Specific Features of the Hemostatic System in Covid-19

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Abstract: This article describes the main clinical characteristics of patients with Covid-19. It's a single-center retrospective cohort study. All COVID-19 patients included in this study were diagnosed according to the guidelines for the diagnosis and treatment of pneumonia caused by infection with the novel coronavirus. All patients had laboratory-confirmed infection with SARS-CoV-2 (real-time RT-PCR specific for SARS-CoV-2 was positive). The value of D- dimer coagulation indices, prothrombin time, activated partial thromboplastin time, thrombin time and fibrinogen as well as C-reactive protein, procalcitonin, ferritin in predicting the severity and prognosis of COVID-19 was studied. Dysfunction of blood coagulation and procalcitonin are widely used to assess the risk of bacterial infection and C-reactive protein - an indicator of an acute inflammatory process - was found in almost everyone, more often in severe patients.

Keywords: COVID-19, D-dimer, C-reactive protein.

Introduction. COVID-19 is a disease caused by the new coronavirus SARS-CoV-2. [1, 2, 3]. Most patients with COVID-19 develop symptoms of respiratory infection, some of them weigh down to a more severe systemic disease characterized by persistent fever, acute lung injury with acute respiratory distress syndrome, multiple organ failure, shock and high lethality' [4, 5]. Close observation of patients with COVID-19 showed that many of them had abnormalities in the results of laboratory studies of the blood coagulation system, resembling other systemic coagulopathies, such as disseminated intravascular coagulation (ICE) and thrombotic microangiopathies [6]. In addition, COVID-19-associated coagulopathy also appears to have features that distinguish it from ICE and TMA [7].

Coagulation disorders have been reported COVID-19 patients in several descriptive studies [8,9,10]. Increased levels of D-dimer and fibrin degradation products (FDP), shortened or increased prothrombin time (PV), abnormal platelet count, occurrence of thrombosis or bleeding, and complications of disseminated intravascular coagulation were observed in patients with COVID-19 at different clinical stages [11,12]. These data show that impaired blood coagulation plays an important role in the clinical process of COVID-19. Impaired blood coagulation at the end stage of COVID-19 or after invasive treatment is common and valid, but with limited predictive value. Studies of patients with COVID-19 have shown that CRP levels directly correlate with disease severity' and progression.

A recently published study showed that low levels of CRP are common in both patients who do not require oxygen (mean 11 mg/L, interquartile range 1-20 mg/L) and patients who have developed hypoxemia (mean 66 mg/L, interquartile range 48-98 mg/L) [13]. Procalcitonin in coronavirus infection with respiratory lung lesions is withm reference values [14,15]. The increase in PKT indicates the attachment of bacterial infection and correlates with the severity' of the course, the prevalence of inflammatory infiltration and prognosis in bacterial complications.

Aim. To study clinical characteristics of patients with COVID-19.

Materials and research methods. This study was a single-center retrospective cohort study. We included all patients with confirmed SARS-CoV-2 infection hospitalized in an infectious disease hospital from March 21 to August 12, 2020 in Bukhara. Clinical data were obtained from electronic health records, including demographic data, exposure history', signs and symptoms, and laboratory data at admission. Common blood tests: white blood cell count (WBC), lymphocyte count (LYM), mononuclear count (MONO), neutrophil count (NEU) were performed on blood samples. Blood biochemistry parameters: aspartate aminotransferase (ACT), alanine aminotransferase (ALT), glucose (BLU), urea, creatinine and C-reactive protein (CRP) were measured using the automatic biochemical analyzer MINDRAY BC - 30 (China) Coagulation functions (D-dimer, thrombin time (TV), prothrombin time (PTV), fibrinogen (FIB), activated partial thromboplastin tune (ACTV) were determined using a MINDRAY BA- 88A analyzer (China). The concentration of D- dimer was determined by ELISA using immunoenzyme assay kits to determine the concentration of D- dimer in the blood plasma of D- dimer-ELISA-BEST. Patients with moderate severity and severe fonn used data from their first laboratory' test at admission. All tests were performed by specially appointed personnel in strict accordance with the instructions for the use of reagents.

Research results and discussion. Upon admission to the stationary ambulance department, all patients were assessed using the NEWS scale. The average score was 5.6±1.6. This made it possible to quickly sort the patients and the most serious to be sent to the intensive care unit. All COVID-19 patients included in this study were diagnosed according to the guidelines for the diagnosis and treatment of pneumonia caused by infection with the novel coronavirus. All patients had laboratory-confirmed infection with SARS- CoV-2 (real-time RT-PCR specific for SARS-CoV-2 was positive).

From March 21 to August 12, 2020, 70 patients were hospitalized at the Bukhara regional infectious diseases hospital. The patients were divided into severe patients (n = 32) and patients with moderate forms (n = 38). Of these. 12 (8.6%) patients were admitted to the intensive care unit.

The average age was 53 years, out of 70 patients, 56 were men. The median time from symptom onset to hospitalization was 4-5 days, and the median time to diagnosis of severe illness was 6-7 days.

The most frequent chronic diseases were: hypertension, in 6 patients: cardiovascular disease, in 5; chronic obstructive pulmonary disease, in 8 patients.

The distribution of patients by severity can be represented by the degree of lung damage. CT scan 0 was in 8.7% of patients, CT scan 1 - 14.2%, CT scan 2 - 47.1%, CT scan 3 - 30.0% of patients, mean $Sp02 = 91.5\%$.

The most common symptoms upon admission of patients were: fever, detected in 60 patients, followed by cough in 52, sputum in 15, dyspnea in 16, fatigue in 54, anorexia in 61, myalgia in 22, sore throat - in 32, diarrhea - in 9, nausea - in 11. vomiting - in 7, headache - in 55, dizziness - in 12, abdominal pain - in 6, hemoptysis - in 2, loss of taste - in 20 , loss of smell - in 24, confusion - in 12, conjunctivitis - in 16, arthralgia - in 17, convulsions - in (picture 1).
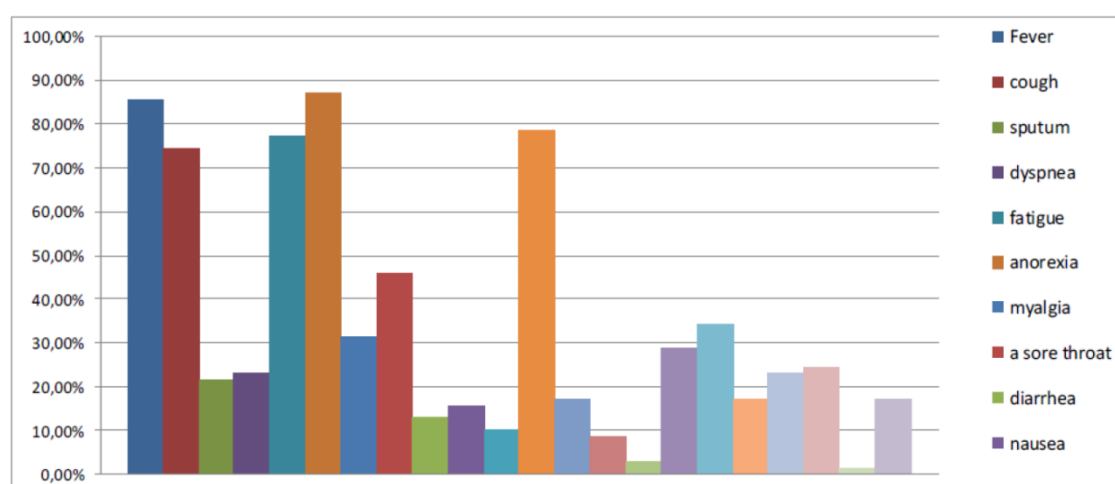
Graph 1 - Frequency of occurrence of clinical signs in percentages (%)

According to the results of the data obtained on 70 patients, it turned out that skin manifestations were found in 12 patients. In 5 patients, they manifested themselves in conjunction with the manifestation of other symptoms, in 7 patients - after hospitalization. Among the skin manifestations prevailed: erythematous rash (in 7 patients), common urticarial (in 3 patients), also vesicles similar to rashes in chickenpox (in 2 patients).

According to the results of laboratory data, it was found that 24 patients (34.3%) had leukopenia, 12 patients (17.1%) had leukocytosis; in 58 patients (82.9%) lymphocytopenia was revealed, in 12 patients (17.1%) - an increase in the number of lymphocytes.

Platelet count and coagulation parameters were analyzed in the present study. Of the 70 patients included in the study, thrombocytopenia was found in 9 (12.9%), thrombocytosis - in 8 (11.4%).

Indicators of hemostatic homeostasis in patients with coronavirus infection on admission are shown in the table. From this table, it follows that the concentration of D-dimer is increased in 57.9% of patients with a moderate form, and in patients with a severe form, it is detected in 75%. A similar picture was found when studying the prothrombin time, the indicators are 10.5% and 18.8%, respectively. In 50% of patients with a moderate form, the concentration of fibrinogen is increased, and patients with a severe form are 75%. Activated partial thromboplastin time was lengthened in 26.3% of patients with a moderate form of the disease, and 46.9% with a severe one.

Conclusion. Thus, such indicators of hemostatic homeostasis as D-dimer, prothrombin time, fibrinogen and Activated partial thromboplastin time, also C-reactive protein can be used as indicators of the severity of the disease in patients.

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