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Research Article



# Complete blood count and some cytokines levels for COVID- 19 in diabetic patients

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## Abstract

Coronavirus disease (COVID-19) is now a worldwide pandemic. The researchers are trying to find more about this virus in terms of diagnosis and management. Many researchers reported that the routine complete blood count is one of the main analyses to be performed for the patients as part of the confirmation test for the disease. We aim to find more about the complete blood count (CBC) of patients infected with COVID-19 and to see whether the results would show any significant differences regarding age and gender. A group of 95 diabetic patients with confirmed COVID-19 was admitted to the Salah El- Deen Hospital in Tikrit City, Iraq. The cases were collected and analyzed from January to December 2020. CBC analysis showed a significant difference in the values of red blood cells (RBCs), white blood cells (WBC), Platelets (PLT), and its parameters (PDW & MPV) and C-reactive protein (CRP) in diabetic patients infected with COVID-19. Cytokines levels (IL-6, IL-8, IL-10, and TNF- $\alpha$ ) were all elevated and IL-6 is believed to be a reliable biomarker for COVID-19 detection.

**Keywords** Coronavirus, COVID-19, Complete blood count, WBC, PLT, HGB, CRP, cytokines. IL-6

## Introduction

Coronavirus or COVID-19 is caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). It was first identified in Wuhan, China in 2019 and rapidly spread across the world. On March 11, 2020, the World Health Organization announced it as a pandemic (Ng and Rickard, 2020). Since then, it has infected more than 5 million people in the United States, and the death toll continues to rise to more than 219,000 at the time of publication (CDC, 2020). U.S. states that initially emerged as epicenters for COVID-19 were able to decrease community transmission with shelter-in-place orders, mandatory masks, and social distancing measures. COVID-19 can rapidly spread from one human to another through respiratory droplets produced through breathing, singing, talking, coughing, or sneezing. COVID-19

continues to be spread in the community in multiple states, prompting the reversal of reopening plans (CDC, 2020). According to the American Diabetes Association (ADA), at this time, "there isn't enough data to show if those with diabetes are more likely to become infected with COVID-19; however, those with diabetes have worse outcomes, such as higher rates of serious complications (Association, 2020):

It is known that older people with chronic obstructive pulmonary disease, heart disease, diabetes, chronic kidney disease, and obesity are at increased risk for severe infection COVID-19, and most of the time they require hospitalization (Razzaghi et al., 2020). With a long incubation time reported to be up to 24 days and both symptomatic and asymptomatic carriers able to transmit the disease, COVID-19 has proven to be highly infectious (Zhong et al., 2020).

At this time, there is no effective cure for COVID-19. The most common clinical signs of COVID-19 are fever, chills, cough, shortness of breath or difficulty breathing, fatigue, muscle or body aches, headache, the new loss of taste or smell, sore throat, congestion or runny nose, nausea or vomiting, and sometimes diarrhea. A multitude of medications to treat COVID-19 patients have been and continue to be studied in clinical trials around the world. Some medications include remdesivir, lopinavir plus ritonavir, tocilizumab, anakinra, as well as convalescent plasma therapy. Most patients receive supportive care, and those who become severely ill may require mechanical ventilation (Zhong et al., 2020).

This study aims to detect the diagnostic values of complete blood count and some cytokines levels for COVID-19 in diabetic patients.

The study was conducted in accordance with the Declaration of Helsinki Ethical Principles and was approved by the Iraqi Ministry of Health.

**Materials and methods**

The data of 95 diabetic patients infected with COVID-19 admitted to the Salah El-deen Hospital located Tikrit, Iraq, were analyzed from January to December 2020. All patients were confirmed, COVID-19 patients. Their age ranged from 20 to 70 years old. As for the control group, 50 healthy participants were included with matching ages and genders as the studied cases.

Five ml of blood samples were drawn under sterile conditions in different blood differentiation tubes for presumed tests.

Five ml of blood was drawn from patients and a complete blood count was performed by Genex count 60 Automated Hematology Analyzer. Serological tests (IL-6, IL-8, IL-10, and IL-17) were performed using ELIZA technique and the kits were from (Komabiotech- technology, France). Data analysis and statistics by The Mann-Whitney U test, P= <0.05 was considered statistically significant.

**Results**

A group of 95 confirmed cases of COVID-19 was tested. The mean age of the patients was 59 years, with 52 (54.7%) males and 43 (45.3%) females as shown in Table 1.

White blood cells (WBCs), red blood cells (RBCs), hemoglobin (HGB), platelets (PLTs), hematocrit (HCT), mean corpuscular volume (MCV), (MCH & MCHC) concentrations, platelet distribution width (PDW), Procalcitonin (PCT), and C-reactive protein (CRP) counts were among the laboratory results in Table 2. WBC, PLT, MPV, and CRP levels all increased slightly. Furthermore, the latest research discovered. In addition, the current research discovered a statistical disparity between CBC parameters for these three laboratory parameters dependent on gender groups: RBC (P=0.006),

HGB (P=0.001), HCT (P=0.006), and CRP (P=0.004), Table 3.

Control group values were relatively similar to the normal ranges of CBC. Table 4 showed the results of interleukines levels in diabetic patients, the levels were significantly high in comparison to the control group.

**Table 1. Basic distribution of studied patients**

Characteristics	Mean ± Standard Deviation
Age (n.= 95)	59 ± 20.317
<b>Gender %</b>	
Male	52 (54.7)
Female	43 (45.3)

**Table 2. CBC parameters result for all diabetic patients**

Parameters	Normal ranges	In patents Mean ± Standard Deviation	Control group
WBC (10 <sup>3</sup> /uL)	4.0 – 10.0	11.828 ± 3.892	6.711 ± 1.545
RBC (10 <sup>6</sup> /uL)	4.92	4.842 ± 0.788	4.439 ± 0.835
HGB (g/dL)	13.4	12.758 ± 2.092	12.919 ± 1.846
HCT (%)	40.1	37.642 ± 7.969	40.401 ± 1.520
LYM (10 <sup>3</sup> /uL)	1.3	1.69 ± 1.0094	1.901 ± 1.184
LYM (%)	16.4	16.94 ± 4.582	16.032 ± 2.819
MCV (fL)	81.6	78.068 ± 12.081	79.280 ± 11.320
MCH (pg)	27.2	26.574 ± 2.700	27.735 ± 0.365
MCHC (g/dL)	33.4	33.878 ± 1.968	33.220 ± 1.073
PLT (10 <sup>3</sup> /uL)	207	332.24 ± 81.137	351.647 ± 128.386
PDW (fL)	11.4	11.264 ± 2.754	15.213 ± 2.713
MPV (fL)	8.6	9.19 ± 1.345	9.523 ± 1.196
PCT (%)	0.17	0.603 ± 0.173	30.518 ± 0.148
CRP (mg/L)	> 10 mg/L	27.16 ± 15.581	9.31 ± 1.665

**Discussion**

The CBC results showed high levels of CRP (27.16 ± 15.581) (Table 2). This rise in CRP levels can be interpreted as the normal response of the human immune system to the infection. Studies by Guan(2020) (Guan et al., 2020) presented results from various provinces in China, interesting biochemical findings were described; C-reactive protein (CRP) was elevated in 60.7% of patients". WBC was also raised by about (11.828 ± 3.892). Our analysis has found lower HGB (12.758 ± 2.092) and reduced HCT (37.642 ± 7.969) and almost normal RBC (4.842 ± 0.788), as well as a slightly respective increase in PLT, MPV, and PDW (332.24 ± 81.137), (9.19 ± 1.345) and (11.264 ± 2.754) levels in patients with Covid-19, which are common and normal results in the case of infection with the SARS-CoV-2 infection.

**Table 3. CBC values according to gender**

Parameters	n= (110)	Gender		Control group	P-value
		Male (n.= 67)	Female (n.=39)		
WBC (10 <sup>3</sup> /uL)	11.828 ± 3.892	11.287 ± 4.1447	10.079 ± 15.0942	6.711 ± 1.545	0.177
RBC (10 <sup>6</sup> /uL)	4.842 ± 0.788	5.089 ± 0.8149	4.439 ± 0.5557	4.439 ± 0.835	0.006*
HGB (g/dL)	12.758 ± 2.092	13.439 ± 2.0146	11.647 ± 1.7488	12.919 ± 1.846	0.001*
HCT (%)	37.642 ± 7.969	39.229 ± 9.0874	35.053 ± 4.8829	40.401 ± 1.520	0.063*
LYM(10 <sup>3</sup> /uL)	1.69 ± 1.0094	1.735 ± 1.1749	1.353 ± 0.6141	1.901 ± 1.184	0.342
LYM (%)	16.94 ± 4.582	16.597 ± 13.2052	16.842 ± 15.0942	16.032 ± 2.819	0.552
MCV (fL)	78.068 ± 12.081	77.368 ± 14.5504	79.210 ± 6.5010	79.280 ± 11.320	0.631
MCH (pg)	26.574 ± 2.700	26.781 ± 2.6821	26.237 ± 2.7695	27,735 ± 0.365	0.472
MCHC (g/dL)	33.878 ± 1.968	33.284 ± 0.8046	33.137 ± 2.2738	33.220 ± 1.073	0.764
PLT (10 <sup>3</sup> /uL)	332.24 ± 81.137	229.645 ± 94.373	236.474 ± 85.106	351.647 ± 128.386	0.453
PDW (fL)	11.264 ± 2.754	10.161 ± 1.2396	10.431 ± 2.6897	15.213 ± 2.713	0.857
MPV (fL)	9.19 ± 1.345	9.113 ± 1.2396	9.316 ± 1.5299	9.523 ± 1.196	0.348
PCT (%)	0.603 ± 0.173	0.201 ± 0.0769	0.207 ± 0.0618	30.518 ± 0.148	0.429
CRP (mg/L)	27.16 ± 15.581	25.741 ± 15.3850	22.947 ± 16.891	9.31 ± 1.665	0.004*

**Table 4. CBC parameters result of all diabetic patients**

Parameters	Interleukins levels in patients	Control group	P-value
IL-6	30.710 ± 7.874	6.451 ± 1.419	0.0001*
IL-8	245.607 ± 116.041	20.44 ± 9.793	0.0001*
IL-10	15.691 ± 2.342	10.400 ± 1.921	0.0001*
TNF-α	11.648 ± 2.982	9.219 ± 0.826	0.0001*

The data was also analyzed regarding gender. The results found a statistically significant *P*-value of the following data; RBC (*P*=0.006), HGB (*P*=0.001), HCT (*P*=0.006), and CRP (*P*=0.004), based on gender groups. But not in the other parameters.

The statistical changes in RBC, HGB, HCT, and CRP values regarding gender groups perhaps because these levels are usually lower in females and these parameters are usually altered changed due to infections; however, the results showed no significant differences in all parameters regarding age groups, although; the observational clinical signs showed a sever reaction to the infection in older people compared to younger ones. Although, the infection holds more risks for older people it does not show in routine blood analysis as it is in clinical signs. As for interleukin levels in diabetic patients, the results showed high significant levels for each of IL-6, IL-8, IL-10, and TNF-α compared to control groups, as shown in [Table 4](#).

Cytokines play a significant role in the control of immune responses. These molecules are well-known anti-inflammatory cytokines, but their enhanced involvement in our diabetic samples could suggest a nuanced interplay between them and their pro-inflammatory counterparts, with anti-inflammatory cytokines serving as a counter-inflammatory and offsetting element. This should be done to reduce the negative effects of a pro-inflammatory system. In a study on IL10 and the risk of heart disease, it was discovered that circulating IL10 concentrations were positively associated with pro-inflammatory mediators like CRP and IL6 ([Welsh et al., 2011](#)). Additionally, elevated pro-inflammatory cytokines such as IL-6 and TNF have been found to accompany anti-inflammatory IL-10 production in certain inflammatory conditions to compensate for inadequate anti-inflammatories ([Botha-Scheepers, 2020](#)).

IL-6 is considered of major importance due to its immunological effect ([Chen et al., 2020](#)). Researchers have

presented evidence that IL-6 levels are closely associated with the severity of COVID-19 pathogenicity. "An increase in IL-6 levels has previously been observed in patients with respiratory dysfunction", implying a possible conjugated mechanism of cytokine-mediated lung damage caused by COVID-9 infection (Wang et al., 2020). In a study on IL10 and the risk of heart disease, it was discovered that circulating IL10 concentrations were positively associated with pro-inflammatory mediators like CRP and IL6. Additionally, elevated pro-inflammatory cytokines such as IL-6 and TNF have been found to enhance anti-inflammatory IL-10 production in certain immune responses to compensate for inadequate anti-inflammatories. As well as IL-8 and other cytokines that need to be studied in the future. Researchers also found that "an elevated level of IL-6 has been proven to be a good biomarker for severity of hepatitis B virus (HBV) infection" (Xia et al., 2015). Therefore, it only makes scenes that immediate evaluation of IL-6 level must be performed upon hospital admission of COVID-19 patients, because of its potential benefits to detect the severity of the clinical symptoms and disease progression in COVID-19 cases (Mustafa and AL-Samarraie, 2020) (Mustafa, AL-Samarraie and Ahmed, 2020)

## Conclusion

This study has shown the CBCs of 95 of diabetic COVID-19 patients. The laboratory results in studied patients were raised in the following parameters; WBC, RBCs, HGB, HCT, CRP, PLT, PDW and MPV. Based on gender the results showed a statistically significant differences in RBCs, HGB, HCT and CRP regarding, but no differences related to age groups. The Interleukins of IL-6, IL-8, IL-10 and IL-17 levels were all elevated in COVID-19 cases more studies need to be made about this subject before we give a definitive conclusion.

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## Conflict of Interest

The author hereby declares no conflict of interest.

## How to cite this article

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## Ethical Considerations

The study was approved by the institutional ethical committee

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