



**CARDIAC MARKERS IN CHILDREN WITH TYPE 1 DIABETES  
MELLITUS: MODERN ASSESSMENT CRITERIA**

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**Abstract:** *Type 1 diabetes mellitus is one of the most common endocrine diseases in childhood and is characterized by a high risk of developing chronic vascular complications. In recent years, particular attention has been paid to the early detection of cardiovascular disorders in children with type 1 diabetes, as diabetic cardiomyopathy and endothelial dysfunction can develop long before the onset of clinical symptoms. Cardiac markers are an important tool for assessing the functional state of the cardiovascular system and can detect early signs of myocardial and vascular damage.*

*Type 1 diabetes mellitus remains one of the most pressing issues in pediatric endocrinology due to its high prevalence and the risk of developing early vascular complications. Long-term hyperglycemia negatively impacts the cardiovascular system, contributing to the development of functional and structural myocardial changes already in childhood. Therefore, the study of cardiac markers that can detect preclinical signs of cardiac and vascular damage in children with type 1 diabetes is particularly important.*

*It has been established that children with type 1 diabetes exhibit signs of subclinical cardiovascular damage associated with the duration of the disease, the degree of carbohydrate metabolism compensation, and the presence of diabetic complications. The use of a set of cardiac markers facilitates the timely diagnosis of cardiac abnormalities and allows for the prediction of the risk of developing cardiovascular complications. Early detection of pathological changes is essential for preventive and therapeutic measures aimed at maintaining children's health and improving the long-term prognosis.*



**Key words:** *type 1 diabetes mellitus, children, cardiac markers, cardiovascular complications, troponin, natriuretic peptide, echocardiography, electrocardiography, diabetic cardiomyopathy, endothelial dysfunction, early diagnosis.*

**The aim of this study is** to analyze the diagnostic value of cardiac markers in children with type 1 diabetes mellitus and determine their role in the early detection of cardiovascular complications. This paper examines current data on the clinical significance of biochemical and instrumental parameters, including troponin levels , natriuretic peptides, lipid profile parameters, inflammatory markers, echocardiographic parameters, and electrocardiographic changes.

### **Research objectives**

To study modern literary data on the state of the cardiovascular system in children with type 1 diabetes mellitus.

To evaluate the diagnostic significance of cardiac markers in type 1 diabetes mellitus in children.

To investigate the relationship between the level of glycemic control and changes in cardiac parameters.

To analyze the influence of the duration of the disease on the functional state of the cardiovascular system.

To identify the most informative cardiac markers for early diagnosis of cardiovascular complications.

To determine the potential of using cardiac markers to predict the risk of developing cardiovascular disorders in children with type 1 diabetes mellitus.

To develop recommendations for the early detection of cardiovascular changes in this category of patients.

### **Research methods**

An analysis of domestic and international scientific literature devoted to the study of cardiac markers in children with type 1 diabetes was conducted. A search for scientific publications was conducted in the international databases PubMed , Scopus , and Web. of Science , Google Scholar and other specialized sources.



The study utilized methods of systematic review, comparative analysis, synthesis, and interpretation of scientific data. The results of clinical, laboratory, and instrumental studies were analyzed, including assessment of glycated hemoglobin (HbA1c) levels, lipid profile, and cardiac-specific biomarkers, electrocardiography (ECG) and echocardiography (EchoCG) indicators.

The obtained data were systematized to determine the diagnostic and prognostic value of cardiac markers, as well as to identify the most significant risk factors for the development of cardiovascular complications in children with type 1 diabetes mellitus.

**Research findings** indicate that children with type 1 diabetes can exhibit signs of endothelial dysfunction, impaired diastolic myocardial function, vascular wall changes, and other risk factors for cardiovascular complications early in the disease's course. The severity of these changes has been shown to depend on the duration of the disease, the level of glycemic control, and the presence of diabetic complications. A comprehensive assessment of cardiac markers facilitates the timely identification of high-risk patients and improves the effectiveness of preventive measures.

An analysis of modern scientific data has revealed that children with type 1 diabetes can develop functional and structural changes in the cardiovascular system even in the early stages of the disease. Long-term hyperglycemia has been shown to have an adverse effect on the myocardium and vascular wall, contributing to the development of endothelial dysfunction and early manifestations of diabetic cardiomyopathy.

The analysis showed that the most informative cardiac markers are blood lipid spectrum indicators, glycated hemoglobin level (HbA1c), high-sensitivity C-reactive protein, cardiac-specific Troponins, natriuretic peptides, as well as electrocardiography and echocardiography data were analyzed. Children with poor glycemic control showed more pronounced changes in cardiovascular parameters compared to patients who achieved target HbA1c values.



A direct relationship has been established between the duration of diabetes mellitus and the severity of cardiac complications. As the disease duration increases, the risk of developing diastolic myocardial dysfunction, changes in intracardiac hemodynamics, and signs of vascular dysfunction increases. Furthermore, a link has been identified between chronic hyperglycemia and elevated levels of inflammatory markers, suggesting the involvement of chronic inflammation in the pathogenesis of cardiovascular complications.

The obtained results confirm the high diagnostic value of a comprehensive assessment of cardiac markers for the early detection of cardiovascular changes in children with type 1 diabetes. Timely detection of subclinical abnormalities allows for the identification of high-risk patients, the implementation of preventive measures, and the optimization of dynamic monitoring strategies to prevent the development of severe cardiovascular complications in the future.

Thus, the use of modern cardiac markers is an important area for the early diagnosis of cardiovascular disorders in children with type 1 diabetes mellitus and allows for the optimization of monitoring and treatment tactics for this category of patients.

## **Conclusions**

Type 1 diabetes mellitus in children is associated with an increased risk of developing early functional and structural changes in the cardiovascular system, which may be asymptomatic in the early stages of the disease. Cardiac markers are an important tool for the early diagnosis of cardiovascular disorders and enable the detection of subclinical signs of myocardial and vascular damage in children with type 1 diabetes.

The most informative indicators for assessing cardiovascular risk are the level of glycosylated hemoglobin (HbA1c), lipid profile indicators, inflammatory markers, cardiospecific Troponins, natriuretic peptides, as well as electrocardiography and echocardiography data. The severity of cardiac changes is directly related to the duration of the disease and the degree of carbohydrate



metabolism compensation. Children with poor glycemic control have a significantly higher risk of cardiovascular complications.

A comprehensive assessment of cardiac markers facilitates the timely identification of high-risk patients and enables the implementation of preventive and therapeutic measures at the early stages of complications. Regular monitoring of cardiac parameters in children with type 1 diabetes should be considered an important component of clinical follow-up aimed at reducing the risk of cardiovascular complications and improving the long-term prognosis.

Early detection and correction of risk factors help maintain the functional state of the cardiovascular system, improve the quality of life of patients, and prevent the development of severe complications in adulthood.

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