



PEDIATRIC HEART FAILURE: ETIOLOGY, CLINICAL FEATURES, AND CONTEMPORARY MANAGEMENT

No'monov Husniddin Mutalibjon o'g'li

Teacher, Department of Paediatrics, Andijan State Medical Institute

husniddinnomonov61@gmail.com

+998943855060

Abstract

This paper reviews the main aspects of heart failure in children, a syndrome that differs substantially from adult heart failure in its causes, presentation, and treatment. The etiology, pathophysiology, age-related clinical manifestations, diagnostic methods, and current therapeutic strategies are discussed. Particular attention is given to congenital heart disease and cardiomyopathies as leading causes, the role of echocardiography and natriuretic peptides in diagnosis, and the importance of a multidisciplinary approach. The findings emphasize that early recognition and cause-specific treatment are decisive for survival and quality of life.

Keywords: Pediatric heart failure, congenital heart disease, cardiomyopathy, myocarditis, echocardiography, natriuretic peptides, multidisciplinary care.

Introduction

Heart failure in children is a clinical and pathophysiological syndrome in which the heart is unable to supply sufficient blood to meet the metabolic needs of a growing organism or can do so only at elevated filling pressures [1, 3]. Although it is less common than in adults, it is associated with considerable morbidity, repeated hospitalizations, and mortality [2]. In contrast to adult patients, in whom ischemic heart disease and hypertension predominate, the pediatric population presents with a broad range of structural and functional causes, and the clinical picture changes with age. For this reason, adult guidelines cannot be transferred directly to children, and age-specific approaches are required.



The causes of pediatric heart failure can be divided into two large groups. The first comprises structural abnormalities, mainly congenital heart defects with volume or pressure overload, such as ventricular septal defect, atrioventricular septal defect, patent ductus arteriosus, and left-sided obstructive lesions. In infants, these defects are the most frequent reason for heart failure [3, 4]. The second group includes myocardial diseases, among which dilated cardiomyopathy is the most common, followed by hypertrophic and restrictive forms [5]. Acute myocarditis, most often of viral origin, as well as tachyarrhythmias, anthracycline cardiotoxicity, metabolic and neuromuscular disorders, and Kawasaki disease, may also lead to ventricular dysfunction. Population data from the United States show that heart failure-related hospitalizations in children are frequent and are accompanied by a substantial in-hospital mortality rate, particularly among those with cardiomyopathy and complex congenital disease [2].

Reduced cardiac output activates compensatory neurohormonal mechanisms, including the sympathetic nervous system and the renin-angiotensin-aldosterone system. In the short term, these mechanisms maintain perfusion pressure and circulating volume. In the long term, they increase afterload and cause fluid retention, myocardial remodeling, and further deterioration of contractile function, thereby creating a vicious circle [3]. In children with congenital defects, an additional factor is the pulmonary overcirculation that develops as pulmonary vascular resistance falls after birth, which explains why symptoms often appear during the first weeks of life.

The manifestations depend strongly on the child's age. Infants usually present with tachypnea, tachycardia, feeding difficulties, excessive sweating during feeding, irritability, and poor weight gain. Older children and adolescents more often show fatigue, exercise intolerance, abdominal pain, nausea, and peripheral edema, which resemble the symptoms seen in adults [1, 4]. Hepatomegaly, a gallop rhythm, and cool extremities are important physical findings. To grade severity, the modified Ross classification, which is adapted to different age groups, is widely used [6].



Diagnosis is based on a combination of clinical assessment and instrumental methods. Chest radiography may reveal cardiomegaly and pulmonary congestion, while electrocardiography helps to identify arrhythmias, ischemic changes, and hypertrophy. Echocardiography is the key method, as it allows evaluation of anatomy, ventricular size and function, valvular status, and filling pressures. Elevated levels of B-type natriuretic peptide and N-terminal pro-BNP support the diagnosis and are useful for monitoring, although age-specific reference values must be applied [1, 8]. In selected patients, cardiac magnetic resonance imaging, cardiac catheterization, endomyocardial biopsy, and genetic testing are used to clarify the cause.

Treatment has three main objectives: correction of the underlying cause, relief of symptoms, and prevention of disease progression. In acute decompensation, intravenous diuretics, inotropic agents, and, where necessary, respiratory support are used. In chronic heart failure, the basis of therapy consists of diuretics for congestion, angiotensin-converting enzyme inhibitors to reduce afterload and limit remodeling, and beta-blockers [1, 8]. It should be noted, however, that evidence for several drugs in children is less robust than in adults. For example, a randomized trial of carvedilol did not demonstrate a significant improvement in the composite clinical outcome in the overall pediatric population [7]. More recently, sacubitril/valsartan has been investigated in children with systemic left ventricular systolic dysfunction and has become an additional option [10].

Nutritional support is an essential part of care, since increased energy expenditure and reduced intake often lead to growth failure. Infants may need calorie-enriched formulas or enteral feeding. Surgical or catheter-based correction of congenital defects is often curative or substantially improves hemodynamics. When medical therapy fails, mechanical circulatory support, such as the pediatric ventricular assist device, serves as a bridge to transplantation or recovery [9], and heart transplantation remains the final option for end-stage disease [8].

The prognosis depends on the underlying cause, the severity of ventricular dysfunction, and the timing of intervention. Children with correctable structural defects generally have a favorable outcome, whereas those with some forms of cardiomyopathy have a higher risk of progression, arrhythmia, and need for



transplantation [5]. Optimal care is provided by a team that includes pediatric cardiologists, cardiac surgeons, intensive care specialists, nutritionists, nurses, and psychologists. Education of parents regarding medication adherence, fluid and nutritional needs, and warning signs of deterioration reduces the number of readmissions and improves quality of life.

Pediatric heart failure is a heterogeneous condition whose management requires an age-specific, cause-oriented approach. Early recognition of symptoms, timely echocardiographic and laboratory evaluation, individualized medical and surgical treatment, and coordinated multidisciplinary follow-up are the key factors that determine outcome. Further multicenter studies are needed to strengthen the evidence base for drug therapy in children.

References

1. Kantor PF, Loughheed J, Dancea A, et al. Presentation, diagnosis, and medical management of heart failure in children: Canadian Cardiovascular Society guidelines. *Can J Cardiol*. 2013;29(12):1535–1552.
2. Rossano JW, Kim JJ, Decker JA, et al. Prevalence, morbidity, and mortality of heart failure-related hospitalizations in children in the United States: a population-based study. *J Card Fail*. 2012;18(6):459–470.
3. Hsu DT, Pearson GD. Heart failure in children: Part I: history, etiology, and pathophysiology. *Circ Heart Fail*. 2009;2(1):63–70.
4. Hsu DT, Pearson GD. Heart failure in children: Part II: diagnosis, treatment, and future directions. *Circ Heart Fail*. 2009;2(5):490–498.
5. Lipshultz SE, Law YM, Asante-Korang A, et al. Cardiomyopathy in children: classification and diagnosis. A scientific statement from the American Heart Association. *Circulation*. 2019;140(1):e9–e68.
6. Ross RD. The Ross classification for heart failure in children after 25 years: a review and an age-stratified revision. *Pediatr Cardiol*. 2012;33(8):1295–1300.
7. Shaddy RE, Boucek MM, Hsu DT, et al. Carvedilol for children and adolescents with heart failure: a randomized controlled trial. *JAMA*. 2007;298(10):1171–1179.



Modern American Journal of Medical and Health Sciences

ISSN (E): 3067-803X

Volume 2, **Issue** 10, **October** 2026

Website: usajournals.org

This work is Licensed under CC BY 4.0 a Creative Commons Attribution 4.0 International License.

-
8. Kirk R, Dipchand AI, Rosenthal DN, et al. The International Society for Heart and Lung Transplantation guidelines for the management of pediatric heart failure. *J Heart Lung Transplant*. 2014;33(9):888–909.
 9. Fraser CD Jr, Jaquiss RDB, Rosenthal DN, et al. Prospective trial of a pediatric ventricular assist device. *N Engl J Med*. 2012;367(6):532–541.
 10. Shaddy R, Burch M, Kantor PF, et al. Sacubitril/valsartan in pediatric heart failure (PANORAMA-HF): a randomized, multicenter, double-blind trial. *Circulation*. 2023;148(25):1715–1725.