

## Causes of Complications in the Cardiovascular System in Patients with Covid-19

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**Abstract:** Although COVID-19 belongs to the respiratory viruses that affect the respiratory tract, more and more doctors are considering a new coronavirus infection as a disease that has a significant impact on the cardiovascular system.

When data were collected on the possible effects of COVID-19, scientists found that post-covid syndrome was more severe in patients than in viral infections.

**Keywords:** cardiovascular, thrombosis, COVID-19, prothrombin time, prothrombin index, APTT (Activated partial thromboplastin time), INR (international normalized ratio), fibrinogen, thrombin time.

**Actuality:** It is difficult to determine the exact risk of thrombosis in coronavirus. Most of the things depend on the condition of the person. Doctors detected blood clots in the veins or arterioles in 16–30% of hospitalized patients [1].

Even six months later, doctors reported the inflammation of the heart tissue in patients with COVID-19 including those who have asymptomatic transmission of the disease [2].

Thus, one of the most dangerous complications in the heart after coronavirus is myocarditis. The inflammatory process that affects the heart muscle tissue may not be felt for a long time, but can result in serious problems. Untreated myocarditis can lead to serious complications [3]:

- arrhythmia - a violation of the conduction of electrical impulses, manifested by tachycardia, extrasystole, atrial fibrillation;
- cardiomyopathy - heart failure, which is accompanied by changes in the volume of the ventricles, enlargement of the atrium, impaired blood flow from the heart to the vascular bed;
- formation of intracardiac thrombus;
- sudden death.

As noted above, the SARS-CoV-2 virus binds to ACE2 receptors in endothelial cells lined with human blood vessels. Because these cells are involved in the management of blood clots, scientists speculate that if the endothelium is infected with the SARS-CoV-2 virus, the control of the blood clotting system is disrupted, resulting in the formation of blood clots. [4]

In addition to large blood vessels, the coronavirus also affects small blood vessels, in which bleeding occurs from blood clots that block them [5].

Patients with chronic diseases of the cardiovascular system before infection with the SARS-CoV-2 virus have already undergone changes in the walls of blood vessels (blood clots, thickening). COVID-19 aggravates the condition of the blood vessels, which can lead to thrombus rupture and subsequent heart attack. [6]

Thus, excessive immune response to SARS-CoV-2 virus, side effects resulting from the use of drugs in some patients with coronavirus, cardiovascular pathology after coronavirus may occur [7]:

- tachycardia (heartbeat); -arrhythmia (arrhythmia);
- heart failure;
- inflammation of the myocardium (myocarditis);
- thrombosis;
- pulmonary embolism (PE);
- stroke;
- myocardial infarction, atypical infarction.

**Objective:** to identify changes in the coagulation system which causes of complications in the cardiovascular system in patients with Covid-19.

**Research materials.** Medical history of 97 patients who were diagnosed as a viral pneumonitis with the help of nasopharyngeal and oropharyngeal tampons using PCR-positive and computer tomography (CT) for COVID-19, hospitalized and treated in Tashkent Medical Academy's multidisciplinary clinic in January-August 2021 was studied as a research object. The average age of the subjects was 57 years. Of these, 34.0% (33 people) were women and 66.0% (64 people) were men.

Patients were divided into the following groups:

Group 1. 31 patients (32.0%) were patients with mild Covid-19.

Group 2. 33 patients (34.0%) were patients with moderate Covid-19.

Group 3. 33 patients (34.0%) were patients with severe Covid-19.

The control group included 30 healthy people of different ages and genders.

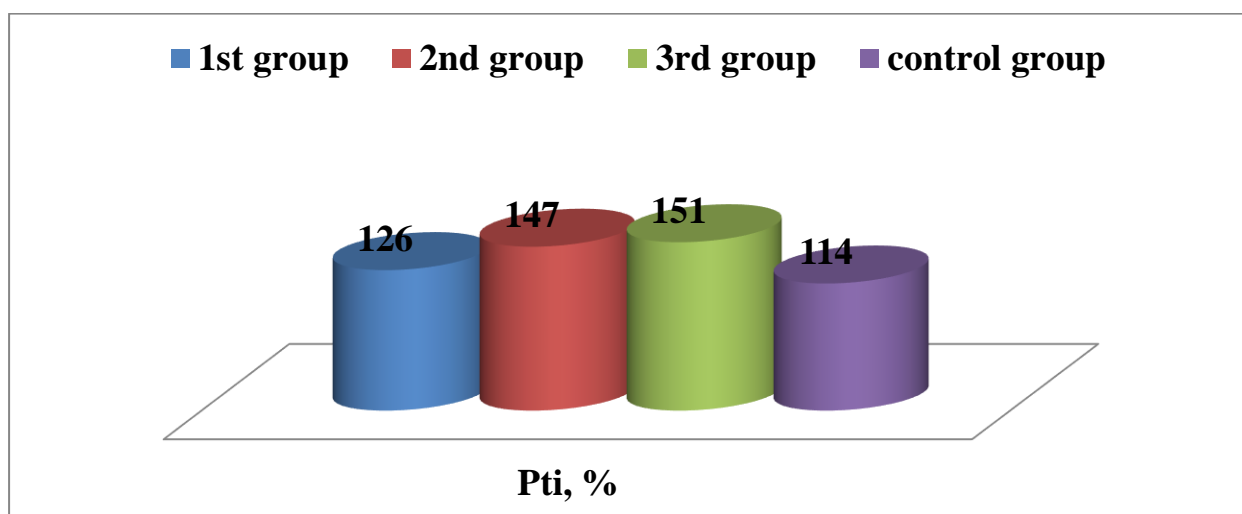
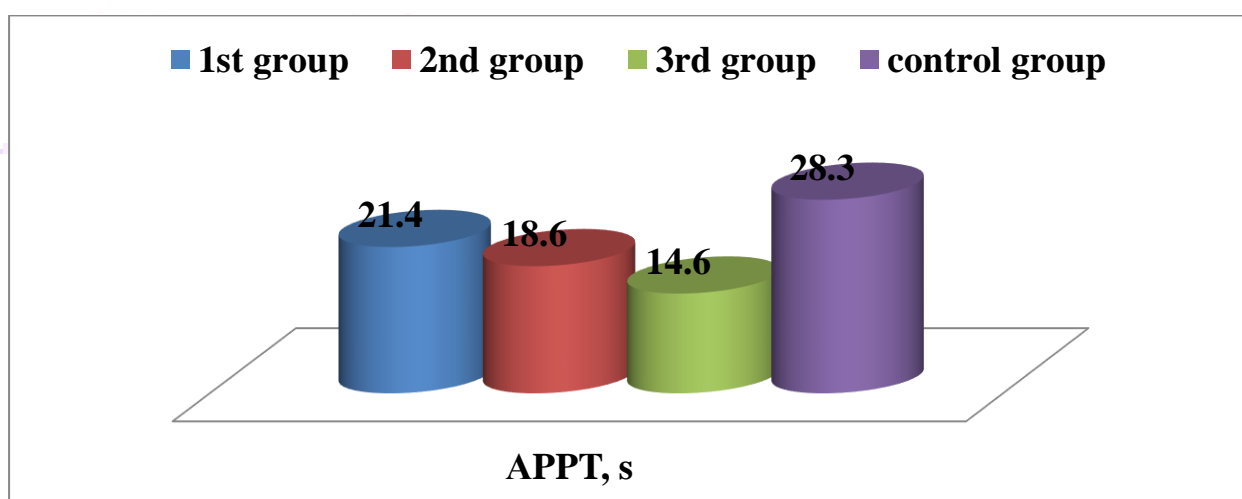
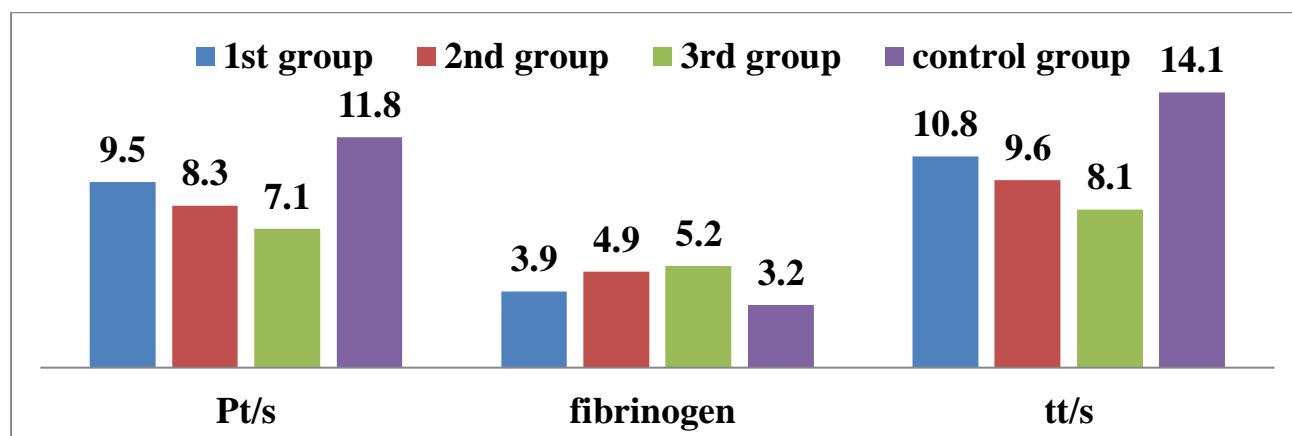
**Research methods:** Main and control groups were diagnosed with Covid-19 by PCR and followings determined from the blood samples: prothrombin time, prothrombin index, APPT, INR, fibrinogen, thrombin time.

**Results.** Main and control group. Average index and average deviation index which were taken from blood samples.

	Ptt, s	Pti, %	INR
1 <sup>st</sup> group	9,5±0,5	126±7	0,79±0,04
2 <sup>nd</sup> group	8,3±0,5	147±6	0,69±0,04
3 <sup>rd</sup> group	7,1±0,9	151±5	0,59±0,07
Control group	11,8±0,4	114±6	0,98±0,03

	APPT, s	Fibrinogen, l/g	Tt, s
1 <sup>st</sup> group	21,4±3,2	3,9±0,9	10,8±2,2
2 <sup>nd</sup> group	18,6±2,9	4,9±0,6	9,6±2,4
3 <sup>rd</sup> group	14,6±2,9	5,2±0,4	8,1±2,0
Control group	28,3±4,5	3,2±0,6	14,1±2,4

Comparison of the results from the main and control groups using diagrams.



**Conclusion.** Damage to the walls of blood vessels can also be triggered by factors that cause their inflammation and blood clotting, which can lead to a heart attack, stroke or pulmonary embolism. Acute myocardial infarction can occur due to increased blood viscosity, thrombus formation, and vascular injury.

Patients with COVID-19 are characterized by the development of hypercoagulability, which is accompanied by a clear and steady increase in the content of D-dimer and fibrinogen in the blood. The severity of coagulopathies with diabetes mellitus and the time to normalization of the basic parameters of the coagulogram were significantly increased. Fibrinogen levels are an important indicator of adverse effects in the SARS-CoV-2 patient population in general and in diabetes in particular.

The results show that in patients with COVID-19, thrombosis is shifted to hypercoagulability, therefore timely detection of changes in it and thrombosis prevention are of great importance in recovery after disease and prevention of post-covid syndrome.

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