course of new SARS-CoV-2 coronavirus infection in children of the Republic of Sakha (Yakutia) during the first and second waves of COVID-19. Accumulation of epidemiological and clinical data will make it possible to find ways of preventing and treating the new infection, taking into account the peculiarities of the region and the population.

The work was performed within the research theme "Monitoring of the state of health of children in the Republic of Sakha (Yakutia)" (State Registration No. 0120-128-07-98), within the state assignment of the Ministry of Science and Education of the Russian Federation (FSRG-2020-0016).

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CARDIOVASCULAR PATHOLOGY AND COVID-19 IN RESIDENTS OF YAKUTSK

A study was conducted on 161 citizens of Yakutsk who had a new coronavirus infection in the period from March to December 2020. A high incidence of arterial hypertension, obesity, and lipid-metabolic disorders was revealed. The relationship of lipids, glucose and uric acid in blood serum, arterial hypertension, waist circumference with the severity of the new coronavirus infection was shown. The high prevalence of cardiovascular pathology and its risk factors among study participants requires long-term follow-up of patients with post-COVID syndrome, which prevents premature death from diseases of the circulatory system.

Keywords: cardiovascular pathology, arterial hypertension, lipid disorders, new coronavirus infection, COVID-19, Yakutsk.

In recent years, the world has been agitated by the prolonged outbreak of the new coronavirus infection COVID-19, causing huge social and economic losses. At the time of submission of the article on 02/03/2022, there are 388,100,320 confirmed cases of the disease in the world, 5,713,256 people died [3]. In Russia, 12,284,564 cases were confirmed, 333,357 people died [2]. Numerous studies demonstrate the influence of cardiovascular pathology on the severity of COVID-19, causing high mortality among these patients [6;7;8]. There is also evidence of cardiovascular complications after COVID-19. The pandemic affected the course of the existing pathology or contributed to its appearance, causing long-term consequences in the form of the post-covid syndrome. The relevance of the research is to identify the aggravating effects of COVID-19 on human health in order to develop new recommendations for the management of patients with post-covid syndrome in order to prevent cardiovascular disasters.

The aim of the study was to research cardiovascular pathology in residents of Yakutsk who had suffered the new coronavirus infection COVID-19.

Materials and methods of research. A pilot single-stage study was conducted in March 2021 of residents of Yakutsk, geographically attached to the YSC CMP clinic, with a history of new coronavirus infection COVID-19 in the period from March to December 2020 (1st wave). The response rate was 78%. The object of the study were 161 people, 68 of which were men (42.2%), and 93 were women (57.8%). The average age was 51 [44, 57] years for men and 54 [48, 57] years for women.

Inclusion criteria: adult population of Yakutsk from 30 to 70 years old, attached to the Clinic of the YSC CMP, with a history of COVID-19, voluntary consent to the study.

Exclusion criteria: malignant neoplasms, acute infectious diseases, exacerbations of chronic diseases, acute myocardial infarction, acute cerebrovascular accident.

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The examination program included: a questionnaire survey to assess symptoms and quality of life, an anthropometric study measuring height, weight, waist circumference (WC) and hips circumference, resting ECG, spirometry, blood sampling from the ulnar vein in the morning on an empty stomach for general clinical, biochemical and immunological studies, clinical examination by a cardiologist. Blood pressure (BP) was measured by an automatic tonometer "OMRON M2 Basic" (Japan) twice in a sitting position with the calculation of average blood pressure with a limit of permissible measurement error of ± 3 mm Hg (ESH/ESC, 2018). Informed consent to conduct an examination, questionnaire, and blood collection for further analysis of the results was obtained from all participants of the study according to the protocol of the Ethics Committee of the YSC CMP (Protocol No. 52 of 03/24/2021).

The abdominal obesity (AO) is exposed to the value of the waist measurement (WM) ≥ 80 cm on women, ≥94 cm on (VNOK, 2009).

The blood pressure level of ≥140/90 mmHg or the use of antihypertensive drugs was taken for hypertension. According to degrees of severity, they were divided into: stage 1 AH - BP 140-159/90-99 mm Hg, stage 2 AH - BP 160-179/100/109 mmHg, stage 3 AH - BP ≥180/≥110 mmHg [4].

Laboratory methods of the research included analysis of total cholesterol (TC), triglycerides (TG), high density lipoprotein cholesterol (HDL Cholesterol), low-density lipoprotein cholesterol (LDL Cholesterol), very low-density lipoprotein cholesterol (VHDL Cholesterol), levels glucose, uric acid, immunoglobulins class M and G to coronavirus SARS-CoV-2.

When judging the incidence of disorders of the blood lipid profile in a population, we used the Russian recommendations of the VII revision of Society of cardiology of Russian Federation, 2020, into account the European recommendations, 2019. Hypercholesterolemia (HCS) is the level of TC ≥ 5,0 mmol/l (190 mg/dl) taking into account the risk of cardiovascular death on the SCORE scale, the high LDL Cholesterol level >3,0 mmol/l (115 mg/dl) with low, > 2.6 mmol/l with moderate, >1,8 mmol/l with high, > 1,4 mmol/l with very high and extreme risk, the low HDL Cholesterol level <1,0 mmol/l on men; <1,2 mmol/l on women, the hypertriglyceridemia (HTG) is the TG level is >1,7 mmol/l. The atherogenic index (IA) was determined by the formula: IA (cu) = (TC - HDL Cholesterol) / HDL Cholesterol (Klimov A.N., Nikulcheva N.G., 1999). A

Characteristics of patients according to the degree of lung damage

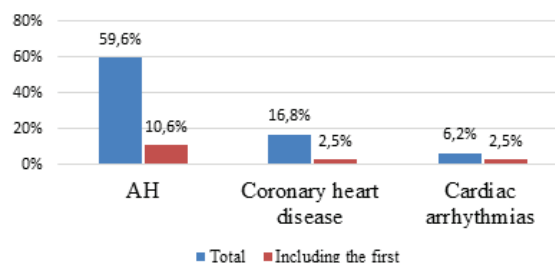|	CT-0	CT-1	CT-2	CT-3	CT-4
Abs. number	27	60	42	26	6
%	16.8	37.3	26.1	16.1	3.7

Note. CT - computed tomography.

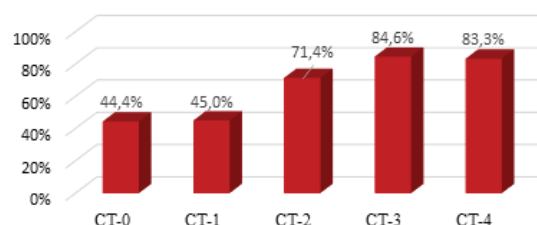**Fig.1.** The frequency of cardiovascular pathology in people after COVID-19

Fig.2. The frequency of arterial hypertension depending on the degree of lung damage
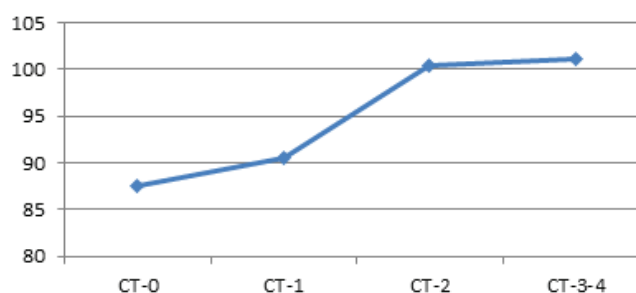

Fig.3. The relationship of waist measurement with the severity of COVID-19 (according to CT picture) (cm)

hyperglycemia (HG) on an empty stomach (a glucose in a blood plasma on an empty stomach > 5,6 mmol/l). Respondents with these disorders also included participants receiving specific medication for these conditions.

The degree of lung damage and its severity were assessed according to the results of computer tomography (CT): CT-0 – absence of viral pneumonia, CT-1 lung lesions less than 25%, CT-2 – 25-50%, CT-3 – 50-75%, CT-4 >75% lung damage in the form of "ground-glass opacities".

Statistical processing of the results was carried out using the standard SPSS 22.0 package. The arithmetic mean (M), the error of the mean (m), median (Me) and the 25th and 75th quartiles (Q1, Q3) were calculated. The intergroup differences were assessed using variance analysis or nonparametric criteria. The correlation analysis was carried out by Spearman's correlation coefficient. The differences were considered statistically significant at p<0.05

Results and discussion. The largest number of respondents (63.4%) had a mild to moderate infection with CT-1 and CT-2 lung damage. Their characteristics according to the severity of the suffered COVID-19 (CT picture) are presented in Table 1.

After suffering the new coronavirus infection, the most frequent complaints

were shortness of breath, which was observed in 43 people (26.7%), discomfort in the area of the heart (n=32 or 19.8%), 24 respondents complained of palpitations (14.9%), 19 people of chest pain (11.8%), 18 - of extrasystole (11.2%).

The majority of the study participants had diseases of the cardiovascular system (97 people or 60.2%), mainly represented by arterial hypertension (AH) (96 people. or 59.6%), 27 of them had coronary heart disease (16.8%). After COVID-19, pathology was first diagnosed in 22 people (13.6%), including hypertension in 17 (10.6%), in 4 - coronary heart disease (2.5%). Cardiac arrhythmias were registered in 10 people (6.2%), represented by sinus tachycardia, sinus bradycardia, supraventricular extrasystole, of which 4 (2.5%) were registered for the first time. The mechanism of arrhythmias has not yet been clarified and remains controversial. It is possible that cytokine inflammation provoked arrhythmias, or that they were a side effect of drugs, or were not properly diagnosed earlier before the infection. The same applies to newly diagnosed hypertension and coronary artery disease.

It should also be noted that 23 respondents had type 2 diabetes and accounted for 14.3% of the total, for 1 person it was registered for the first time. Our data is consistent with the research conducted by domestic and foreign scientists. Thus, 56.6% of 5,700 patients from New York, Long Island and Westchester County (USA) had hypertension, 509 (49%) of 1,043 patients from Milan, Italy had hypertension and 17% - DM, 30.5% of patients from Wuhan, China, had hypertension and 14.4% - DM [5; 8; 9]. The conducted study of the AK-TIV international registry, which included 5808 patients from the Russian Federation, the Republics of Belarus, Armenia, Kazakhstan and Kyrgyzstan, showed a high incidence of hypertension (55.41%), ischemic heart disease (20.6%), type 2 diabetes (17.5%) [1].

The analysis of the relationship between glucose and uric acid levels in all respondents with a CT picture of a new coronavirus infection was carried out. It was shown that the levels of blood glucose (r=0.162, p=0.041) and uric acid (r=0.160, p=0.043) positively correlated with the severity of the infection.

The study of the relationship of systolic blood pressure (SAD) with the severity of the infection was carried out. We obtained a strong correlation (r=0.373, p=0.000). That is, the higher the SBP indicators, the more severe is the course of COVID-19. The level of SBP was also strongly correlated with IgG titer (r=0.307, p=0.000), and no relationship was obtained with IgM titer (r=0.070, p=0.380).

Analysis of the conjugacy of infection with hypertension was carried out. It was revealed that persons with hypertension were exposed to a more severe course of COVID-19 in the anamnesis. If the mild course of the disease was registered almost equally in both hypertensive and normotonic patients, then the average and severe course was mainly found in individuals with hypertension from 71.4 to 84.6% (χ 2=18.49, p=0.001) (Fig.2). The stage of hypertension also had a correlation with the severity of COVID-19 (r=0.386, p=0.000).

A study of lipid metabolism disorders in the participants of the pilot project was conducted. In more than half of both men and women, high cholesterol was detected - 54.5% and 59.4%, respectively, there was no statistical difference (p=0.552). Atherogenic HCV was most often registered in men (65.4%) compared with women (56.3%) (p=0.386), a reduced level of HDL cholesterol was also detected in more than half of the respondents (55.6% and 58.9%, respectively), there was no significant difference (p=0.687). TG concentrations were significantly higher in men (62.2%) compared to women (41.2%) (p=0.028).

The analysis of the relationship of the lipid spectrum with the severity of COVID-19 was carried out. The average lipid values had no statistical difference between men and women, except for the concentrations of HDL cholesterol (0.90±0.03 in men and 1.12±0.04 in women, p=0.000) and LDL cholesterol (0.69±0.05 and 0.50±0.03, respectively, p=0.002).

In the postcovid period, an average correlation was revealed between the severity of the infection (according to CT of the lungs), total cholesterol (r=0.187, p=0.018), LDL cholesterol (r=0.142, p=0.073), TG (r=0.251, p=0.001), HDL cholesterol (r=0.056, p=0.479). Comparing by gender, it was revealed that men's CT picture had a correlation with mean values of total cholesterol (r=0.278, p=0.022), LDL cholesterol (r=0.251, p=0.039). Women had a correlation with the level of TG (r=0.294, p=0.004). Lipid metabolism disorders often accompany cardiovascular pathology, which is most common in participants of the pilot study with a more severe course of COVID-19.

Abdominal obesity (AO) plays an important role in the development of cardiovascular pathology and type 2 diabetes mellitus. There was a high incidence of AO in both men (75%) and women (71%).

There was a strong correlation between WC and the degree of lung damage in COVID-19 (r=0.348, p=0.000), the more WC, the worse the disease progressed.

Thus, we have proven a conjunction of arterial hypertension and the new coronavirus infection, most pronounced in severe infection. The relationship of lipid, carbohydrate metabolism disorders and obesity with the severity of the disease is also presented. Diabetes mellitus may also have been a background comorbid disease that affected the course and outcome of the disease.

Conclusion. A pilot study of the attached population of Yakutsk with a history of the new coronavirus infection showed a high probability of its long-term consequences, which were a possible trigger for the development or complications of existing diseases of the cardiovascular system. A high frequency of arterial hypertension, obesity and lipid-metabolic disorders was revealed. The relationship of arterial hypertension, waist circumference, lipids, glucose and uric acid of blood serum with the severity of the new coronavirus infection is presented. The high prevalence of cardiovascular pathology and its risk factors among the study participants requires long-term follow-up of patients with postcovid syndrome, which prevents premature death from diseases of the circulatory system. The activities include the development of clear algorithms for medical examination, the organization of a remote way of consulting patients, the popularization of a healthy lifestyle, the correction of modifiable risk factors such as dyslipidemia, hypertension and obesity.

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ARCTIC MEDICINE

I.V. Averyanova, E.A. Lugovaya

DETERMINATION OF VITAMIN D CONCENTRATION OF 25(OH) IN THE WORKING-AGE POPULATION OF THE NORTHERN REGION

The study examined working-age population of the North region to determine 25 (OH) vitamin D concentrations and compared insufficient subjects (Group 1) with those having the proper/optimal vitamin D concentration (Group 2) in terms of main indicators of physical development, cardiovascular system, biochemical and trace element picture.

Material and Methods: fifty-five men of working age (mean age was 37.4±0.5 yr.) all Caucasians residing in the territory of Magadan region participated in the research. We used photometric, immunochemiluminescent and spectrometric methods of investigation, as well as standard cardiovascular and anthropometric measurements. Study Results: 42% (Group 1) tested low for vitamin D while 58% (Group 2) had the proper vitamin amounts. Group 1 was up to 78% made up of high body mass index men versus 40% of subjects exceeding standard range of this index in Group 2. Cardiovascular system and circulation values tended to be increasingly stressed and high thyroid-stimulating hormone indicated the development of preclinical hypothyroid pathology with Group 1 examinees. They were more atherogenic in lipid pictures in comparison with Group 2 northerners who showed a shift towards healthier lipid profiles. Moreover, vitamin D deficient subjects proved to also lack vitamin B12 and were low in trace elements.

Conclusion: Subjective vitamin D deficits develop disorders in physical development, cardiovascular system, as well as biochemical and trace element profiles. Our study can be applied for making recommendations on correcting vitamin D deficiency/insufficiency in residents of Russia's northeast.

Keywords: men of working age, 25 (OH) vitamin D, North, physical development, cardiovascular system, biochemical picture, trace elements.

Introduction. Vitamin D insufficiency has become a pandemic health problem [24] since it is common in a third of the world's population, even in Earth's tropical and subtropical regions [16]. It can be invasively assessed in blood serum 25-hydroxyvitamin D (25(OH) vitamin D) concentration [27]. In addition to significantly influencing calcium and phosphorus metabolism, thereby bone health and muscle strength, vitamin D deficiency has been recently reported to develop non-skeletal disorders like cardiovascular [20] and autoimmune diseases, cancers [19], higher blood pressure, depression, as well as overall mortality [34]. Some authors have investigated the relationship between low blood 25(OH) vitamin D and chronic diseases, including insulin resistance [21] and type 2 diabetes mellitus [18].

Vitamin D deficit is a variable which the patient's mineral picture can also be referred to. Therefore, vitamin D control is crucial for the body mineral imbalance management [37]. Trace elements are known to be involved in metabolic activities. They promote vascular tone, nervous and immune functioning at the enzymatic level. Unlike blood or urine, hair is known to constantly accumulate chemicals as the hair shaft grows and is supplied with blood [36]. Therefore, hair elemental composition reflects longer exposure to the chemicals owing to the hair biomonitoring abilities to keep past changes in metabolism as well as environmental effects [1,7,13].

The role of vitamin D in maintaining the proper blood calcium and phosphorus levels has been commonly reported [3] for it ensures bone tissue mineralization and enhances the re-absorption of calcium in kidneys. Extremely low levels of vitamin D can provoke improper calcium and phosphate metabolism, which causes bone tissue impairment. Insufficient absorption of calcium in the intestine results in accelerated release of calcium from bones, which decreases the bone density and increases the risk of fractures [8]. Vitamin D deficiency is often accompanied by shortage of thyroid-specific elements such as cobalt, iron, magnesium, selenium, copper, and zinc, which can be seen under the goiter endemic conditions. The so called northern deficit in essential macro- and microelements owing to the biogeochemistry of the region, as well as poor soils and weakly mineralized drinking waters can develop insufficient absorption of the vitamin, even being taken as a supplement. The specific light regime of the

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