POINT OF VIEW

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BACKGROUND FOR STUDYING CIRCULATORY SYSTEM DISEASES USING BIOIMPEDANCE ANALYSIS IN RESIDENTS OF YAKUTIA

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The scientific review highlights the results of studies of the features of the circulatory system diseases (CSD) and human body parameters among the inhabitants of Yakutia and confirms the existence of a research backlog for studying the association of CSD regional characteristics with the body composition, determined by bioimpedance analysis. The relevance of continuing to study the regional characteristics of CSD is confirmed by the data of Rosstat, indicating the predominance of working-age population CSD mortality in Yakutia over the national indicator.

Keywords. North, Arctic, Siberia, metabolic syndrome.

Introduction. Circulatory system diseases (CSD) occupy a dominant position in the structure of the total deaths in Russia. In addition, in recent decades, their “rejuvenation” has been noted [14]. CSD are also the leading cause of death worldwide [50]. CSD mortality rates in Russia have significant regional variability [27].

The results of Russian and foreign studies demonstrate a strong connection between CSD risk factors and indicators of anthropometry and body composition [5,23,40]. A bioimpedance analysis has become a simple and useful diagnostic tool for assessing the human body composition. Bioimpedance analysis uses the difference in electrical resistance between the fat and lean components to assess the development of lean (non-fat) mass, total fat and visceral body fat [46].

In Yakutia, the regional features of CSD have been studied for quite a long time [37]. Medical anthropometric research in Yakutia also has a long history [1]. However, bioimpedance analysis for assessing the Yakutia inhabitants’ body composition has been used relatively recently [11]. There are no scientific works exploring in the Yakutia population links between the CSD features and assessed by bioimpedancemetry the body composition.

Therefore, the purpose of this review article is to substantiate the existence of a research backlog for studying the association of CSD features with determined by bioimpedance analysis the body composition among the Yakutia inhabitants. It was decided to highlight the Yakutia CSD mortality in comparison with the all-Russian mortality for confirming the relevance of continuing regional studies of CSD and to identify existing studies on the CSD features and anthropometric parameters among the Yakutia inhabitants.

Materials and methods. For a comparative analysis of the situation related to the CSD in Yakutia and in the Russian Federation the latest open data from the Federal State Statistics Service (Rosstat) [32] were used, access to which is in the state information resource "EMISS" [9]. Information about studies on the features of CSD and anthropometric parameters of the Yakutia inhabitants was extracted from the eLIBRARY.RU electronic library, a Russian information and analytical portal in the field of science, technology, medicine, and education, containing scientific publications [35].

Results and discussion. Rosstat data is presented in the compiled by the authors of this article Table 1. The comparison shows that in Yakutia the CSD mortality including mortality from ischemic heart diseases, heart attack, cerebrovascular diseases, and acute cerebrovascular accident is lower than the national average. However, in such a seemingly more favorable condition, the CSD mortality of the working-age population in Yakutia prevails over the all-Russian similar indicator. The most contribution in the mortality both in Yakutia and in the all-Russia is made by ischemic heart diseases, which is also confirmed by third-party studies [3].

Yakutia has a heterogeneous ethnic structure of the population. According to the 2010 census, representatives of more than 120 nationalities live in Yakutia. The most numerous in the total population of the Republic are Yakuts - 48.7% and Russians - 36.9%. The share of Evenks, Evens, Dolgans, Yukaghirs and Chukchis is 4.2% [20].

A large number of medical scientific works devoted to the Yakutia inhabitants including the study of various aspects of CSD as well as anthropometric studies are aimed at identifying ethnic differences. Most often, patients are grouped into "indigenous people" (or "indigenous peoples, residents, ethnic groups") and "non-indigenous people".

The indigenous peoples of Yakutia are Yakuts, Evenks, Evens, Dolgans, Yukaghirs and Chukchis. There is no unified definition of the term “indigenous peoples”. The UN highlights the fundamental criterion of a person's belonging to indigenous peoples - a person's own awareness of himself as a representative of an indigenous people. Indigenous people have a historical hereditary connection with a certain territory and a strong connection with their lands; have their own languages, traditions, beliefs and knowledge systems [47].

Studies of CSD among the Yakutia inhabitants, which were carried out during the last decade of the last century and the first decade of this century, found that atherosclerosis is less common among the indigenous population [37]. Among patients with ischemic heart diseases, non-indigenous residents of Yakutia compared with indigenous (Yakuts) were more often observed atherogenic changes in the lipid profile, increased BMI, central obesity, and arterial hypertension. But regardless of ethnicity arterial hypertension and central obesity indicated the risk of developing ischemic heart diseases [22, 28]. The differences were that an increased level of cholesterol among the Yakuts and an increased level of triglycerides and smoking among non-indigenous people were additional risk fac-

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tors for ischemic heart diseases [25]. In a comparative study that included a 40-year follow-up (1963-2004) it was found an increase in the prevalence of coronary artery atherosclerosis for both indigenous and non-indigenous populations [2], and clinical observations showed an equal prevalence of heart attack among them [36].

As a result of CSD studies conducted in the north of Yakutia - in the Arctic zone, it was found that among the indigenous peoples of the northern regions of Yakutia arterial hypertension and abdominal obesity are significantly widespread and related to each other [29]. Also the relationships between arterial hypertension and the atherogenic fraction high cholesterol [4] and between the level of systolic blood pressure and BMI [21] were identified.

A comparative study conducted among the indigenous inhabitants of the Arctic and southern regions of Yakutia, selected in a one-stage population study by random sampling, showed that the atherogenic coefficient calculated from a blood test exceeded the normal level in the residents all regions without statistically significant differences. Elevated levels of total cholesterol were less common in the northern regions indigenous inhabitants than in the inhabitants of the southern regions. It was noted that in a direction from the north to the south the indigenous people have an increase in blood triglycerides, cholesterol, and atherogenic lipid fractions [30].

In studies conducted in other northern regions of Russia were found that non-indigenous residents of the Yamalo-Nenets Autonomous Okrug are characterized by a higher prevalence and severity of ischemic heart diseases and arterial hypertension compared with residents of the south of the Tyumen region [12]. Residents of the temperate climate zone of the Tyumen region were less likely to have heart attack and chronic heart failure compared to residents of the Yamalo-Nenets Autonomous Okrug, who had heart attack and chronic heart failure at a younger age [31].

In general, taking into account the data of epidemiology, etiology, clinical picture, diagnosis and treatment of complications, the prevalence of CSD is increasing among the population of all northern territories around the world [45]. Researchers come to the conclusion that living in the North is associated with a significant stress of adaptation, which leads to a restructuring of metabolism, primarily carbohydrate and lipid metabolism, and contributes to the development of the metabolic syndrome that affects the occurrence, course, and outcome of CSD [24].

According to clinical guidelines developed on behalf of the Ministry of Health of Russia and approved by the Russian Medical Society for Arterial Hypertension and the specialized commission on cardiology the characteristics of the metabolic syndrome are as follows: an increase in the mass of visceral fat, a decrease in the sensitivity of peripheral tissues to insulin and hyperinsulinemia, which cause the disorders of carbohydrate, lipid, purine

CSD mortality in the Russian Federation and the Sakha (Yakutia) Republic

Indicator	Methodology for calculating the indicator	Year of indicator *			Web link:
			RF	S(Y)R	
CSD mortality	The ratio of the number of deaths from CSD to the average annual population, per 100 thousand people	2019/2021	573.2/640.3	357.1/405.5	https://www.fedstat.ru/indicator/55382
CSD mortality of the working-age population	The ratio of the number of deaths from CSD to the average annual population at the corresponding age, per 100 thousand people of the corresponding age	2019	141.76	154.34	https://www.fedstat.ru/indicator/57315
Heart attack mortality	The ratio of the number of deaths from a given cause of death (ICD-10 codes - I21-I22) during the calendar year to the average annual population according to the current estimate, per 100 thousand people	2021	38.27	23	https://www.fedstat.ru/indicator/59776
Ischemic heart disease mortality	The ratio of the number of deaths from a given cause of death to the average annual population, per 100 thousand people	2021	348.13	171. 82	https://www.fedstat.ru/indicator/62025
Cerebrovascular diseases mortality	The ratio of the number of deaths from a given cause of death to the average annual population, per 100 thousand people	2021	190.73	90.87	https://www.fedstat.ru/indicator/62026
Acute cerebrovascular accident mortality	The ratio of the number of deaths from a given cause of death (ICD-10 codes - I60-I64) during the calendar year to the average annual population according to the current estimate, per 100 thousand people	2021	90.25	53.8	https://www.fedstat.ru/indicator/59777

Note: * The year of collection of the indicator is shown according to the latest available open data in the EMISS.

metabolism and arterial hypertension [26].

According to the National Heart, Lung, and Blood Institute (USA) definition, patients were considered to have metabolic syndrome when they have abdominal obesity and three or more of the following: high blood pressure, sugar, triglycerides and low blood levels of high-density lipoprotein cholesterol [44].

Polish professional medical societies - Hypertension Society, Obesity Treatment Society, Lipid Association, etc. proposed that the definition of metabolic syndrome should include the presence of obesity and two of the following three criteria: high blood pressure, impaired glucose metabolism, and elevated levels of low-density lipoprotein (non-HDL) cholesterol (atherogenic dyslipidemia) [43].

The International Diabetes Federation (IDF) defines the metabolic syndrome as a group of the following factors: diabetes and prediabetes, abdominal obesity, high cholesterol and high blood pressure [42].

In all definitions abdominal obesity is noted as a characteristic of the metabolic syndrome. In the medical literature abdominal obesity is often referred to as visceral and central obesity [34]. Its diagnosis is a problem, since uniform methods and criteria have not been developed for it. The risks of CSD determine not only the degree of abdominal fat development. It is very likely that the CSD is associated with the peculiarities of the combination of metabolically conditionally neutral subcutaneous fat and metabolically aggressive abdominal fat that is from the metabolic phenotypes of obesity [39].

The external reflection of the human phenotype is his body type [17]. Body features are determined genetically and are formed by the external environment [10].

The results of recent anthropometric studies indicate that indigenous people (women, Yakuts) have smaller body dimensions compared to non-indigenous women, but the increase in BMI, overweight and obesity with age does not depend on ethnicity [7]. The study of age and territorial differences among the indigenous women of the northern and central regions of Yakutia showed that the “northern women” of 75-89 years old have the maximum values of body weight, BMI, the occurrence of overweight and obesity [6]. Another study, already devoted to men, indigenous people, revealed that the greatest development of the fat and muscle components of the body was observed in the age group of 36-60 years [8,18]. Diagnosis and assessment of the obesity degree is a problem associated with the lack of uniform methods and criteria. The most commonly used assessment of obesity is based on the calculation of body mass index (BMI), but it is difficult to use it to assess the development of adipose tissue outside the development of muscle and, thus, to differentiate the distribution of fat in the body. It is known that an increase in BMI in obese individuals may not be associated with an increase in internal fat and an increase in the severity of metabolic disorders [5]. Anthropometric indicators such as waist-to-hip ratio [26] and waist circumference [48] are used to reflect the distribution of central fat. As an indicator of central obesity, it is also proposed to take into account the ratio of waist circumference and height [49].

Among the Yakut population a waist circumference is most often used as an indicator of abdominal obesity [16,29,33]. But the waist circumference reflects not only the amount of visceral fat in the abdominal region, but also the thickness of the subcutaneous adipose tissue of the lumbar region and the anterior abdominal wall.

A significant relationship has been established between the component of the body composition calculated using bioimpedance analysis - fat mass, lean mass, visceral fat and muscle mass with ischemic heart diseases and metabolic syndrome factors in domestic and foreign studies, [23,38]. Studies conducted among the inhabitants of Yakutia a considerable time ago without the use of bioimpedancemetry showed that, in general, the functional reserves of the human cardiovascular system are interconnected with the body composition [15]. This connection is also confirmed in other scientific works [13,19,46].

To identify obesity, it is necessary to establish standard anthropometric indicators taking into account ethnic specifics [41]. Currently scientific work with bioimpedance analysis is underway to standardize anthropometric indicators so far only in young Yakuts in Yakutia [11].

Conclusion. The relevance of continuing to study the regional characteristics of CSD is confirmed by Rosstat data indicating the predominance of CSD mortality in the working-age population in Yakutia over the all-Russian similar indicator. Scientific articles review covering the results of studies on regional features of CSD and the human body parameters confirms the presence of a research backlog for studying the relationship (association) of CSD features with the body composition determined by bioimpedance analysis in Yakutia residents.

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HELICOBACTER PYLORI INFECTION AND NON-ALCOHOLIC FATTY LIVER DISEASE IN THE WORKING POPULATION OF SOUTH YAKUTIA: ASSOCIATION RESEARCH

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A one-time study of the working population of non-indigenous nationality in the southern zone of Yakutia was carried out. A total of 78 people were analyzed, including 31 men, Me age 45.0 [35.0-54.0] years, and 47 women, Me - 43.5 [36.0-53.0] years. A high incidence of Helicobacter pylori infection was found, regardless of comorbidity. The association of HP infection with body mass index, waist circumference, lipid spectrum disorders and metabolic syndrome according to IDF 2005 criteria was not obtained (p>0.05). In the course of the study, the relationship between NAFLD and infection with Helicobacter pylori infection was not obtained (p>0.05).

Keywords: Helicobacter pylori infection, obesity, non-alcoholic fatty liver disease, non-indigenous population, Yakutia.

There is a steady increase in the spread of non-alcoholic fatty liver disease (NAFLD) in the world, along with obesity and metabolic syndrome. Metabolic disorders in addition to metabolic syndrome, insulin resistance, type 2 diabetes mellitus includes NAFLD. The development of both metabolic syndrome and NAFLD is often based on insulin resistance, leading to disorders of lipid, carbohydrate and fat metabolism, the release of free fatty acids and the accumulation of fat and an inflammatory reaction in the liver. It has been proven that NAFLD is an independent predictor of the development of malignant tumors, including hepatocellular carcinoma [4; 10; 13]. In patients, one of the risk factors for NAFLD is increased permeability of the intestinal wall caused by excessive bacterial growth and the action of endotoxins (lipopolysaccharides). The influence of *Helicobacter pylori* (HP) on the development and course of gastritis, peptic ulcer and stomach cancer is evident, but in recent years there has been an assumption about its systemic effect on many different organs, special attention is paid to the contribution to the development of metabolic syndrome and NAFLD. But the evidence is few and mostly contradictory. Some researchers have proved that HP–infected individuals had a more unfavorable metabolic profile, increased body mass index (BMI), blood pressure (BP), triglyceride level (TG) and the highest prevalence of NAFLD [7; 8; 11; 16]. Other studies have not revealed a connection between them [12; 14; 15]. Previously, studies were conducted on the non-indigenous population of South Yakutia, where the highest frequency of pathology of the digestive, cardiovascular and endocrine systems was revealed [3]. Given the high frequency of detection of digestive diseases in this contingent, as well as the few studies of the effect of *Helicobacter pylori* on the development of NAFLD, the relevance of our study is beyond doubt.

The aim of the study: identify the association of HP infection with the development of non-alcoholic fatty liver disease in the working population of non-indigenous nationality living in south Yakutia.

Materials and methods of research. A pilot cross-sectional study of 78 industrial and social workers in the southern zone of Yakutia was conducted. All were representatives of non-indigenous nationality, including 31 men, whose median (Me) age was 45.0 [35.0-54.0] years, and 47 women, Me age 43.5 [36.0-53.0] years.

All study participants were surveyed, their complaints and anamnesis were taken, anthropometric study with the

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