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# MENTAL COMPLICATIONS IN PATIENTS WITH INFECTION

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**Abstract:** The new coronavirus SARS-CoV-2 was revealed in December 2019 in Wuhan, China, rapidly spread over the world and caused a global pandemic. The main clinical feature of COVID-19 is a severe acute respiratory deficiency. With the accumulation of new studies, it is clear that the coronavirus causes neurological damages ranging from light (headache, anosmia) to severe acute (encephalitis, meningitis, cramps, strokes et set) in 1/3 of patients with COVID-19. In this review we describe symptoms and neurological manifestations in patients infected with SARS-CoV-2, the structure of this virus, mechanisms of its penetration in cells, probable pathways of neuronal cell infection, and pathogenetic mechanisms of neurological damages. Also, we pay special attention to the beginning and development of psychological and psychiatric problems that originated from the pandemic.

**Keywords:** new coronavirus infection, mental disorders, mechanisms of development of mental disorders in new coronavirus infection.

**Relevance.** While COVID-19 causes a crisis that threatens physical health in the first place, it can cause serious mental health problems if appropriate measures are not taken. Even in the best periods, solid mental health is necessary for the functioning of society. COVID-19 This crisis has seriously affected the mental health and well-being of all world communities and has become one of the priorities that requires an urgent solution. Psychological stress has become the most common phenomenon among the population. Many people experience stress caused by the direct effects of the virus on their health and physical isolation. Many feared infection, death, and loss of family members. People were separated from their loved ones and colleagues. Millions of people faced economic problems as a result of their livelihood or loss of income sources. The main reasons for concern were often misinformation and rumors about the virus, as well as a lack of confidence in tomorrow. There is a possibility that the number and severity of mental disorders will increase dramatically for quite some time [20]. The Serine protease helper virus (TMPRSS2) and the membrane synthesis enzyme attempt to make expression by attacking the virus' RNA genome, which leads to successful DNA synthesis. [8, 10, 17, 31]. Then its translocation occurs, forming two polyprotein and structure proteins, initiating viral genome replication. Newly formed shell glycoproteins are lined up in the membrane of the endoplasmic reticulum and Goldji apparatus, resulting in nucleocapsid formation from the RNA genome and nucleocapsid proteins. After that, virus particles enter the endoplasmic reticulum and the Goldji apparatus, join with the plasmatic membrane, and exit outside the cell [14, 21]. But SARS-CoV-2 has a higher affinity for ase 2, due to which it has a higher pathogenicity and is easier to penetrate the cell compared to SARS-CoV, and MERS-CoV viruses. Since ASE 2 receptors are also expressed in the central nervous system, it can be assumed that the entry of the SARS-CoV-2 virus into the nerve cell is through these same receptors, and thus neurological symptomatic occur and brain tissue is damaged [14, 21]. Two possible pathogenetic mechanisms are promoted that lead to the development of various fog neurological complications: direct invasion of the virus's nerve tissue or nonadoptive inflammatory response [17, 27].

**Clinical picture.** The main target of COVID-19 is the respiratory system. But the disease affects not only the respiratory organs. More than a third of patients experience severe neurological symptoms [1, 13, 14, 20]. It is important to note that the onset of neurological symptoms indicates a worsening of the course of the disease and a poor prognosis. Due to this, timely detection and adequate treatment of neurological disorders can be very important in the treatment of patients with the SARS-CoV-2 virus. When considering cases confirmed by laboratory tests (PZR) of COVID-19 based on a series of original studies and data analysis of meta-analyses, the following main symptoms of this disease can be identified [5, 15, 16, 18, 19, 27, 28, 30]: 77% -98.6% of patients reported high temperatures; dry cough - 59.4% - 82%; weakness, rapid fatigue - 78 38.1% - 75%; the presence of phlegm - 33.4% - 56%; shortness of breath - 18.6% - 36.7%; sore throat - 5% - 13.9%; headache - 6.5% - 34%; myalgia and joint pain - 11% - 34.8%; trembling - 11.4%; nausea, vomiting - 5% - 17.3%; runny nose - 4.8%; diarrhea - 3.7% - 12.9%; vomiting blood - 0.9% - 3%; redness of the conjunctiva - 0.8%; dizziness - 9.4%; abdominal pain - 2.2% - 5.8%; lymphopenia - 70.3% - 75.4%; increased prothrombin time - 58%; mental disorders - 9%; runny nose - 4%; Blunt Back Pain - 2%; anorexia - 12.2%. Many groups of researchers claim that the severity of symptoms depends on the immune response. At the initial stage of infection, immunodeficiency is noted, the number of lymphocytes decreases, and the concentration of C-reactive protein in the peripheral blood of patients with COVID-19 increases [11, 30]. Storm cytokine, which includes secondary hemophagocytic lymphohistiocytosis, is an unexplored but fatal complication for patients with COVID-19. It is known that in some infected people, although the virus is found in the blood, the disease is accompanied by no symptoms [25, 26]. Such patients can be carriers of the disease.

**Psychological and mental disorders in COVID-19.** The very rapid spread of COVID-19 and limited opportunities in the treatment of the disease have led to increased anxiety and panic attacks in several countries where the pandemic is still happening. Alarming disruptions, xenophobia, and a frantic level of demand for various commodity products are growing among the population, and various conspiracy theories and robberies are increasing. According to the U.S. press, there was an increase in cases of invasion, violence, and alcoholism. Quarantine, isolation, social distance, as well as self-isolation have had their impact on the psychological state of the entire population. Psychological reactions to pandemics include inadequate correspondence, emotional distress, and protective reactions in the form of behaviors such as anxiety, fear, frustration, anger, feelings of loneliness, boredom, depression, and withdrawal [24]. In this pandemic, a specific syndrome called "headline stress disorder" is observed: a strong emotional reaction in the form of stress and anxiety. This syndrome can also have physical symptoms: a strong heartbeat and insomnia, which can later lead to mental disorders. Similar reactions have been found after the SARS-CoV, MERS-CoV, and Ebola virus pandemics. In the early stages of the pandemic in China, it was found that between 7% and 53.8% of the population were experiencing psychological distress. At the same time, the following negative psychological reactions were observed: in addition to anxiety, depression and stress, insomnia, dissatisfaction, anxiety about loved ones and his health, sensitivity to social risks, dissatisfaction with life, phobias, humanism, compulsive inferiority, antisocial behavior, somatic symptoms [13, 24]. Levels of Stress, anxiety, and depression ranged from moderate to severe. Among students, anxiety was light, moderate, and heavy levels of 21.3%, 2.7%, and 0.9% respectively. It turns out that the level of anxiety and stress depends on the level of education, gender, and age of a person [24]. Considering the psychological impact of the pandemic on the population, it will be necessary to divide them into several groups: medical workers, patients with COVID-19, and patients with pre-existing mental disorders. Medical workers have been shown to have a higher risk of negative psychological trauma during a pandemic, especially if in direct contact with sick people [4, 12, 24]. 27.39% of medical workers - 71.5% develop stress, 50.4% - depression, 34.0% - insomnia, 29.04% - 44.6% - anxiety [12, 13, 16]. Many had mild to moderate symptoms. Severe, moderate, and mild levels of anxiety were distributed as 2.17%, 4.78%, and 16.09% respectively [16]. Symptoms of a relatively more severe level were observed in middle

and small medical workers, women, and young people working in the "red zone". In general, no significant difference was detected between the psychological reactions of the ordinary population and medical personnel who worked in close contact with patients. In patients with COVID-19, psychopathological symptoms manifest themselves for several reasons: clinical signs and development of the disease, side effects of ongoing medical treatment, feelings of danger, fear of transmitting the virus to others, social isolation, insecurity, physical discomfort, negative media reports [24]. Clinically stable, 96.2% of COVID-19 patients have symptoms of psychological problems and stress disorder, which leads to a decrease in quality of life and impairs performance stability. Significant levels of stress are observed during periods of morbidity, especially in the elderly contingent. Depression was observed in 50% of COVID-19 patients, anxiety in 55%, and psychosomatic symptomatic in about 70%. Married patients with positive pcr test (polymerase chain reaction) scores experienced more severe depression, with more somatic complaints found in patients with negative pcr test pcr test (polymerase chain reaction) scores; 67.92% of these patients suffered from insomnia, with about 25% considering suicide. As for patients with prior mental disorders, it should be noted that during the pandemic they were given much less attention than required, and often there was no permanent treatment. Such patients often have chronic somatic disorders with poor overall health, which in turn increases their susceptibility to SARS-CoV-2 infection. Mental patients with COVID-19 have lower treatment outcomes and have a higher emotional response to the disease [2]. According to the results of our study, it was found that psychological and mental disorders during the COVID-19 pandemic are not much different from those observed during other epidemics and emergencies. In our opinion, the main reason for the emergence and development of psychological and mental disorders during this epidemic is long-term social isolation and constant mention in the media of the need to comply with it.

**Possible mechanisms for the development of psychiatric complications in COVID-19.** It is known that in the case of an epidemic and even more so a pandemic, the number of mental disorders increases due to the development of stressful situations associated with the fear of infection and death, quarantine, and social isolation. In people sensitive to stress in such a stressful situation, stress-dependent corticotropic hormone (CRH) is released from hypothalamic-paraventricular nuclei (PVN) neurons and binds to CRH receptors to activate the hypothalamusgipophysis-adrenal (HPA) axis. Stimulates the release of the anterior pituitary gland, adrenocorticotropic hormone (ACTG) [7, 23]. An increase in ACTG in the blood leads to an increase in the concentration of glucocorticoids in the blood, which bind to glucocorticoid receptors (GR) expressed in various organs, including the brain [9]. Hyper activation of effector glucocorticoids and glucocorticoid receptors of the NRA axis leads to the expression of stress-related genes and induces different behaviors. In addition to reactivation of the NRA axis, impaired expression of stress-dependent genes increases sensitivity to exogenous stress [6]. Exogenous stress can alter the epigenetics of SERT, BDNF, GR, FKBP5, and CRHR genes through various mechanisms such as DNA methylation, chromatin modification, and histone deacylation. Such changes in the expression of these genes lead to impaired transcription and the development of stress-related diseases [22]. With great confidence, it can be assumed that in the event of the COVID-19 pandemic, strong exogenous, including psychological stress, can lead to the development and exacerbation of mental disorders. One of the possible mechanisms for the occurrence of diseases can be the activation of the NRA axis and the alteration of epigenetic modifications of stress-related genes. Stress can also increase sensitivity to SARS-CoV-2 infection and aggravate the patient's condition [29].

**Conclusion.** A large percentage of COVID-19 patients experience neurological complications such as headache, dizziness, nausea, vomiting, increased neck muscle tension, impaired sense of smell and taste, as well as psychological and mental disorders. Although in most cases such symptoms may seem insignificant against the background of acute respiratory disorders, nevertheless, cases of encephalitis, meningitis, cerebrovascular disorders, depression, and other mental disorders have been found. The appearance of

neurological signs in patients with COVID-19 is an indicator of a poor prognosis during the disease period, so the Prevention of such symptoms can be very important for treatment.

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