RISK FACTORS FOR CHRONIC CARDIOVASCULAR COMPLICATIONS IN TYPE 1 CHILDREN WITH COVID-19

Sadirkhodjaeva Azizakhon Alavitdinovna.

Associate Professor (PhD), Department of Propaedeutics of Childhood Diseases Tashkent Pediatric Medical Institute

Ashurova Dilfuza Tashpulatovna

Professor Department of Propaedeutics of Childhood Diseases Tashkent Pediatric Medical Institute

Abstract Identify risk factors and develop an algorithm of early diagnosis of heart complications in children with type 1 diabetes who have undergone Covid-19. We comprehensively examined 68 children with 1 DM in the period from 2021 to 2023: at the age of 5 to 18 years and the duration of the disease from 0.5 to 16 years. The work uses general clinical, biochemical studies (HbA1c, lipoproteins, CK-MV, hs CRP), statistical research methods. Thus, the developed algorithm allows in practice to timely identify DKAN in children with type 1 DM who have undergone Covid-19, to carry out differential diagnostics of functional changes and small anomalies of heart development, to determine the degree of severity of disorders and tactics of patient management.

Keywords: diabetes mellitus type 1, children, heart system, a diagnostic algorithm, risk factors for complications, Covid-19.

Relevance. Coronavirus disease 2019 (COVID-19), caused by severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2), poses a significant global health hazard. 1 People with diabetes are at increased risk of mortality and severe infection from COVID-19 compared to people without diabetes [6, 7, 8, 12]. Although there are differences in risk associated with diabetes type, age, comorbidities, ethnicity, and glycemic control, the relative risk is higher for most people with diabetes [9, 10, 13]. These risks are evident in the high proportion of people with diabetes among those hospitalized with COVID-19. 6 COVID-19 was also associated with an increase in acute episodes of hyperglycemia and, possibly, with a new onset of diabetes [10, 13]. Therefore, we urgently need more information about how the pandemic is affecting people with diabetes regarding both their physical and psychological health.

SARS CoV 2 virus is characterized by a high rate of spread, a variety of manifestations, high incidence and mortality in persons with predisposing risk factors. Pathophysiological mechanisms include increased systemic inflammation, cardiometabolic disorders, and varying degrees of glucose intolerance. The latter may manifest as severe hyperglycemia leading to a new development of diabetes or worsening of a pre-existing disease. Unfortunately, the clinical course outside the acute phase of the disease can persist in the form of a variety of symptoms, which collectively form the so-called "prolonged COVID" or "post-COVID syndrome." It is believed that during this phase, a chronic mild inflammatory and immunological condition persists, which can last weeks or month [1, 4, 5].

With additional data on the clinical course of COVID-19, it turned out that this is a multi-organ disease, which sometimes led to the development of complications,

while patients continued to suffer from persistent and cyclical symptoms [3]. This spectrum of persistent symptoms can manifest in people differently, regardless of the severity of the original disease, and can range from mild to chronic and debilitating. It was called "post-COVID-19 syndrome" (PCS) or "long-term COVID." In fact, in terms of symptoms, more than 90% of patients recovered within 35 weeks or longer [2]. This greatly affects productivity: more than a third of patients need a reduced work schedule compared to the previous, healthier condition, and almost one third still cannot return to work after 7 months of follow-up. due to persisting symptoms. Some researchers used the term "long-term COVID" for symptoms lasting more than 4 weeks, whereas PCS refers to a duration of more than 12 weeks [11].

Purpose of the study. Identify risk factors and develop an algorithm of early diagnosis of heart complications in children with type 1 diabetes who have undergone Covid-19

Research materials and methods. We comprehensively examined 68 children with 1 DM in the period from 2021 to 2023: at the age of 5 to 18 years and the duration of the disease from 0.5 to 16 years. The work uses general clinical, biochemical studies (HbA1c, lipoproteins, CK-MV, hs CRP), statistical research methods.

Results and discussion. DCN is the consequence of DM, which is characterized by premature and disseminated neuronal degeneration of small nerve fibers of both the sympathetic and parasympathetic sections. DCAN is an insidious complication of DM, which largely determines the course of the disease and the structure of mortality, but is often underestimated and not recognized by general practitioners. History collection and physical examination are not necessary for diagnosis. Laboratory diagnostics and instrumental methods for assessing DKANs are complex and not always readily available. Timely detection of DKAN in patients with DM is the primary task, as it allows you to start therapy on time. So far, a unified algorithm for diagnosing DKAN has not been developed at patients with different carbohydrate metabolism disorders.

At the further stage of our work, we analyzed groups of children depending on the presence of DKAN.
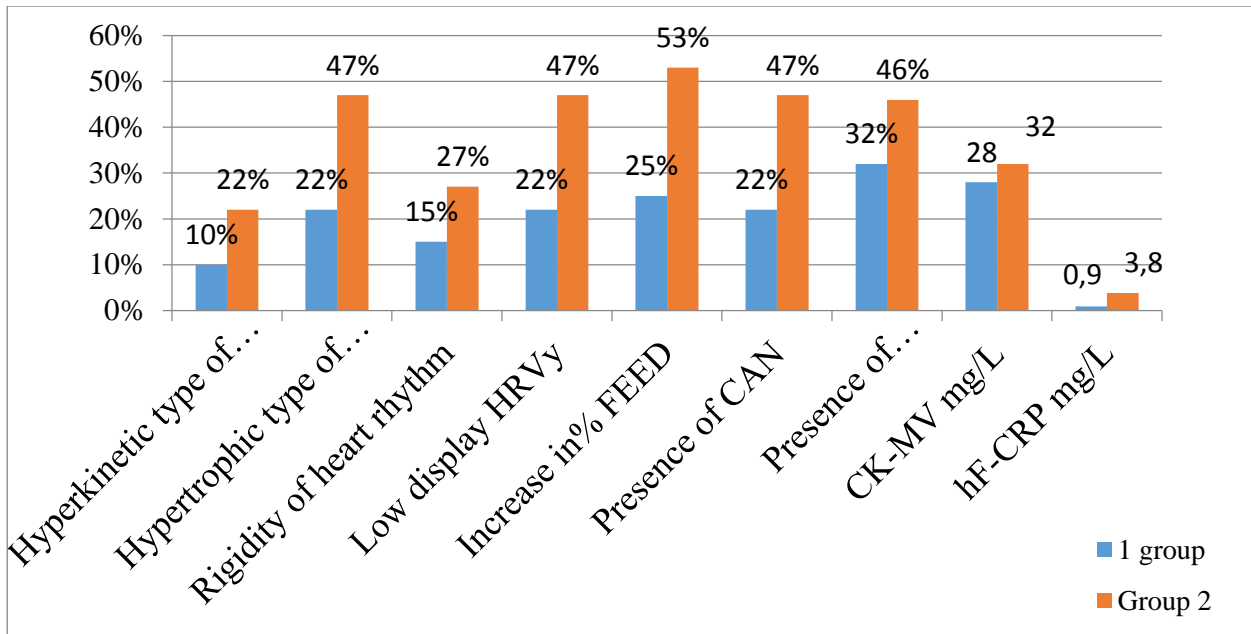
Fig. 1. Risk factors for chronic complications of type 1 DM in children

Thus, the basis of the pathogenesis of cardiovascular disorders in children with 1 DM of Covid-19 is diffuse generalized microangiopathy of the heart muscle, disorders of nervous regulation of the heart, cardiorenal syndrome and endothelial vascular dysfunction.

Risk factors were calculated using the formula

AR=(a/a+b-c/c+d) or AR= RF+ - RF-

The calculation algorithm was as follows:

Probability of pathology occurrence in the presence of a risk factor - a/(a + b)

Probability of pathology occurrence in the absence of risk factor - c/(c + d)

Chance of pathology in the presence of a risk factor - Chance F + = probability at F +/1-probability at F +

Chance of pathology in the absence of a risk factor - Chance F- = probability at F-/1-probability at F-
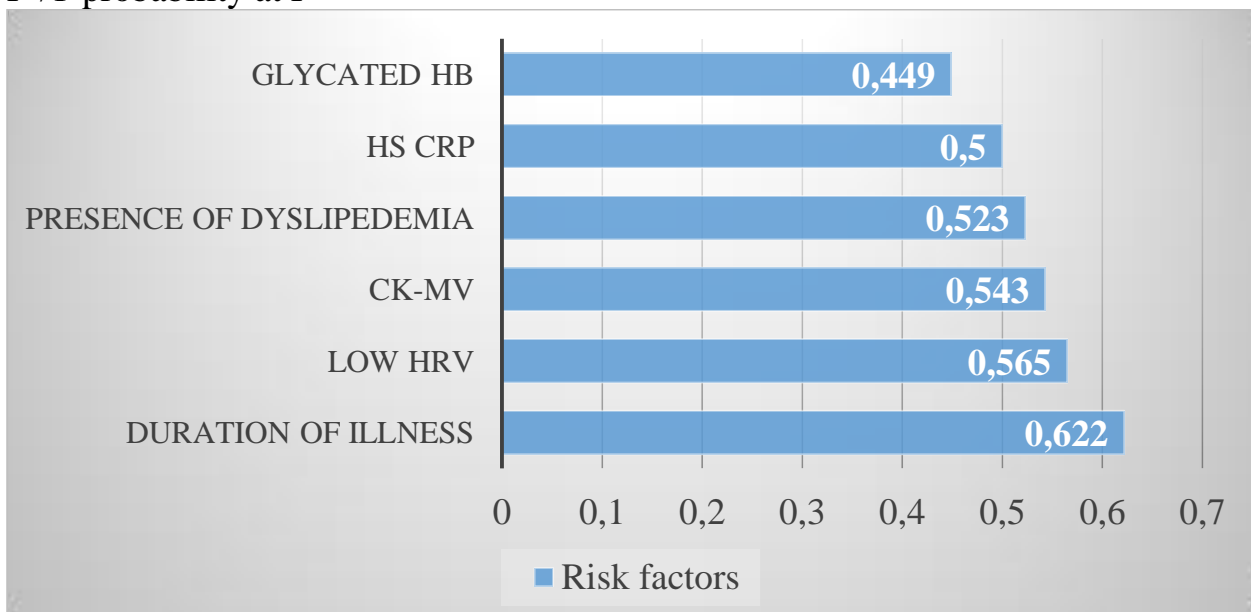
Fig. 2. Risk factors for cardiovascular complications

Thus, among the studied factors, the greatest importance in the reduction of HRV and the formation of DACN was:

☐ duration of the disease 1 DM more than 5
years (risk 0.622);
☐ low HRV (risk 0.565);
☐ presence of dyslipedemia (risk 0.523);
☐ increase in CK-MV (risk 0.543);
☐ hs-CRP increase (risk 0.5);
☐ increase in HbA1c 7.5% (risk 0.449),

Other parameters have no influence in the formation of DACN and are not indicated by the program by risk factors for its development.

Other parameters have no influence in the formation of DACN and are not indicated by the program by risk factors for its development. According to the results of automated linear modeling, the most important are the duration of DM, low HRV, low CK-MV and hs-CRP, HbA1c and the HDL/LDL ratio.

Algorithm for the diagnosis of myocardial lesions in children with type 1 diabetes mellitus

A significant number of disorders that can be traced in laboratory, electrocardiographic and echocardiographic studies should be summarized, since each of the indicators cannot be regarded as specific to a specific heart disease. To correctly identify the degree of risk, a quantitative assessment of the identified changes is necessary. When compiling the algorithm, modern recommendations for the diagnosis of diabetic moacardiodystrophy were taken as the base.

The diagnostic algorithm is presented schematically in Figure 3. As follows from it, in case of newly identified violations of subjective and objective research (on the part of complaints, physical examination) according to laboratory, electrocardiographic and echocardiographic examinations. Laboratory diagnostics included biochemical methods study determination of glycated hemoglobin levels, lipid spectrum cardio specific markers: CK-MV and hs-CRP.

Clinical functional examination

- Presence of risk factors

-sympathicotonic direction of autonomic regulation of heart rhythm and blood pressure

No

Is

Repeat after 6 months

HS-CRP above 1 mg/L

CK-MV above 25E/L

Daily monitoring (HRV reduction)

Doppler EchoCG Hypokinetic type of hemodynamics

Metabolic changes

Structural changes

Direct correlation relationship of HbA1c level

DKAN - diabetic autonomous cardiovascular neuropathy.
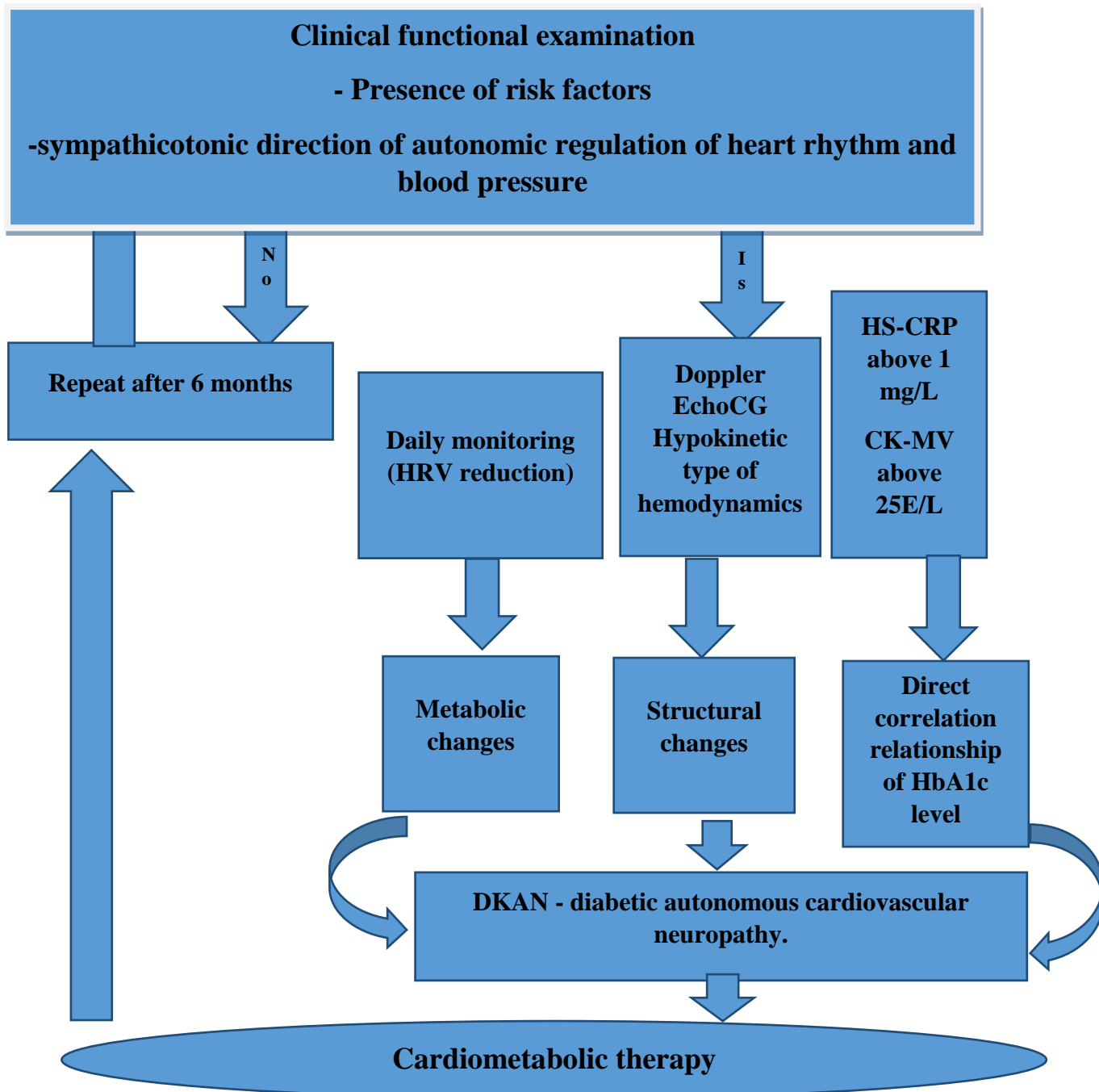
Cardiometabolic therapy

Fig. 3. Clinical and functional examination of children with DM

Conclusion. Thus, the developed algorithm allows in practice to timely identify DKAN in children with type 1 DM who have undergone Covid-19, to carry out differential diagnostics of functional changes and small anomalies of heart development, to determine the degree of severity of disorders and tactics of patient management.

The criteria we have developed for the early diagnosis of DKAN in children with type 1 diabetes mellitus who have undergone Covid-19 allow us to create and introduce into practical health care an algorithm for dispensary monitoring of children with 1 DM who have undergone Covid-19 examination rates every 6 months.

List of references used.

1.   Apicella M, Campopiano MC, Mantuano M, Mazoni L, Coppelli A, Del Prato S. COVID-19 in people with diabetes: understanding the causes of worsening outcomes. Lancet Diabetes Endocrinol. 2020; 8 (9): 782-792.
2.   Davis HE, Assaf GS, McCorkell L, et al. Characteristics of long-term COVID in the international cohort: 7 months of symptoms and their impact. ECclinical medicine. 2021; 38.
3.   Dennis A. et al. Researchers of the COVERSCAN study. Multi-organ disorders in low-risk individuals with post-COVID-19 syndrome: a prospective community-based study. Open BCG. 2021; 11.
4.   Doherty AB, Harrison EM, Green CA, et al. Features of 16,749 hospitalized COVID-19 patients in the UK using the WHO ISARIC clinical characterization protocol. medRxiv. 2020;2020.04.23.20076042.
5.   Elbarbari NS, Dos Santos TJ, de Beaufort S, Agwu JS, Calliari LE, Scaramuzza AE. COVID-19 outbreak and childhood diabetes: perceptions of healthcare professionals worldwide. Pediatric Diabetes 2020; 21 (7): 1083–1092.
6.   Guan W-J, Ni Z-Y, Hu YU, et al. For the China Group of Experts on Medical Treatment Covid-19. Clinical Characteristics of Coronavirus Disease 2019 in ChinaN Eng J Med 2020; 382 (18):1708-1720.
7.   Holman N, Knighton P, Kar P, et al. Risk factors for COVID-19-related mortality in people with type 1 and type 2 diabetes in England: a population-based cohort study. Lancet Diabetes Endocrinol. 2020; 8 (10): 823-833.
8.   Hussain A, Bhovmik B, Do Vale Moreira, N.C. COVID-19 and diabetes: knowledge in the process. Diabetes Res Clin Pract. 2020; 162:108142.
9.   Joensen LE, Madsen CP, Holm L, et al. Diabetes and COVID-19: The psychosocial consequences of the COVID-19 pandemic in people with diabetes in Denmark - what characterizes people with high levels of COVID-19-related anxiety? Diabetes Med. 2020; 37 :1146-1154.
10.   Li J, Wang X, Chen J, Zuo X, Zhang H, Deng A. COVID-19 infection can cause ketosis and ketoacidosis. Diabetes Obesity Metab.2020; 22 (10): 1935-1941.
11.   Nalbandian A, Segal K, Gupta A, et al. Post-acute COVID-19 syndrome. Nat Med. 2021; 27 : 601–615.

12.   Remuzzi A, Remuzzi G. COVID-19 and Italy: what's next? The Lancet. 2020; 395:1225-1228.

13.   Rubino F, Amiel SA, Zimmet P, et al. New diabetes in Covid-19. New English J Med. 2020; 383 (8): 789-790.