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PREVALENCE OF CONGENITAL HEART DISEASES IN CHILDREN OF SCHOOL AGE ACCORDING TO ECHOCARDIOGRAPHY DATA

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Conflict of interest
The authors declare that they have no conflicts of interest

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Abstract

Purpose of the study. *Study of the prevalence of congenital heart defects among schoolchildren in the Kyrgyz Republic.*

Materials and methods. *The material for the study were 38598 schoolchildren aged 6 to 16 surveyed in Jalal-Abad, Osh, Batken and Naryn regions. Using the instrumental technique, 2919 children out of all schoolchildren underwent an echocardiographic (EchoCG) study. The indication for echocardiography of the study was presence of a heart murmur, revealed by auscultation.*

Results. *Based on the study, the authors identified 171 (5.8%) cases of congenital heart defects.*

Conclusion. *The presented results indicate changes in the size of the heart cavities, valve apparatus and pressure in the pulmonary artery with an enriched pulmonary circulation. With tetralogy of Fallot and pulmonary atresia, there is an increased size of the pancreas and a smaller size of the left ventricle. More complex defects are detected at a younger age. All of the above indicates the need to optimize early diagnosis and management tactics for children with congenital heart defects.*

Keywords
schoolchildren, valvular regurgitations, prevalence

Эхокардиография мәліметтері бойынша мектеп оқушылары арасында туа біткен жүрек ақауларының таралуы

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Аңдатпа

Зерттеу мақсаты *- Қырғыз Республикасының мектеп оқушылары арасында туа біткен жүрек ақауларының таралуын зерттеу.*

Материалдар мен әдістер. *Зерттеу материалы Жалал-Абад, Ош, Баткен және Нарын облыстарында сауалнамаға қатысқан 6 мен 16 жас аралығындағы 38598 оқушыны қамтиды. Аспаптық техниканы қолдану арқылы барлық мектеп оқушыларынан 2919 бала ЭхоКГ (ЭхоКГ) зерттеуден өтті. EchoCG зерттеуіне көрсеткіш жүректе аускультация арқылы анықталған шудың болуы болды.*

Нәтижелер. *Қырғыз Республикасындағы мектеп оқушыларының арасында туа біткен жүрек ақауларының таралуын зерттеу.*

Қорытынды. *Ұсынылған нәтижелер байытылған өкпе айналымы бар өкпе артериясындағы жүрек қуыстарының, клапан аппаратының және қысымының өзгеруін көрсетеді. Фалло тетрадасы мен өкпе артериясының атрезиясы кезінде ұйқы безінің ұлғаюы және сол жақ қарыншаның кішіреғюі байқалады. Неғұрлым күрделі ақаулар жас кезде анықталады. Жоғарыда айтылғандардың барлығы туа біткен жүрек ақаулары бар балаларды ерте диагностикалау және басқару тактикасын оңтайландыру қажеттілігін көрсетеді.*

Түйін сөздер
мектеп оқушылары, жүректің туа біткен ақаулары, қақпақшалық ақаулар, таралуы

Распространенность врожденных пороков сердца у детей школьного возраста по данным эхокардиографии

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Конфликт интересов
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Аннотация

Цель исследования *- изучение распространенности врожденных пороков сердца среди школьников Кыргызской Республики.*

Материалы и методы. *Материалом исследование стали 38598 школьников в возрасте от 6 до 16 лет обследованных в Жалал – Абадской, Ошской, Баткенской и Нарынской областях. С использованием инструментальной методики из всех школьников 2919 детям проведено эхокардиографическое (ЭхоКГ) исследоваине. Показанием к проведению ЭхоКГ исследования послужило наличие шума в сердце, выявленного аускультативно.*

Результаты. *Изучение распространенности врожденных пороков сердцасреди школьников в Кыргызской Республике.*

Выводы. *Представленные результаты свидетельствуют об изменениях размеров полостей сердца, клапанного аппарата и давления в легочной артерии с обогащенным малым кругом кровообращения. При тетраде Фалло и атрезии легочной артерии отмечаются увеличенные размеры ПЖ и меньшие размеры левого желудочка. Более сложные пороки выявляются в более младшем возрасте. Все вышеперечисленное свидетельствует о необходимости оптимизации ранней диагностики и тактики ведения детей с врожденными пороками сердца.*

Ключевые слова
школьники, врожденные пороки сердца, клапанные регургитации, распространенность

Congenital heart defects are abnormalities in the structure and (or) function of the cardiovascular system resulting from a violation of its embryonic development [1]. According to the clinical guidelines of the European Society of Cardiology 2020, the frequency of congenital heart defects is 9 per 1000 live births [2].

Patent ductus arteriosus (PDA) usually occurs in premature babies and is extremely rare in babies born at term. With these criteria, the frequency of isolated pathology is about 0.14-0.3 / 1000 live births, 7% among all congenital heart defects (CHD) and 3% among critical CHD. The average life expectancy for patients with PDA is approximately 40 years. 20% of patients die before age 30, before age 45 - 42%, before age 60 - 60% [12].

Coarctation of the aorta occurs in about 2 - 5 per 104 newborns, which is 6 - 7% of all diagnosed CHD [13].

The incidence of atrial septal defect (ASD) in childhood is 1 case per 1500 live births, or 7% among all CHD [14].

Partial abnormal drainage of pulmonary veins (PADPV) is usually combined with the presence of an interatrial communication (ASD), an open foramen ovale. Less commonly, the atrial septum is intact. For each type of PADPV there are preferential localizations of ASD, however, combinations of PADPV variants with ASD cannot be considered absolute. The frequency of partial abnormal drainage of pulmonary veins ranges from 0.3% of all CHD according to clinical data to 0.6% according to autopsy data [15].

Isolated stenosis of the pulmonary artery valve, according to Nadas` Pediatric Cardiology (USA) is 6.8%, which can be only 8.8 cases of CHD of the type of “pulmonary artery / pulmonary valve stenosis (PA/PVS)” of all severity degrees per year per 1 million population [16]. Russian data on the frequency of such stenosis is much less - only 1.2% [17], which is 3 cases per 1 million population.

Ventricular septal defect is the most common congenital heart disease, found in 32% of patients, either alone or in combination with other abnormal heart defects.

Tetralogy of Fallot is diagnosed in 8-13% of all patients with congenital heart disease. Among the defects requiring surgical treatment in early childhood, the tetralogy of Fallot accounts for 15%. The incidence of malformation in newborns ranges from 4 to 7%. The average life expectancy of patients with tetralogy of Fallot is 12-13 years and depends on the degree of PA stenosis. Mortality during the first year of life - 25%, by age 3 - 40%, by age 10 - 70%, by age 40 - 95%. With the “pale” forms of the defect, life expectancy is somewhat longer than with the cyanotic form. Usually, severe non-operated patients die from thromboembolism of cerebral vessels with the formation of abscesses, the development of heart failure, infective endocarditis [3–4].

The frequency of the defect according to clinical data is 0.72% [5]. The prognosis of the course of the defect largely depends on the hemodynamic variant. Life expectancy is higher in patients with right ventricular outlet obstruction [6].

Pulmonary atresia occurs in 3-5% of all CHD cases. The prognosis of a patient's life depends on the nature of the pulmonary blood flow. The mortality rate of children with ductus-dependent hemodynamics up to 12 months is 90%. In 6 patients with several sources of pulmonary blood flow and moderate cyanosis, by 3-5 years of age, the mortality rate is 50%. With increased pulmonary blood flow and the presence of large aorto-pulmonary collateral arteries, patients die as pulmonary hypertension develops, mainly in the third decade of life. In general, the median survival rate for patients with pulmonary atresia (PA) and VSD is within six months to two years old [7].

The frequency of a single ventricle (SV) is about 0.13 / 1000 of newborns, among all CHD - 2.5%, among "critical" CHD - 5.5%, during the first year of life without treatment, mortality is 75% [8.9]. The most common variant is a double inflow left ventricle (LV) with transposition of the great arteries (TGA) [1].

The forecast of the natural course of SV is unfavorable: 55–67% of children die in the first year of life without surgery, and up to 90% of children by age 10 [10].

According to the International Register of Pediatric Pulmonary Hypertension, among all reported cases of pulmonary hypertension (PH) in children, 88% of patients were diagnosed with pulmonary arterial hypertension (PAH). The overwhelming majority (over 85%) were associated with PAH, which complicated the course of congenital heart defects [18, 19].

Until now, no studies have been conducted in the Kyrgyz Republic to study the prevalence of congenital heart defects, which determines the relevance of this study.

Purpose of the study

Study of the prevalence of congenital heart defects among schoolchildren in the Kyrgyz Republic.

Material and methods

Between 2015 and 2019, 38,598 schoolchildren aged 6 to 16 (average aging 11) living in Jalal-Abad, Osh, Batken and Naryn regions were surveyed. All examined underwent a questionnaire survey, a general clinical examination with auscultation of the heart. Out of these, 2919 children (7.56%) with heart murmur underwent Echocardiography. Echocardiography was performed according to the standard technique on a portable device "SonoscapeS9" from "SonoScapeMedicalCorp".

Results and discussion

2919 students with heart murmur were examined, who were often monitored in polyclinics at their place of residence. All the examined underwent echocardiography with Doppler analysis. 171 students were diagnosed with congenital heart defects, which accounted for 5.9% of the total number of patients examined.

By sex, the surveyed children were distributed as follows: 80 (46.8%) boys and 91 (53.2%) girls. By age, children were divided into the following groups: primary school age (6–11 years old) - 109 children (63.7%), senior school age (12–16 years old) - 73 students (36.3%).

Survey results. As a result of the study, patent ductus arteriosus (PDA) was diagnosed in 15 (8.8%) children, coarctation of the aorta (CoA) in 5 (2.9%), ASD in 20 (11.7%), PADPV in 5 (2.9%), isolated pulmonary valve stenosis (IPVS) - 3 (1.7%), VSD - in 88 (51.4%), incomplete form of atrioventricular communication (AVC) - 4 (2, 3%), tetralogy of Fallot (TF) - 22 (12.9%), double vascular discharge from the right ventricle with pulmonary artery stenosis (PAS) - in 7 (4%), type I pulmonary atresia with VSD (PA) - in 1 (0.58%), the single ventricle with pulmonary artery stenosis (SV) - in 1 (0.58%) (Fig. 1).

- The number of students in the lower grades is higher than in the senior ones.
- Complex heart defects such as SV, PA, PAS from the right ventricle (RV) rarely survive to an older age [11].

When examining the valves, mitral regurgitation was detected in 102 cases, which amounted to 59.6% of the examined. Of these, I degree - in 86 (50.3%) schoolchildren, II degree - in 16 children, which, respectively, amounted to 9.3%.

Tricuspid regurgitation was observed in 93 (54.4%) students; Grade I was detected in 82 (47.9%), grade II tricuspid valve insufficiency - in 11 (6.4%).

Regurgitation on the pulmonary valve was diagnosed in 36 cases, which amounted to 21%. Aortic valve regurgitation was 7 (4%).

The gradient on the pulmonary valve was detected in 33 (19.2%) cases. In 4 cases, aortic regurgitation is associated with prolapse of the right coronary valve in VSD.

Combined regurgitation on the mitral, tricuspid, aortic and pulmonary valves was observed in 24 cases, which accounted for 14% of the subjects. Mitral-aortic regurgitation - in 74 (0.43%) cases. Mitral-tricuspid regurgitation - in 159 (92.9%) schoolchildren. Regurgitation on the tricuspid and pulmonary valve - in 106 (61.9%) students; regurgitation on the mitral valve and gradient on the pulmonary valve - in 12 (7%) patients. Regurgitation on the tricuspid valve and a gradient on the pulmonary valve - in 50 (29.2%) children.

The dimensions of the heart cavities were calculated considering the body surface area (BSA) (m^2) [20,21]. End-diastolic and end-systolic dimensions of the left ventricle (EDV and ESR) were increased in subjects with PDA, VSD, coarctation of the aorta, PAS from the pancreas, incomplete form of AVC by more than 25-28 percent. An increase in the size of the pancreas was diagnosed in schoolchildren with TF, IPVS and PA by more than 30-35%. Patients with tetralogy of Fallot and pulmonary atresia had low values of EDV and ESR were below normal.

When determining pulmonary hypertension, clinical guidelines for pulmonary hypertension in children were followed [22]. The criteria for the reliability of pulmonary hypertension were the blood flow velocity of tricuspid regurgitation (Vtc)> 3.4 m / s, systolic pressure in the pulmonary artery (PPA)> 50 mm Hg.

Out of 137 patients with hypervolemia of the pulmonary circulation, pulmonary hypertension was detected in 66 patients, which amounted to -38.5%. The data are presented in table 3.

Conclusion

The presented results indicate changes in the size of the heart cavities, valve apparatus and pressure in the pulmonary artery with an enriched pulmonary circulation. With tetralogy of Fallot and pulmonary atresia, there is an increased size of the pancreas and a smaller size of the left ventricle. More complex defects are detected at a younger age. All of the above indicates the need to optimize early diagnosis and management tactics for children with congenital heart defects.

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