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Study of some immunological indicators for COVID-19 patients in Babylon city

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Abstract

COVID-19 has been a global challenge caused by a coronavirus that infects the respiratory system and poses a high risk to life. This study dealt with some immunological indicators associated with this disease. A total of 150 samples was collected from COVID-19 patients (120 samples) and non-infected individuals (30 samples; control group) who were admitted to the Marjan Medical City Hospital in Al-Hilla, Babylon, Iraq for the period from March 1 to August 30, 2022. Of these participants, 65% were men and 35% were women, with ages ranging from 16 to 75 years. The samples were collected under the supervision of specialized doctors, according to the approved by the Iraqi Ministry of Health protocols. The parameters examined in this study included the complete blood count, the red blood cell (RBC) count, the packed cell volume, the haemoglobin levels, the platelet count, the white blood cell (WBC) count, and the levels of immunological indicators such as interleukin-1 beta (IL-1β), interleukin-17 (IL-17), the tumour necrosis factor-alpha (TNF-α), the C-reactive protein (CRP), and the erythrocyte sedimentation rate (ESR). Our results indicate a clear increase in the WBC count, the IL-1β levels, IL-17 levels, the TNF-α levels, the CRP levels, the ESR, and the RBC count, as well as a clear decrease in the lymphocyte count, as a result of COVID-19.

KEYWORDS
COVID-19, immunological indicators, Iraq, blood cells, cytokines

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1. INTRODUCTION

A coronavirus is a large and coated virus containing genetic material of the RNA type, and this new virus responsible for COVID-19 is now known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The Australian scientist Wilson confirmed that COVID-19 patients can be divided into two categories: (i) those who carry the virus and do not show symptoms of the disease (and are the least harmful group), and (ii) those who carry the virus with the appearance of symptoms (such as fever and headache and other symptoms) [1,2].

2. PATIENTS AND METHODS

A total of 150 samples was collected from COVID-19 patients (120 samples) and non-infected indi-

viduals (30 samples; control group) who were admitted to the Marjan Medical City Hospital in Al-Hilla, Babylon, Iraq for the period from March 1 to August 30, 2022. Of these participants, 65% were men and 35% were women, with ages ranging from 16 to 75 years. The samples were collected under the supervision of specialized doctors, according to the approved by the Iraqi Ministry of Health protocols. The parameters examined in this study included the complete blood count, the red blood cell (RBC) count, the packed cell volume (PCV), the haemoglobin levels, the platelet count, the white blood cell (WBC) count, and the levels of immunological indicators such as interleukin-1 beta (IL-1β), interleukin-17 (IL-17), the tumour necrosis factor-alpha (TNF-α), the C-reactive protein (CRP), and the erythrocyte sedimentation rate (ESR). The complete blood count was conducted as previously described [3], while the determination of CRP and TNF-α levels was done through special kits, according to the manufacturer's instructions. The determination of the interleukin levels was done by ELISA. Statistical analysis was undertaken by using the Statistical Package for Social Sciences (SPSS) program.

Table 1. Comparative levels of immune variables, inflammation markers, and some common blood test parameters in the groups studied. Abrreviations used: CRP, C-reactive protein; ESR, erythrocyte sedimentation rate; Hb, haemoglobin; IL-1β, interleukin-1 beta; IL-17, interleukin-17; PCV, packed cell volume; RBC, red blood cell; SD, standard deviation; TNF-α, tumour necrosis factor-alpha; WBC, white blood cell.

Parameter	Group	Mean	SD	Min	Max	*P*-value (control *vs*. patients)
IL-17 levels (pg/mL)	Control	123.27	18.9	99	155	0.01
	Patients	230.08	23.6	188	260	
	Total	208.71	48.5	99	260	
IL-1β levels (pg/mL)	Control	182.43	16.8	159	211	0.01
	Patients	276.02	21.3	242	310	
	Total	257.30	42.7	159	310	
TNF-α levels (pg/mL)	Control	202.60	21.3	175	235	0.01
	Patients	408.23	46.2	300	545	
	Total	367.11	92.7	175	545	
ESR (mm/h)	Control	8.03	3.8	5	20	0.01
	Patients	43.02	14.5	20	85	
	Total	36.02	19.1	5	85	
CRP levels (mg/L)	Control	3.35	1.4	0.4	6.1	0.01
	Patients	46.77	18.01	18.0	81.0	
	Total	38.09	23.73	0.4	81.0	
WBC count ($\times 10^3/\mu L$)	Control	5.95	1.8	4.20	7.44	0.001
	Patients	8.16	2.7	3.58	21.52	
	Total	7.72	2.6	3.58	21.52	
Lymphocytes (%)	Control	23.84	12.8	2.61	38.90	0.002
	Patients	12.55	3.8	4.90	19.70	
	Total	14.80	8.02	2.61	38.90	
RBC count ($\times 10^6/\mu L$)	Control	4.58	0.5	3.47	5.81	0.001
	Patients	5.12	0.5	3.81	6.73	
	Total	5.01	0.6	3.47	6.73	
Hb levels (g/dL)	Control	12.58	1.9	7.8	15.8	0.003
	Patients	14.41	1.7	9.5	19.0	
	Total	14.05	1.9	7.8	19.0	
PCV (%)	Control	39.06	5.2	25.7	48.0	0.002
	Patients	43.72	4.7	29.5	56.5	
	Total	42.79	5.1	25.7	56.5	
Platelet count ($\times 10^3/\mu L$)	Control	292.27	41.38	54	841	0.001
	Patients	265.52	75.13	89	445	
	Total	270.87	92.27	54	841	

3. RESULTS AND DISCUSSION

This study dealt with the secondary infections, as well as with the immune and inflammatory variables associated with COVID-19. In this study, out of the 120 COVID-19 patients included, 78 (65.0%) were male and 42 (35.0%) were female. Their average age was 40.7 years. Among the non-infected individuals (control group), 50% were men and 50% were women, with an average age of 39 years. These results contradict those of Morris *et al*. [4].

As detailed in Table 1, a clear increase in the levels of IL-1β and IL-17 was observed in COVID-19 patients. This significant rise may be attributed to the fact that IL-1β is one of the basic cytokines for the formation of inflammatory bodies as part of the immune response to the disease [5].

In COVID-19 patients, complete blood count blood tests have been associated with a lack of oxygen in the blood and body tissues, pneumonia, high cytokine storm, and increased lung secretions which lead to the closure of the alveoli and the bronchi with mucous pulmonary secretions thereby causing suffocation and respiratory failure that requires resorting to artificial respiration [6]. This coincides with a leak in the blood vessels, the clotting of the blood itself, the lowering of the blood pressure, and many systems beginning to fail to perform their functions. In fact, during a severe COVID-19 infection, the body believes that its tissues are extraneous and invasive bodies, thereby resulting in the generation of a cytokine storm.

Table 1 shows a clear increase in the TNF-α levels of the COVID-19 patients, and a clear difference with those of the control group. Moreover, a clear increase in CRP levels was recorded in COVID-19 patients; an indicator of bacterial infections. The latter finding is in agreement with that of Langford *et al*. [3], but in disagreement with that of Sun *et al*. [7].

The ESR values of COVID-19 patients were high compared to those of the control group, due to the rapid sedimentation of RBCs; these results are similar to those reported earlier [7]. The clear rise in WBCs observed may also be attributed to bacterial infections, although these results are also in disagreement with those of Sun *et al*. [7]. However, a clear decrease in the number of lymphocytes was observed in COVID-19 patients when compared with those of the control group (Table 1). Lymphocytes are target cells for the coronavirus, and their % may be affected by the presence of asymptomatic individuals among the control group [8].

As detailed in Table 1, there is a strong statistical significance (P=0.001) associated with the high number of RBCs in COVID-19 patients due to the lack of oxygen in the blood and tissues as well as the patients' need for oxygen carriers. These findings were somewhat similar to those of a previous study conducted on the complications of the coronavirus and the influenza virus [6].

A relative decrease in the PCV of COVID-19 patients, especially in the advanced stages of infection, was observed (Table 1). This may be attributed to anaemia as a result of poor appetite, especially at the peak of the disease. As far as the platelet count is concerned, Table 1 reveals a statistically significant drop of this parameter in COVID-19 patients. Platelets have a clear role in the formation of blood clotting in COVID-19 patients, forcing the patient to take anticoagulants so as to avoid blood clots due to the infection by this dreaded virus [9].

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

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