Assessment of WBCs, CRP, LDH and other Biomarkers of Moderate and Severe COVID-19 Patients in Iraq

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Abstract

Though most Iraqi patients who are infected by COVID-19 only suffering from mild symptoms, but in some cases a patient's condition deteriorates, leading to a negative outcome. This study aims to assess the clinical laboratory features of moderate and severe COVID-19 patients

One hundred diagnosed as moderate and severe COVID-19 patients as well as fifty healthy participants were involved in our current study. Assessment was made for WBCs, Monocytes, Lymphocyte, and Platelets. In addition, serum levels of lactate dehydrogenase (LDH) and C-reactive protein (CRP).

A hundred patients aged 33 to 70 years with COVID-19 had severe and moderate cases. Present in DAR AL-SALAM for COVID-19 isolation in Baghdad, Iraq. COVID-19 patients showed increased serum levels LDH and CRP as well as WBCs count and others when compared to healthy individuals. The severe group showed a statistically significant increase in WBCs account, neutrophil activity and LDH levels, compared with moderate group. While the moderate COVID-19 groups displayed a significant rise in lymphocytes activity, CRP, and Platelet.

The current investigation found that WBC count, lymphocyte count, LDH activity, and CRP level were effective indicators for determining the severity of COVID-19, making them good assessment indicators.

Keywords: COVID-19, biomarkers, moderate, severe

Irak'taki Orta ve Şiddetli COVID-19 Hastalarının WBC'leri, CRP, LDH ve Diğer Biyobelirteçlerinin Değerlendirilmesi

Öz

COVID-19 ile enfekte olan çoğu Iraklı hasta yalnızca hafif semptomlardan muzdarip olsa da, bazı durumlarda hastanın durumu kötüleşerek olumsuz bir sonuca yol açar. Bu çalışma, orta ve şiddetli COVID-19 hastalarının klinik laboratuvar özelliklerini değerlendirmeyi amaçlamaktadır.

Mevcut çalışmamıza yüz orta ve ağır COVID-19 hastası ve elli sağlıklı katılımcı dahil edildi. WBC'ler, Monositler, Lenfosit ve Plateletler için değerlendirme yapıldı. Ek olarak, laktat dehidrojenaz (LDH) ve C-reaktif protein (CRP) serum seviyeleri.

Yaşları 33 ile 70 arasında değişen yüz COVID-19 hastasının ciddi ve orta şiddette vakaları vardı. Irak, Bağdat'ta COVID-19 izolasyonu için DAR AL-SALAM'da mevcut. COVID-19 hastaları, sağlıklı bireylerle karşılaştırıldığında artan serum seviyeleri LDH ve CRP'nin yanı sıra WBC sayısı ve diğerlerini gösterdi. Şiddetli grup, orta grupla karşılaştırıldığında WBC hesabında, nötrofil aktivitesinde ve LDH seviyelerinde istatistiksel olarak anlamlı bir artış gösterdi. Ilımlı COVID-19 grupları lenfosit aktivitesinde, CRP'de ve Trombositte önemli bir artış gösterirken.

Mevcut araştma, beyaz kan hücresi sayısı, lenfosit sayısı, LDH aktivitesi ve CRP seviyesinin COVID-19'un ciddiyetini belirlemede etkili göstergeler olduğunu ve bu göstergelerin iyi değerlendirme göstergeleri olduğunu ortaya çıkardı.

Anahtar Kelimeler: COVID-19, biyobelirteçler, ılıman, haşin

1. Introduction

Since COVID-19 first appeared in China [1,2], the infections have spread globally led to causing as pandemic [3]. About 2% of COVID-19 patients die from the illness, and 5–10% of them go on to have severe, life-threatening conditions [3]. Multiorgan damage and hyperinflammation are the main features of COVID-19 infection, which results in multiorgan damage.

Acute severe respiratory distress brought on by epithelial infection and activated alveolar macrophages of lungs is the main factor contributing to COVID-19-related death [4]. As a result, immune modulation and suppression medicine may prevent COVID-19 patients' conditions from worsening. [5]. Many COVID-19 patients have mild to moderate illness, while a small number have severe disease or die [6, 7].

A growing body of research revealed that COVID-19 is completely complicated in its pathophysiological modifications, with multiple organs being damaged by the virus infection and the immune system overreacting. Rised cytokines levels and inflammatory reactive proteins have been seen in serum and lung alveoli

A variety of risk factors for severe illness have been found, including age [8, 9], malignant tumors [9], chronic renal disease [10], chronic obstructive pulmonary disease [11], hypertension [12], diabetes mellitus [13], obesity [14], smoking [13], and immunodeficiency following transplantation [15]. There have been reports of particular indicators of severity, such as prothrombin time, lactate dehydrogenase (LDH), lactate dehydrogenase (LDH), D-dimer, ferritin, interleukin-6, white blood cell (WBC) count, lymphocyte count, platelet count, albumin, and levels of these substances (PT) [16].

CRP has been investigated in a variety of diseases and is a universal inflammatory predictor. CRP, which is also involved in COVID-19, has a significant impact on both the disease's prognosis and diagnosis [17].

LDH is an enzyme that is found in almost all the body's cells and helps to produce energy. Measurements from LDH blood tests are frequently used to monitor tissue damage brought on by a variety of illnesses, including interstitial lung disease and liver disease [17,18].

An increase in LDH is a common sign of tissue or cell damage and tissue or cell death, pointing to viral infection or lung damage, such as pneumonia caused by SARS-CoV-2 [18].

A significant biomarker for the activity and severity of idiopathic pulmonary fibrosis has been identified as serum LDH. Results from clinical laboratories are therefore essential for determining the best course of treatment and evaluating a patient's condition [18].

The pathophysiology of COVID-19 is, however, not fully known. Undoubtedly, the development and severity of the illness are significantly influenced by the cytokine storm that causes inflammation and the virus evasion of cellular immune responses [19].

Numerous laboratory anomalies have been linked to worse outcomes in COVID-19 cases [20]. Patients with severe and fatal COVID-19 were shown to have significantly higher levels of inflammatory biomarkers, cardiac and muscle damage, liver and kidney function, and coagulation measurements, according to a meta-analysis by Henry et al. In particular, serum ferritin, interleukin (IL)-6, and IL-10 were strong indicators of severe illness [21].

We examined the clinical laboratory and demographic data of 100 COVID-19 patients who were admitted to the DAR-ALSALAM hospital for COVID-19 isolation as part of the current study with the goal of identifying the predictors of COVID-19 severity.

2. Material and Method

Ethically, Official permissions regarding the ethics of scientific research were obtained prior to the study's launch. The patient's family also gave their consent for the patient to participate in the study and have blood drawn. One hundred COVID-19 patients (their ages 33–70th) were attended to DAR AL-SALAM for COVID-19 isolation in Baghdad/ Iraq from 1 August 2021 to 30 December 2022 and participated in our study. Other fifty healthy subjects were collected from private health centre.

Based on Iraqi and WHO Medical Care Guidelines, the severity of COVID-19 was assessed [15]. Some patients had moderate disease (pneumonia treated with oxygen treatment without mechanical ventilation), whereas others had severe disease (pneumonia with mechanical ventilation). Patients suffering from chronic conditions were excluded.

5 ml of blood was drawn from each case. It was separated into two types of gel tubes for separating the serum purpose, and the other part was placed in an EDTA tube for complete blood count purpose.

All analysis were done by Cobas e411 system (Roche Diagnostics K.K., Tokyo, Japan). CBC were tested using a fully automated blood cell counter XN-3000 (Sysmex Co., Kobe, Japan).

The current study's data were analyzed using the Chi-square (X^2) test to compare percentages. (Mean SD) was used to describe numerical data. The T test is used to compare two numerical variables, whereas the F test (ANOVA) is used to compare three or more numerical variables. The test was run with a significance level of =0.05. Programs for analyzing current data (SPSS v.22 and Excel 2013).

3. Results and Discussion

3.1. Results

The results showed that all parameters were affected according to age, WBCs levels were significantly higher in the aged between 50-69 years while neutrophil, lymphocytes, and CRP levels were significantly increased in aged $\geq$ 70. While lymphocytes, Platelets, and LDH showed significantly increasing in the group who their ages between 33-49 years as shown in the table (1).

Table 1. Parameters effects according to age for severe and moderate COVID-19 patients

Parameters	N	Age		
		33 – 49 years	50 – 69 years	≥ 70
WBCs	100	13.45 ± 5.877 b	14.83 ± 12.820 a	13.96 ± 5.509 b
neutrophil	100	4.68 ± 0.555 b	4.61 ± 0.570 b	5.38 ± 3.193 a
lymphocyte	100	13.17 ± 1.663 ab	13.06 ± 1.826 b	15.53 ± 9.375 a
Platelet	100	282.96 ± 99.957 a	265.20 ± 95.261 ab	222.96 ± 89.255 b
CRP	100	33.25 ± 23.936 b	36.33 ± 27.110 b	53.31 ± 51.843 a
LDH	100	949.18 ± 503.725 a	808.70 ± 298.145 b	798.89 ± 353.364 b
Different litters horizontally mean significant differences at the 0.05 level				

Regarding the laboratory data results, patients in the moderate and severe groups showed significantly higher WBCs count, neutrophils, lymphocytes activities, Platelet, LDH, and CRP level compared with healthy controls. Severe patients showed significantly higher levels of WBCs count, neutrophil, and LDH activity levels compared with the moderate group.

Serum Lymphocyte activity, Platelet, and CRP exhibited a significant increase in moderate COVID-19 patients compared with severe COVID-19 cases with P-value< (0.1, 0.01, and 0.001) as shown in table 2.

Table 2: The levels of WBCs, RBCs, Platelet, CRP, and LDH in sever and moderate patients comparing with healthy control

parameters	Sever/n=100	Moderate/ n=100	Healthy/ n=50
WBCs	14.27±9.7*	11.46± 8.54*	5.92±0.21
neutrophil	14.907± 7.024**	12.74±5.563**	7.38±1.03
lymphocyte	11.507±3.696**	13.04 ±4.269**	2.06±0.78
Platelet	247.55± 98.469*	277.59± 93.441*	175.23±4.68
CRP	30.01 ± 38.724***	42.15 ± 62.559 ***	1.97 ±0.19
LDH	939.37±381.561 ***	738.37±329.097 ***	261.6±3.00
*. mean significant differences at the 0.1 level.			
**. mean significant differences at the 0.01 level.			
***. mean significant differences at the 0.001 level.			

3.2 Discussion

Patients with COVID-19 who had moderate or severe cases had different haematological characteristics. Even though there were differences in platelet counts between moderate and severe cases, WBCs as well as their differential numbers appeared be crucial in determining how severe the condition was. When compared to moderate instances. Therefore, the SARS-CoV-2 infection may cause a variety of clinical manifestations, from mild pneumonia to subclinical illness. Our preliminary results demonstrated that, in addition to age, comorbidity presence, and symptoms at admission, laboratory markers such as WBCs count, lymphocytes count, neutrophil, LDH activities, and CRP levels made the biggest contribution to the prediction of the illness severity.

The patients in the ICU group, according to Wang et al., were older and showed more comorbidities than those in the non-ICU group [22]. Dyspnea and a dry cough were notable admission

symptoms that were significantly more common in the severe group. According to the laboratory analysis, SARS-CoV-2 has an impact on a few common blood indicators. Regarding the admission laboratory results, very ill patients typically have elevated WBCs, neutrophil, lymphocyte activity, LDH, and CRP levels [23].

Higher levels of leukocytes were a distinguishing characteristic of the critically ill patients in the current investigation, which is consistent with the meta-analysis (Zeng et al., 2020) [23], which discovered increased WBC counts in patients with severe COVID-19. Anaemia is a result of SARS-disruption CoV-2's of red blood cells (RBC) and decreased erythrogenesis (Sun et al., 2020) [24]. Lymphopenia was discovered to be a COVID-19 feature that can help differentiate COVID-19 pneumonia from non-COVID-19 pneumonia. According to study, the decrease in lymphocytes is mostly caused by T-lymphocyte subset depletion, specifically T-helper and T-suppressor cells, and the presence of lymphopenia in COVID-19 patients implies significant inflammation and tissue damage [25].

Our data imply that in severe cases, the absolute lymphocyte count is lower, although the difference is not as pronounced as the difference in NLR.

Shi et al., investigated that there is a link between LDH and moderate COVID-19 disease. While Han et al., suggested that the LDH is useful in predicting disease development in severe COVID-19

Henry et al. discovered that an increase in LDH levels is linked with disease severity (OR = 6.53) and death (OR = 16.64) in a meta-analysis comprising nine trials in mild, moderate, and severe COVID-19 patients [26].

Higher WBC, specifically increased neutrophil counts and reduced lymphocyte counts, accurately predicted the severity of COVID-19 disease. An increase in inflammatory cytokines is coupled with a decrease in lymphocytes may due to CD4+ cell death [27]. CRP was also an excellent predictor of the severity of COVID-19 sickness. [28].

In the current study, we discovered that higher WBC counts, CRP levels, and LDH activity were linked to hospital admission in the severe group. Finding a marker that could be used to precisely forecast a severe prognosis was the aim of this study.

We noticed that WBCs, LDH, CRP, and lymphocyte were effective biomarkers for COVID-19 severity diagnosis. As a result, it may be added to the list of severe prognosis predictions that are easy to gather since it is a parameter reported in standard testing. Cellular immunological deficiencies and hypercoagulation may account for all of our study's findings.

4. Conclusions and Recommendations

The coronavirus disease of 2019 exhibits strong haematological symptoms. Common haematological abnormalities have been discovered in COVID-19 individuals with severe and moderate disease. The increases in WBC count, lymphocyte count, and CRP level may be strongly related to other organ injuries, such as liver injury, in COVID-19 patients. WBCs count, LDH activity, CRP level, and lymphocyte count, to a greater extent, were effective predictors for identifying the severity of COVID-19 infection.

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