(18.28%) and in the medical physical training group (SMG-2) - 115 (15.23%).

**CONCLUSIONS**

Thus, the analysis of the results of the study of health of student youth from the Republic Sakha (Yakutia) uluses (districts) testifies, that the health of students is weakened even before entering the university. The conducted examination of the health indicators of the NEFU 1st course students showed that most of them are unhealthy, with low indicators of physical working ability, indicative of poor physical fitness, and they need preventive measures for forming and strengthening their health.

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## HYGIENE, SANITATION, EPIDEMIOLOGY AND MEDICAL ECOLOGY

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# EPIDEMIOLOGY OF CONGENITAL HEART DISEASES IN CHILDREN

**ABSTRACT**

The article presents data from registers of congenital heart defects in foreign countries and regions of the Russian Federation. Overall, according to the literature there are significant variations of prevalence and primary morbidity of congenital heart disease, probably due to good monitoring based on a network registers with the use of modern diagnostic possibilities in more developed countries.

**Keywords:** congenital heart disease, children, registers.

**INTRODUCTION**

Congenital heart disease (CHD) is a heterogeneous group of diseases, including isolated, combined and combined anomalies of multifactorial etiology. The urgency of the problem of the developmental defects of the circulatory system is due to high mortality rates, especially during the first year of life, and disability. More than 90 species of isolated and associated (CHD) are known. Without a radical correction, 50-60% of children die in the first year of life. The mortality of children with circulatory defects is highest in the neonatal period [19].

To study the etiology, develop preventive measures and plan the organization of medical care for children with malformations, accurate data on prevalence of the (CHD) are needed. The organization of their monitoring is carried out on the basis of the analysis of epidemiological data taking into account the dynamics in different age periods. The main tool for such monitoring is the specially created registers [6]. In addition to registering new cases of (CHD), such databases can serve as a basis for identifying new possible teratogenic factors and other causes contributing to the formation of mutational processes at both individual and population levels [4, 7]. In addition, registers containing information about families with hereditary-conditioned pathology, provide us with an opportunity to study the mechanisms of development of genetic prerequisites for the formation of malformations [10].

**1. Prevalence and structure of congenital heart diseases in Europe, Asia and America**

Congenital malformations of the cardiovascular system, according to world statistics, occur at a frequency of 8.0-10.2 per 1000 newborns, among the live-born children this figure is 6-8 cases per 1000 children [3, 2, 29]. In England, it is at the level of 8.2 per 1000 newborns, in the USA - from 1.5 to 6.3 per 1,000 newborns [26].

In a systematic review on the analysis of the incidence of congenital heart defects and the circulatory system in the world for the period from 1955 to 2012, (11 studies), it was shown that severe CHD occurred at a frequency of 0.414-2.3 per 1000 live births, moderate-grade malformations were 0.43-2.6 per 1000 newborns, and malformations with minimal changes were 0.99 -10.3 per 1,000 children [32]. At the same time, there were no statistically significant differences in the incidence of heart disease, depending on their severity.

According to Hoffman J.I. (2004), the total number of newborns with newly diagnosed CHD in the world in 2000 was about 623,000 children, of whom

approximately 320,000 had isolated congenital anomalies, and the remaining children had combined and associated defects [26]. At the same time, a combination of heart defects with other congenital developmental anomalies is observed in approximately 35-40% of cases [21], and on the contrary, about one third of children with chromosomal abnormalities (most often represented by aneuploidy or a change in the number of chromosomes) suffer from congenital heart disease [33].

According to French researchers who analyzed the frequency of occurrence of CHD in Paris on the basis of the Register of congenital anomalies, in 2005-2008, the total prevalence of these vices was 9.0 per 1,000 children, of which 40% of the isolated defects were diagnosed prenatally [28, 27].

An epidemiological study based on the CHD database in Quebec, Canada, from 1983 to 2010, containing information on 107559 patients with congenital heart anomalies, showed that the average prevalence of this pathology among children in the first year of life was 8.21 per 1000 children, in 2010 it reached 13.11 per 1000 children and 6.12 per 1000 adults. From 2000 to 2010 there was an increase in the prevalence of CHD by 11% in children and 57% in adults. At the same time, the prevalence of severe heart disease increased by 19% among children and by 55% among adults [31].

In 2010, the US had about 2.4 million patients with congenital heart disease, of which 1.4 million were adults and 1 million were children. These data draw the attention of researchers and the medical community to the need to actively identify and provide medical care to patients with CHD not only in children, but also in all age groups [24].

In Europe, a network of EUROCAT registries was established in 1979, based on a population approach, covering about 1.5 million births in 20 countries in Europe, with the aim of monitoring the congenital anomalies epidemiology and standardizing the data obtained [23]. According to this follow-up, hemodynamically significant congenital malformations in European countries were recorded at a frequency of 23.8 per 1000 births, of which 80% of children were born alive, 2.51% of children were born with congenital anomalies incompatible with life, 2.1% of cases, stillbirth was observed, in 17.5% of cases, abortion was carried out due to prenatal diagnosis of congenital malformations [22].

According to the EUROCAT statistical monitoring report published in 2009, congenital heart diseases are among the most common congenital anomalies in Europe, ranked third in the structure of all developmental anomalies, with a downward trend over the last decade. Thus, the prevalence rates of CHD from 2000 to 2009 decreased by 14% (from 19.49 to 16.71 per 10,000 newborns). Particularly pronounced was a decrease in the prevalence of such vices, such as an interventricular septal defect and pulmonary artery stenosis. Such positive trends were associated with the effective preventive use of folic acid by pregnant women. Also, the positive effect of such monitoring could be explained by the improvement of management of such risk factors as chronic diseases of mothers, primarily diabetes mellitus, and also reduction of behavioral risk factors (for example, smoking) [23].

According to official statistics of the Ministry of Health of the Republic of Kazakhstan, for the period from 2003 to 2013, in the country there was a significant increase in the prevalence of CHD from 4.4 to 8.9 per 1000 newborns, respectively, while their share among all developmental anomalies increased from 13.1 to 28.3%. The same trend was observed in the analysis of the prevalence of CHD among children under five: in 2003 this indicator was 2.7 per 1,000 children, and in 2012 - 6.3 per 1000 children, which amounted to 21.4% and 32.2% from all developmental defects, respectively. Defects of the interventricular septum (39.6%), defects of the interatrial septum (15.1%), an open arterial duct (14.3%) and pulmonary artery stenosis (4.4%) prevailed in the structure of the CHD.

Among children with combined defects, in 6.2% of cases, tetrad of Fallot was diagnosed, in 1.31% - double retreat of the main vessels, 2.21% - transposition of the main vessels (TMS), in 1.99% - hypoplastic syndrome of the left divisions and in 2,2% - a syndrome of hypoplasia of the right ventricle [18, 13].

A meta-analysis of studies on the prevalence and structure of congenital heart disease in Nigeria from 1964 to 2015, involving 2,953 children with congenital pathology, showed that the most common defects throughout the study period were defects of the interventricular septum (18.4%), interatrial partitions (11.3%) and tetrad of Fallot (11.8%). Every ten years there was an increase in the prevalence of defects of the interventricular septum by approximately 6%, whereas the incidence of pulmonary artery stenosis was steadily decreasing with time [20].

Thus, in countries far abroad, as well as in Russia, there are significant fluctuations in the prevalence and primary incidence of CHD in different regions with the highest frequency in European countries, which may be due to good monitoring on the basis of a network of registers using modern diagnostic capabilities. In favor of this hypothesis is the tendency of the decrease in the frequency of CHD in Europe in recent years as a result of preventive measures aimed at replenishment of a deficiency of folic acid and trace elements in pregnant women. The most common CHD, as in the Russian Federation, were defects of the interventricular and atrial septa, valvular defects, pulmonary artery stenosis, and from the combined anomalies - the tetrad of Fallot

**2. Prevalence and structure of congenital heart diseases in the Russian Federation**

In the Russian Federation, in order to estimate the prevalence of congenital malformations on the basis of the Research Institute of Pediatrics and Pediatric Surgery of the Ministry of Health of the Russian Federation, a register has been created in which newly detected developmental abnormalities are recorded, including congenital malformations of the circulatory system in live births and stillbirths with a body weight in excess of 500 grams . During the study period from 2006 to 2012, registered 107 763 cases of congenital developmental disorders in thirty-one regions of the country [8]. The frequency of all detected defects in this period was in the range of 22.20- 0.90 per 1,000 children born, which is consistent with the indicator in various countries of Europe, where developmental anomalies occur, on average, at a frequency of 20-50 per 1000 newborns [30 ]. In the structure of congenital malformations, the cardiovascular system had the largest specific gravity - 18.1% [16].

Official statistics, according to the Central Research Institute of Informatization and Health Organizations of the Ministry of Health of the Russian Federation, show that the incidence of CHD among Russian children in 2014 was at the level of 400.5, and in 2015 - 439.0 per 100,000 children's population [12]. According to Demikova NS, in 2003 in the Russian Federation the average frequency of CHD was 4.5 ‰, and their absolute number reached 20-25 thousand children per year.

The prevalence of CHD in certain regions of the Russian Federation is marked by significant fluctuations. So, in the Krasnodar Territory in the period

of 1998-2009. the prevalence of the vascular system of the circulatory system averaged 7.96 per 1,000 newborns with a predominance of isolated interventricular septal defects in their structure that occurred in 51.7% of cases; on the second place were defects of the interatrial septum (16.6%). At the same time, there was a significant unevenness in the prevalence of vices in various territories of the region [1].

The prevalence of malformations of the cardiovascular system in children under the age of one year in Tomsk for the 8-year period (1999-2006) was 9.2%. There was an increase in the frequency of children with CHD in this age group from 5.41 to 12.75%, mainly due to atrial and interventricular septal defects, which can be largely due to the improvement of the quality of specialized cardiological care for the population of the Tomsk region on the basis of a specially created the CHD register [14, 17].

In the Volgograd region, the overall incidence of CHD among children between 2008 and 2011 statistically significantly exceeded the average Russian indicators: 1413.8 and 1280.3 per 100,000 children's population, respectively. The primary incidence of CHD in children was also significantly higher: 466.1 and 346.6.9 per 100 000 population, respectively. At the same time, the prevalence of CHD in adult residents of the region was significantly lower than in the Russian Federation (58.5 and 71.5 per 100,000 adults, respectively) [11].

When studying the structure of CHD among newborn children in Novosibirsk for the period from 2010 to 2013, hemodynamically significant defects were detected in 41% of 317 patients with CHD, and genetically determined pathology (chromosomal abnormalities) was confirmed in 15.4% of children, among them Down's syndrome was found in 12.3%. Heart defects in combination with other congenital anomalies were revealed in 10.8% of sick children, of them more than half of the cases were malformations of the urinary system. Defects of the interventricular septum (19.2%), atrioventricular canal (15.8%), transposition of the main vessels (14.8%) prevailed in the structure of the CHD. Hypoplasia of the left heart was diagnosed in 6.8% of children with CHD, the only ventricle in 5.7% of patients. In 14.8% of patients, multiple defects of the circulatory system were observed [5].

Among the newborns of the Perm Territory in 2005, CHD were diagnosed in 201 cases, the primary incidence rate was 13.4 per 1,000 children. Among children under the age of 14 years, the prevalence of this pathology was at the level of 9.0 ‰. Defects of the interventricular and interatrial septa, as well as valvular defects predominated in the structure of the CHD: failure of the pulmonary artery valve, mitral and tricuspid valve (8.2%, 6.1%, and 5.2%, respectively). More than half of the cases were diagnosed with combined defects [15].

In Astrakhan Oblast in 2009, the incidence of CHD among newborns increased from 6.9 ‰ in 2009 to 9.4 ‰ in 2011. Of these, 25.9% had an interventricular septal defect, 20.7% had an atrial septal defect, and 8.2% had a Fallot tetrad [9].

The presented data testify to rather high rates of morbidity and prevalence of congenital heart diseases among newborns and children of the Russian Federation with a tendency to increase over the last decade and uneven distribution of these indicators in certain regions

Thus, monitoring can be considered as the main means for the prevention of congenital malformations, since an understanding of the role of risk factors and mechanisms of developmental malformations enables us to prevent or eliminate their harmful effects.

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