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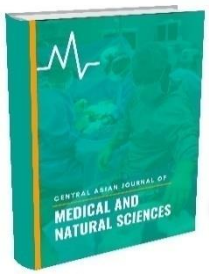

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NEUROLOGICAL DISORDERS IN PATIENTS SURVIVORS OF COVID-19

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Abstract: Almost half of patients with COVID-19 had various neurological changes. Loss of taste and sense of smell after coronavirus, severe headaches, dizziness and a number of other similar symptoms indicate damage to the central nervous system as a result of exposure to the virus. Even patients who recover from a number of COVID-19 have long-term depression, anxiety, memory impairment and other such problems. A deeper study of the effects of coronavirus infection on the nervous system suggests the need to investigate the neurological changes observed in the patient and to develop measures to prevent these complications in COVID-19 patients.

Key words: COVID-19, SARS-CoV-2 central nervous system, peripheral nervous system

Introduction. In December 2019, pneumonia of unknown etiology was first reported in Wuhan Province of the Republic of China, which was intense first in China, and then spread around the world. WHO announced a pandemic of this disease on March 11, 2020. It was found that the disease is caused by a new single-stranded RNA virus belonging to the group of coronaviruses (CoV). The new coronavirus is called SARS-CoV-2, and the disease caused by it is COVID-19.

Coronaviruses are a large group of viruses, mainly of various animals, but primarily affecting bats and birds. Some of them cause diseases in humans - human coronaviruses (hcov)-human coronaviruses. Currently, there are 7 known coronaviruses that cause diseases in humans.

Since the new SARS – CoV-2 causes acute respiratory syndrome, primarily affecting the respiratory tract, since February 11, 2020, the term “Severe acute respiratory syndrome (SARS)” has been used in relation to this disease. The clinical manifestations of infection caused by the SARS-CoV-

2 virus are similar to the acute severe respiratory syndrome caused by the SARS-CoV-1 virus in 2003 [10].

Human coronaviruses in addition, neurological disorders caused by SARS-CoV-2 have attracted the attention of many researchers. Covid-19 infection is not limited to respiratory infection. Case studies show that in many patients, the virus also affects the nervous system.[9] Experimental models have shown that the cross-related SARS-CoV-2 virus and the SARS-CoV-1 virus can cause serious neurological disorders, since they tend to penetrate the brain. Protein structures and RNA of the virus were found in the cerebrospinal and cerebrospinal fluid of patients with symptoms of acute severe respiratory syndrome and nervous system disorders during the epidemic caused by the SARS-CoV-1 virus in 2002-2003 [22,12].

The course of neurological changes in patients diagnosed with COVID-19 was initially defined as L. Investigated by Mao. L.According to the data provided by Mao, out of 241 patients diagnosed with Covid-19 in Wuhan, 88 (41.1%) had a severe form of the disease, while 126 (58.9%) had a mild or moderate severity of the disease. The group of people who had a serious illness consisted mainly of elderly people (58.7±15.0 and 48.9±14.7 years) and those who had more concomitant diseases (47.7 and 32.5%). Neurological symptoms were found in 78 (36.4%) of 214 patients and were more often observed in severe disease (45.5 and 30.2%). In this group, brain stroke (5.7 and 0.8%), impaired consciousness (14.8 and 2.4%) and muscle damage blindly developed [15].

Lopez-Leon S. Studies conducted by others have revealed 5 main symptoms of covid-19 disease. The patients mainly had weakness (58%), headaches (44%), decreased attention (27%), hair loss (25%), shortness of breath (24%). [13]. Several studies have shown that weakness is more common in women [23,21].

The etiology of neuropsychiatric symptoms in patients with COVID-19 is complex and multifactorial. They may be associated with direct consequences of infection, cerebrovascular diseases (including hypercoagulation) [5], physiological disorders (hypoxia), diseases in which side effects of drugs can be fatal [17]. The most common mental disorders are anxiety and insomnia. Sleep disorders may indicate the occurrence of mental illness [12].

The disease can leave a trace in the form of complications that last from several weeks to months after the initial recovery. While significant efforts of the scientific and medical community are focused on determining the sequence of symptoms, diagnosis, treatment and prevention of COVID-19, the long-term consequences for patients suggest that the acute stage of the disease has not yet been determined. Various authors have used several terms to describe symptoms that persist after an outbreak of covid-19, and the term "long-term covid-19" or long-covid has recently appeared [18]. Thus, today it is observed that neurological complications of covid-19 are significantly common and occur in many patients. The variety of neurological complications of covid-19 disease has become one of the pressing medical and social problems [2].

Thus, when summarizing all current articles, two types of damage to the nervous system in COVID-19 can be distinguished, namely: damage to the central nervous system and damage to the peripheral nervous system

Damage to the central nervous system. Studies have shown that coronaviruses cause the formation of blood clots in large blood vessels, which, in turn, causes acute circulatory disorders in the brain, but

neurological disorders are more common mainly in severe disease than in mild. Some neurological symptoms may persist even after recovery from a viral disease [11].

Academician Mazhitov N.M. 33 patients were studied at the private clinic “Neyromed-servis” named after S. M. Kirov, including 19 men and 14 women who underwent COVID 19 and are on inpatient treatment. 7 of these patients had acute circulatory disorders in the brain [3].

The combination of COVID-19 and acute cerebral circulatory disorders is of particular importance. It is worth noting that of the causes of death, which are also common during influenza epidemics in acute severe viral diseases, cardiovascular complications are the main ones.even these complications are ahead of pneumonia [14].

In patients with COVID-19, decompensation of risk factors associated with diabetes, cardiovascular diseases and hypertension is of paramount importance for the development of stroke [15]. It should be noted that since the ACE2 receptor is the main microcirculatory of the brain, COVID-19 causes its weakening. It is also important to emphasize the importance of acute diffuse myocardial damage in cerebrovascular disorders. [20,19]. In addition, a severe course of infection can independently lead to pre-inflammatory changes, a shift in hemostasis towards the procoagulant, and microcirculation disorders. Another aspect of the problem of concomitant cerebrovascular injury COVID-19 is the impact of stroke on the course of infection. Since a stroke is accompanied by activation of the sympathetic nervous system and acute immunosuppression, this can lead to a deeper stroke and aggravate the course of COVID-19.

Several cases of encephalitis (inflammation of the brain), as well as Guillain-Barre syndrome, have been described as severe complications of COVID-19: the patient's immune system begins to attack its own nerve cells, which leads to muscle weakness and, in severe cases, to paralysis.(10)

The problem of cognitive impairment in patients with covid-19 is an obstacle to returning to previous activities. In people who had no problems with intellectual functions before covid, cognitive impairment at a young age is more complex than the problem of origin. This question is closely related to the question of the pathogenesis of damage to the nervous system in COVID-19. However, human cognitive functions are also closely related to emotional state, educational qualifications, gender and age. These factors are poorly covered in the literature. With this in mind, a study was conducted. The study showed that cognitive impairment was evident in people with a high sense of anxiety compared to people with a low sense of anxiety. Cognitive impairment was more pronounced in women belonging to the group with a higher sense of anxiety, according to MMSE and MOCA, compared with men. In addition, cognitive impairment was more pronounced in the group of patients aged 40 years and older than in the group of patients who were relatively young.Alternatively, it should be noted that cognitive impairments manifested almost identically in patients with different data [1].

One of the types of damage to the peripheral nervous system is infection in the brain due to damage to the olfactory nerves. In previous experiments, it was found that SARS-CoV-1, a relative of the SARS-CoV-2 virus, moves from the nasal cavity through the olfactory nerves to the floor of the skull, and then to the brain, which leads to severe damage to it [9,16]. Symptoms of olfactory impairment were diagnosed in 5.1% of patients with COVID-19, while in patients with a mild type of disease, this symptom was more common. This symptom may also be difficult to detect in patients with a severe type of disease [8]. Scientists suggest that loss of sense of smell may be not only one of the symptoms, but even the only clinical manifestation of COVID-19. This M.Eliezer B. A. Also found confirmation in the

articles of others, namely, that CT-MRI of the nasal passage and nasal cavity changes and a slight or complete loss of sense of smell, even in the absence of other clinical symptoms, may be the earliest sign of COVID-19 [6]. The British Association of Otolaryngologists insists that a decrease or loss of sense of smell should be considered as one of the main markers of COVID-19. It is important to note that the olfactory load in COVID-19 contrasts with the loss of sense of smell with the healing of the respiratory tract in other infections.[7]

Conclusion. Thus, COVID—19, caused by a new coronavirus infection, the SARS-CoV-2 virus, can cause damage to the central and peripheral nervous system, as well as damage to the respiratory system. There is a relationship between the severity of COVID-19 and the severity of neurological diseases and the frequency of meetings. Factors that can complicate the course of COVID-19 and increase the likelihood of neurological complications are hypertension, diabetes, heart disease and chronic lung diseases.

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