The Incidence of Myocardial Infarction in Patients with Covid-19

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ABSTRACT

During the COVID-19 pandemic, the relevance of the dynamics of the prevalence of cardiovascular diseases (CVD) increases. The purpose of the study. To evaluate the associative links between the frequency of detection of a new coronavirus infection and the prevalence of CVD, taking into account cardiovascular comorbidity, the severity of COVID-19 and postcovid syndrome (PKS). Against the background of cardiac comorbidity, every fifth participant in the study had an asymptomatic and every second had a symptomatic form of COVID-19. The frequency of detection of COVID-19 does not depend on gender, age, presence or absence of cardiovascular diseases. The frequency of detection of cardiovascular diseases naturally increases with increasing severity of COVID-19. Postcovid syndrome was registered in 41.4% of COVID-19 survivors, it developed more often in women, increased with age, the severity of the disease and depended on the presence or absence of cardiovascular diseases. The course of COVID-19 and the development of postcovid syndrome were negatively affected by tobacco smoking and alcohol abuse.

Keywords: COVID-19, cardiovascular diseases, cardiac comorbidity, postcovid syndrome.

Conduction. The Coronavirus disease pandemic 2019 (COVID-19) is the cause of a rapid increase in the number of cases and high mortality worldwide [1]. This also applies to Russia [2]. According to Rosstat data for 2021 [3], COVID-19 ranks third in the structure of mortality in Russia, second only to diseases of the circulatory system and malignant neoplasms. At the same time, one of the most frequent comorbid pathologies in patients with COVID-19 is cardiovascular diseases (CVD) [4]. Among the latter, when analyzing the health status of patients treated in a hospital [5], hypertension (GB), coronary heart disease, cardiac arrhythmias and chronic heart failure (CHF) were the most common.

The purpose of the study. To evaluate the associative links between the frequency of detection of a new coronavirus infection and the prevalence of CVD, taking into account cardiovascular comorbidity, the severity of COVID-19 and postcovid syndrome (PCS).

Material and methods. Using Google Forms in December 2021, 562 people were surveyed who did not seek medical help at the time of the survey. Of these, there were 213 men (37.9%); 349 women (62.1%). Under the age of 30 — 139 (24.7%); 30-44 years — 219 (39,0%), 45— 59 118 (21.0%) and 60 years and older — 86 (15.3%). Gender, age, height and body weight were noted to determine the body mass index (BMI), behavioral (smoking, eating vegetables and fruits less than 400 g/day, physical

inactivity, alcohol abuse) and alimentary-dependent (obesity: BMI ≥30 kg/ m2) risk factors (FR) for the development of CVD, a history of COVID-19 in asymptomatic form and with symptoms, its severity, PKS, as well as CVD (GB, angina pectoris, myocardial infarction, CHF, cardiac arrhythmias, cerebral stroke and cerebrovascular diseases (CVZ). Statistical processing of the results of the study was carried out using the WinPepi statistical software package. The exact Fisher criterion is used. Study design: a single-stage cross-sectional study using a convenience sample [6]. It includes everyone who wants to take a survey using a smartphone.

Results and discussion. CVD was registered in 159 (28.3%) people, GB — in 116 (20.6%), cardiac arrhythmias — in 66 (11.7%), CHF — in 33 (5.9%), angina — in 32 (5.7%), a brain stroke — in 18 (3.2%), a heart attack myocardium — in 14 (2.5%) and central nervous system — in 12 (2.1%). The frequency of detection of this pathology, as well as according to other studies [7], naturally increased with increasing age. Thus, CVD under the age of 30 years was registered in 9 (6.5%) of respondents, from 30 to 44 years — in 39 (17.8%), from 45 to 59 years — in 54 (45.8%) and at the age of 60 years and older — in 57 (66.3%); p=0.000; GB — respectively y 4 (2,9%), 21 (9,6%), 40 (33,9%) and 51 (59.3%); p=0.000; angina — respectively in 0 (0,0%), 7 (3,2%), 9 (7,6%) and 16 (18.6%); p=0.000; suffered myocardial infarction — respectively in 0 (0,0%), 1 (0,5%), 3 (2,5%) and 10 (11.6%); p=0.000; CHF — respectively in 0 (0,0%), 4 (1,8%), 13 (11,0%) and 16 (18.6%); p=0.000; cardiac arrhythmias — in 6 (4,30%), 19 (8,7%), 23 (19,5%) and 18 (20.9%); p=0.000; suffered a brain stroke — respectively in 0 (0,0%), 1 (0,5%), 2 (1.7%) and 7 (8.1%); p=0.001; CVZ — respectively in 0 (0,0%), 3 (1,4%), 3 (2,5%) and 10 (11.6%). Against the background of considerable cardiac comorbidity, 110 (19.6%) respondents registered an asymptomatic form of COVID-19: men — 46 (41.8%), women - 64 (58.2%). Its detectability did not depend on gender (men — 46 (21.6%); women — 64 (18.3%); p=0.201), age (under 30 years — 33 (21.6%); 30-44 years

— 46 (21.0%), 45-59 years — 23 (19.5%) and 60 years and older — 11 (12.8%); p=0.360), CVD (yes — 31 (19.5%); no — 79 (19.6%); p=0.554), GB (yes — 19 (16.4%); no — 91 (20.4%); p=0.201), angina pectoris (yes - 5 (15.6%); no — 105 (19.8%); p=0.378), CHF (yes — 6 (18.2%); no — 104 (19.7%); p=0.524), myocardial infarction (yes — 3 (21.4%); no — 107 (19.5%); p=0.538), cardiac arrhythmias (yes — 13 (19.7%); no — 97 (19.6%); p=0.545), suffered a cerebral stroke (yes — 2 (11.1%); no — 108 (19.9%); p=0.282) and CVD (yes — 1 (8.3%); no — 109 (19.8%); p=0.284). Another 259 (46.1%) of respondents had previously suffered COVID-19: men — 98 (37.8%), women — 161 (62.2%). Its frequency was the same in both men and women (98; (46.0%) and 161 (46.1%), respectively; p=0.524) and did not depend on age (less than 30 years — 62 (44.1%); 30-44 years — 111 (50.7%); 45-59 years — 53 (44.9%) and 60 years and older — 33 (38.4%); p=0.250). 101 (39.0%) respondents had mild COVID-19, 124 (47.9%) had moderate COVID—19, and 34 (13.1%) had severe COVID—19. One of the features of the new coronavirus infection, according to the examination of patients treated in a hospital, is its high cardiac comorbidity [4,8].

However, in this study, such pronounced (arterial hypertension — in 74.4% of individuals) cardiac comorbidity was not found in general. CVD is registered in a third of cases, GB — in every fifth, and other forms of CVD — even less often. Moreover, it turned out that the frequency of detection of CVD and most of their forms (GB, angina pectoris, myocardial infarction and cerebral stroke, as well as CVD) turned out to be almost the same in people who had and had not had COVID-19. These data correspond to the authors' opinion that the presence of concomitant CVD does not increase the risk of COVID-19 morbidity, but they can aggravate the course of a new coronavirus infection [9]. The differences in the frequency of detection of cardiac comorbidity in this study from the literature data are probably due to differences in the number of examined patients. In the first case, COVID-19 patients who were treated in a hospital were examined, and in the second case, persons who were interviewed

outside medical organizations were examined. The data presented in Table 1 can be considered as confirmation of the above. With severe COVID-19, CVD was registered in them much more often. This concerned both all CVD (p=0.001) and GB (p=0.000), angina (p=0.000), CHF (p=0.000), myocardial infarction (p=0.019), cardiac arrhythmias (p=0.002), stroke (p=0.002) and CVZ (p=0.019). Moreover, as follows from the data in Table 1, with an increase in the severity of COVID-19, the frequency of CVD detection naturally increased, reaching a maximum in severe infectious disease. In this situation, high cardiac comorbidity was manifested, comparable with the results in patients treated in a hospital. The arguments described above correspond to the data of other authors who have registered a low frequency of detection of cardiac comorbidity in outpatient patients [10].

It is noteworthy that in the conducted study among comorbid cardiac pathology in patients with a new coronavirus infection, regardless of its severity, GB prevails. Its detection rate is the highest in patients who have suffered a severe course of COVID—19. These results are consistent with the data of other authors [11]. However, without going into the general pathogenetic subtleties of the associative links between angiotensin converting enzyme inhibitors and angiotensin II receptor blockers in GB, on the one hand, and the course of COVID-19, on the other [12], one cannot agree with the assumption that only arterial hypertension (AH) can be independent of the severe course of COVID-19 [13].

In particular, the authors have shown a statistically significant association of age with such manifestations of PKS as shortness of breath, persistent cough, joint pain and chest pain. The present study also found that the frequency of PKS increases with age. This is probably due to a decrease in the functional capabilities of the body with age. However, in contrast to the data provided in this study, we found that the frequency of detection of PKS increases with increasing severity of COVID-19. This can also be explained by a slower recovery of the functional capabilities of the body in the severe course of the disease. Another feature of

PCOS was discovered by us: the frequency of detection of PCOS in general depended on the presence or absence of CVD. Thus, PKS was more common in patients with CVD, GB, angina pectoris, CHF, cardiac arrhythmias and stroke than in those without such diseases — 61 (81.3%) and 90 (48.9%), respectively, p=0.000; 39 (78.0%) and 112 (53.6%), p=0.001; 15 (100.0%) and 136 (55.7%), p=0.001; 18 (90.0%) and 133 (55.7%), p=0.002; 34 (89.5%) and 117 (52.9%), p=0.000; 11 (100.0%) and 140 (56.5%), p=0.002. At the same time, in persons with myocardial infarction and CVD, compared with the absence of such, PCR was recorded equally often — respectively 5 (83.3%) and 146 (57.7%), p=0.205; 5 (83.3%) and 146 (57.7%), p=0.205. The latter circumstance needs further study. In addition to the above, an associative relationship has been identified between some manifestations of PKS and CVD.

Thus, sleep disorders, shortness of breath, headache, palpitations and pain in the heart area were more often recorded with CVD than without them — respectively 34 (55.7%) and 34 (37.8%), p=0.022; 35 (57.4%) and 29 (33.2%), p=0.002; 27 (44.3%) and 19 (21.1%), p=0.002; 29 (47.5%) and 14 (15.6%), p=0.000; 20 (32.8%) and 12 (13.3%), p=0.004. At the same time, the frequency of signs of weakness, apathy, stool disorders and poor appetite did not depend on the presence or absence of CVD — respectively 31 (50.8%) and 52 (57.8%), p=0.249; 16 (26.2%) and 35 (38.9%), p=0.077; 8 (13.1%) and 6 (6.7%), p=0.146; 14 (23.0%) and 19 (21.1%), p=0.470. It should be noted that significant differences in the frequency of registration of manifestations of PKS in CVD concerned, with the exception of sleep disorders and headaches, symptoms of CVD (shortness of breath, palpitations and pain in the heart area). Complex associative relationships were revealed between the frequency of transferred COVID-19, its severity and the PC depending on the FR of the development of CVD without taking into account the latter (Table 3). Thus, against the background of insufficient consumption of vegetables/ fruits, inactivity and obesity, there was no significant difference in the frequency of registration of transferred

COVID-19, its severity and the PC compared with the absence of these FRS of CVD development. People who smoke were more likely to have PKS compared to non-smokers. With a tendency to abuse strong alcoholic beverages, a mild course of COVID-19 was less often observed, but more often its average severity and PKS compared to persons who do not abuse them. Thus, patients with CVD in the conditions of the COVID-19 pandemic are a special risk group, since the new coronavirus infection is more severe and with a worse prognosis [27]. Tobacco smoking and the abuse of strong alcoholic beverages make a negative contribution to this process.

Conclusion. Against the background of relatively high cardiac comorbidity, one in five respondents had a history of asymptomatic COVID-19 and almost one in two had COVID—19 with symptoms. Their frequency of detection does not depend on gender, age and the presence or absence of cardiovascular diseases. However, the frequency of cardiovascular diseases in general, hypertension, angina pectoris, chronic heart failure, cardiac arrhythmias, myocardial infarction and cerebral stroke, as well as cerebrovascular diseases naturally increases with increasing severity of COVID-19. Postcovid syndrome develops in every second of the COVID-19 survivors. More often it is manifested by weakness, sleep disturbance, shortness of breath, apathy, headache, palpitations, pain in the heart area. Postcovid syndrome is more often registered in women, increases with age, the severity of the disease, depends on the presence or absence of cardiovascular diseases, tobacco smoking and alcohol abuse. Therefore, patients with cardiovascular diseases in the context of the COVID-19 pandemic are a special risk group. Active prevention of cardiovascular diseases may contribute to a lighter course of COVID-19 and a lower incidence of post-ovoid syndrome.

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