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GENERAL CLINICAL CHARACTERISTICS OF SICK CHILDREN WITH PREMATURE VENTRICULAR AROUSAL

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Abstract:
The syndrome of premature ventricular arousal (CVV) of the heart means that part of the ventricular myocardium or the entire myocardium is activated by atrial (sinusoidal) impulses conducted along additional conductive pathways (DPP) before the impulses reach the ventricles through the normal conduction system of the heart.
Manifestations of LVH are rare - from 0.15 to 3.1% of the general population, including 9% of the total number of children with cardiac arrhythmias. In childhood, the manifestation of this pathology is more common than in adulthood. This disease manifests itself in various forms – from constant clinical and electrophysiological manifestations in the manifest form to the absence of any subjective and objective symptoms in the latent form.
The clinical significance of PVA is determined by the fact that almost 80.0% of patients sooner or later develop tachyarrhythmic attacks, both paroxysmal (i.e., transient) and chronic (permanently recurrent form) tachyarrhythmias, atrial fibrillation, atrial flutter, which when under certain conditions, they transform into atrial and ventricular fibrillation, which poses a threat to the patient's life.
That is why early diagnosis and monitoring of these patients is important. Today, doctors are increasingly paying attention to the genetic aspects of various cardiovascular diseases, including PVC syndrome, which is successfully used in predicting and diagnosing latent forms of the disease. The article presents the general clinical characteristics of sick children with premature excitation of the ventricles.

Keywords: Arrhythmia, pre-excitation of the ventricles, children, hearts

INTRODUCTION. The term premature ventricular arousal (PVA), "preexitation" was first proposed by R. Ohnell [1944], means that part of the ventricular myocardium or the entire myocardium is activated by atrial (sinusoidal) impulses conducted along the DPP before the impulses reach the ventricles through the normal conduction system of the heart [1]. According to the literature, manifestations of PVA are rare - from 0.15 to 3.1% of the general population, including 9% of the total number of children with cardiac arrhythmias. At the same time, in 58.0 – 69.0% of children and adults, respectively, an ECG shows a ∙ wave, one of the ECG signs of PVA, without changing the P-Q and QRS intervals [2].

An analysis of the cited literature sources shows that the frequency of PVA among both adults and children has not been established, there is no consensus on the mechanisms of PVA development, cardiac and extracardial factors transforming PVA with tachyarrhythmias have not been established, diagnostic errors in the interpretation of ECG manifestations of PVA are frequent (myocardial infarction, myocarditis, congenital and acquired heart defects, PVA, thyrotoxicosis, neurosis, syncopal states, etc.) [3]. Despite the successes achieved in studying the electrophysiological features of DPP, in the pathogenesis of arrhythmias in them [4], the effects of antiarrhythmic drugs, indications and tactics of surgical treatment of PVA, it remains relevant to identify reliable diagnostic criteria that allow timely recognition of life-threatening arrhythmias in these patients [5]. Despite the numerous proposed methods in the diagnosis of PVA, ECG examination has until recently remained the only method that allows topically diagnosing DPP in PVA patients.

THE PURPOSE OF THE STUDY. To study and provide general clinical characteristics of sick children with various forms of PVA in school-age children in terms of additional diagnostic capabilities of electrocardiography.

MATERIALS AND METHODS OF RESEARCH. The characteristics of the clinical and instrumental data of patients with PVA will be presented in the form of a

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comparative analysis of the examination results of three groups: I - group of children with WPW syndrome (9 children) and WPW phenomenon (17 children); II – group – children with P–Q shortened interval syndrome, or CLC syndrome (24 children) and CLC phenomenon (20 children) and group III with partial Mahaima phenomenon (12 children).

RESEARCH RESULTS AND DISCUSSION. We evaluated the anamnestic data of mothers of sick children with PVA, with an emphasis on the course of pregnancy and childbirth (Table 1). Mothers of sick children with PVA syndrome or phenomena showed a high incidence of late toxicosis, mothers of sick girls 32.0+9.33% p>0.05) and boys (40.4+6.49% p<0.05) compared with healthy children: (24.0+6.04% and 18.0+5.43%). A separate study of variants of late toxicosis showed an increase in preeclamptic conditions in mothers of sick boys (12.3% p<0.013, · 2=2.71, p<0.1; h2· =0.0381, p<0.05). Among mothers of sick boys, there is a high concentration of factors such as polyhydramnios (p<0.013, · 2=2.71, p<0.1, h2· =0.375, p<0.05), prolonged (p<0.018), and rapid childbirth (p<0.013), premature discharge of amniotic fluid (p<0.03, · 2=2.79, p<0.1, h2· = 0.381, p<0.05). Among the mothers of sick girls, anamnestic indications of the pathological course of pregnancy and childbirth were relatively less than in boys and were due to weak labor activity (p<0.041) and prolonged labor (p<0.042). In addition to these factors, pathologies in the form of pelvic and leg presentations (p<0.05), an increase in the frequency of asphyxia in childbirth (p<0.023, · 2=4.02, p<0.05, h2· =0.047, p<0.05) were also revealed in sick boys.

Analyzing these complications of pregnancy and childbirth in mothers of sick children, it should be noted that the detection of a relatively low number of girls with PVA syndrome (30.5%) versus boys (69.5%) is probably not a random fact, in the latter, the ante– and intranatal periods are burdened with pathologies of pregnancy and childbirth on the part of their mothers. It is obvious that the concentration of PVA cases among boys is due to the peculiarities of their prenatal development against the background of a high frequency of manifestations of late toxicosis and polyhydramnios in their mothers. There is information in the literature that with severe manifestations of late toxicosis in pregnant women, gestational dominant inhibition occurs, the main manifestation of which in the fetus is a decrease in heart rate and its motor activity (fetal movement). Such newborns are born with signs of physiological immaturity. At the same time, particular manifestations of physiological immaturity may be the immaturity of the respiratory center, the immaturity of the myocardium and the centers of regulation of heart function with the ensuing consequences (electrical instability of the myocardium), which in turn is the background for the development of life-threatening arrhythmias [6]. At the same time, the impact of factors in the intranatal period, weakness of labor and its consequences, prolonged labor, rapid childbirth, obstetric aids in childbirth, pelvic and leg presentation of the fetus, which most often lead to injury to the spinal cord, its cervical region (hyperflexia, hyperextension), the manifestation of which may be respiratory disorders (asphyxia newborns) and heart rate.

A study of the birth weight of examined children with PVA showed that the main proportion of girls - 17 (68.0%) and boys - 41 (71.9%) had a weight in the range of 3100 - 3500 grams. The average weight of girls (3368.0+72.7 grams) is not statistically different (p>0.05) from that of boys (3392.0+66.9 grams). The proportion of low birth weight babies (<2700 grams) is relatively high among girls – 5 (20.2%) than among boys – 7 (12.3% p<0.05), and the proportion of newborns with high birth weight (>3777.0 grams).

Table 1.
Complications of pregnancy and childbirth in mothers sick children with PVA syndrome (%)

№	Types of complications	The control group		Children with PVA		Pφ1	Pφ2
		Д n=50	М n=50	Д n-25	М n-57		
1	Early toxicosis	6,0	4,00	12,0	10,3	Н.д.	Н.д.
2	Late toxicosis: Nephropathy Preeclampsia Eclampsia	8,0 10,0 4,0 2,0	6,0 8,0 2,0 2,0	8,0 12,0 8,0 4,0	12,3 14,04 12,3 3,51	н.д. н.д. н.д. н.д.	н.д. н.д. <0,013 н.д.
3	Bleeding in the first and second half of pregnancy	4,0	2,0	4,0	3,51	Н.д.	Н.д.
4	Ph and ABO isosensitization	2,0	-	-	3,51	Н.д.	Н.д.

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5	Polyhydramnios	8,0	2,0	12,0	12,3	Н.д.	<0,013
6	Lack of water	6,0	2,0	4,0	7,02	Н.д.	Н.д.
7	Multiple births	2,0	4,0	-	1,75	Н.д.	Н.д.
8	Pelvic and leg presentation of the fetus	-	2,0	4,0	8,77	Н.д.	<0,05
9	Weakness of labor activity	2,0	10,0	12,0	12,3	<0.041	Н.д.
10	Long-term labor	2,0	2,0	12,0	10,3	<0.042	<0,0028
11	Rapid childbirth	2,0	4,0	4,0	14,04	н.д.	<0,03
12	Pathology of the placenta and umbilical cord	6,0	4,0	8,0	8,77	н.д.	Н.д.
13	Premature discharge of amniotic fluid	8,0	4,0	12,0	15,8	н.д.	<0,016
14	Obstetric benefits in childbirth	4,0	4,0	12,0	14,04	н.д.	<0,03
15	Fetal hypoxia	4,0	12,0	8,0	12,3	н.д.	Н.д.
16	Asphyxia of newborns	16,0	14,0	28,0	29,8	н.д.	<0,023

Note: *The reliability of the differences was determined by the exact Fisher method with angular transformation (φ), a one-sided criterion. P φ1 - girls,*
P φ2- boys. N.D.- statistically unreliable.

In the analyzed materials, attention is drawn to the relative increase in the proportion of girls with low birth weight. However, it is currently recognized that the birth of children with a normal body weight (3,200 – 3,500 grams) is not a criterion for their maturity, they may be physiologically mature and immature. It is shown that the features of the activity of the heart and the cardiovascular system as a whole are highly correlated with the signs of physiological maturity.

We studied the incidence of diseases in the examined sick children with PVA syndrome. Studies have shown that the proportion of children who have never been ill is quite low in girls (16.0% p<0.05) and boys (19.3% p>0.05), compared with healthy children (28.0% and 32.0%). In the anamnesis of sick children, pathology of viral and bacterial genesis was most often present, upper respiratory tract in girls (56.0%) and boys (45.6% p>0.05), gastrointestinal tract - viral hepatitis, intestinal infections in 20.0 and 24.6% (p>0.05) cases. Among sick children with manifestations of PVA, the proportion of frequently ill children is high, respectively in 29.8% and 24.0% of boys and girls, which significantly exceeds the data of healthy children (8.0% and 4.0% p<0.001, p<0.006). Chronic foci of infection are quite often detected in the examined sick children, respectively in 29.8 and 32.0% (p>0.05) of boys and girls. Among them, dental caries (8.77% and 8.0% p>0.05), chronic tonsillitis (7.0% and 8.0% p>0.05), adenoiditis (5.26% and 4.0% p>0.05), sinusitis (3.51% and 4.0 p>0.05) and various combinations of the above-mentioned foci were detected with high frequency infections (5.26 and 8.0% p>0.05). There are indications in the literature that in children with cardiac arrhythmias, inflammatory degenerative processes in the nervous apparatus of the heart and working myocardium are detected in intraoperative biopsy material, and therefore cardiac arrhythmias and conduction disorders are considered by some authors as manifestations of primary cardio-neuropathy [7].

To determine the role of heredity in the pathogenesis of PVA manifestations in children, we analyzed the case of family accumulation of certain chronic diseases in relatives according to Rose's questionnaire: a group was formed – relatives of I (410) and II degree of kinship (451) of sick proband children and a control group (496 and 510) of parents of healthy children (100 children), the results are given in **Table 2**. As can be seen from these tables, in sick girls with manifestations of PVA in families, there is a large lesion of relatives of the first degree of kinship for diseases of the respiratory system (p <0.018), urinary system (p <0.002), peripheral blood (p<0.011) endocrine system (p<0.018), diseases of the skin and its appendages (p<0.001), neuropsychiatric diseases (p<0.035). The concentration of rheumatic diseases (p<0.027), peripheral blood diseases (p<0.011) and neuropsychic sphere (p<0.026) was observed in sick boys among relatives of the first degree of kinship. In sick children, respectively, girls and boys, family accumulations of diseases such as diseases of the stomach and duodenum 12 (p <0.025, p <0.01), as well as the

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neuropsychic sphere (p<0.021, p<0.024), liver diseases (p<0.04) were observed among relatives of the II degree kinship, which, with some conditionality, indicates a dominant type of inheritance with incomplete penetrance. Of particular concern is the detection of a high frequency of sudden death in relatives of the II degree of kinship (p <0.031) of sick girls with manifestations of PVA. Data from Table 2. they also show a large accumulation among relatives of sick children with PVA syndrome of diseases with a trophotropic orientation, such as respiratory diseases, diseases of the stomach and duodenum, skin of its appendages, as well as diseases with an ergotropic orientation, such as obesity, diabetes mellitus, thyrotoxicosis and diseases of the neuropsychic sphere, neuroses, migraine, meteosensitivity and emotional lability of parents of children with PVA. It is known that endocrine correlates of emotions are shifts in the functional state of the thyroid gland, the release of steroid hormones and catecholamines [8, 9].

The examined children with manifestations of PVA presented a wide variety of complaints related to age, gender and had different vegetative coloration. So, respectively, boys and girls complained of a feeling of numbness, "goosebumps" (paresthesia) on the skin of the trunk, on the extremities (14.04 and 8.0% p>0.05), general or regional (mainly on the palm and sole) sweating (21.1 and 20.0% p>0.05), a feeling of "rush" when emotional and physical exertion (8.77 and 12.0% p>0.05), could not stand stuffy rooms, driving in a car (10.5 and 16.0% p>0.05), some had intolerance to cold weather (12.3 and 12.0% p>0.05), headache was noted (8.77 and 16.0% p<0.048), at times of a pulsating nature (5.26% and 8.0% p>0.05), accompanied by "ringing in the ears", darkening in the eyes, a feeling of palpitation, which resembles a picture of a symptom complex – presyncopal phenomena. 5,26 and 12.0% of children

Table 2.
The incidence of certain chronic diseases
in parents and relatives of sick children with PVA syndromes (%)

№	A group of diseases	I degree of kinship		II degree of kinship	
		250/125	246/285	234/156	286/295
		D	M	D	M
1	They died suddenly, suddenly	1,6 2,4	3,66 17,5	4,7 9,62*	8,4 9,15
2	Angina pectoris, coronary heart disease, arterial, hyper- and hypotension, myocardial infarction, stroke and others.	7,6 10,4	5,28 8,42	12,3 17,9	15,4 19,3
3	Rheumatic diseases	4,0 8,0	4,88 9,12*	8,11 7,69	6,3 9,15
4	Respiratory diseases	10,4 18,4*	8,13 12,3	14,5 18,6	13,6 18,3
5	Diseases of the stomach and duodenum	5,2 11,2*	7,72 8,07	9,83 16,7*	12,6 19,7*
6	Diseases of the liver and biliary tract	8,8 7,2	6,91 5,26	15,4 16,0	10,8 15,9*
7	Diseases of the urinary tract	4,8 13,6*	6,5 8,77	8,97 7,69	16,8 18,6
8	Peripheral blood diseases	22,4 33,6*	23,2 29,8*	26,5 30,8	22,7 20,3
9	Diseases of the endocrine system (obesity, diabetes mellitus, thyrotoxicosis, etc.)	5,6 12,0*	4,47 11,6*	11,1 13,5	15,7 17,6
10	Diseases of the skin and its appendages (neurodermatitis, eczema, dermatitis)	4,8 14,4*	5,69 11,2*	9,4 12,2	14,7 18,3
11	Diseases of the neuropsychic sphere (neuroses, psychopathies, migraines, etc.)	4,0 8,8*	4,07 8,07*	8,12 14,7*	13,6 19,7*

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Note: *1. In the numerator – the data of the control group, in the denominator in the families of sick children.*
*2. Reliability is determined by the exact Fisher method with angular transformation (φ), one-sided criteria. I degree of kinship (parents, siblings). II degree of kinship (grandparents, aunts, uncles, nieces); *p <0.05-0.01.*

(boys and a girl) there was a feeling of lack of air and "sighs", pain in the extremities (3.51 and 4.0% p>0.05). It is noteworthy that 35.0% of girls and 24.6% of boys had complaints of short-term pain in the heart area with indistinct localization, which were more often "aching", "pressing" in nature (24.0% and 17.5% p>0.05), less often "stabbing" (12.0% 7.02% p>0.05), accompanied by a feeling of "palpitations" and "interruptions" (7.02% and 4.0% p>0.03). These complaints were more often provoked by psychoemotional and physical overstrain (in physical education classes) and passed on their own, children rarely went to the doctor. It is known that in children, cardialgia, which occurs against the background of psychoemotional stress, is most often psychogenic in nature and is not based on myocardial ischemia. However, cardialgia on the background of physical activity, detected in 8.0% and 10.5% of girls and boys, respectively (p>0.05), does not completely exclude the possibility of ischemic pain, especially in children with organic substrates in the heart (carditis, tonsillogenic intoxication, etc.).

Some children, boys and girls, respectively, had complaints of intolerance to dairy products (3.51% and 12.0% p <0.038), legumes (5.26% and 4.0% p>0.05), had rashes on the body (anamnetically) after eating these foods (7.01% and 8.0% p <0.05), back pain abdomen with indistinct localization, unrelated to meals (10.5% 8.0% p>0.05), decreased appetite (15.8% and 20.0% p>0.05).

The neuropsychic environment of the examined children in 21.1 – 16.0% of cases (p>0.05), respectively, in boys and girls was characterized by a rapid change of mood (lability), some haste in actions. Other children looked adynamic, sluggish (7.0% and 24.0% p <0.01), not decisive in lessons (5.26% and 12.0% p<0.01), their sleep in 14.04% and 12.0% (p>0.05) cases was late, difficulty in falling asleep was noted, sleep was short, intermittent, restless, with dreams, there was a feeling of fear (8.77% and 4.02% p>0.05). In some children, sleep came quickly, was prolonged, there was difficulty in waking up (7.0% and 12.0% p>0.05), lethargy, drowsiness in the morning (5.26% and 8.0% p>0.05), combined with passivity in morning classes. Some clinical symptoms in sick children with PVA are given in the table.3.

As can be seen from the data in the table.3 in sick girls, compared with population data [10], the most common clinical symptoms are lethargy and adynamicity (p<0.021), diffuse red dermographism (p<0.045), increased pulsation of cervical vessels during examination (p<0.001), Caudecus symptom (p<0.018), increased tendon reflexes on the arms (p<0.007) and legs (p<0.001), decreased reflexes on the arms and legs (p<0.02), decreased abdominal reflexes (p<0.044), muffled tones at the base of the heart (p<0.026), at the apex (p<0.001), amplification of heart tones (p<0.001) and their uncoupling at the apex (p<0.018). In boys, compared with a healthy population of children, symptoms such as enlargement of the thyroid gland of I and II degrees (p<0.001), increased sweating, decreased limb temperature, acrocyanosis (p<0.001), white dermographism (p<0.042) red (p<0.021), increased pulsation of the cervical vessels were often observed (p<0.005), symptom of Tail (p<0.034), hypotension of the muscles of the arms and legs (p<0.016), increased tendon reflexes in the arms (p<0.035), their weakening in the legs (p<0.048), muffled heart tones at the apex (p<0.006), diffuse soreness in the area epigastrium, around the navel and along the bowel during objective examination (p<0.042).

It was shown that these clinical symptoms depended on the initial vegetative tone and more often had a vagotonic orientation, more pronounced in girls (p<0.048) than in boys. It should be noted that many clinical symptoms identified from the side of the heart – vascular system, such as expansion of the boundaries of the heart (percussion), muffling, amplification, splitting of its tones at various listening points, often accompanied by systolic noise in the heart area, we regarded as a manifestation of functional cardiopathy [11, 12] However, there is evidence in the literature that children with enlarged heart sizes are prone to sudden death and children with systolic noise at the apex are more likely to have mitral valve dysfunction, which is the equivalent of mitral valve prolapse, and they are more prone to heart rhythm and conduction disturbances [13, 14, 15]. We have studied the distribution of cases of normal (meso–) advanced (macro–) and retarded (microsomatotype) development of sick children in a comparative aspect with healthy ones (Fig.1).

The data in Fig.1. it is shown that among children with PVA, the proportion of mesosomatic type of development is significantly reduced (39.0+5.38% p<0.001) and the proportion of microsomatic, i.e. retarded, type of development is increased (51.2+5.52%, p<0.001, · 2=12.2, p<0.001,

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h2· =0.073, p<0.001). In terms of severity, cases of microsomatotype in the PVA structure are dominated by WPW syndrome (66.7+5.2% p<0.001), Maheim phenomenon (50.0+5.52% p<0.001), WPW phenomenon (47.1+5.51% p<0.001) than CLC syndrome (45.8+5.50% p<0.01), and the phenomenon CLC (40.0+5.41% p<0.05).

Thus, the analysis of the obtained materials on the study of the physical development of children with PVA suggests that the latter are significantly lagging behind according to many anthropometric indicators, their rates of biological maturation are reduced. It has been shown that the somatic immaturity of children with PVA is mediated with their pre- and perinatal periods of development (r=0.428) and burdened heredity for trophotropic diseases(r=0.784), than ergotropic genesis (r=0.384, p<0.05).

Table 3.
Some clinical symptoms in the examined healthy and sick children with manifestations of PVA (%)

№	Clinical symptoms	Girls		Boys	
		Здоровые n=50	Больные n=25	Здоровые n=50	Больные n=57
1	Lethargy	8,0	24,0*	14,0	7,02
2	Mobility, anxiety	6,0	16,0	12,0	21,1
3	Enlargement of the thyroid gland	12,0	24,0	4,0	19,3*
4	III degree	14,0	20,0	6,0	26,3
5	Excessive sweating of the extremities, acrocyanosis	8,0	12,0	6,0	8,77
6	Hyperemia of the face, palms, soles	6,0 12,0	24,0* 16,0	6,0 8,0	17,5 19,3*
7	Dermographism is red	12,0	28,0*	12,0	24,6*
8	Dermographism is white	8,0	24,0*	10,0	26,3
9	Increased pulsation of the cervical	10,0	20,0	12,0	28,1*
10	vessels (visually)	8,0 6,0	24,0* 12,0	2,0 12,0	14,0* 16,5
11	is a symptom of grade I and II tail	4,0 8,0	24,0 20,0	14,0 4,0	21,1 15,8
12	Hypotension of the muscles of the arms and legs	84,0 16,0	76,0 14,0	80,0 20,0	80,7 19,3
13	Tendon reflexes on the hands: Increased	6	16,0	10,0	12,3
14	Lowered	4,0 2,0	16,0* 12,0*	2,0 10,0	12,3* 19,3
15	Tendon reflexes on the legs: Increased	6,0 6,0	16,0 12,0	10,0 8,0	17,5 12,3
16	Lowered	8,0 4,0	24,0* 12,0	12,0 6,0	15,8 8,77
17	Abdominal reflexes are caused by	12,0 6,0	20,0 8,0	14,0 8,0	17,5 10,6
18	They are called weakly	10,0	16,0	12,0	24,6*

Note: ** According to the exact Fischer method, p<0.05-0.01.*

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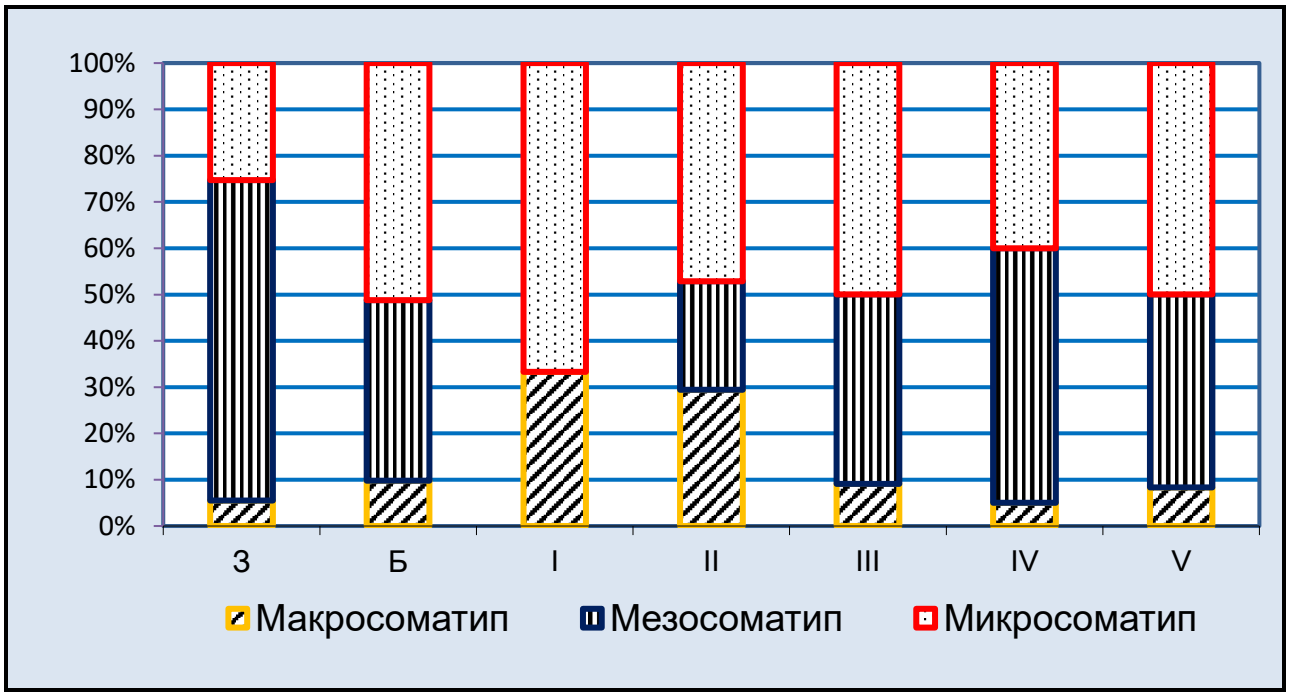

Drawing. 1. Distribution of somatic types among healthy and sick children with PVA
Note: H – healthy, B – the general group of sick children, I –V, respectively, PVA: WPW syndrome (I), WPW phenomenon (II), CLC syndrome (III), CLC phenomenon (IV) and Mahaim phenomenon (V).

CONCLUSIONS

1. Syndromes and phenomena of premature ventricular arousal (PVA) in school-age children are significantly more often detected during targeted preventive examinations (63.4% $p<0.01$) than in a clinic (36.6%).

2. The population frequency of PVA averages 0.47 per 1000 examined, is significantly more common in boys (0.69 $p<0.01$) than in girls (0.26). The proportion of this syndrome and phenomenon among sick children with cardiac pathologies is 1.47%, and 7.42%, of all cases of cardiac rhythm and conduction disorders.

3. The main structure of PVA is the syndrome (29.3%), the CLC phenomenon (24.4%) and the WPW phenomenon (20.7%), than the Mahaim phenomenon (14.6%) and WPW syndrome (11.0%).

4. Sick children with PVA are significantly retarded and disharmonious in general somatic development – in 51.2% of cases ($rt<0.01$), their development corresponds to the microsomatic type of development, often detected with WPW-type PVA (66.6% $rt<0.01$). Somatic immaturity of children with PVA is often associated with immaturity of the atrial and ventricular myocardium ($\chi2=7.82$, $\chi2=12.4$), mediated with their pre- and perinatal periods of development ($r=0.428$) and burdened by heredity for diseases more often trophotropic ($r=0.782$) than ergotropic ($r=0.384$).

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