COVID-19 AND DIABETES MELLITUS: TWO PANDEMICS

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Introduction. The spread of the new SARS-COV-2 coronavirus on almost all continents of the world (except Antarctica) has become an unprecedented challenge for human health around the world. The most vulnerable category of people prone to this disease in patients with severe chronic diseases, such as cardiovascular diseases (ischemic heart disease, heart failure, hypertension, cerebrovascular diseases), chronic obstructive pulmonary diseases (COPD), and kidneys. The infectious epidemic of COVID-19, caused by the new coronavirus, is characterized by a particularly severe course in patients with diabetes, the rates of which are increasing every year. According to the definition of WHO, this disease is a non-infectious epidemic by the nature of its spread. According to the International Diabetes Federation, there are 463 million people with diabetes in the world.

Aim of the study was to analyze clinical data on the mutual influence of coronavirus and diabetes mellitus on the course of these two pathologies.

Materials and methods. An analysis of clinical data on the combined course of diabetes mellitus and coronavirus infection was carried out according to Google Scolar and Pub Med.

Results and discussion. Diabetes mellitus is a complex chronic disease characterized by impaired glucose metabolism due to absolute or relative insulin deficiency. According to the modern classification, it includes different types, among which the most common subtypes are type 1 DM and type 2 DM. Type 1 diabetes is characterized by the autoimmune destruction of insulin-producing pancreatic β-cells, whereas type 2 diabetes results from a combination of the β-cell secretory defect and insulin resistance.

The severity of the COVID-19 epidemic is largely explained by the frequent combination of diabetes. The accumulated knowledge of previous influenza epidemics, as well as available data on current COVID-19 infection, suggest that DM and obesity are predictors of a more severe course of COVID-19 and death. SARS-CoV-2 can worsen diabetes by directly affecting pancreatic beta cells, damaging them, and causing liver damage, increasing insulin resistance.

According to modern ideas, the leading role in the pathogenesis of diabetes is played by changes in the immune system. It has been shown that type 1 diabetes can develop due to the destruction of pancreatic β-cells by T cells. The significant role of generalized inflammation and activation of the

innate immune system in the pathogenesis of type 2 diabetes has also been proven.

In the conditions of type 2 diabetes, pro-inflammatory cytokines are activated and both links of the immune system – humoral and cellular – are disrupted, what leads to a decrease in the resistance of patients with diabetes to infections of viral, fungal, and bacterial origin.

Accumulated data confirm that hyperglycemia is a negative predictor of the course of COVID-19 due to the increased release of inflammatory mediators, endothelial dysfunction, thrombus formation, and formation of reactive oxygen species. Patients with type 2 diabetes who have high hyperglycemia on admission were found to have the most severe course of disease due to COVID-19 and the worst prognosis than patients with glycated hemoglobin (HbA1c) levels close to normal (6.5%).

On the other hand, in patients without a history of diabetes, under the condition of COVID-19, the activation of the innate immune system can also provoke the development of hyperglycemia. It is known that the reproduction of the virus in the body triggers a non-specific immune response, which proceeds in several successive stages: the exit of the virus through the gates of infection, viremia, activation of the monocyte-macrophage system; induction of cytokine synthesis.

Hyperproduction of pro-inflammatory cytokines (TNFα, interferons of types I and II, IL-1β, IL-6, IL-8) or "cytokine storm", as a result of hyperreactivity of innate immunity, triggers a systemic inflammatory reaction that leads to damage to the vascular endothelium and disruption of microcirculation (initial signs of systemic organ damage and tissue hypoxia appear).

Activation of the innate immune system can not only initiate "Cytokine storm", but also involve various mechanisms of pancreatic β-cell death, including apoptosis and activation of lipid peroxidation.

Conclusion. COVID-19 and DM are associated with acute and chronic inflammation. Characteristic changes in indicators of the immune system (increase in leukocytes, neutrophils, cytokines, markers of inflammation, coagulopathy) together with the level of glycemia can serve as reliable markers of the general condition of patients and predict a severe course of the disease or critical conditions in patients with and without diabetes.