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Research Article

Who is Developing Complications of Covid-19

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Abstract

Aim of the Study: The aim of this study was to study the circumstances of the risk of complications of a new coronavirus infection.

Materials and Methods: 148 patients with COVID-19 were examined, the patients were divided into 2 groups: the first group (60 people) had complications of coronavirus infection, and the second (88 patients) had no complications. The selection criterion was the presence of acute viral pneumonia and a confirmed diagnosis of COVID-19. The age of the patients is from 29 to 89 years. The values of ferritin, C-reactive protein, D-dimer, as well as concomitant diseases of the patients were analyzed. The factors influencing the development of complications of COVID-19 were studied.

Results: Significantly more often, COVID-19 was complicated in patients with grade II-III arterial hypertension, chronic kidney disease, obstructive pulmonary disease and postinfarction cardiosclerosis, as well as in the group of patients with complications, higher values of C-reactive protein, D-dimer and ferritin were observed ($p < 0.05$).

Conclusion: The development of a complicated course of a new coronavirus infection is facilitated by uncontrolled arterial hypertension, myocardial infarction, chronic lung and kidney pathology, as well as an increase in the level of markers of inflammation and thrombus formation.

Keywords: New Coronavirus Infection; Complications; Risk Factors

Abbreviations

CRP: C-Reactive Protein; ALT: Alanine Aminotransferase; AST: Aspartate Aminotransferase; COPD: Chronic Obstructive Pulmonary Disease; PICS: Postinfarction Cardiosclerosis; CKD: Chronic Kidney Disease; DM-2: Diabetes Mellitus; PaO_2: Partial Pressure of Oxygen; SaO_2: Saturation; N.D: No Significant Differences; ACVA: Acute Cerebrovascular Accident; RF I-II: Degree-Respiratory Failure I-II Degree; GIQ: Gastrointestinal Bleeding

Introduction

The novel coronavirus pandemic poses a threat to populations, significantly increasing the risk of poor outcomes. Age, hypertension, diabetes mellitus and obesity increase the likelihood of hospitalization and negative consequences in patients with COVID-19. From this point of view, the task of clarifying the characteristics of the risk group for a complicated course of coronavirus infection seems relevant. This paper analyzes the factors predisposing to the development of complications of COVID-19.

Materials and Methods

The study is based on the analysis of the features of the course of COVID-19 in patients with acute viral pneumonia. A total of 148 patients were examined at the age from 29 to 89 years. The analysis of the values of ferritin, CRP, D-dimer, ALT and AST was carried out. Complications resulting from coronavirus infection have been analyzed. All patients were divided into 2 groups: the first included patients who did not have complications against the background of COVID-19 (88 patients); the second group consisted of 60 patients with complications from COVID-19.

COPD was diagnosed using a questionnaire (Chronic Airways Diseases, A Guide for Primary Care Physicians, 2005), where a score of 17 or more was highly likely to have COPD. The diagnosis of PICS was established in the presence of a history of myocardial infarction and the presence of corresponding changes in the ECG. Arterial hypertension was analyzed according to the recommendations of the international classification (ACC/AHA Hypertension Guidelines 2017). CKD was diagnosed based on guidelines (KDIGO 2013). The diagnosis of DM-2 was made in the case of glycated hemoglobin values of more than 6.5% or when the patient confirmed the appropriate treatment. The calculation of the body mass index was carried out according to the formula: a person's body weight (in kilograms) is divided by a person's height (in meters) squared. In accordance with the WHO recommendations, the results were assessed as follows: 18.5 - 25 - normal body weight, from 25 - preobesity or obesity. The severity of respiratory failure was determined by the value of PaO_2 (mm Hg) and SaO_2 (%).

Comorbid pathology in the identify patients is shown in table 1.

Concomitant Diseases	Patients with COVID-19 without Complications	Patients with COVID-19 Complications	P
PICS, n (%)	4 (4,5)	8 (13)	p < 0,05
Arterial hypertension of the II-III degree, n (%)	60 (68)	54 (90)	p < 0,001
COPD, n (%)	4 (4,5)	8 (13)	p < 0,05
Obesity, n (%)	32 (36)	28 (47)	N.d.
CKD, n (%)	12 (28)	28 (35)	p < 0,001
ACVA, n (%)	14 (15,9)	12 (20)	N.d.
DM-2, n (%)	38 (43)	26 (43)	N.d.

Table 1: Characteristics of patients.

Results

During the study, it was revealed that diseases such as arterial hypertension II-III degree, COPD, CKD, postinfarction cardiosclerosis predispose to the development of complications of new coronavirus infection (p < 0.05; Table 1).

Complications of the analyzed patients are presented in figure 1.

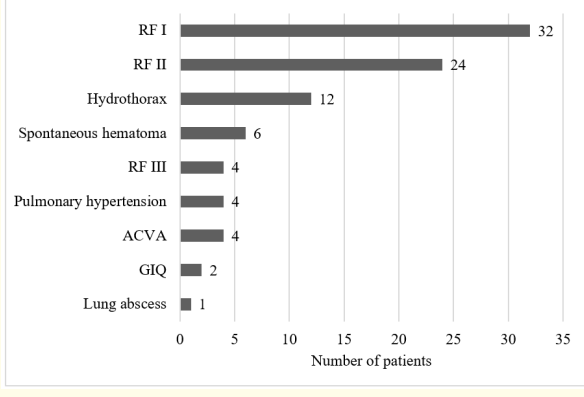

Figure 1: The incidence of complications in patients with COVID-19.

It should be noted that there is a significant occurrence of RF I-II degree in the analyzed individuals. CRP values in patients with COVID-19 without complications went beyond the reference values (more than 15 mg/L) in 82% of cases and amounted to 22.82 mg/L. In patients with complications, the CRP level was exceeded in 97% of cases and amounted to 92.37 mg/L (p < 0.05; table 2).

Specifications	Patients with COVID-19 without complications	Patients with COVID-19 complications	p
Average CRP level	22,82 mg/l	92,37 mg/l	p < 0,05
Frequency of increase CRP	82%	97%	p < 0,05

Table 2: Average level and occurrence of excess of reference values C-reactive protein in individuals with and without complications.

A study of the ferritin level in the observed patients showed that in the absence of COVID-19 complications, this indicator increased in 59% of cases and was equal to 284 μg/l, and in persons with complications it went beyond the reference values in 90% of cases and amounted to 544 μg/l (p <0.05; table 3).

Specifications	Patients with COVID-19 without complications	Patients with COVID-19 complications	p
Average ferritin level	284 μg / L	544 μg / L	p < 0,05
Frequency of ferritin increase	59%	90%	p < 0,05

Table 3: Average level and occurrence of excess of reference values of ferritin in persons with and without complications.

During the study, it was found that the D-dimer went beyond the reference values in patients with COVID-19 without complications in 27% of cases and was equal to 0.38 μg/ml. In streets with complications, the excess of D-dimer was observed in 70% of cases; this indicator was 0.75 μg/ml (p <0.05; table 4).

Specifications	Patients with COVID-19 without Complications	Patients with COVID-19 Complications	P
Average D-dimer level	0,38 μg/ ml	0,75 μg/ ml	p < 0,05
Frequency of D-dimer increase	27%	70%	p < 0,05

Table 4: Average level and occurrence of excess of reference values of D-dimer in persons with and without complications.

In patients with a complicated course of COVID-19, ALT and AST levels increased in 87% and 83% of cases, respectively, and were equal to 210 U/L and 158 U/L. In patients without complications, ALT and AST increased in 52% and 39% of cases, respectively, and were equal to 53 U/L and 48 U/L (p < 0.05; table 5).

Specifications	Patients with COVID-19 without Complications	Patients with COVID-19 Complications	P
Frequency of AST	39%	83%	p < 0,05
Frequency of ALT	52%	87%	p < 0,05

Table 5: The incidence of exceeding the reference values of AST and ALT in persons with and without complications.

Discussion

Complications of the new coronavirus infection are potentially dangerous, affecting treatment outcomes. Traditionally, attention is paid to the complications of COVID-19 from the respiratory system, but cardiovascular complications are no less significant: myocardial infarction, arrhythmias, heart failure, myocarditis, etc. [1]. In this study, thrombohemorrhagic complications of COVID-19 were recorded, incl. gastrointestinal bleeding, hematomas, ischemic stroke, consequences of thromboembolism of the branches of the pulmonary artery, which is specific for this infectious pathology [6].

It is believed that the incidence of cardiovascular complications in the case of a new coronavirus infection is higher than in other similar conditions (SARS-CoV; MERS-CoV) [2]. The initial cardiovascular pathology influences the possible development of the complicated course of COVID-19, although there are alternative points of view [7].

In the study, the complications of new coronavirus infection were significantly more frequent in cases of grade II - III arterial hypertension, COPD, CKD, and postinfarction cardiosclerosis. Some studies indicate that a significant factor in the risk of complications is coagulopathy, metabolic disorders and systemic inflammation [4].

The study of markers of inflammation, as well as other laboratory tests, can provide an idea of the category of persons who are at risk of a complicated course of COVID-19 [3,5]. In the present study, the complications of new coronavirus infection were more common against the background of increased levels of ferritin, CRP and D-dimer [8,9].

Conclusion

In the course of this study, it became known that arterial hypertension of II-III degrees, COPD, CKD and postinfarction cardiosclerosis predispose to the development of dangerous complications of a new coronavirus infection. Exceeding the reference values of ferritin, CRP, D-dimer is a circumstance of the risk of developing complications of COVID-19.

Conflict of Interest

There is no conflict of interest.

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