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Post-covid syndrome: consequences and psychoemotional status in patients with cardiac pathology

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Abstract

Post-Covid syndrome (PCS) is a consequence of COVID-19. This disorder is still poorly understood and, according to various sources, significantly reduces the standard of living in an average of 17-30% of people. Symptoms of mental disorders appear within a period of several weeks to six months. Post-Covid syndrome occurs regardless of the form of the disease. It does not have a clear clinical picture, since each person has different symptoms. The patient's medical history, the degree of organ damage and treatment methods during the disease are of great importance. Manifestations of psychopathological disorders after coronavirus were observed 2 times more often than after influenza or ARVI.

Keywords: coronavirus infection, COVID-19, SARS-CoV-2, cardiovascular diseases, post- Covid syndrome, Long COVID-19, anxiety, depression

Introduction

The novel coronavirus disease (COVID-19), caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), primarily affects the lungs, causing interstitial pneumonitis and severe acute respiratory distress syndrome (ARDS), but the cardiovascular consequences of the infection are particularly significant [1].

Entry of SARS-CoV-2 into host cells is known to require binding to receptors through a viral protein called the spike protein. SARS-CoV-2 binds to ACE2 (angiotensin-converting enzyme 2-ACE2) receptors of target cells. Despite the relatively low expression of ACE2 in the human brain, there is evidence that neurons are targeted by SARS-CoV-2. Presumably, this is due to the fact that even the basal level of ACE2 expression is sufficient for the virus to enter neurons. In addition, there is a high probability of the presence of other neuron-specific factors that bind the virus to cells of the nervous system [2].

Angiotensin-converting enzyme type 2 (ACE 2), which regulates the renin-angiotensin-aldosterone system (RAAS), is believed to play a key role in binding to SARS-CoV-2 viral particles and their entry into the cell. ACE 2 is found in the tissues of the brain, kidneys, heart,

lungs and testicles. In addition, ACE 2 is expressed especially strongly in type 2 alveolocytes, epithelial cells of the ileum and colon, esophagus, as well as in cholangiocytes. There is evidence that more than 80% of ACE 2 is present in type 2 alveolocytes and endothelial cells, and therefore the respiratory and cardiovascular systems are more susceptible to damage. The pathogenic cardiovascular mechanism of action of the virus includes systemic inflammation through cytokine storm and direct myocardial damage [1,2]. The most commonly reported cardiovascular complications of COVID-19 include acute myocardial injury, myocarditis, myocardial infarction, heart failure, cardiomyopathy, arrhythmias, and venous thromboembolic complications. Additionally, pre-existing cardiovascular disease in patients with COVID-19 is a major marker for the development of severe disease and is associated with high mortality rates. Finally, investigational drugs for COVID-19 may have individual adverse cardiovascular effects [3,4].

To study in patients with cardiovascular diseases hospitalized for a new coronavirus infection (COVID-19) of varying severity, dynamic changes in the clinical, laboratory and psychological manifestations of COVID-19 after discharge.

Material and methods

The study was conducted in the Bukhara branch of the Republican Specialized Scientific and Practical Medical Center of Cardiology in the city of Bukhara. The study included 225 patients with cardiovascular diseases hospitalized for COVID-19. Inclusion criteria: age 18-75 years, cardiovascular diseases (ischemic cardiomyopathy, heart failure NYHA I-III, hypertension, stable angina pectoris, atrial fibrillation) and previous COVID-19 confirmed by polymerase chain reaction. Exclusion criteria: disagreement to participate in the study, inability to complete the informed consent and/or questionnaires provided independently, patients in the intensive care unit with severe disease, chronic heart failure (CHF) functional class IV according to NYHA, respiratory failure stage III, severe dementia (result <10 points on the MMSE scale). A conversation was held with the patients: a life history was collected, a history of CVD and a detailed questioning about the clinical picture and features of the course of COVID-19. After the survey, they were asked to fill out a number of scales: the HADS Hospital Anxiety and Depression Scale, the Beck Anxiety Rating Scale, and the Hamilton Depression Rating Scale. Physical examination data, laboratory parameters (complete blood count, transaminases, C-reactive protein, glucose, total cholesterol, low-density lipoproteins), chest radiography, and computed tomography of the lungs were assessed. Patients were interviewed regarding the ongoing clinical manifestations of COVID-19, the duration of symptoms, and the duration of the recovery period. All patients underwent blood sampling for general clinical and biochemical blood tests, an electrocardiogram was recorded, and they were also asked to fill out the HADS Hospital Anxiety and Depression Scale and the Beck Anxiety Rating Scale. For statistical processing of the material, Excel (Microsoft Office 2016-2019 software package) and Statistica

8.0 software package (Statsoft Inc., USA) were used. The following were taken into account: the absolute magnitude of events and their percentage ratio. The cross-tabulation method was used (construction of tables of absolute frequencies of paired observations) using the $\chi 2$ criterion. Before inclusion in the study, written informed consent was obtained from all participants.

Results and its discussion

The average age of patients included in the study was 47.6±4.52 years. Women made up 57.7% and men - 42.3%. all patients were divided according to the WHO-approved age classification. According to it, patients aged 18-24 years made up 10.6%, patients aged 25-44 years - 44.7%, patients aged 45-59 years - 32.4%, and people over 60 years old - 23. 5%. Analysis of the results showed that PS is most common among patients aged 25-44 years (Fig. 1)

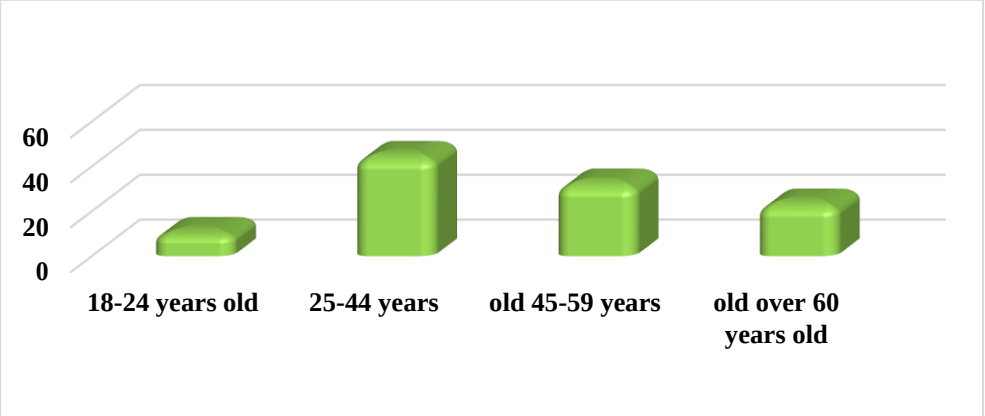

Figure 1. Age structure of patients with post-Covid syndrome with cardiac pathology

When assessing the results obtained, attention is drawn to the generally more severe course of the new coronavirus infection, as well as the more frequent occurrence of post-Covid syndrome in patients suffering from cardiac pathology.

Table 1.

Characteristics of patients according to the severity of COVID-19

Index	Patients with coronary artery disease, n=225 (%)
Mild course	10 (4.4%)
Moderate severity	157 (69.8%)
Severe course	58 (25.8%)

Arterial hypertension occurred in the vast majority of patients and amounted to 96.4%. The

duration of hypertension was 8.6 ± 7.5. In the post-Covid period, 83 (36.8%) patients had a course of stable coronary artery disease, which was manifested by a decrease in tolerance to physical activity, an increase in frequency and intensification of anginal attacks, and an increase in the need for nitrates. The presence of exertional angina was diagnosed for the first time in the post-Covid period in 42 (18.7%) When analyzing the course of coronary artery disease in the post-Covid period, functional class III (FC) of exertional angina was diagnosed in 32 (14.2%) patients. Before contracting COVID-19, 17 (7.6%) suffered a MI. 27 (12%) patients had type 2 diabetes mellitus, 9 (4%) had impaired glucose tolerance (IGT). Chronic kidney disease (CKD) was detected in all patients, while CKD stage 3b occurred only in patients with moderate COVID-19 (4 people - 1.7%); Stage 3a PD was detected in 72 (32%) patients with mild COVID-19 and in 55 (24.4%) with moderate COVID-19; CKD stage 2 – in 142 (63.1%) patients. Chronic obstructive pulmonary disease and bronchial asthma occurred in 5 (2.2%) patients. The majority of patients retained the contractility of the left ventricle (LV), and 24 (10.6%) patients had CHF with a slightly reduced EF. Stage 1 CHF was diagnosed in 13 (54.2%) patients, stage 2A CHF – in 7 (29.1%) patients; CHF stage 2B – only in 4 (16.7%) patients (Fig. 2).

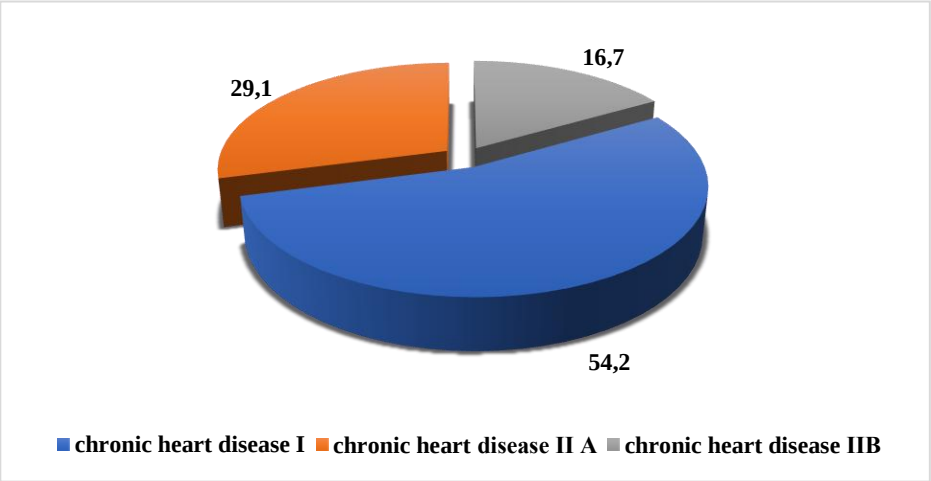

Figure 2. Prevalence of CHF among patients who have had COVID-19

All patients without exception received drug therapy for ischemic heart disease and hypertension after coronavirus infection. The therapy included antiplatelet agents, statins, β-blockers, slow calcium channel blockers, angiotensin-converting enzyme inhibitors, sartans, long-acting nitrates in individual combinations and dosages.

Changes in the psychological sphere were verified using the Spielberger-Khanin self-assessment scale of the level of personal and reactive anxiety. High personal anxiety was noted, both during the first and repeated examinations: in the group of men - 43.8 + 1.32 and 48.3 + 1.53 points, respectively; in the group of women, the value of the indicator was higher: 54.47 + 1.61 points ($p < 0.05$ in relation to the group of men upon admission), and during the repeated study in women, the indicator of personal anxiety decreased to 47.74 + 1.32 and according to in relation to the group of men, the indicator began to be characterized as unreliable. In addition,

reactive anxiety was also high at the first and repeated examinations: in men 43.2 + 1.57 and 42.4 + 1.24, respectively; in the women's group – 53.06+2.53 and 48.0+2.21. Thus, high personal anxiety has been recorded as a stable characteristic of a person with a tendency to perceive situations as threatening, and high reactive anxiety as a state of tension and anxiety, which causes attention disturbances. Moreover, high personal and reactive anxiety was revealed with a significant predominance in the group of women ($p < 0.05$) upon admission to the department.

In psychological disorders, anxiety is comorbid with depressive syndrome, so the level of both anxiety and the depressive component was additionally specified using the Hospital Anxiety and Depression Scale (HADS). According to these data, at the first examination in men, the average indicator of anxiety was 8.21 + 0.78, depression - 9.21 + 0.71. However, upon repeated examination, the indicators were unreliably normalized (anxiety - 6.85 + 1.10 points; depression - 7.78 + 0.78 points). In women, both during the first and re-examination, the anxiety indicator indicated clinically expressed anxiety in the range of 11.83 + 0.52 points, which was significantly higher than in men (with $p < 0.001$ in relation to the group of men on admission) without dynamics during repeated examination: 11.22+2.21 (with $p < 0.01$ in relation to the group of men). At the same time, the depression indicator both at the first and at the second examination indicated subclinically expressed depression (9.88 + 0.65 and 7.67 + 0.84, respectively) without a gender difference. So, a component of the post-Covid syndrome with a predominance of the anxiety-depressive variant was identified. This finding correlates with the FAIR Health study of US residents, which found that 23% of people developed mental health problems within one month or later after infection, with anxiety being the most common. This was followed by depression and adjustment disorder [2].

After 1 month after discharge, there is a decrease in the number of patients with signs of damage to the respiratory system, such as cough, shortness of breath, chest congestion, while a decrease in tolerance to physical activity persists - in 80.5% (of 95.5% at the hospital stage), general weakness and increased sweating - in 69.5%. 38.9% of patients noted noticeable, previously undetected hair loss. Noteworthy is the abundance of neurological symptoms at the hospital stage, incl. dizziness, severe headaches that cannot be relieved with analgesics and non-steroidal anti-inflammatory drugs, lethargy, disorientation in place and time, and in some cases even hallucinations. Some symptoms persist after 1 month: 55.5% note a decrease in memory, 36% of respondents say they still have feelings of fear and anxiety, 63.9% of patients who noted problems with sleep during COVID-19 continue to have problems in the form of frequent night awakenings (19.4%), insomnia (16.6%), and a long time to fall asleep (11.1%). Some respondents experienced adverse events over the past month: destabilization of blood pressure (BP) in the form of episodes of increase and decrease in blood pressure during the day - 36.0%, hypertensive crisis - 14.0%. There was an increase in the number of patients with subclinical and clinically significant depression ($p<0.05$). There is also an increase in the number of

patients with hypercholesterolemia compared to the period of inpatient observation by 15.5%.

Conclusion

After 1 month after discharge, clinical manifestations of the respiratory system naturally decrease, but new symptoms appear, such as shortness of breath during exercise in patients who have not previously noted breathing difficulties, fatigue, unsteadiness of gait, hair loss, and increased sweating. There has been an increase in the number of patients with subclinical and clinically severe depression. Laboratory parameters revealed an increase in the number of patients with increased levels of total cholesterol and low-density lipoproteins. Asthenovegetative syndrome is a common complication of coronavirus infection. Patients seeking outpatient medical appointments after a coronavirus infection have significantly increased levels of depressive and anxiety disorders. Treatment of patients with post-COVID-19 psychological disorders gives a faster effect in relation to asthenic and cognitive disorders and slower positive dynamics in relation to anxiety and depressive disorders.

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