues is shown.

Conclusion. One of the main unsolved problems of the Arctic health care is the low staffing of doctors, including graduates of the NEFU Medical Institute. It is a complex problem and to solve it it is necessary to strengthen the work on improving working and living conditions for medical workers and material and technical base of medical institutions, introduction of new technologies. It is important to pay attention to vocational guidance of graduates of schools of AZ RS(Ya). Taking into account the temporary effect of the programs "Zemsky Doctor" and "Zemsky Feldsher", we consider it necessary to provide preferential conditions for assignment of labor pension for medical workers working in the Arctic zone. Integration of new technologies, improvement of infrastructure and creation of programs to retain and attract medical workers are important steps not only to improve the health care system in the Arctic zone of the RS(Ya), but should also contribute to reducing the outflow of population.

Keywords. Arctic zone; health care organization; population dynamics, staff shortage, Yakutia.

Introduction. The Arctic zone of the Republic of Sakha (Yakutia) (AZ RS(Ya)) occupies more than 40% of the Arctic zone of Russia and more than half of the region's area. This vast area, divided into 3 time zones, is not only a strategically important territory of the Russian Federation, but also a settlement area for the indigenous peoples of the North, where their language and original culture are preserved due to their traditional way of life and economic activities. AZ RS(Ya) is also rich in mineral resources and has an impressive recreational potential due to its diverse natural conditions**.** However, remoteness from the center, dispersed settlement of residents, a significant number of small and medium-sized rural settlements, focal character of industrial and economic development and poorly developed social and transport infrastructure against the background of extreme climate cause its significant dependence on the "big earth", high resource intensity, dependence on supplies from other regions and low living standards of the local population. As a result of the above, the population of AZ RS(Ya) has decreased by more than a quarter in the last two decades alone. The loss of people has increased the costs of social and medical services, education, created a shortage of personnel (especially highly qualified) and a threat to traditional economic activities, as well as created a noticeable imbalance in the capital of the region, where the economically active part of the Far North residents mainly resettle.

Objective. To analyze the problems of modern public health care in AZ RS(Ya) as a territory with extremely specific socio-ecological conditions.

Materials and methods. To analyze the long-term population dynamics in the Yakut Arctic, the authors used data from the Federal State Statistics Service of the Republic of Sakha (Yakutia), including materials from the 2002 and 2020 All-Russian Population Censuses (ARPC). Information on the number and technical condition of buildings of medical institutions, staffing with doctors and nurses, the most common problems encountered in the course of work of the Arctic medical institutions of Yakutia was obtained from the heads of central district hospitals of AZ RS(Ya). Data on applicants enrolled in the NEFU Medical Institute and their academic performance were provided by the educational and methodological department of the mentioned educational institution. The results of the work of mobile medical teams and sanaviation are presented by the Yakutsk Republican Oncological Dispensary (YAROD), the Regional Center of the RS(Ya) (YAROD), the Regional Center for Mobile Brigades and the Republican Center for Disaster Medicine of the Ministry of Health of the RS(Ya).

Results and discussion. As can be seen from Table 1, from 2002 to 2020, the number of children in AZ RS(Ya) de-

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creased by 31.4% (from 24407 to 16748 people), while the number of citizens over 60 years old increased by 57.7% (from 6271 to 9888 people). In the region as a whole, the number of children decreased insignificantly (-5.0%), while the number of the elderly increased by 88.4%. additional evidence of the outflow of young people from AZ RS(Ya) is evidenced by a direct correlation (r = +0.7) between the population outflow indicator by ulus (%) and the share of Arctic residents over 60 years old in 2020.

When analyzing the national composition of the population, it is clearly seen that the loss of Arctic residents (in some areas up to 1/3 and higher, for example, Verkhnekolymsky or Ust-Yansky uluses) is due to the departure of the non-indigenous population. Thus, if in 2002 their share in the total structure of AZ residents was 32.3%, by 2020 this figure is 20.9% (tab. 2).

Due to remoteness and lack of year-round land communication with the central part of the region, one of the pressing problems of the residents of AZ RS(Ya) is high prices for all goods and air tickets, so not all residents have the opportunity to travel to Yakutsk every year. In addition, due to climatic conditions almost throughout the territory of AZ RS(Ya), the population has no opportunity to fully engage in crop production. Undoubtedly, the extremely specific conditions of the Arctic have a significant impact on the human body - the lack of biologically active ultraviolet radiation, increased electromagnetic activity, winds, low air temperatures and other features of the North can lead to exacerbation of chronic diseases, the appearance of the so-called polar stress syndrome and other serious health disorders, as well as an increase in mortality from external causes [3, 7, 13-15]. Moreover, according to a number of researchers, due to the small indigenous population and the peculiarities of their settlement, Yakutia has a high incidence of hereditary diseases [2, 11, 16]. It should be emphasized that the climatic changes observed in recent decades lead to the destruction of permafrost, which in turn increases methane emissions, which is a catalyst of global warming [1]. This is not only a direct threat to the entire infrastructure of the Arctic, but also new environmental problems, including prerequisites for expanding the range of vectors and pathogens of various diseases and carrying dangerous infections of the past from permafrost soils [8].

Analysis of literature data shows that a significant part of the population of the Arctic zone of Russia is dissatisfied with the quality of medical care received. Thus, in the research conducted in 2017 in the Murmansk Oblast, the activity of the regional health care system was rated "unsatisfactory" by 34.9% [10]. In 2019 in the Yamalo-Nenets Autonomous District, only 16.9% of respondents were satisfied with the quality of medical services provided [9]. This is despite the fact that a significant proportion of respondents in these regions were residents of cities. Unfortunately, no such surveys have been conducted in remote areas of Yakutia in recent years, except for Oymyakonsky ulus, the question of including it in the AS of RS(Ya) is still open [4-6]. Thus, in the course of the medical and social survey conducted in the spring of 2023, it was found that 9.3% of the district residents were fully satisfied with the work of doctors, 22.4% with the work of nursing staff, and 4.1% with the quality of medical care In general, more than 40% of the surveyed Oymyakon residents planned to change their place of residence. And it was dissatisfaction with the quality of medical services that was the most significant reason for the proposed departure, while harsh climatic conditions and unemployment were only secondary predictors [12].

It can be confidently stated that a similar situation is observed in all Arctic uluses, because out of 84 settlements of AZ RS(Ya) about half of them are located at a distance of more than 100 km (by air) from their ulunar centers, and more than 80% have no land communication with them for six months and more. For example, the village of. Kharyyalakh village of Olenek ulus, located only 2 kilometers from the ulus center in the spring and autumn period remains cut off from the Central Regional Hospital. That is, given the sparsely populated AZ RS(Ya), it is obvious that the generally accepted indicators of provision of the population with medical workers or beds (people/10 thousand people) should not be used as an indicator of the state of health care in this area. For the same reason, due to the law of small numbers, even insignif-

Table 1

Age structure of residents of AZ RS(Ya) according to the 2002 and 2020 National Population Census

District/Ulus	Total. people.	up to 15 years		60 +		Old age index	Total. people.	up to 15 years		60 +		Old age index
		people.	%	people.	%			people.	%	people.	%	
	2002						2020					
Abyisky	4750	1400	29.5	456	9.6	32.6	3838	900	23.4	654	17.0	72.7
Allanhovsky	3421	1013	29.6	263	7.7	26.0	2379	612	25.7	432	18.2	70.6
Anabarsky	4024	1386	34.4	193	4.8	13.9	3479	1095	31.5	321	9.2	29.3
Bulunsky	9775	2657	27.2	565	5.8	21.3	7706	1892	24.6	888	11.5	46.9
Verhnecolymsky.	5653	1366	24.2	542	9.6	39.7	3803	846	22.2	797	21.0	94.2
Verkhoyansky.	13666	4332	31.7	1108	8.1	25.6	10037	2408	24.0	1614	16.1	67.0
Zhigansky	4312	1352	31.4	359	8.3	26.6	4177	1246	29.8	599	14.3	48.1
Momsky	4699	1592	33.9	385	8.2	24.2	3733	1098	29.4	588	15.8	53.6
Nizhnekolymsky	5932	1581	26.7	490	8.3	31.0	4214	1059	25.1	705	16.7	66.6
Olenek	4091	1465	35.8	295	7.2	20.1	4313	1386	32.1	482	11.2	34.8
Srednekolymsky.	8353	2637	31.6	811	9.7	30.8	6805	1770	26.0	1310	19.3	74.0
Ust-Yansky	10009	2724	27.2	583	5.8	21.4	6810	1595	23.4	1108	16.3	69.5
En. -Bytantai	2761	902	32.7	221	8.0	24.5	2913	841	28.9	390	13.4	46.4
Total/average*	81446	24407	30.0*	6271	7.7*	25.7	64 207	16748	26.1*	9888	15.4*	59.0
for RS(Ya)	949280	251880	26.5	79109	8.3	31.4	995686	239300	24.0	149046	15.0	62.3

icant annual changes in the number of sick or dead people per 100 thousand population show significant fluctuations in the context of districts. By the way, the data on the number of population presented in official sources actually differ greatly from the real figures to a lesser extent. For example, in rural settlements of Nizhnekolymsky ulus there are currently 844 people (including 254 children), while in the data of the ERP-2020 there are 1591 people. In Utaya village of Verkhnekolymsky ulus, no more than 25 people actually live in the winter period, i.e. 4 times less than indicated in the WHI data.

Thus, for the average Arctic resident living outside the district center, which is about half of the population, the first priority issue is to overcome the road to the Central Regional Hospital. Similar difficulties arise for health care workers traveling to the districts. In addition, many local medical institutions have problems due to the lack or malfunction of transportation, diagnostic and treatment equipment necessary for the area. As a rule, high tariffs for public utilities are noted everywhere. Often there are difficulties with delivery of medicines. Low speed and instability of Internet connection, as well as high prices for communication services, create significant interference in the activities of medical institutions, do not allow to fully use modern technologies.

Particular attention should be paid to the high level of deterioration of buildings at the CRBs. For example, as of 2024, 4 out of 10 buildings at the Abyisk CRH are in emergency condition, in Verkhnekolymskiy ulus - 7 out of 15, and in Srednekolymskiy ulus 8 out of 12 buildings were built more than 30 years ago (Table 3). In total, as of the first half of 2024, 65% of all buildings in the CDBs either require major repairs or are in emergency condition. However, it should be noted that over the last 2-3 years there have been significant positive changes in improving the material and technical base of district medical institutions. Thus, within the framework of the national project "Health Care", which envisages measures to improve the material and technical base of district medical institutions, new FAPs appeared in Bykovsky village of Bulunsky ulus (2022), in Chkalov village of Allaihovsky ulus (2023) and in Khayyr village of Ust-Yansky ulus (2023). In 2021, medical outpatient clinics will be commissioned in Aleko-Kyuel village of Srednekolymsky ulus and Kuberganya village of Abyisky ulus, and in 2022, in Nalimsk village of Srednekolymsky ulus. - in Nalimsk village of Srednekolymsky ulus, Nelemnoye village of Verkhnekolymsky ulus, Saidy village of Verkhoyansk ulus, Kustur village of Eveno-Bytantai ulus and Ust-Kuiga village of Ust-Ya ulus; in 2023 - in Kyusyur village of Bulunsky ulus and Andryushkino village of Nizhnekolymsky ulus. Andryushkino village of Nizhnekolymsky ulus, and in 2024 - in Sasyr village of Momsky ulus. Also in Moma ulus (Khonuu village), a three-storey hospital complex with adult and children's polyclinics was inaugurated on March 12, 2024.

Although a number of uluses actively practice social support measures for newly arrived medical workers, living conditions do not always meet the needs of specialists, especially in the cold season. Moreover, with the exception of participants of the "Zemsky Doctor/"Zemsky Feldsher" program, newly arrived medical workers do not have permanent res-

Table 2

Data on the number and composition of the population in AZ RS(Ya)

District/Ulus	Population, thousand people		National composition, % (according to National Population Census data)					
			2002			2020		
	2000	2023	КМНС	саха	другие	КМНС	саха	другие
Abyisky	5.1	3.8	5.9	80.9	13.2	10.3	80.2	9.5
Allanhovsky	3.7	2.3	20.7	39.9	39.4	26.4	38.2	35.4
Anabarsky	3.9	3.5	45.4	27.3	27.3	76.3	19.2	4.5
Bulunsky	9.9	8.0	30.3	23.2	46.5	40.8	24.4	34.8
Verhnecolymsky.	6.1	3.7	10.3	25.9	63.8	16.7	28.3	55.0
Verkhoyansky	15.2	10.0	3.2	70.2	26.6	5.2	78.7	16.1
Zhigansky	4.5	4.1	49.1	33.5	17.4	63.5	25.0	11.5
Momsky	4.7	3.8	17.9	70.0	12.1	31.0	62.1	6.9
Nizhnekolymsky.	6.7	4.2	22.9	18.7	58.4	37.2	17.5	45.3
Olenyoksky	4.1	4.4	64.0	30.5	5.5	83.4	13.9	2.7
Srednekolymsky.	8.4	6.7	5.6	80.8	13.6	8.8	79.8	11.4
Ust-Yansky	11.9	6.8	11.6	37.7	50.7	22.2	46.7	31.1
En. -Bytantai	2.7	2.9	43.6	53.4	3.0	59.4	39.0	1.6
Total/average*	86.9	64.2	20.3*	47.5*	32.2*	32.4*	46.7*	20.9*
Average for RS(Ya)	…	…	3.5	45.5	51.0	4.2	47.1	48.7

Table 3

Number and technical condition of medical buildings in AZ RS(Ya) as of the first half of 2024

Hospital facilities	Район/улус													Total
	Abyisky	Allanhovsky	Anabarsky	Bulunsky	Verhnecolymsky.	Verkhoyansky	Zhigansky	Momsky	Nizhnekolymsky.	Olenyoksky	Srednekolymsky.	Ust-Yansky	Eveno-Bytantai	
CDP	1	1	1	1	1	1	1	1	1	1	1	1	1	13
Community hospitals	-	-	-	-	-	-	-	-	1	-	-	-	-	1
City hospitals	-	-	-	-	-	1	-	-	-	-	-	-	-	1
Doctor's clinics	5	-	1	5	3	7	1	1	1	3	9	4	1	41
Antitussive dispensaries		-	-	-	-	1	1	-	1	-	-	-	-	3
FAP	1	4	-	2	2	11	2	4	-	-	-	5	1	32
FP	-	-	-	-	-	-	-	-	1	-	-	-	-	1
Total	7	5	2	8	6	21	5	6	5	4	10	10	3	92
Number of CRB buildings	10	7	3	10	15	40	5	6	8	6	12	14	6	142
including emergency	4	2	1	4	7	17	1	3	4	2	5	4	2	56
overhaul	4	2	0	2	2	16	1	-	2	0	2	4	1	36
Number of CRB buildings commissioned in 2014-2024	1	1	0	1	1	5	1	2	2	0	3	4	1	22

idence registration, which deprives them of the benefits provided for residents of AZ RS(Ya), for example, the purchase of air tickets at subsidized prices. All the described problems cause a high turnover of migrant staff. This was observed during the COVID-19 pandemic - there were cases when specialists left uluses in pursuit of "covid payments". The shortage of highly specialized doctors, including infectious disease specialists, psychiatrists-drug specialists, ophthalmologists, neurologists, etc. should be considered a separate problem. Unfortunately, due to the small number of the Arctic population it is not possible to organize a full-fledged geriatric service, although over the last two decades the number of people in the AS of RS(Ya) over 60 years of age has increased significantly.

In general, the staffing levels of doctors (59.7%) and EMTs (69.7%) are low throughout the Arctic, which means that in some areas specialists are forced to combine 2-3 positions. It should also be recognized that the effect of the "Zemsky Doctor" and "Zemsky Feldsher" programs implemented since 2012 is only temporary - in the vast majority of cases, specialists are initially set up for a short period of work.

It is important to emphasize that among newly arrived medical workers, the share of graduates of the NEFU Medical Institute remains low (54.8%), while it is this educational institution that should be the main forge of the medical elite of the republic (tab. 4). By the way, in the period from 2018 to 2023, from the total number of those admitted to the MI NEFU (n = 2451), only 3.8% are natives of AZ RS(Ya). At the same time, even after passing the competitive selection, graduates of northern schools are much more likely to drop out than other students. Thus, according to the data of the educational and methodological department of MI NEFU, out of 269 natives of AZ RS(Ya), enrolled in the specialties "Medicine", "Dentistry" and "Pediatrics" in the period from 2010 to 2023, 33.8% (91 people) received a diploma of graduation, 29.7% (80 people) are studying or are on leave of absence, 36.4% (98 people) were expelled. Most of the total number of students on leave of absence and expelled dropped out due to the low level of basic secondary education, primarily in the subjects "chemistry" and "biology". This is another clear evidence that the problem of shortage of medical personnel in the North is complex and should not be placed solely on the shoulders of higher education or the Ministry of Health.

Table 4

Information on the number of medical workers and staffing of medical institutions in AZ RS(Ya) as of the first half of 2024

Ulus												
Abyisky	Allanhovsky	Anabarsky	Bulunsky	Verhnecolymsky.	Verkhoyansky	Zhigansky	Momsky	Nizhnekolymsky.	Olenek	Srednekolymsky.	Ust-Yansky	Eveno-Bytantai
Absolute number of doctors/including NEFU graduates, people												
15/9	12/3	9/6	33/20	19/5	38/18	19/14	12/9	15/4	16/12	24/19	28/9	10/9
Absolute number of nursing staff/including graduates of Yakutia's educational institutions, people												
54/52	27/27	30/29	72/68	39/28	128/114	48/48	50/48	35/14	39/27	79/75	71/31	30/30
Physician staffing, %												
51,7	55,8	58,7	63,5	69,1	58,5	71,6	55,8	42,5	54,0	63,5	54,9	76,9
Staffing of nursing staff, %												
78,8	60,0	71,8	58,8	73,5	61,1	84,2	78,1	47,2	69,0	72,5	57,7	93,9

Table 5

Performance indicators of IMBs in the Arctic uluses of the RS(Ya) for 2023

Район/улус	Quantity of medical team sorties per year	Total length of stay, days	Settlements visited	Persons examined		Coverage (of the total number of inhabitants on the	Diseases detected for the first time, cases	Taken from Dispensary registration, people	Referred to republican medical institutions, persons
				total	including children				
Abyisky	3	42	7	2440	870	64,4	365	60	117
Allanhovsky	3	30	5	1396	453	59,4	282	76	203
Anabarsky	3	30	2	1938	673	56,1	442	289	286
Bulunsky	4	52	8	2983	1006	37,3	873	29	201
Verhnecolymsky.	3	39	6	1749	410	46,7	342	73	285
Verkhoyansky	4	80	19	5522	2407	55,2	1158	191	681
Zhigansky	4	31	4	2327	1090	57,0	713	88	370
Momsky	3	33	7	2371	817	62,7	641	249	342
Nizhnekolymsky.	4	46	4	2132	882	50,6	405	27	151
Olenek	3	29	4	1683	434	38,6	440	125	241
Srednekolymsky.	5	66	10	4172	1632	61,9	861	148	507
Ust-Yansky	4	60	10	3157	787	46,4	812	318	324
En. -Bytantai	3	26	3	1356	423	46,0	279	113	188
Total	46	564	89	33226	11884	51,7	7613	1786	3896

Taking into account all the above-mentioned, in order to retain doctors in rural areas it is necessary not only to improve working and living conditions of doctors, to strengthen the work on target distribution of young specialists, but also to pay special attention to vocational guidance of entrants starting from school, as well as to strengthen the subject training of graduates in specialized subjects. In addition, in our opinion, an effective lever for attracting new personnel to remote uluses would be the introduction of additions to the RF Government Decree of

September 22, 1999 N 1066 on the provision of preferential conditions for the appointment of labor pensions for medical workers working in the Arctic zone.

Nevertheless, despite the numerous difficulties in work, the republic continues active activities on medical examination of the population of remote areas of the republic. For example, one of the achievements of regional healthcare is the creation of a mobile multidisciplinary brigade "Oncodesant", consisting of oncologists from YaRD. In the period from 2020 to 2023, working in close connection with ulu medical institutions, the specialists visited almost all Arctic uluses, except Bulunsky, where they examined 3,841 people. In the course of research, 33 cases of cancer were identified, and 169 people were sent to Yakutsk for further examination.

It was possible to significantly improve the provision of comprehensive medical care to the residents of AZ RS(Ya) thanks to the implementation of a large-scale project of the Ministry of Health of the RS(Ya), developed and implemented with the active support of a number of other regional bodies - the Ministry of Arctic Development of the RS(Ya), the Ministry of Transport of the RS(Ya) and the Ministry of Innovation of the RS(Ya). Thus, on January 30, 2023[1] a Regional Center of Mobile Brigades was established on the basis of the Republican Center of Public Health and Medical Prevention. At present, the center unites 7 multidisciplinary teams (including one pediatric team), staffed with specialists of narrow focus and all necessary equipment. During the first year of operation, the mobile multidisciplinary teams visited each of the Arctic uluses at least 3 times. The total time spent in each district averaged 1.5 months (Table 5). During this period, the doctors traveled to all settlements of the Yakut Arctic and examined 33226 people, including 11884 children. In addition to scheduled examinations, 359 patients received home care and 159 received emergency care. Also 72 small surgical interventions were performed. Unfortunately, a psychiatrist-narcologist and a clinical psychologist were present only during the visit to Ust-Yansky ulus. In general, the results of the IMB's activities have shown the best side, and therefore, from 2024, the area of their activities began to cover 5 more industrial uluses - Mirny, Neryungri, Lensk, Aldan and Oymyakonsk.

Introduction of such projects into practical healthcare not only increases the quality of medical care, promotes timely diagnosis of diseases, forms a culture of public health, but also obviously significantly reduces financial costs for residents of remote uluses. As for prompt medical assistance in AZ RS(Ya), the activities of sanaviation undoubtedly play an invaluable role here. According to the data of the Republican Center for Disaster Medicine, in 2020-2023, 2510 sanaviation missions were carried out in the Yakut Arctic, 3,833 patients were assisted, including 742 with COVID-19[2] .

All the above-mentioned expeditions provide invaluable assistance to uluses medical institutions. Therefore, it is obvious that all this work will continue. In this regard, we consider it expedient to find funds for the construction of additional residential modular comfortable premises at the Arctic CRBs both for medical workers arriving for permanent work and for the rest of seconded specialists.

Conclusion. The study of the current state of health care in AZ RS(Ya) reveals serious challenges and problems arising in the unique socio-ecological conditions of this region. The mass outflow of people from this territory is associated with a number of factors, among which dissatisfaction of the population with medical care takes one of the leading places. To address this problem, under the auspices of the Ministry of Health of the RS(Ya), mobile teams of doctors have been created since 2020 to serve residents of hard-to-reach settlements in the Arctic and industrial areas. It is important to emphasize that a significant contribution to strengthening the material and technical base of the Arctic CDCs was made by the implementation of the national project "Health Care", thanks to which 14 health care facilities were built in AZ RS(Ya) in 2021-2024.

However, the problem of low staffing of physicians in RS(Ya) AH, including graduates of the Medical Institute of the North-Eastern Federal University (NEFU) currently requires close attention. It is a complex problem and its solution requires consolidation of various regional agencies. It is necessary to strengthen work on improving working and living conditions for medical workers and the material and technical base of medical institutions, to introduce new technologies, to focus on career guidance for schoolchildren, to strengthen scientific research and medical and social projects in the field of Arctic medicine. Taking into account the temporary effect of the programs "Zemsky Doctor" and "Zemsky Feldsher", we consider it necessary to provide preferential conditions for the appointment of labor pensions for medical workers working in the Arctic zone.

[1] Order of the Ministry of Health of the RS(Ya) No. 01-07/163 dated January 30, 2023.

[2] Reference from the Republican Center for Disaster Medicine of the Ministry of Health of the RS(Ya) dated 26.03.2024 No. 0118/180.

References

1. Arustamova IS, Isaeva LO, Ostapenko PR. Ekologicheskie posledstviya vy`brosov metana v atmosferu [Environmental consequences of methane emissions into the atmosphere]. Nauchny`e chteniya imeni professora N.E. Zhukovskogo: Sb. nauch. st. XIII Mezhdunar. nauch.-prakt. konf., Krasnodar, 21-22 dekabrya 2022 g. [Scientific readings named after Professor N.E. Zhukovsky: Sat. scientific Art. XIII Int. scientific-practical Conf., Krasnodar, December 21-22, 2022. Krasnodar, 2023:186-190 (In Russ.).]

2. Aftanas LI, Voevoda MI, Puzyryov VP, et al. Arkticheskaya medicina v XXI veke [Arctic medicine in the XXI century]. Vestnik Rossijskoj akademii nauk [Bulletin of the Russian Academy of Sciences. 2015; 85 (5-6): 501-506 (In Russ.).] doi: 10.7868/S086958731506002X

3. Gmoshinsky IV, Nikityuk DB. Polyarny`j stress: mexanizmy` i modelirovanie v e`ksperimente [Polar stress: mechanisms and experimental modeling]. Vestnik Rossijskoj akademii medicinskix nauk [Bulletin of the Russian Academy of Medical Sciences. 2022; 77 (6): 447-457 (In Russ.).] doi: 10.15690/vramn2209

4. Polar stress: mechanisms and experimental modeling //. 2022. T. 77, no. 6. pp. 447-457. (In Russ.) doi: 10.15690/vramn220911

5. Danilov YuG. Fiziko-geograficheskij podxod k vy`deleniyu Arkticheskoj zony` v Yakutii [Physiographic approach to the identification of the Arctic zone in Yakutia]. Arktika XXI vek. Estestvenny`e nauki [Arctic XXI century. Natural Sciences. 2016; 1: 4-9 (In Russ.).]

6. Ivanova RN. Klimat Ojmyakon`ya kak faktor otneseniya k territorii arkticheskoj zony` Rossijskoj Federacii [Climate of Oymyakon as a factor of classification as a territory of the Arctic zone of the Russian Federation]. Voprosy` geografii Yakutii. Vy`p. 12. Prirodno-klimaticheskie usloviya Severo-Vostochnoj Yakutii. Sbornik nauchny`x trudov [Issues of geography of Yakutia. Vol. 12. Natural and climatic conditions of North-Eastern Yakutia. Collection of scientific papers. Novosibirsk: Nauka, 2017: 32-37 (In Russ.).]

7. Ivanova TS. K voprosu o vklyuchenii Ojmyakonskogo ulusa Respubliki Saxa (Yakutiya) v sostav Arkticheskoj zony` Rossijskoj Federacii [On the issue of including the Oymyakonsky ulus of the Republic of Sakha (Yakutia) in the Arctic zone of the Russian Federation]. Xolod i zdorov`e: Sbornik materialov mezhdisciplinarnogo mobil`nogo nauchno-prakticheskogo seminara (24–29 marta 2021 g.) / Pod red. S.S. Slepczova. Novosibirsk: Nauka [Cold and health: Collection of materials from an interdisciplinary mobile scientific and practical seminar (March 24–29, 2021) / Ed. S.S. Sleptsov. Novosibirsk: Nauka, 2023: 24-33 (In Russ.).] doi 10.7868/978-5-02-041524-9(3)

8. Konnova LA, Lvova YuV, Rudnev EV. O vliyanii polyarnogo siyaniya i geomagnitny`x bur` na texnosferu i naselenie v Arkticheskom regione [On the influence of the aurora and geomagnetic storms on the technosphere and population in the Arctic region]. Vestnik Sankt-Peterburgskogo universiteta Gosudarstvennoj

protivopozharnoj sluzhby` MChS Rossii [Bulletin of the St. Petersburg University of the State Fire Service of the Ministry of Emergency Situations of Russia. 2020; 3: 1-5 (In Russ.).]

9. Malkhazova SM, Mironova VA, Bashmakova IKh. Prirodnoochagovy`e bolezni v Arktike v usloviyax menyayushhegosya klimata [Natural focal diseases in the Arctic in a changing climate]. Vestnik Moskovskogo universiteta. Seriya 5: Geografiya [Bulletin of Moscow University. Episode 5: Geography. 2022; 1:43-57 (In Russ.).]

10. Markin VV, Silin AN, Vershinin IS. Zdorov`e lyudej v Arktike: social`no-prostranstvenny`j diskurs (na primere Yamalo-Neneczkogo avtonomnogo okruga) [Human health in the Arctic: socio-spatial discourse (using the example of the Yamalo-Nenets Autonomous Okrug)]. E`konomicheskie i social`ny`e peremeny`: fakty`, tendencii, prognoz [Economic and social changes: facts, trends, forecast. 2020; 13 (5): 182–199 (In Russ.).] doi: 10.15838/esc.2020.5.71.11

11. Polozhentseva OA. Uroven` i kachestvo zhizni kak faktor samorazvitiya mestny`x soobshhestv Murmanskoj oblasti [Level and quality of life as a factor in the self-development of local communities in the Murmansk region]. Vestnik Altajskoj akademii e`konomiki i prava [Bulletin of the Altai Academy of Economics and Law. 2020; 10-1:69-75; URL: https://vaael.ru/ru/article/view?id=1348 (date of access: 02/29/2024) (In Russ.).]

12. Savvina MT, Maksimova NR, Sukhomyasova AL, et al. Nasledstvenny`e bolezni i programmy` molekulyarno-geneticheskogo skrininga v geneticheski izolirovanny`x popu-lyaciyax [Hereditary diseases and carrier's screening programs in genetically isolated populations]. Medicinskaya genetika [Medical Genetics. 2022; 21(1):3-13 (In Russ.).] https://doi.org/10.25557/2073-7998.2022.01.3-13

13. Sleptsov SS, Andreev MN, Sleptsova SS. Vliyanie kachestva zdravooxraneniya na ottok naseleniya iz otdalenny`x rajonov Yakutii (na primere Ojmyakonskogo ulusa) [The influence of the quality of healthcare on the outflow of the population from remote areas of Yakutia (on the example of the Oymyakonsky ulus)]. Uspexi sovremennogo estestvoznaniya [Advances in modern natural science. 2023; 7: 42-48 (In Russ.).] doi: 10.17513/use.38069.

14. Solonin YuG, Boyko ER. Mediko-fiziologicheskie problemy` v Arktike [Medical and physiological problems in the Arctic]. Izvestiya Komi nauchnogo centra UrO RAN [News of the Komi Scientific Center of the Ural Branch of the Russian Academy of Sciences. 2017; 4(32): 33-40 (In Russ.).]

15. Tikhonov DG. Arkticheskaya medicina [Arctic medicine. Ed. V.A. Galkina, M.I. Tomsky; RAMS, SO, YSC CMP. Yakutsk: Publishing house YSC SB RAS, 2010: 313 (In Russ.).]

16. Tomsky MI. Naselenie promy`shlenny`x rajonov Yakutii i «sindrom polyarnogo napryazheniya [Population of industrial regions of Yakutia and the "polar voltage syndrome]. E`konomika Vostoka Rossii [Economics of the East of Russia. 2015; 1:78-81 (In Russ.).]

17. Fedorov AI. Sukhomyasova AL, Golikova PI, et al. Rasprostranyonnost` spinocerebellyarnoj ataksii 1 tipa v Yakutii: sovremennoe sostoyanie [Prevalence of spinocerebellar ataxia type 1 in Yakutia: current state]. Medicinskaya genetika [Medical genetics. 2020; 19(7): 29-30 (In Russ.).] doi: 10.25557/2073-7998.2020.07.29-30.

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ANALYSIS OF CORTISOL AND DEHYDROEPIANDROSTERONE-SULFATE LEVELS IN MALE NORTHERNERS: THE INFLUENCE OF GENERATION LIVING IN THE NORTH

DOI 10.25789/YMJ.2024.87.20

UDC: 612.45; 57.017.3

Relevance. The body's ability to resist the effects of harsh climatic and geographical conditions is determined by characteristics of adaptive mechanisms and the process of their change based on the hypothalamic-pituitary-adrenal axis and depending on the length of residence in the North.

Purpose. This study examined male Northerners to assess fluctuations in their cortisol and dehydroepiandrosterone-sulfate mean levels in the increasing reliance on the generation of residence in the North.

Methods. Seventy male residents of the Magadan Region (mean age 40.0±0.8 yrs) participated in the survey and made up subgroups varying with the length (generation) of residence in the North: the 0th generation (n=15), the 1st generation (n=35), and the 2nd-3rd generation (n=20). Immunochromatographic and immune enzyme analyses were applied in the research.

Results. Subjective mean levels of serum cortisol and dehydroepiandrosterone-sulfate and their ratio tended to significantly fluctuate based on the generation of residence in the North: the highest values were observed in examinees with the longest period of residence (2nd-3rd generation), and the lowest – in representatives with a shorter period of adaptation to the North extremes (0th generation). In addition, the cortisol concentrations in the evening saliva test were optimized according as we traced them in representatives of 0th to 2nd-3rd generations.

Conclusion. The study has resulted in referring serum cortisol and dehydroepiandrosterone-sulfate concentrations, their ratio, as well as cortisol concentrations in the evening saliva tests to significant markers that reflect readjustments in the endocrine picture with increasing length of residence in the North, thus confirming the generally recognized role of glucocorticoids in hormonal support of the body adaptation to extreme factors including climatic environments.

Keywords: North, middle-aged men, cortisol, DHEA-S, the generation of residence

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Introduction. The issue of the mechanisms of newcomers' long-term adaptation to the harsh conditions of the north remains relevant and requires further study. Currently, in addition to the indigenous peoples in the Magadan Region, the permanent residents are made up of quite numerous ethnic groups of Caucasians: migrants and those born to them in the north in different generations [1]. In the course of our long physiological research, we found that migrants and north-born Caucasians have their own specific characteristics and also much in common in their body functional adaptive readjustments. As we were examining young male adults from Caucasian migrants and those born to migrants in the 1st-3rd generations, all being residents of the Magadan Region, we identified the main components of the adaptation strategy according as the examinees be-