Alterations in immune-inflammatory indices and hematological parameters in COVID-19 patients: with positive RT-PCR

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Dear Editor,

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the cause of the pandemic in 2019, has symptoms that vary in range from a dry cough to shortness of breath. Not only is the damage of this virus restricted to the respiratory tract, but also the heart, liver, kidneys, and immune system may change. For instance, the increased level in Th17 cells and cytotoxicity of CD8+ cells show severe immune injury [1].

Diagnosis of severe COVID-19 needs nasopharyngeal specimens and blood samples to be collected for the real-time PCR (RT-PCR) and antibody testing, respectively [2]. Alongside these tests, other screening assays can be helpful to rule out other similar diseases. These tests include CBC, assessment of coagulation pathways, and evaluation of inflammatory parameters such as C-reactive protein (CRP) and erythrocyte sedimentation rate (ESR). The hematological changes showed a decline in hemoglobin level and lymphocyte, monocyte, eosinophil, and platelet count, besides an increase in the neutrophil count. The Chinese government considered eosinopenia is not a reliable symptom. However, referring to Hu Yun et al. the blood indicators such as neutrophil count (NEUT#), monocytes count (MONO#) were increased compared to negative patients. In contrast, white blood cell count (WBC), lymphocyte count (LYMPH#), basophil count (BASO#), eosinophil count (EO#), and platelet count (PLT), were decreased [3]. These changes might be coupled with an increase in alanine aminotransferase (ALT), aspartate aminotransferase (AST), total bilirubin, blood urea nitrogen (BUN), creatinine (Cr), lactate dehydrogenase (LDH), prothrombin time (PT), D-dimer, and glucose level [4]. Indeed, CRP is an acute-phase protein made by the liver, which is a more significant factor since it shows a peak before ESR. The RT-PCR technique detects the active phase of the disease. Also, available rapid antigen detection tests detect the same phase as RT-PCR but with a lower sensitivity as a complementary test. This test differentiates the acute and chronic phases of COVID-19 by measuring the levels of IgM and IgG in the serum, respectively; beside the function of humoral immunity in patients [2].

In order to alleviate the intensity of this condition, some drugs such as angiotensin-converting-enzyme 2 (ACE2) is presented to block the entry and binding of the virus. To decrease inflammatory response and cytokine storm, the hydroxychloroquine is prescribed for COVID-19 patients. It is proved that protease inhibitors such as lopinavir/ritonavir (LPV/r) can be useful for COVID-19 patients due to the inhibitory effect on MERS-CoV disease. On the other hand, neuraminidase inhibitors such as Oseltamivir, Peramivir, and Zanamivir are not recommended. Ribavirin in combination with LPV/r reduces the distress effect on respiratory system. On the last updated researches, however, Favipiravir is recommended as a stronger effector on COVID-19 patients [5].

In this study, a total of a hundred patients (n = 100) diagnosed with COVID-19 in Mashhad Educational Hospital, were examined. To confirm COVID-19 nasopharyngeal and oropharyngeal specimens were retrieved from all patients, and the presence of rRNA-dependent RNA polymerase (RdRp) gene was measured using real-time reverse-transcription polymerase chain reaction (rRT-PCR, Pishtaz Teb, Lot.99006) technique. Subsequently, blood samples of patients were collected for complete blood count (CBC) to determine the discrepancy between the healthy and COVID-19 patients. Also, CRP and ESR of patients were evaluated to see whether there is a correlation between these immune-inflammatory parameters or not. All of the gathered data from this study were analyzed by IBM-SPSS26.

The results of the descriptive analysis of a hundred patients (n = 100) with COVID-19 are as what Table 1 illustrates.

The results of the CBC panel indicated a mean of 9.101 ± 4.13 WBCs per microliter for leukocyte counts that means an increased level in COVID-19 patients. Specifically, a mean of 82.887 ± 8.28 percent for the differential counts of neutrophils demonstrated a rise. However, a mean of 12.506 ± 6.87 percent

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TABLE 1. The descriptive analysis of hematological indices and immune-inflammatory parameters

Indexes and parameters		Mean	*Standard deviation*	Maximum	Minimum	Valid	Invalid
Hematological indices	Leukocyte count (WBCs per microliter)	9.101	4.138	24.7	1.0	100	0
	Neutrophil differential count (%)	82.887	8.281	96.3	48.0	100	0
	Lymphocyte differential count (%)	12.506	6.877	34.3	2.6	99	1
Immune-inflammatory parameters	C-reactive protein (mg/L)	116.86	65.193	304.4	1.9	96	4
	Erythrocyte sedimentation rate (mm/h)	51.93	32.474	159	1	58	42

for the differential counts of lymphocytes proved that lymphopenia is one of the laboratory findings in COVID-19 patients. By contrast, in other infections, it has a backward result. Hence, these results ended up with an increase in neutrophil to lymphocyte ratio (NLR). As for immune-inflammatory parameters, Not only did the mean of 51.93 ± 32.47 mm/h for ESR showed a significant increase in COVID-19 patients, but also the mean of 116.86 ± 65.19 mg/L for CRP indicated the same result. Considering that both CRP and ESR can escalate in inflammations, COVID-19 provides similar changes, too. The results of CRP and ESR determined a significant correlation between them (P-value < 0.05).

Declaration of competing interest

There is no conflict of interest to declare.

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