

EVALUATION OF ACUTE PHASE INFLAMMATION MARKERS IN PATIENTS WITH CHRONIC HEART FAILURE WHO HAVE RECOVERED FROM COVID-19

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Abstract: During the COVID-19 pandemic, the mortality rate from chronic heart failure has significantly increased compared to patients with chronic heart failure who were not infected. In the early stages of the disease, the use of enzyme-linked immunosorbent assays as sensitive methods, in addition to traditional clinical and laboratory methods, is a relevant task for early detection of clinical signs of the disease. (1,2,3)

The assessment of endothelial function in patients with chronic heart failure who have recovered from COVID-19 worldwide is important to prevent complications that may arise after the illness. (4,5,6)

A key and important aspect of this is the determination of the quantity of endothelial dysfunction biomarkers in the blood of patients with chronic heart failure who have recovered from COVID-19.

Keywords: COVID-19, acute phase inflammation markers, chronic heart failure.

Research objective:

To evaluate acute phase inflammation markers in patients with chronic heart failure who have recovered from COVID-19.

Materials and methods:

100 patients aged 38-71 years with chronic heart failure who have recovered from COVID-19 received inpatient treatment at the Republican Scientific and Practical Medical Center of Specialized Therapy and Medical Rehabilitation, with an average age of 60.92 ± 0.54 years. Of these, 59% were male ($n=59$), and 41% were female ($n=41$). In the analysis of patient discharge summaries before COVID-19, the functional classes of patients with chronic heart failure who have recovered from COVID-19 were as follows: patients with functional class I before COVID-19 accounted for 48 (48%) patients, while patients with functional class II accounted for 30 (30%) patients, and patients with functional class III accounted for 22 (22%) patients.

Patients who had COVID-19 were grouped according to the New York Cardiology Association classification based on the results of the 6-minute walk test 4 months after recovering. In this study, 25 (25%) patients with NYHA Class I had an average age of 58.32 ± 1.19 years. NYHA Class II was found in 39 (39%) patients with an average age of 61.18 ± 0.94 years, and NYHA Class III in 36 (36%) patients with an average age of 62.44 ± 0.74 years. The control group consisted of 40 patients with an average age of 60.6 ± 1.06 years with chronic heart failure who did not have COVID-19, of which 45% were male ($N=18$) and the remaining 55% were female ($N=22$).

The optimal drug therapy received by the patients included:

- ACE inhibitors taken by 59% of patients
- Angiotensin II receptor blockers taken by 48.8% of patients

- Beta-blockers taken by 100% of patients
- Diuretics taken by 43% of patients
- Spironolactone taken by 73.3% of patients
- Aspirin taken by 87.5% of patients
- Clopidogrel taken by 12.5% of patients
- Nitrates taken by 22.7% of patients
- Statins taken by 91% of patients

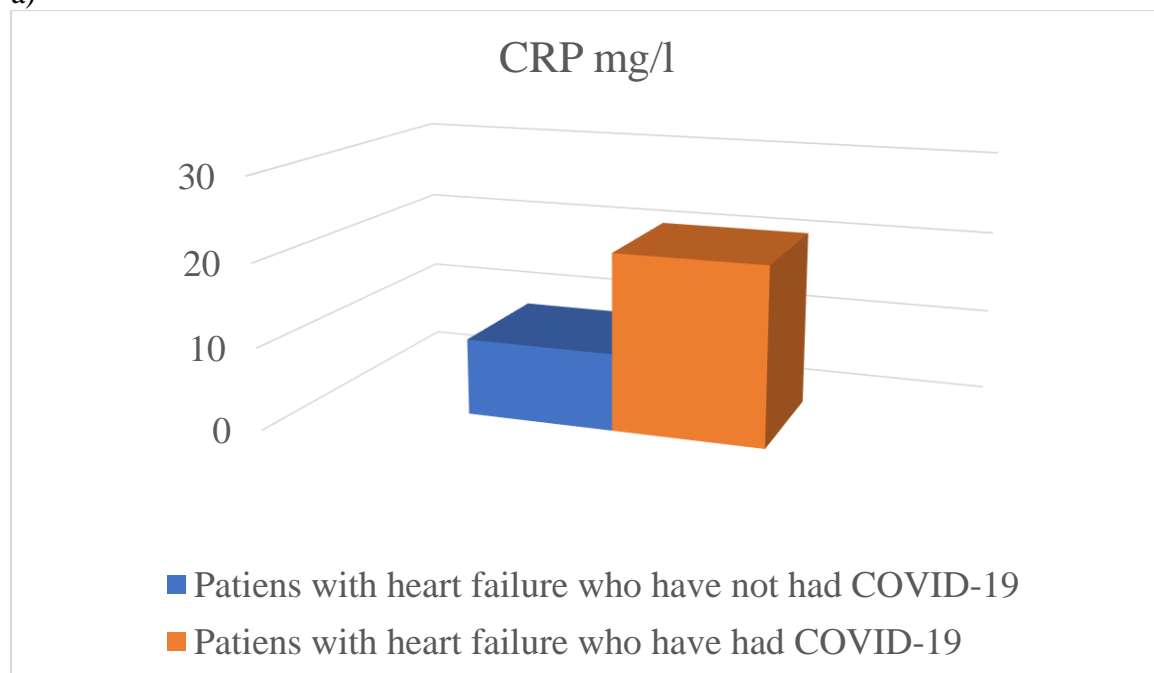
All patients underwent examination in a hospital setting, during which their clinical and anamnestic data on ischemic heart disease, heart failure, and other comorbid conditions were evaluated.

RESEARCH RESULTS:

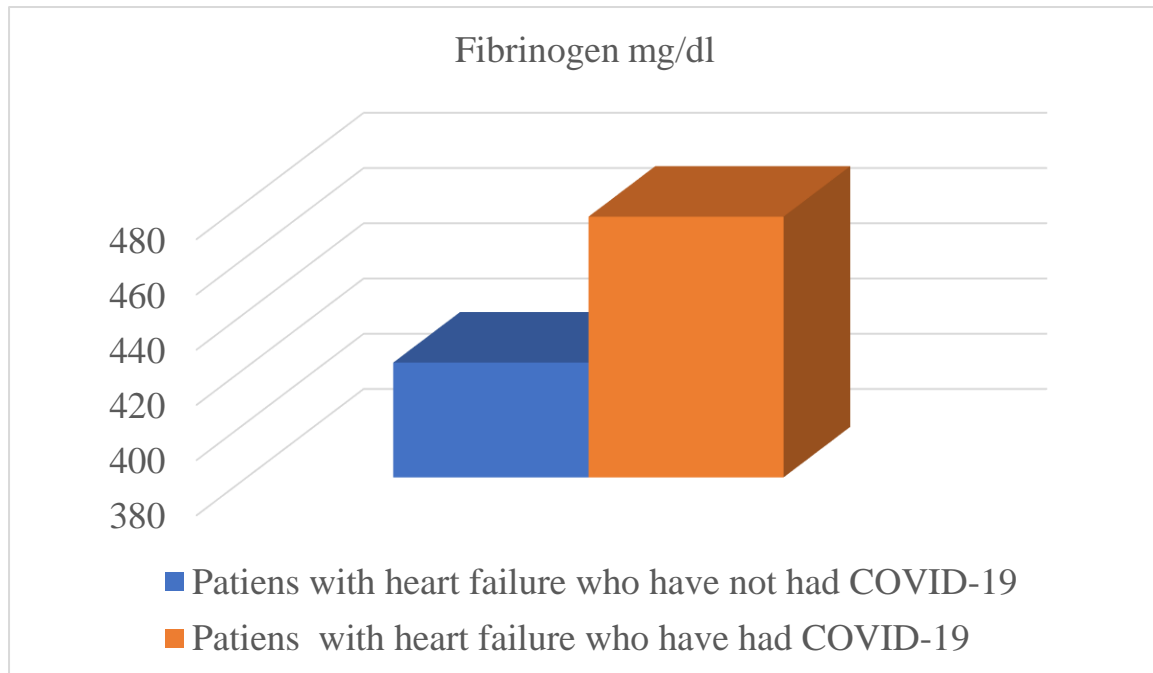
Patients with chronic heart failure who had COVID-19 showed a significant increase in the levels of C-reactive protein, fibrinogen, and D-dimer in the blood.

In the control group, C-reactive protein was 9.29 ± 0.57 mg/l, fibrinogen was 421.57 ± 5.54 mg/dl, and D-dimer was 0.45 ± 0.01 mg/l. The levels of C-reactive protein in the blood of patients who had COVID-19 were 2.28 times higher than in the control group ($p < 0.01$), fibrinogen increased by 11% ($p < 0.05$), and D-dimer increased by 1.32 times ($p < 0.01$) (Fig.3.1.6 a, b, c).

a)



b)



c)

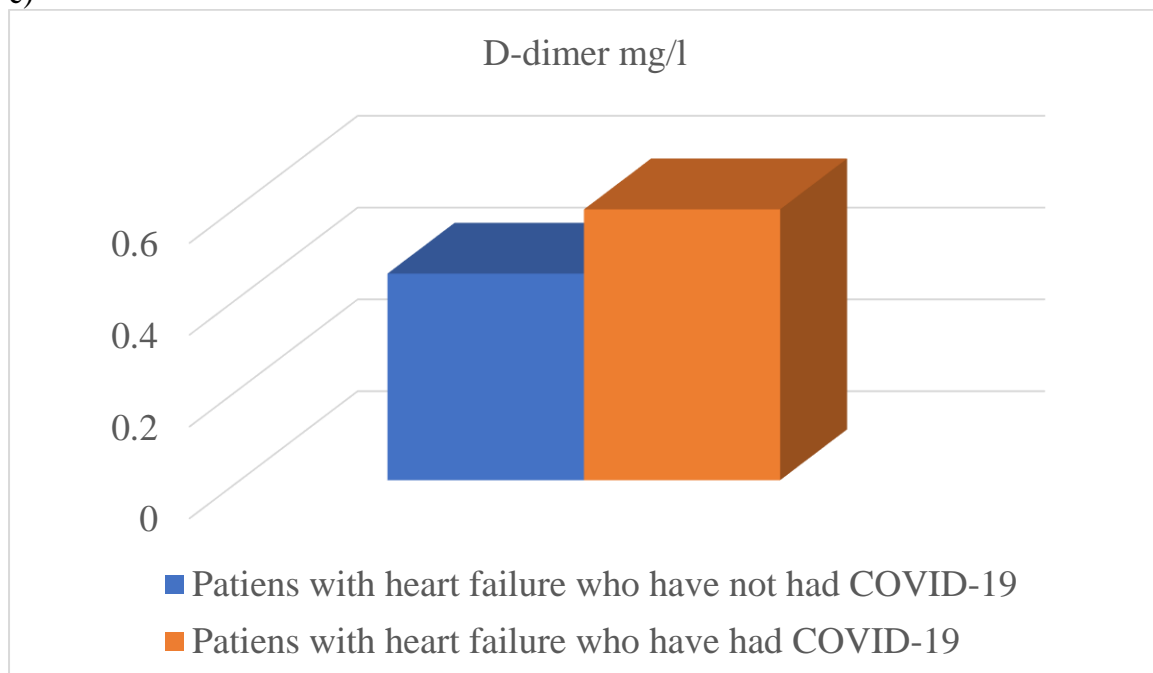
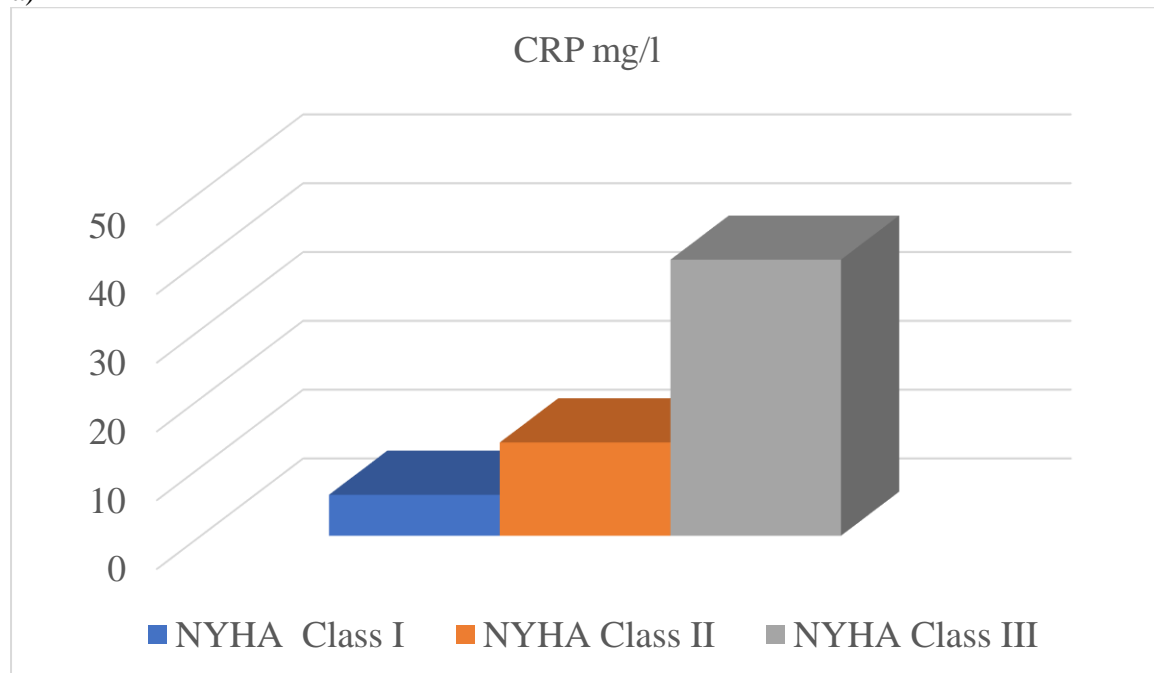


Figure 1.1.6. Levels of C-reactive protein, fibrinogen, D-dimer in the blood of patients with chronic heart failure who had and did not have COVID-19.

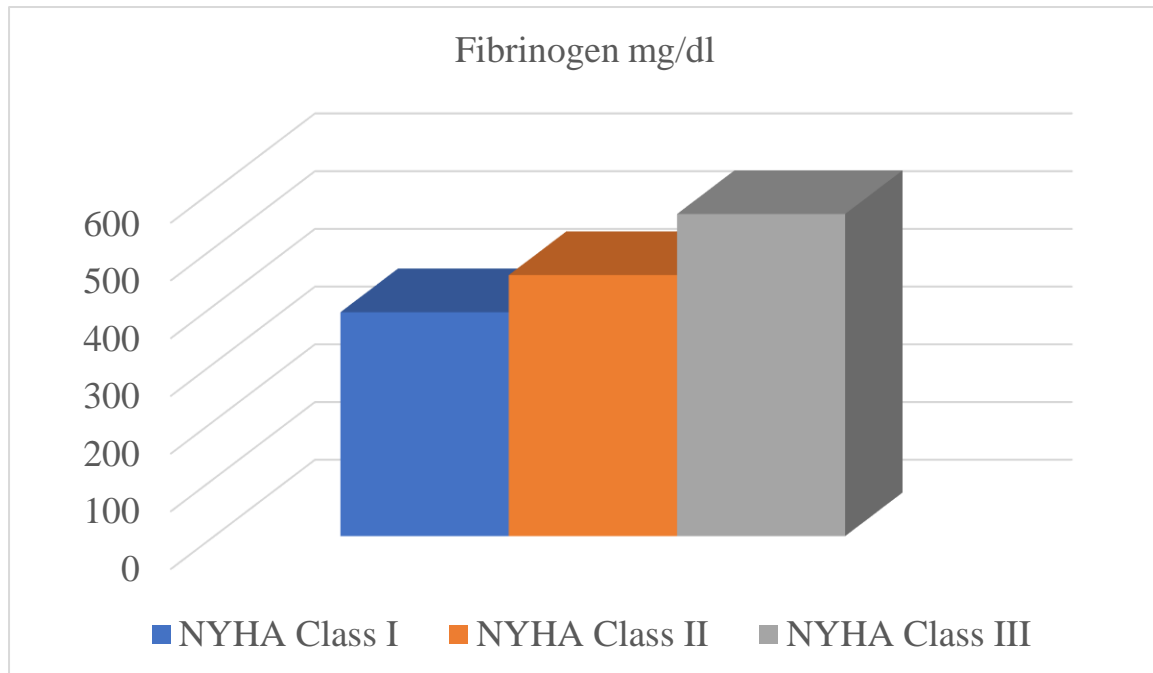
Note: * - $p < 0.05$; ** - $p < 0.01$ compared to the indicators of patients with chronic heart failure who did not have COVID-19.

In the analysis conducted in the main group, it was noted that levels of C-reactive protein, fibrinogen, and D-dimer increase in parallel with the course of the disease, corresponding to an increase in NYHA functional class. Accordingly, the C-reactive protein content in NYHA Class I was 5.96 ± 0.22 mg/l, fibrinogen was 388.04 ± 4.15 mg/dl, and D-dimer was 0.43 ± 0.01 mg/l. In patients with NYHA Class II, it was found that the C-reactive protein content was 13.56 ± 0.58 mg/l, fibrinogen was 452.38 ± 6.1 mg/dl, and the amount of D-dimer was 0.55 ± 0.01 mg/l. A significant increase in these parameters in the blood of patients with NYHA Class III was observed. The C-reactive protein content was 40.12 ± 0.76 mg/l, fibrinogen was 558.16 ± 6.78 mg/dl, and D-dimer was 0.76 ± 0.01 mg/l. Comparing these parameters in patients with NYHA Class III to those with NYHA Class I, the following changes were observed: there was a 6.73-fold increase in C-reactive protein content (40.12 ± 0.76) ($p < 0.001$), a 1.44-fold increase in fibrinogen (558.16 ± 6.78) ($p < 0.05$), and a 1.77-fold increase in D-dimer ($p < 0.01$) (Fig.3.1.7 a, b, c).

a)



b)



c)

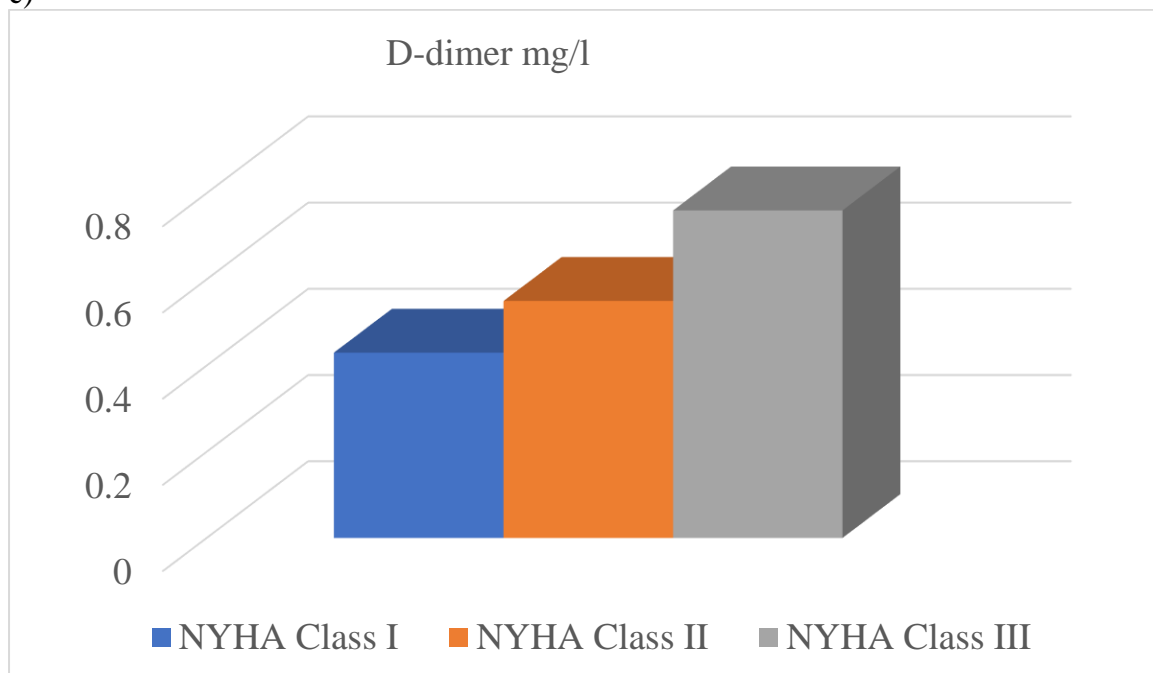


Figure 1.1.7. Relationship between levels of C-reactive protein, fibrinogen, D-dimer and NYHA functional class.

Note: * - $p < 0.05$; ** - $p < 0.01$ compared to NYHA Class I.

Conclusions:

Thus, patients with chronic heart failure who had COVID-19 showed a significant increase in the levels of C-reactive protein, fibrinogen, and D-dimer in the blood. It was found that the



levels of C-reactive protein, fibrinogen, and D-dimer increase in parallel, corresponding to the increase in NYHA functional class.

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