

MANAGEMENT TACTICS FOR YOUNG CHILDREN WITH CONGENITAL HEART DEFECTS BEFORE CARDIAC SURGERY

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Abstract. CHD is an anomaly of the structure of the heart and large vessels that form during embryonic development (embryopathy), which results in hemodynamic disorders, which can lead to heart failure and dystrophic changes in the body's tissues. In live - born newborns, the incidence of heart damage averages 8-14 per 1,000 newborns. CHD is responsible for at least 11% of infant deaths and accounts for about 50% of all deaths associated with malformations. [1,2].

Keywords: congenital heart threshold, nutrition, protein- and energy deficiency, heart disease, surgical intervention.

Ventricular septal defect (IVD) is the most common type of CHD (about 28% of live births). Thanks to the development of pediatric cardiac surgery, surgical treatment of newborns and infants has become possible, and advances in this area contribute to reducing infant mortality rates [4]. Timely correction of an anatomical defect prevents the development of complications and creates conditions for the child's return to a full life [5].

Factors for the development of delayed physical development in children with CHD are reduced caloric intake (decreased appetite, increased fatigue), malabsorption syndrome due to impaired intestinal blood supply, hypermetabolism (due to tachycardia, tachypnea) [5].

In some cases, due to the condition of the child, surgical intervention is postponed for weeks or months. Patients with this pathology often have a significant deficit of weight and height indicators at an early age and, unlike adult patients with cardiac cachexia (which occurs only in the end stages), need long-term adequate support for optimal development.

How significant the impact of these factors on the outcome of surgical intervention is not precisely determined. At the same time, the elimination of some of them and the development of treatment methods in accordance with the most common problems of newborns would allow achieving the desired reduction in mortality after CHD correction.

Thus, ensuring adequate physical development of children with CHD is an urgent problem in pediatrics and pediatric cardiology, as well as a necessary and important component of the treatment of children with CHD.

Purpose of the study. To optimize the method of preoperative management of young children with congenital heart defects based on the assessment of the state of physical development, and to develop methods of nutrition correction.

Material and methods of research. A comprehensive examination of 106 children with an established diagnosis of CHD, 54-girls (46.7%) and 52 - boys (53.3%) aged from 0 months to 3 years was conducted. The diagnosis of CHD was confirmed by echocardiography and X-ray examinations, and in some 9 cases (8.4%) by angiography. Depending on their age (0-12 months and 1 year-3 years), the study children were divided into 2 study groups.

The main group consisted of 76 children with congenital heart defects who underwent the proposed preoperative preparation. The comparison group consisted of 30 patients with congenital heart defects who underwent preoperative preparation according to the traditional method before surgery. Depending on their age, all children were divided into 2 study groups.

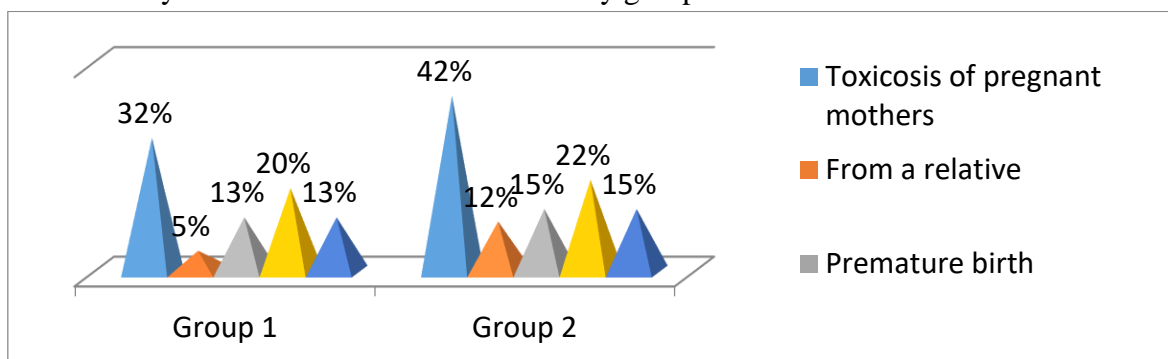
Thus, in group 1 of the study, 42.1% were children under 1 year of age, and 57.9% of children were children under 1 to 3 years of age. In the comparison group of 0-12months, 56.6% and 43.3%, respectively, were children aged 1-3 years.

The evaluation of anthropometric indicators of physical development was carried out in accordance with WHO recommendations. In order to obtain the necessary information about the child's physical development, several consecutive measurements of the child's physical development indicators were carried out and plotted on the physical development curves.

Interpretation of the results of anthropometric studies was carried out using maps of curves, weight, height and MRI indicators. After inserting the dots, we connected them and interpreted the results using the WHO recommended table.

Research results. All children in the period of preoperative preparation had heart failure, of which 9 (16.7%) were grade I, 41 (75.9%) were grade II (A), 3 (5.5%) were grade II (B), and one (1.9%) were grade III (B). 32 (59.3%) children showed signs of pulmonary embolism. hypertension: grade I – in 11 children (20.4%), grade II – in 13 (24.1%), grade III – in 8(14.8%) patients. Patients received diuretics, cardiac glycosides, and ACE inhibitors.

2. Analysis of anamnestic data in the study groups.



85% of women gave birth to this child first, but only 73% of them died from the first pregnancy. The functional state of newborns was estimated by 8-10 points on the Apgar scale in 90% of children and at the 5th minute-in all of them. All children from the maternity hospital were discharged for home care, under the supervision of the district psychiatrist. 90.1% of children were born full-term. Intrauterine growth retardation was found in 15.8% of full-term infants: Stage 1-9.5%, Stage 2-2.8% , and Stage 3-3.5%.

Features of physical development of children with CHD in the study groups. Anthropometric data of 106 children from 0 to 3 years of age of both sexes average values of growth indicators have their own characteristics that correspond to age and gender standards. The children were divided into age categories. There were slight differences in the growth rates of children in both boys and girls.

In the course of the study, we analyzed the presence of protein-energy insufficiency in children with CHD in the study groups, suggested management tactics and correction of nutrition of children depending on age and degree of protein-energy insufficiency.

Depending on the state of physical development at admission, the children were divided into the following study groups.

Table 3.

Percentage of examined children with CHD in the main group of the pa study in terms of body weight and body length / height to WHO standard deviations (n=76)

	Main group (n=76)							
	0-12 months				1-3 years			
	old Boys (n=15)		Girls (n=17)		Boys (n=23)		Girls (n=20)	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%
-3SO	3	9,3	4	12,5	6	13,9	5	11,9
-2SO	7	21,8	9	28,1	12	28,5	8	19,1
-1CO	2	6,2	1	3,1	3	7,1	3	7,1
med	2	6,2	2	6,2	2	4,7	3	7,1
+1SO	1	3,1	1	3,1			1	2,3
+2CO								
+3CO	-		-		-	-		

Thus, when analyzing anthropometric parameters, body weight and body length / height, it was determined that at the age of 0-12 months, this indicator was determined at the level of -3CO in 9.3% of cases, and in 18.7% -2CO in boys and -3CO - 12.5%, respectively -2CO-25% in girls. Also, signs of BEN were determined in the age group of 1 month-3 years, and, respectively, in 13.9% of cases, it was determined at the level of -3CO, and in 11.9% - 2CO in boys and -3CO-28.5%, respectively -2CO-19.1% in girls.

The weight-to-length/height indicator reflects the ratio of the child's weight to the achieved body length/height. This indicator is especially important in cases where the child's age is unknown. The body mass curve-body length / height allows you to identify those children whose body weight is insufficient, possibly due to protein-energy malnutrition (LDL)/exhaustion or severe LDL / exhaustion.

Table 4. Percentage of examined children with CHD in the control group of the po study in terms of body weight and body length / height to WHO standard deviations (n=30)

	Control group (n=30)							
	0-12 months				1-3 years			
	old Boys (n=7)		Girls (n=10)		Boys (n=6)		Girls (n=7)	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%
-3SO	2	11,7	3	17,6	1	7,6	2	15,3
-2SO	3	17,6	4	13,5	3	23,0	3	23,0
-1CO	1	3,3	3	17,6	2	15,3	1	7,6
med	1	3,3	-	17,6	--	-	1	7,6
+1CO	--		-					

+2CO	-		-		-			
+3CO	-		-		-	-		

When evaluating physical development, we obtained the following data:

indicators of body weight and body length / height to WHO standard deviations the indicators in the control group were comparable to those in the main study group and were determined as follows: at the age of 0-12 months, this indicator was determined at the level of -3CO in 6.6% of cases, and 2CO in 10% in boys and -3CO in 10%, accordingly -2CO-10%.

Detailing the reasons, we found that in the control group, the ratio between children with a deficit (body weight or height) and the number of children with CHD with low and very low values: by body weight-17 people

(31.5%), in terms of height-16 (29.6%), in terms of chest circumference – 19 (35.2%), while in the control group such children were 7 (14%), 6 (8%) and 7 (14%), respectively.

The most reliable indicator in the harmonious development of children is the body mass index (BMI).

Table 3.

Percentage of examined children in the main study group with CHD by age-related BMI according to WHO standard deviations (n=76)

	0-12 months (n=32)				1-3 years (n=43)			
	Boys (n=15)		Girls (n=17)		Boys (n=23)		Girls (n=20)	
	Abs.	%	Abs.	%	Abs.	%	Abs.	%
-3SO	4	12,5	4	12,5	5	11,6	3	6,9
-2SO	6	18,7	5	15,6	8	18,6	11	25,5
-1CO	4	12.5	7	21.8	8	18.6	6	13.9
Med	1	3.1	1	3.1	1	2.1	1	2.1
CO1+	-1				1	2.1		
CO2+	-							

Low BMI values in the range of -3CO and -2CO were found in 31.2% of boys aged 0-12 months and 28.1% of girls in this возрастной group. Among children with CHD aged 1-3 years, low BMI values were found in 30.2% of boys and 30.1% of girls.

Thus, the physical development of children with CHD of both sexes who have signs of SSN has its own characteristics. Disharmonious MFS due to weight deficit was registered in 37.6% of children I, 33.9% II and 23.6% of children in the control group; and sharply disharmonious significantly prevailed in children in the age group of 0-12 months (39.0%, 9.2%, respectively, $p < 0.001$). See Table 4.

Percentage of our patients in the comparison group with CHD according to their BMI and age according to WHO standard deviations (n=30)

	0-12 months (n=17)				1-3 years (n=13)			
	Boys (n=7)		Girls (n=10)		Boys (n=6)		Girls (n=7)	
	Abs	%	Abs	%	Abs	%	Abs	%
-3CO	1	5,8	3	17,6	1	7,6	2	15,3

-2SO	3	17,6	4	23,5	3	23,0	3	23,0
-1CO	3	17.6	2	11.7	1	7.6	2	15.3
Med	-		1	5,8	1	7,6	-	
CO1+	-							
CO2+	-							
CO3+	-							

Thus, in the comparison group, low BMI values were also determined in 23.4% of cases aged 0-12 months among boys and in 41.1% of cases among girls, respectively. Among the subjects aged 1-3 years, 30.6% of boys and 38.3% of girls had low BMI values.

Harmonious growth and weight gain are closely related to the development of functional abilities of organs and systems. Due to hemodynamic disorders, CHD has a direct negative impact on the child's development.

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Low BMI scores were attributed to a lack of body mass and short stature. The most frequently detected were: LDL (moderate exhaustion – in 31 patients (40.7%), and mild exhaustion or risk of exhaustion in 27 patients (31.5%), median indicators, these are normal indicators of physical development were determined in only 5 patients (10.8) children with CHD in the main study group.

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Comparative data on the physical development of children with CHD with the control group are given in the table.

l **Table 5. Comparative data on physical development of children with CHD and healthy children.**

	Main group of CHD study (n= 76)		Comparison Group CHD comparison group (n=30)					
BENP Risk of exhaustion (mild)								

* - significance of differences between the main study group and the group of healthy children.

Thus, the physical development of young children with congenital heart defects is characterized by rather low anthropometric indicators, a very significant proportion of children with disharmonious and sharply disharmonious development due to body weight deficit.

The next stage of the study included evaluating the effectiveness of the proposed management of children in the preoperative period.

At this stage of the study, preoperative preparation of children was carried out, which consisted in nutritional support for children with CHD.

Table 6.

Types of feeding of children with CHD in the study groups.

Main study group				Control group
0-12 months	Breast milk +Izikol baby	Breast milk +Mixture (hydrolysis)	Breast milk +Mixture (Amino acid)	They received a standard age-related diet and preoperative complex therapy
From 6 months	of age Complementary foods Trimetabol	Complementary foods Trimetabol	Trimetabol	
1-3 years	of age Rational nutrition	Rational nutrition +Balanced mix (2 months)	Rational nutrition +Balanced mix (4 months)	

When comparing the studied indicators in children with CHD, depending on the type of preoperative preparation (the main group-up to one year-exclusively breast milk and adapted milk formula as complementary foods, with early introduction of complementary foods, from 1-3 years of age-rational nutrition and adapted milk formula as complementary foods.

The control group consisted of children who were on a standard age diet. Children with CHD and HF are known to have higher calorie requirements than healthy children. And these needs cannot be met by using only mother's milk or an adapted milk formula, it is necessary to use special fortifiers for mother's milk. At 20 days of life, children with CHD who received breast milk and complementary foods as the main diet managed to achieve a higher protein and carbohydrate content in the diet.

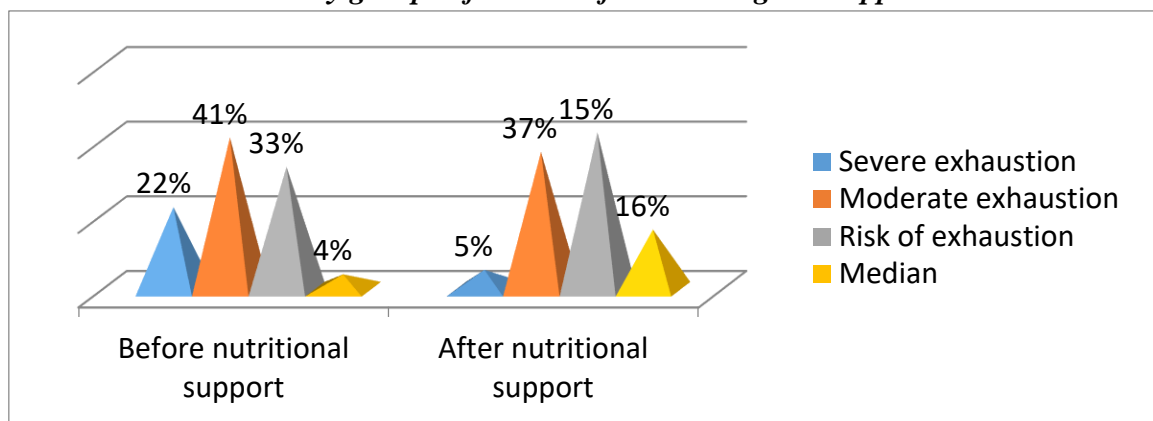
When analyzing physical development indicators after preoperative training (after 20 days), the following results were obtained.

Thus, after a comprehensive approach, physical development improved in children of the main group, which was manifested in a decrease in the percentage of children with severe BENP from 22% to 5% (>0.05), and an increase in the median percentage from 4% to 16% (>0.01) was also noted

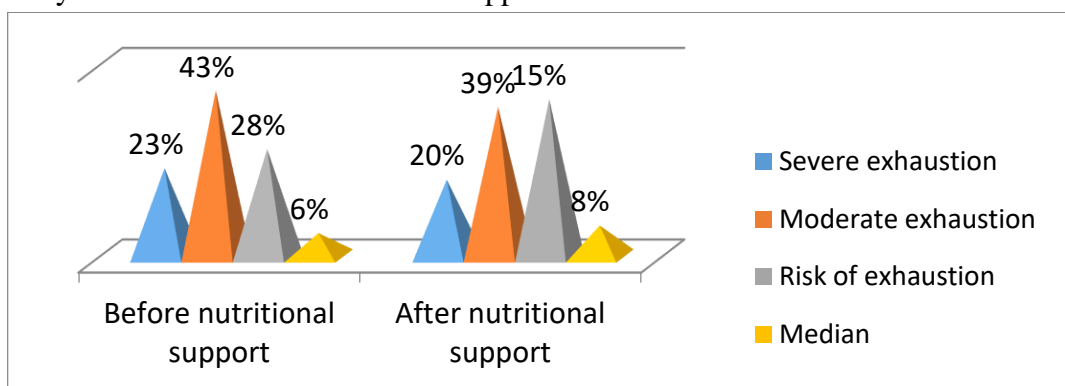
When conducting a comparative analysis in children of the control group, the following results were obtained.

The physical development of children in this study group also improved, but the indicators were lower than in the main study group, so children with severe BEND decreased from 23% to 20%, and an increase in the median percentage was noted from 6% to 8%.

Figure 2. Analysis of physical development indicators of children with CHD in the main study group before and after the integrated approach.



3. Analysis of physical development indicators of children with CHD in the control group of the study before and after the combined approach.



The improvement of physical development indicators in the control group of the study was comparatively lower in comparison with the main group.

Severe LDL in the main group decreased from 21% to 16.6%, in comparison with the control group from 23% to 20%, and the median values (normal BMI) were determined in the main study group increased from 4% to 16% in comparison with the control group from 6% to 8%.

Thus, the use of semi-elemental mixtures based on high-grade protein hydrolysis for a complex approach in patients with CHD can improve nutritional tolerance and improve protein synthesis indicators after 30 days, reduce the activity of systemic inflammation, and get a tendency to increase somatometric indicators.

Conclusions

1. Young children with CHD in this study are characterized by lagging physical development and feeding disorders that occur in unfavorable conditions of the medical and social status of families. Analysis of the physical development of children with CHD was determined by a progressive α -response to the effects of hemodynamic disorders. Only one out of every five children (21.0%) was diagnosed with severe LDL, and the risk of mild LDL (exhaustion was determined) (31.5%); 1/3 of the children were diagnosed with moderate LDL in 40.7% and normal BMI values were determined. - 5,2%.

2. When comparing the results obtained with the control group, it was statistically significant ($p < 0.05$) that the children of the main group had higher (1.6 times) indicators of

physical development than the children who did not receive the suggested recommendations.

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