# Effect of comorbid conditions on the course of COVID-19 in patients with chronic diseases of the cardiovascular and pulmonary systems

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**Abstract.** The pandemic of the novel coronavirus infection COVID-19 has become a serious challenge to humanity. Prior to this period, cardiovascular diseases (CVS) were a major health problem in all countries, including hypertension (AH), which is a leading risk factor for vascular disasters; acute disorders of cerebral circulation, myocardial infarction. Hypertension makes a significant contribution to the structure of mortality and disability from cardiovascular diseases. The year 2020 changed the decades-old perception of diseases that pose a threat to health on a global scale. The leading clinical symptoms of COVID-19 in patients with background diseases CVS and hypertension are described. An important aspect of COVID-19 is the course of infection in patients with a burdened comorbid background, while the role of hypertension as a risk factor for severe forms is noted. The data obtained will serve to understand the systemic effects, including cardiovascular, that COVID-19 has, which will optimize the provision of timely comprehensive medical care to patients, develop an algorithm for the tactics of management and observation in different periods of the COVID-19 disease.

## 1 Introduction

The most vulnerable categories of people affected by COVID-19 are patients with severe chronic diseases, such as heart and vascular diseases (coronary heart disease (CHD), heart failure, hypertension, cerebrovascular diseases), chronic obstructive pulmonary disease (COPD), chronic kidney disease and, of course, diabetes mellitus (DM). Analysis conducted by different groups of scientists from China, Italy and the United States showed different incidence of confirmed infection with SARS COV-2 in patients with diabetes. Thus, according to the Centers for Disease Prevention and Control, the incidence of diabetes among COVID-19 patients was 5.3% of the 20,892 patients in China [1, 2], 10.9% of the 7162 patients in the United States [3] and 35.5% of the 355 patients in Italy [4]. In Uzbekistan, these data coming to the Federal Register of COVID-19 have yet to be analyzed.

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Objective **is t**o study theclinical prevalence of COVID-19 in patients with chronic diseases of the cardiovascular and pulmonary systems.

## 2 Materials and methods of research

The study was conducted in the period from March 2020 to November 2021 in the departments of the Samarkand City Specialized Center for COVID-19. 221 patients receiving inpatient treatment were examined with a diagnosis of COVID-19 with concomitant diseases - main group, COVID-19 without comorbidities - comparison group. Of the 94 patients in main group, 45% were diagnosed with H II and 55% with H III. Comparison group included 91 patients with an average age of 64.1±1.2 years. Of these, 53% were men and 47% were women. Their average age was 64.8±1.2 years. All patients in the groups underwent a comprehensive examination, which included: history taking, physical examination, pulse oximetry, blood pressure and weight measurement, clinical blood test, coagulogram with D-dimer, chest X-ray and CT. The clinical trial was conducted based on the following criteria and included: patient complaints and a history of life expectancy and risk factors for H, duration of fever common signs of catarrhal symptoms and all clinical signs of Covid-19 clinical development and outbreak during illness and comorbidities.

## 3 Results of the study and their discussion

In our research, patients with comorbid conditions were hospitalized after 4.8±0.4 days from the onset of clinical manifestations of the disease, and in the group of patients without comorbid conditions after 5.7 ±0.2 days. The duration of hospitalization was 15.6±0.6 days in the main follow-up group and 12.9±0.3 days in the comparison group. When analyzing the frequency of hospitalization, a statistically significant difference was not obtained by group. However, the timing and duration of hospitalization in the main group were higher and differed statistically significantly. Patients predominantly indicated the suddenness of the onset of clinical symptoms of this disease. Sometimes there was a prodromal period with phenomena of general nonspecific malaise. Very typical in the clinical picture is the presence of fever. In the main group of patients, it was noted in 80.6%, in 17.3% of hyperthermia was not noted and in 2% the disease proceeded with hypothermia. At the same time, among febrile patients in the main group, most often the figures reached febrile values of -37.6%, subfebrile temperature was in 27.6% of patients and in 15.3% it reached hectic figures. The duration of the febrile period ranged from 1 to 30 days and most often was 7-14 days.

One of the distinguishing features of COVID-19 is the development of various olfactory disorders - dysosmia in the form of anosmia, parosmia, hyposmia and, especially painful, cacosmia. There were also violations of taste: ageusia, paragevsia. Clinical manifestations of a decrease in olfactory function are fundamentally different from similar observed symptoms in other acute respiratory infections. At the same time, often disorders of smell and taste were observed even without nasal congestion and rhinitis phenomena. In our study, a symptom such as anosmia in the main group of patients occurred in 58.1% of patients. In the comparison group, anosmia occurred in 50.5% of patients. On average, it appeared on 5-6 days, and olfactory disorders persisted from 3 to 120 days. In some patients, a year after suffering COVID-19, olfactory function has not been restored. Thus, in the present observation, anosmia was significantly more common in group A, especially pronounced in patients with hypertension.

In patients on echocardiography, the following changes were detected. In patients of the main group, the diastolic size of the left ventricle on average decreased from 6.8±0.1 cm to 6.0±0.1 cm, the last systolic size, in turn, decreased from 5.4±0.1 cm to 4.7±0.1 cm and the fraction of blood ejection into the left ventricle increased from 36.5±4. With a high significant increase of 44.5±1.2%, the final diastolic volume changed positively from 218.5±5.9 ml to 190.4±9.0 ml, and the final systolic volume -from 139.1±4.9 ml to 104.4±5.6 ml. In the comparison group, the final diastolic index decreased from 6.0±0.09 cm to 5.8±0.08 cm, and the final systolic index decreased from 5.0±0.1 cm to 4.6±0.1 cm, while the blood ejection fraction in the comparison group was 35.9±1.2% to 39.0±1.04%, the late diastolic volume changed from 210.9±4.8 ml to 194.4±4.9 ml, and the late systolic volume changed from 146.9±5.0 ml to 134.8±5.1 ml. In patients of the comparison group, the final diastolic size of the left ventricle is from 6.2±0.1 cm to 5.9±0.1 cm, the final systolic size is from 4.9±0.1 cm to 4.6±0.2 cm ($R<0.05$), the blood ejection fraction is from 42.9±1.2% to 46.9±1.3%, the last diastolic volume changed from 186.8±11.2 ml to 179.6±11.2 ml, and the last systolic volume changed from 112.0±8.6 ml to 104.7±8.5 ml. While the indicators of transmittal Doppler Blood flow underlying treatment had no statistically significant changes in patients of the comparison group, early diastolic filling in patients of the main group ranged from 0.47±0.02 to 0.55±0.03 ($p<0.05$), and the ratio of E/A was from 0.66±0.04 to 0.85±0.04 an increase was found.

Using a test with a 6-minute walk, we determined how well patients withstand physical exertion. This method of research is considered the simplest and at the same time the most common method of assessing the performance of all patients with GB and CVD. The indicator of patients' resistance to physical exertion in the study was assessed based on the results of the test with 6-minute walking. The results in the initial case in patients with FC II in the control group, this indicator was 346.8±11.46 meters. In patients with FC II who had COVID-19 based on hypertension in the main group and the comparison group, it was 328.6±12.54 and 334.6±13.54 meters, respectively. It was found that the indicator of resistance to physical activity in the control group in patients of the main group and the comparison group decreased by 5.3% and 4.2%, respectively. After the prescribed treatment, it was revealed that the patients' level of exercise tolerance in both groups changed positively with an increase in the average distance in the test with 6-minute walking.

If we compare the data on the prevalence of COVID-19 in China and the United States (5.3% and 10.9%, respectively) with the total prevalence of diabetes in these countries (10.9% and 13.3%, respectively) [2], it becomes obvious that the number of infected patients with diabetes does not exceed the total prevalence of diabetes in these countries. This means that the risks of contracting this disease in patients with diabetes do not exceed those risks in the general population. However, if a person with diabetes is already infected with the new coronavirus SARS COV-2, then the disease in him flows much more severely than in patients without diabetes, and the frequency of deaths in patients with diabetes is significantly higher. This fact is confirmed in several studies of Chinese colleagues, the experience of which is summarized in the review [6]. According to the studies cited in the review, the frequency of severe COVID-19 was 1.3–3.9 times higher, and the mortality rate was 1.5–4.4 times higher in people with diabetes compared to people without diabetes [5-10]. A just-published meta-analysis of 30 studies describing the outcomes of COVID-19 pneumonia confirms that diabetes patients have significantly higher risks of severe disease (RR=2.45; 95% CI 1.79–3.35; $p<0.001$), more frequent development of acute respiratory distress syndrome (RR=4.64; 95% CI 1.86–11.58; $p=0.001$), and higher mortality (RR=2.12; 95% CI 1.44–3.11; $p<0.001$), than in persons without diabetes [11].

Among hospitalized patients, type 2 diabetes mellitus was first detected in 24% of cases among patients with CAD with MS, which developed against the background of COVID-19.

During hospitalization, the glucose level: in women with coronary artery disease without MS, on average, was 7.7±2.8 mmol/l; in women with MS - 9.8±5 mmol/l; while in men without MS this indicator was 7.7±2.4 mmol/l; in men with MS - 12 ± 4.9 mmol/l, which indicates an increased glucose level among men with CAD and MS with COVID-19. The results of the study showed that a quarter of the observed patients had persistent hyperglycemia, in whom type 2 diabetes mellitus was subsequently diagnosed for the first time (Table 1)

**Table 1.** The frequency of newly diagnosed type 2 diabetes mellitus among patients with coronary artery disease and COVID-19

| | **Women with CAD without MS (n=32)** | **Women with CAD and MS (n=29)** | **Men with CAD without MS (n=26)** | **Men with CAD and MS (n=30)** |
|---|---|---|---|---|
| Absolute number of patients with DM | 3* | 18** | 1* | 11** |
| % ratio of patients | 12,5 | 60 | 1,7 | 37,5 |
| Type 2 DM compensation phase: | | | | |
| Compensated | 1 (25%) | 4 (22,2%) | 0 (0%) | 4 (33,3%) |
| Subcompensated | 2 (75%) | 12 (66,7%) | 1 (100%) | 3 (25%) |
| Decompensated | 0 (0%) | 2(11,1%) *** | 0 (0%) | 4 (33,3%) *** |

* $\chi^2$= 4,665, p=0,01539

** $\chi^2$=3,139, p=0,03823

*** $\chi^2$=3,578, p=0,02628

Among patients without MS, diabetes mellitus was detected in women in 12.5% of cases, while in women with MS, type 2 diabetes developed due to COVID-19 in 60%. Moreover, it should be noted that in patients with decompensated DM among those with severe hyperglycemia, it was observed in patients with CAD with MS, which, apparently, is since severe forms of diabetes are combined with other components of MS.

Thus, coronavirus infection was a pathogenetic impetus for the progression of MS and destabilization of coronary artery disease, resulting in the manifestation of decompensated type 2 diabetes.

The normal geometry of the left ventricle among patients with COVID-19 and coronary artery disease against the background of MS, when compared with the comparison group, was significantly lower (31% vs. 12%). In the structure of left ventricular remodeling in patients with COVID-19 and CAD without MS, the concentric type prevailed (55.5% vs. 25%, p<0.005). In patients with COVID-19 and CAD with MS, compared with patients with CAD without MS, concentric LV myocardial hypertrophy was more common (59% versus 10%).

With the mortality in a subgroup of patients with comorbidities COPD assessed with 10 patients with COPD, of whom 6 died [12]. In a larger cohort study that included1,13 COVID-19 patients seeking emergency care, the presence of COPD was associated with an increased risk of hospitalization (OR 1.77; 95% CI 1.67-1.87) and a tendency to increase

mortality (OR 1.08; 95% CI 0.88-1.33) [13]. Similar results were obtained in the Italian cohort study with a total of 1,113 hospitalized COVID-19 patients, among whom COPD patients had a significantly high risk of developing severe respiratory failure (OR 1.17; 95% CI 1.09–1.27) [14]. In a Spanish longitudinal cohort study, the presence of COPD in COVID-19 patients was associated with a 70% increased risk of death (OR 1.69; 95% CI 1.23–2.32) [15]. The prevalence of COPD is higher among patients suffering from more severe forms of COVID-19. Thus, among 257 patients hospitalized with COVID-19 in the intensive care unit of a hospital in New York, the prevalence of COPD was 9%, and former smokers and smokers - 33% [16]. In addition, the presence of COPD was associated with a significantly higher risk of death (HR 3.15; 95% CI 1.84–5.39). According to the Italian registry of 3,032 patients, COPD as a comorbidity occurred in 16.4% of patients who died due to COVID-19. This corresponded to a COPD prevalence of 17.2% among patients aged ≥ 65 years and 11.1% among younger patients. In a retrospective study conducted in 60 regions of the Russian Federation, Avdeev S. N. et al. determined the prevalence of COPD at 3.1% among 1,307 patients with pneumonia caused by SARS-CoV-2 hospitalized in intensive care units. COPD patients have shown a tendency towards a more severe course of COVID-19, including a greater incidence of shock and the need for non-invasive ventilation.

## 4 Conclusion and recommendation

It has been established that in patients with comorbid conditions with COVID-19, there is a significantly more frequent fluctuation in blood pressure figures in one direction or another compared to patients whose history is not burdened with comorbid conditions. Identified changes in the course of hypertension require changes in the therapy; dose reduction and cancellation are less often required, more often - increased therapy in the form of increasing doses and prescribing combinations of groups of antihypertensive drugs with the progression or start of hypertension. Thus, based on the data obtained during the study and analyzing the information available earlier, it is advisable to single out hypertension as an independent risk factor that determines the severity of the course of COVID-19. There is no doubt that this group of patients is shown monitoring of blood pressure and dose adjustment of drug therapy. The information obtained creates the need for a screening examination of patients in order to determine the degree of risk of possible complications and develop management tactics. The foregoing necessitates preventive measures, differentiated in each specific clinical group.

## References

1. WHO, Clinical guidelines for the management of patients with severe acute respiratory infection for suspected novel coronavirus (2019-nCoV) infection. Interim Guidance January 28 (2020)
2. L. Zhonghua, X. Xing Bing, Z. Za, Epidemiology Working Group for Ncip Epidemic Response. The epidemiological characteristics of an outbreak of 2019 novel coronavirus diseases (COVID-19) in China. (In Chinese), **41(2)**, 145−151 (2020)
3. CDC. Preliminary estimates of the prevalence of selected underlying health conditions among patients with coronavirus disease 2019 − United States, February 12 − March 28, MMWR, **69(13)**, 382-386 (2020)
4. G. Onder, G. Rezza, S. Brusaferro, Case-fatality rate and characteristics of patients dying in relation to COVID-19 in Italy, JAMA (2020)

5. E. N. Tashkenbaeva, A. I. Mukhiddinov, B. M. Togaeva, Features of the clinical course of bronchial asthma in young people, **3**, 359 (2019)
6. A. I. Mukhiddinov, E. N. Tashkenbaeva, G. I. Sunnatova, Z. Kurbonova, D. Khoshimov, S. Oripov, Antihypertensive therapy in patients with arterial hypertension with metabolic risk factors. In Youth and medical science in the XXI century, 228-229 (2014)
7. S. S. Istamova, et al., Features of the clinical course of heart failure in patients with acute myocardial infarction in the background of type 2 diabetes mellitus, E-Conference Globe, 1-3 (2021)
8. E. N. Tashkenbaeva, G. A. Abdieva, Features of ischemic heart disease in association with climacteric cardiopathy, European Science Review, **3-4**, 190-192 (2018)
9. A. I. Mukhiddinov, E. N. Tashkenbaeva, G. A. Abdieva, D. D. Xaydarova, B. M. Togayeva, Clinical features of the course and development of arterial hypertension with the risk of cardiovascular complications in COVID-19, Journal of Biomedicine and Practice, **7(4)**, 318-325 (2022)
10. S. S. Istamova, E. N. Tashkenbayeva, G. A. Abdieva, O. A. Murotkobilov, Yu. Yu. Kurbonova, *Left ventricular diastolic dysfunction in patients with acute myocardial infarction in comorbid condition*, Euro-Asia Conferences, **1(1)**, 334–338 (2021)
11. A. O. Lakhanov, E. N. Tashkenbaeva, G. A. Abdieva, Effect of the presence of atrial fibrillation on the outcome of myocardial infarction, Zamonaviy dunyoda amaliy fanlar: Muammolar va yechimlar, **1(29)**, 37-39 (2022)
12. D. S. Fatulloyeva, et al., Evaluation of the effectiveness of thrombolytic therapy in myocardial infarction in the conditions of the samarkand branch of rscemc, Euro-Asia Conferences, **1(1)**, 177-182 (2021)
13. F. O. Rasuli, et al., Clinical features of ihd course on the background of atrial fibrillation, Euro-Asia Conferences, **1(1)**, 195-199 (2021)
14. S. N. Ellamonov, et al., Factors of arterial hypertension progression in patients in comorbidity with type 2 diabetes mellitus, Journal of cardiorespiratory research, **2(2)**, 16-21 (2020)
15. Interim guidelines. Prevention, diagnosis and treatment of novel coronavirus infection (COVID-19), Version 7
16. E. Z. Golukhova, N. Yu. Sokolova, N. I. Bulaeva, The view of a cardiologist on the problem of the pandemic of a new coronavirus infection covid-19 (literature review), Creative Cardiology, **14(1)**, 5-15 (2020)