

### Frequency of Occurrence of Arrhythmias in Patients with COVID-19

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#### ABSTRACT

The spread of coronavirus infection is particularly dangerous in relation to decompensation of existing chronic diseases, specific damage to the cardiovascular system (CVD), especially in the case of severe coronavirus infection and a high risk of adverse outcomes in patients with CVD. Among the cardiovascular manifestations in patients with COVID-19, different types of arrhythmias prevail. Among hospitalized patients, the frequency of arrhythmias is about 17%, and in patients in the Intensive Care Unit, it increases to 44%. Although the cumulative estimated rate of arrhythmia was slightly higher than the rate of acute heart injury (26.1%), it was reported in only four studies, and the 95% confidence interval was 2.5–51.5%.

**The purpose of the study:** to study the frequency of occurrence of different types of arrhythmias in patients who have undergone COVID-19.

**Materials and methods of research:** On the basis of the Samarkand branch of the Republican Scientific Center for Emergency Medical Care and the Samarkand regional branch of the Republican Specialized Scientific and Practical Medical Center of Cardiology, 114 patients with a diagnosis of coronary heart disease (CHD) and arrhythmia of various types of COVID-19 patients were examined from 2020 to 2022. The average age of patients with coronary heart disease was  $52.43 \pm 10.74$  years. The male sex was 67.2% (n=76), the average age of this group was  $66.2 \pm 13.4$  years. And the female sex is 32.8% (n=38). A comparable group consisted of 80 patients, including 48 (60%) men and 32 (40%) women with various cardiac arrhythmias, without a history of coronavirus infection.

All patients needed to record an electrocardiogram, Holter ECG monitoring, pulse oximetry, computed tomography of the chest organs, echocardiography, followed by completion of protocols. All patients were surveyed for adherence to treatment. All patients were also assigned by age. In the main group (n=114), young patients accounted for 15.8% (n=18), middle-aged 57% (n=65) and elderly 27.2% (n=31). And in the comparable group (n=80), young patients accounted for 20% (n=16), middle-aged 55% (n=44) and elderly 25% (n=20).

Patients were also divided depending on the presence of modifiable and unmodifiable risk factors for coronary heart disease. ( Table 1)

**Table 1.**

Risk factors	Group 1, n=114	Group 2, n=80
<b>Unmodified:</b>		
Age, years	59,14	56,94
Burdened family history of CVD, %	21,9	32,8
<b>Modifiable:</b>		
Overweight, %	48,2	50,4
Smoking, %	16,9	18,1
AH, %	32,1	49,3
DM, %	28,6	18,4
Dyslipoproteinemia, %	51,3	34,4

After assessing weight and height, all patients were divided into 3 groups depending on body mass index (BMI):

Group I – 55 people with Obesity 1-3 degrees, average BMI  $34.9 \pm 5.0$  kg/m<sup>2</sup>;

Group II – 31 people with excess body weight, average BMI  $27.3 \pm 1.5$  kg/m<sup>2</sup>;

Group III – 28 people with normal body weight, average BMI  $23.3 \pm 1.3$  kg/m<sup>2</sup>.

And in a comparable group, patients with normal BW were 20 people (25%), 28 people with excessive BW (35%), and 32 patients with obesity (40%). Taking into account the fact that all patients with obesity had arterial hypertension, patients with a similar pathology were included in the 2nd and 3rd groups (persons with excessive and normal BW) for comparability of groups

Depending on the occurrence of arrhythmias in patients with coronary heart disease who had a coronavirus infection, the following data were revealed: atrial fibrillation was observed in 29 patients (25.4%), atrial flutter in 14 patients (12.3%), tachycardia in 22 patients (19.3%), various types of heart blocks in 28 patients (24.5%) and 21 patients (18.2%) had extrasystoles.

A comparable group consisted of 80 patients with rhythm disorders who had no history of coronavirus infection. Among the patients of group 2, atrial fibrillation was noted in 21 patients (26.3%), atrial flutter in 7 patients (8.7%), tachycardia in 18 patients (22.5%), blockades in 18 patients (22.5%) and extrasystoles in 16 patients (20%).

55 out of 114 (48.2%) had no structural heart disease; arrhythmia was accompanied by rheumatic heart disease in 6 patients (5.2%), ischemic heart disease in 46 (40.3%), dilated cardiomyopathy in 2 (1.7%) and other diseases (hypertrophic cardiomyopathy, chronic constrictive pericarditis).

Atrial fibrillation was the most common arrhythmia. It was present in every fourth patient in our study population and accounted for 25.4% (n=29), accounting for two thirds of diagnosed arrhythmias or conduction disorders. Of these patients, 14 (48.3%) were men, with an average age of  $63.8 \pm 10$  years.

Electrical cardioversion had previously been performed or was considered indicated at the time of consultation in 2 patients (1.7%), and 11 (37.9%) received antiarrhythmic therapy. EFI was performed or indicated in 2 patients, although this procedure was proposed for the treatment of additional pathways, atrial flutter, ablation of the AV node or concomitant ventricular arrhythmias.

Widespread atrial flutter was detected in 14 patients, in two of them it was constant. The average age of the patients was  $71.8 \pm 9$  years, 8 (57.1%) of the victims were men. Although 10 (71.4%) patients had no structural heart disease, 78.5% (n=11) had hypertension and 7.1% (n=1) had diabetes mellitus. One patient underwent an electrical cardioversion. EFI was performed 3. In 10 cases (71.4%), fluttering was associated with AF; 9 patients (64.3%) received antiarrhythmic

therapy, 5 (35.7%) received anticoagulant therapy.

In 22 patients, regular tachycardia with a narrow QRS complex was diagnosed, which did not meet the criteria for normal fluttering; in 2 (9.1%), a superficial electrocardiogram revealed the presence of permanent or intermittent Wolf-Parkinson-White syndrome. The average age was  $57 \pm 16.8$  years (range from 14 to 83 years), 13 patients (59.1%) were male. 17 (77.3%) patients showed no signs of structural heart disease; coronary artery disease was reported in 5 (22.7%). More than half of the patients, 59.1% (n=13), suffered from hypertension, and 1 (4.5%) of the patients suffered from diabetes. One patient underwent electrical cardioversion, EFI was performed and indicated for 19 (50%), in all cases, in order to perform radiofrequency ablation of an arrhythmogenic substrate. 3 patients (13.6%) received antiarrhythmic therapy.

Ventricular extrasystoles and ejection fraction of less than 30% due to ischemia were detected in 21 cases. In two out of 10 patients with PV of less than 30% without documented arrhythmias, the QRS complex was more than 120 ms. Patients with ventricular extrasystole were included in the study because this disorder was accompanied by non-syncopal symptoms, was very often combined with a bigeminal rhythm and required treatment with beta-blockers. Three patients (14.3%) had automatic defibrillators, 1 of them with biventricular stimulation; EPS was shown to another 1 during their visit. One patient underwent electrical cardioversion, and 10 (47.6%) received antiarrhythmic therapy.

The average age of patients with coronary heart disease was  $72 \pm 9.1$  years (range from 35 to 86 years), of which 5 (23.8%) were over 75 years old. In this group, 83.3% of patients were men, 52.8% were hypertensive, 33.3% were diabetics, 8.3% were smokers, and 36.1% were former smokers.

Intraventricular block was the most frequent disorder after AF and was diagnosed in 28 (24.5%) patients. One patient had syncopal symptoms (3.5%) and EF of less than 30% of non-ischemic origin in the absence of documented ventricular arrhythmias or conduction disorders. In 1 patient, the electrocardiographic record corresponded to Brugada syndrome in the absence of symptoms or sudden deaths in the family history, and no additional examinations were required.

To sum up, among patients who had a new coronavirus infection, the most common type of arrhythmia was atrial fibrillation, which was found in 29 patients and complete and incomplete intraventricular blockade, found in 28 patients.

**Clinical and laboratory features of the course of arrhythmia among patients who underwent COVID-19.**

To identify the relationship between the severity of the underlying disease and the transfer of a new coronavirus infection, we studied such indicators as the lipid spectrum, which showed a link between the development of lipid imbalance and the transfer of Covid-19.

**Table 2. Indicators characterizing lipid metabolism and the level of MK in the blood in patients with coronary heart disease, M ±m**

Indicator	Group 1, Arrhitmia+ Covid-19, n=114	Group 1, Arrhitmia, n=80	P-value	
Total cholesterol, mmol/l	6,7±0,3**	5,6±0,2	<0,01	P1
			>0,2	P2
High-density lipoproteins, mmol/l	0,85±0,07	0,95±0,08	>0,5	P1
			>0,5	P2
Low-density	4,1±0,2	3,8±0,2	>0,2	P1

lipoproteins, mmol/l			>0,5	P2
KA	6,9±0,3***	4,9±0,2#	<0,001	P1
			<0,01	P2

The analysis of the research results showed that among patients with HP+ Covid-19, the indices of Total cholesterol and LDL cholesterol were statistically significantly higher in comparison with patients with various HDL without Covid-19 (Table 2), i.e. patients of the main group had a level of Total cholesterol equal to 6.7±0.3 mmol/l, whereas the comparable group They had a Total cholesterol of 5.6± 0.2 mmol/ L. The coefficient of atherogenicity was statistically increased in all groups of patients, whereas the optimal value is considered when the CA is 2-3. But among patients with Arrhythmias + Covid-19, these values were significantly higher and amounted to 6.9±0.3, whereas in the comparable group it was 4.9± 0.2. This study confirms the development of metabolic syndrome among patients who underwent Covid-19, which may cause a complicated course of the underlying disease.

During the study, we also decided to investigate the indicators of a biochemical blood test, where we found a slight increase in ALAT, ASAT, and creatinine. During the study, a statistically significantly increase in glucose levels was revealed. Patients of the main group the glucose level was 6.9±0.31 mmol/l, GFR was 117.18±5.9 ml/min, whereas in patients of the 2nd group these indicators were 5.85±0.30 mmol/l and 107.85±3.9 ml/min, respectively. An interesting finding of our study was the significantly high uric acid levels in patients of group 1, which was equal to 452.7±14.1 mmol/L.

Thus, a biochemical blood test confirmed that the patients of the main group had not only a violation of lipid metabolism, but also a change in creatinine, glucose, and liver metabolism.

### Conclusion

The risk of arrhythmia after COVID-19 is likely to increase with the development of severe infection and increases with increasing severity of infection and systemic inflammatory response. Significant myocardial damage and lightning-fast myocarditis have been described, as well as reports of cardiac arrest associated with ventricular arrhythmia (as well as rhythms that do not require discharge). The use of several drugs in combination should be carried out with caution, as this may increase the risk of QT prolongation, atrial fibrillation and pirouette tachycardia. Knowing this risk allows clinicians to ensure adequate monitoring of the QT interval and management of arrhythmic risk, maximizing the safety of our patients during this difficult time.

In our study, atrial fibrillation was the most common arrhythmia in our study and is detected in every fourth patient examined, which once again justifies the name of the epidemic of the twenty-first century. Another noteworthy finding is the high proportion of patients with rheumatic valve defects in our study, 1 out of every 5 patients with AF. This situation is not reflected in other studies, in which the percentage of patients with valve defects ranges from 4% to 19%.

The prevalence of atrial flutter among patients who have undergone a new coronavirus infection in our study is low. The average age of patients was greater than that of patients with AF, and AF was registered in 2 out of every 3 patients in this group, which confirms previous reports of a frequent association between these two arrhythmias. Although the number of patients with ventricular arrhythmias and systolic dysfunction of the left ventricle is considerable (1.6% of all patients according to the MADIT II criteria), it should be noted that, as expected, an outpatient cardiology clinic is not a gateway to the healthcare system for patients with this type of heart disease, and thus, newly diagnosed cases are the exception is at this level of help.

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