

## SIMILARITIES OF SIDE EFFECTS AFTER VACCINATION AGAINST CORONAVIRUS INFECTION WITH DISEASE PATHOGENESIS

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### Abstract

This article is about the family of coronaviruses, the causative agent of the COVID-19 disease, its morphological structure, the importance of glycoproteins in binding to the cell, the areas of the ACE2 receptor located in the body, the processes that occur in the pathogenesis of the disease, the storm of cytokines, biochemical changes in the blood, the symptoms of the disease and the characteristics of the course of side effects after vaccination.

**Keywords:** Coronaviridae group, acute respiratory distress syndrome, angiotensin-converting enzyme 2, fibrotic proliferative inflammation, terminal domain, cytokine storm, chemokines, dilated cardiomyopathy, myocarditis.

### INTRODUCTION

**Relevance of the problem:** Coronaviridae is a large family of RNA viruses that infect humans and some animals. Currently, the circulation of 4 representatives of coronaviruses (HCoV-229 E, -OC43, NL63 and HKU1) is known among the population. They are an acute respiratory viral infection that damages the upper respiratory tract in light and moderate severity throughout the year. Coronaviruses can cause a number of diseases in humans - from mild acute respiratory infection to severe acute respiratory distress syndrome (ARDS). As we all know, vaccination remains the most alternative option in the fight against coronavirus infection. COVID-19 vaccines are safe and can help prevent the development of severe COVID-19 or death. At the same time, it also shows side effects. Although side effects do not have a certain direction like the pathogenesis of the disease, they develop based on certain laws.

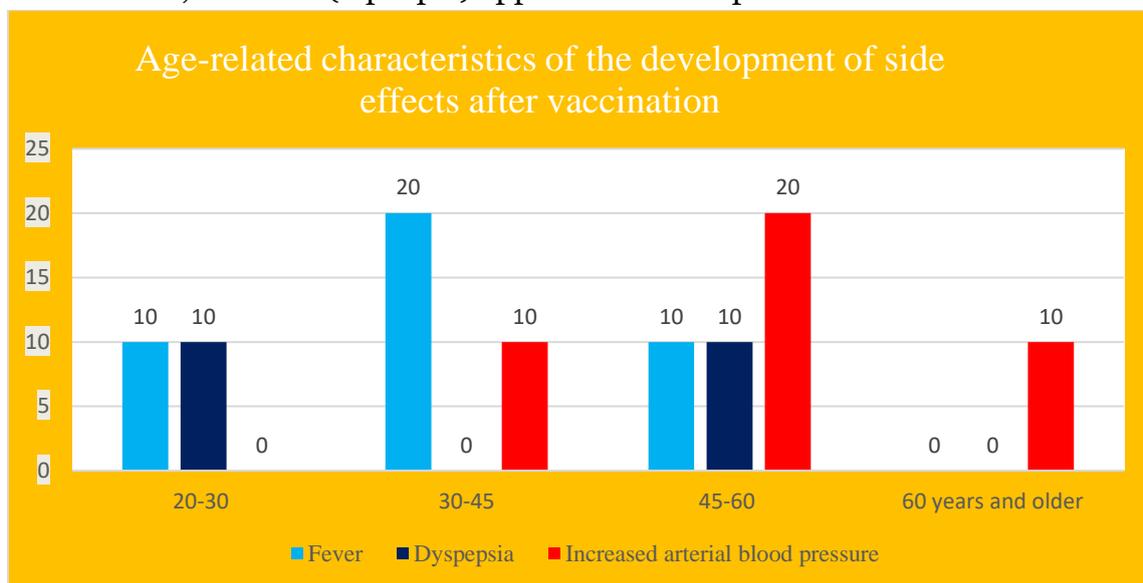
**The purpose of the study:** to study the origin of side effects of vaccination, the factors that ensure their development, as well as the similarities and differences with the pathogenesis of the disease.

**Materials and research methods:** In order to study the origin of the side effects of vaccination, the factors that ensure their development, the representatives of the population who participated in the vaccination and the patients who began to undergo pathological

processes and were treated in the therapy department of the Urganch city hospital of Khorezm region were observed. Their medical history, life anamnesis, results of instrumental laboratory examinations were analyzed.

### Results:

If we pay attention to the course of side effects after vaccination, the same symptoms as in the disease were observed: nausea 20% (12 people), headache 20% (12 people), pain in the nape of the neck pain 10% (6 people), weakness 30% (18 people), muscle pain 20% (12 people), pain in the injected arm 20% (12 people), loss of appetite 20% (12 people), urticaria 10% (6 people), drowsiness-30% (18 people), fever 30% (18 people), arthralgia (joint pain) 10% (6 people), urinary tract and kidney pain was 10% (6 people). The condition of the patient worsened, and 10% (6 people) applied to the hospital and were treated.



Graph 1

### Discussion of Results

This situation can be explained by the topography of ASE 2 receptors on organs. Also, another similar aspect is that the polyorgan can cause changes. In addition, vaccination shortens the incubation period of chronic diseases in the body, just like the disease itself. The reason for this is a decrease in the body's resistance. It was also noted that it causes the period of exacerbation of chronic diseases during the period of remission. In my study, the most side effects were observed in patients with autoimmune diseases. Because the genetic elements or domains of the virus or vaccine increase the synthesis of interleukins, inflammatory mediators are actively produced, and these, in turn, cause aggravation of autoimmune diseases. In order to explain the connection between the course of the disease and the mechanisms of the development of side effects after vaccination, it is first necessary to dwell on the etiology and pathogenesis of the disease. According to the results of today's serological and phylogenetic analysis, its 4 generations are distinguished: Alphacoronavirus,

Betacoronavirus, Gammacoronavirus and Deltacoronavirus. It is known that the natural hosts of most coronaviruses are mammals. New coronavirus On January 12, 2020, the WHO provisionally named this virus 2019-nCoV, and then on February 11, 2020, it was officially named New coronavirus-COVID-19 (Coronavirus disease 2019). According to the Russian "Vector" center of biotechnology and virology, the size of this virus is 100-120 nm. This virus has become the leading cause of interstitial pneumonia. Nowadays, among all types of pneumonia, interstitial pneumonia is one of the urgent diseases. Often, doctors cannot determine where it originates from, what are its real causes. However, the disease proceeds aggressively and seriously damages the lungs themselves [1,2,6]. The main difference between interstitial pneumonia is the inflammatory process of the tissue that surrounds the alveoli and forms the framework of the organ (interstitial or connective tissue) [3,4,5]. Today, two ways of entering the cell of the virus are distinguished. Its action is carried out through the angiotensin-converting enzyme 2 (ASE2) receptor or through a glycoprotein called CD147 on the cell membrane. The effect of ASE 2 can be imagined as follows: the S-protein of the virus is similar to the ASE 2 receptor according to its structure, so the virus successfully binds to the ASE 2 receptor. The interaction of the virus with the receptor is carried out with the substance S2. Then the virus easily inserts its RNA into the cell, but the substance that ensures the invagination of the cell membrane with the virus complex is not yet known. The effect of the virus on the cell through the CD 147 receptor takes place in the same way as ASE2. The CD147 receptor belongs to the family of immunoglobulins. Its spiky S-protein plays an important role in the connection of the virus with the macroorganism through both ways. This protein consists of a three-stranded glycoprotein in its shell, consisting of three ectomenes, a membrane shell, and a short tail domain inside the cell. Ectomen consists of S1 (binding substance) and S2 (membrane-bound substance) receptors. The S1 receptor contains 2 unrelated N (N-terminal domain-NTD) and C (C-domain-CD) terminal domains. The CD domain of the C protein of the SARS-CoV-2 coronavirus is considered a receptor-binding domain (RBD), and this part of the virus recognizes and binds to the ASE 2 receptor of the macroorganism cell. The RBD part of the SARS-CoV-2 coronavirus is the main target for neutralizing cells. ASE 2 receptor is mainly located in type I alveolocytes, cardiomyocytes, cholangiocytes in the liver, colonocytes in the large intestine, keratinocytes in the esophagus, epithelial cells of the stomach, ileum and rectum, kidney proximal tubules, and urinary bladder. When infected with this virus, the damage to the lower respiratory tract and the development of abdominal and dyspeptic syndrome in some patients are explained by the high expression of the ASE 2 receptor in alveolar and small intestinal epithelial cells. RNA of the SARS-CoV-2 coronavirus enters the cell and replication begins. First, the virus collects several unrelated components, then the virions fuse with the plasma membrane, forming a whole virus and causing its release. The RNA of the SARS-CoV-2 coronavirus, unlike other pathogenic coronaviruses, replicates in the upper respiratory tract until the clinical manifestation of the disease is evident. After a latent period lasting several days, the metabolic processes in the cell are disrupted, which leads to a decrease in the synthesis of ingredients for the normal functioning of the alveoli. Then, the damaged cell

dies and disintegrates through a process of apoptosis. As a result of the effect of fibrinoid compounds on the pulmonary vessels, the permeability of the vessels increases, blood and serum leak into the intercellular space. Dysfunction of endothelial cells causes coagulopathy and thrombosis. These processes interact with activated neurohormones in the body, in particular, renin-angiotensin-aldosterone and the components of the immune inflammatory system, causing the accumulation of excess collagen in the extracellular matrix of the lung tissue, and the occurrence of fibrotic proliferative processes. As a result, severe respiratory distress syndrome develops. Its outbreak is related to the activity of the coronavirus. Necrotic changes occur in the parenchyma of organs and tissues as a result of vasculitis and thrombovasculitis due to vascular endothelium damage. Intensification of the process causes violation of lung ventilation and perfusion and filling of alveoli with liquid. As a strong hyperergic immune response of the body to the SARS-Co-V-2 coronavirus, acute systemic inflammatory processes develop and the functioning of all organs and tissues is disrupted. Nevertheless, its pathogenesis has not been fully studied. In the pathogenesis of the disease, the storm of cytokines is an important factor that determines the course and severity of the disease. In patients infected with the virus, the storm of cytokines caused excessive inflammatory cytokines (IL-1 beta, IL-6, IL-8, IL-12, IL-18, IL-33, Alfa-O`NO, GM-CSF) and chemokines (CCL2, CCL3, CCL5, CXCL8, CXCL9, CXCL10) are observed with increased synthesis, and this process is therefore named like this. Cytokines and chemokines increase the production of immunocytes and cause the development of local inflammation. The activation of the inflammatory process in the SARS-CoV-2 coronavirus causes a decrease in the synthesis of IL-10 and leads to the development of a severe form of the disease. The activity of all organs in the body can be disturbed (polyorgan failure). [4, 788B]

**Conclusion.** Another similarity between disease symptoms and post-vaccination side effects is the age-related feature, that is, the younger the age of patients with cardiovascular system problems, the more disease symptoms and vaccination side effects. It was found that the secrets are manifested so strongly. Patients suffering from diseases of the cardiovascular system were almost not observed over the age of 60, which can be explained by a decrease in the body's reactivity, but when communicating with people carrying the virus, the risk of developing bilateral interstitial pneumonia was found to be high. It was observed in patients with dilated cardiomyopathy from patients with cardiovascular system, because it is easy for ASE 2 receptors located in the myocardium to pass to the myocardium, which causes myocarditis. The difference is that side effects after vaccination appear like symptoms of diseases of the family of coronaviruses, that is, they are more common in young people and less common in adults. So, even if the side effects after vaccination are not completely subject to certain laws, by applying preventive measures according to the chronic diseases of the recipient of the vaccine, as well as medical analysis, the results of instrumental examination, the side effects after vaccination can be prevented.

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