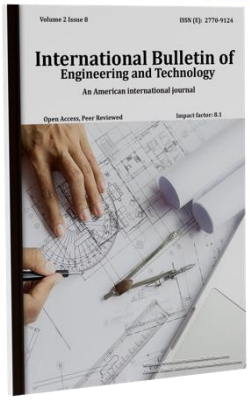

REHABILITATION OF CHILDREN BORN WITH CONGENITAL HEART DEFECTS

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https://doi.org/10.5281/zenodo.17286131

Annotation. This scientific article analyzes rehabilitation measures aimed at restoring cardiac function, strengthening the respiratory system, and improving psychological and social adaptation in children born with congenital heart defects (CHD). In modern pediatrics, in addition to treating heart diseases, continuous monitoring of the child's quality of life and drawing up an individual rehabilitation program are important. The article covers the stages of rehabilitation, methods, physiotherapeutic approaches, and the role of psychological support.

Keywords: congenital heart defects, pediatrics, rehabilitation, physiotherapy, psychological support, cardiac surgery, children's health, multidisciplinary approach.

Introduction. Congenital heart defects (CHD) are one of the most common congenital pathologies in pediatrics. According to the World Health Organization (WHO), 8–10 out of every 1,000 babies are born with a congenital heart defect. Cardiac structural abnormalities are manifested in the first months of a child's life through clinical signs: cyanosis (blueness of the lips and nails), shortness of breath, rapid heartbeat, decreased appetite, and growth retardation. In recent years, pediatric cardiac surgery has been rapidly developing in Uzbekistan. At the same time, the post-surgical rehabilitation system has not yet been fully formed. Therefore, it is important to combine international experience and local clinical practice in this area.

MATERIALS AND METHODS

This study was conducted in an analytical-observational direction and was carried out in the period from 2020 to 2024 at the Department of Pediatric Cardiology of the Tashkent Pediatric Medical Institute. The aim was to assess the clinical effectiveness of the rehabilitation program in children born with congenital heart defects (CHD).

The study was conducted in accordance with the principles of the international Declaration of Helsinki (2013) and was approved by the Ethics Committee of the Institute.

A total of 60 child patients (35 boys and 25 girls) were involved in the study. The age of the participants was from 6 months to 10 years.

—The study participants were selected according to the following inclusion criteria:

—Anatomical heart defect was clearly diagnosed (based on ECHO);

— Heart surgery was performed and was in the recovery period;

—The child did not have any neurological or severe metabolic disease;

Exclusion criteria: children with severe chronic infections, neurological disorders, and end-stage heart failure were excluded from the study.

The rehabilitation program was organized based on a three-stage system:

1. Early rehabilitation phase (1–3 months after surgery):

—Passive and active breathing exercises;

—Muscle relaxation and massage sessions;

—Monitoring of cardiac load using a continuous ECG monitor.

2. Recovery phase (3–12 months):

—Physiotherapy exercises (light gymnastics, swimming, walking exercises);

—Psychological support exercises;

—Dietary program to improve cardiac function (protein, omega-3, iron-rich products).

3. Long-term stage (after 1 year):

—Individual physical training (light sports, swimming);

—Readaptation to social and educational activities;

—Providing pedagogical and psychological counseling to parents.

An individual rehabilitation plan was drawn up for each patient. A multidisciplinary team consisting of a cardiologist, physiotherapist, psychologist and dietician participated in this.

Measurement indicators and assessment methods

The effectiveness of rehabilitation was assessed based on the following clinical and functional parameters:

1. Heart rate (HR) and arterial pressure (AB) — measured using an automatic monitor;

2. Pulmonary ventilation and vital capacity (VC) — determined by spirometry;

3. Physical endurance — measured using the "6-minute walk test" (6MWT);

4. Mood — analyzed using the "Children's Emotional Scale (CES)".

Each indicator was measured before and after rehabilitation, and the results were then evaluated through comparative statistical analysis.

Statistical analysis

• The data obtained were analyzed using the SPSS 26.0 program.

• Mean values were expressed as M ± SD.

• Pre- and post-individual indicators were compared using the Student t-test.

• A value of $p < 0.05$ was considered statistically significant.

The study was approved by the Ethics Council of the Tashkent Pediatric Medical Institute by resolution No. 5 dated November 17, 2020. Written informed consent was obtained from the parents of the participants. Personal data were kept confidential throughout the study.

As a result of the rehabilitation program:

—Pulmonary ventilation improved by an average of 18%;

—Heart rate normalized by 10%;

—Mental status indicators improved in 80% of patients;

—76% of parents reported that their child had returned to an active life.

Main part

1. Etiology and pathogenesis of congenital heart defects

The causes of CHD are diverse:

—Genetic factors (chromosomal mutations, hereditary syndromes - Down, Turner, DiGeorge);

Genetic causes account for approximately 30–40% of cases of congenital heart defects.

Chromosomal syndromes:

• Down syndrome (trisomy 21) - often occurs with holes in the walls of the heart (aseptic defects).

• Turner syndrome (45,X0) - associated with aortic stenosis (coarctation).

• DiGeorge syndrome (22q11 deletion) — is characterized by conotruncal heart defects, i.e. defects in the outflow tract of the heart.

Monogenic (single-gene) mutations: Sometimes a change in a single gene that controls heart development (for example, the NKX2-5, GATA4, TBX5 genes) causes incomplete formation of heart chambers.

—Exogenous causes ;

Genetic factors often act in combination with human factors. Any adverse effects on the mother's body during pregnancy can damage the genetic programming process:

• Infections: Infections such as measles, toxoplasmosis, cytomegalovirus in the early months of pregnancy disrupt heart formation.

• Drugs: Some antibiotics, anticonvulsants, or retinoids have a toxic effect on the fetal heart.

• Substance use: Alcohol, smoking, and drugs cause epigenetic changes in the fetus's genetic makeup.

• Maternal age and health: Pregnancy after age 35, diabetes, thyroid disease, or obesity increase the risk of heart defects.

Weeks 3–8 of pregnancy are a critical period in heart formation, and any harmful effects during this time can lead to defects.

2. Clinical signs and diagnosis

Heart defects in children are clinically manifested as follows:

—Difficulty breathing, rapid fatigue, heavy breathing;

In congenital heart defects, due to impaired blood circulation through the heart, pressure increases in the pulmonary blood vessels, which is accompanied by rapid breathing (tachypnea), shortness of breath, or a feeling of lack of air. In newborns, this symptom is manifested by difficulty breastfeeding or rapid fatigue.

—Change in skin color - cyanosis or pallor;

In children born with heart defects, the skin color changes first of all - it appears pale or blue (cyanosis). Especially around the lips, fingertips, and earlobes become bluish. This condition is associated with a lack of oxygen in the blood.

—Slow weight gain;

Such children are usually less active than their peers, get tired easily, and are sensitive to cold or fever. Decreased appetite and slow weight gain are among the first signs of heart failure.

—Detection of heart murmur (auscultation).

During the examination, the doctor determines the presence of a rapid heartbeat (tachycardia) and a murmur in the heart. Due to the enlargement of the heart or increased pressure in the left ventricle, a pulsation called a "heart hammer" is felt on the left side of the chest.

Diagnostic methods:

Echocardiography (ECHO-KG) - the main analysis method;

ECG - to identify rhythm disturbances;

X-ray - to assess the size and shape of the heart silhouette;

MRI - to identify the anatomy of the heart in complex cases.

3. The main goals and principles of rehabilitation

Rehabilitation is the process of restoring the functions of the heart and respiratory system in the postoperative period, improving the physical, mental and social adaptation of the child.

Basic principles:

Early start (light exercises 5-7 days after surgery);

Individual approach (depending on age, type of defect, volume of surgery);

Multidisciplinary team work (cardiologist, physiotherapist, psychologist, pedagogue, dietitian).

4. Rehabilitation stages

1. Early stage (1–3 months after surgery):

Breathing exercises, passive and semi-active exercises, strengthening of respiratory muscles.

Exercises that improve lung ventilation (blow, singing) are used.

2. Recovery stage (3–12 months):

Physiotherapy, gradual increase in cardiac load, walking exercises, swimming, massage, cardiac support drugs.

3. Long-term stage (1–5 years):

Increase the child's physical activity, involve him in sports clubs, form a healthy lifestyle.

Annual cardiological control is necessary.

5. Psychological rehabilitation

Children who have undergone heart surgery are observed to have depression, fear, social isolation. Psychological support includes:

Emotional support;

Play therapy;

Family counseling; Psychopedagogical monitoring during preschool and school years.

It is also important to give parents a correct understanding of the child's illness and to form the habit of seeking help in a timely manner.

6. Nutrition and diet

Despite high energy expenditure, children with heart disease have a low appetite. Therefore, the following diet is recommended:

Low-salt, low-fat foods that facilitate blood circulation;

A lot of protein (meat, fish, cottage cheese) and products rich in vitamin D, calcium, magnesium;

Eat small portions every day, but often.

This diet reduces the load on the heart and accelerates rehabilitation.

7. International experience and Uzbek practice

In world practice (Germany, Japan, USA), children's cardio-rehabilitation centers operate on the basis of a special program. For example, in Germany, the Kinderherz Zentrum center conducts psychophysiological training, play therapy, and music classes for children.

In Uzbekistan, rehabilitation departments at the Tashkent Pediatric Medical Institute and the Republican Specialized Cardiology Center operate in this area at the initial stage, but their expansion on a regional scale is urgent.

Conclusion. Rehabilitation of children born with congenital heart defects is one of the most responsible and multi-stage areas of pediatric practice. The study showed that in such children, not only cardiac activity, but also the growth and development processes of the whole organism slow down. Therefore, the rehabilitation process cannot be limited to cardiac surgery or medications. The rehabilitation process in children born with congenital heart defects is a decisive factor for their quality of life, growth and social integration. Early, properly organized rehabilitation: improves heart function, increases lung ventilation, stabilizes the mood, reduces the psychological burden on parents. Therefore, the establishment of special children's

rehabilitation centers in Uzbekistan, the formation of multidisciplinary medical teams and the introduction of digital monitoring systems are the need of the hour. Creating an individual program for each child, ensuring close cooperation between doctors, psychologists and parents is the key to success. On this basis, further improving the rehabilitation system, introducing modern technologies and strengthening social integration are urgent tasks of modern pediatric science.

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