Acta Scientific MICROBIOLOGY (ISSN: 2581-3226)

Volume 6 Issue 4 April 2023

Research Article

The Role of Some Biomarkers for Diagnosis of Coronavirus Infection in Diyala Province

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DOI: 10.31080/ASMI.2023.06.1235

Received: March 13, 2023

Published: March 20, 2023

Abstract

One of the main viruses that affect people, the Coronavirus, primarily targets the respiratory system. Animals could also be infected by Coronaviruses causing a group of respiratory and gastrointestinal severe diseases. After severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV), severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is the third epidemic coronavirus. SARS-CoV-2 causes Coronavirus Disease 2019 or what so called (COVID-19). Since its first confirmation in December 2019, the spreading of COVID-19 has generated a great interest in all the world. Patients who are severely infected with COVID-19 are susceptible to hyper inflammation (HI), that accompanied biomarkers (BMs) could be useful for risk stratification (RS).

Aim and Objective of the Study: The aim of the presented study is to identify some BMs including: Interleukin-6 (IL)-6, Lactate Dehydrogenase Hormone (LDH), D-dimer, Procalcitonin (PCT), Ferritin, and C-reactive protein (CRP), in patients infected with SARS-CoV-2.

Materials and Methods: Serum samples were taken from patients in Diyala Governorate-Iraq during the period of January to April 2021. After detection of the virus through using of real time-PCR technique, the level of the BMs in study groups have been measured.

Results: The current study revealed highly significant relationship between some of the studied BMs in the mean concentrations in the serum of the patients and control group.

Conclusion: The studied BMs have been accompanied with poor outcomes. They could be the main concerns for RS models in testing of severe COVID-19 (S-COVID-19) and guiding the appropriate clinical care.

Keywords: Coronavirus; IL-6; CRP; Ferritin; D-dimer; PCT

Introduction

One of the main viruses that affect people, the Coronavirus, primarily targets the respiratory system [1]. Animals could also be infected by Coronaviruses causing a group of respiratory and gastrointestinal severe diseases [2,3].

COVID-19 virus is Beta-coronavirus (β-COV). It is one of the four genera classified viruses of Coronaviridae family namely: α-, β-, δ-, and γ-COV. This family is composed of enveloped viruses with single positive-strand RNA. SARS-CoV and the MERS-CoV are strongly pathogenic viruses that have been a public concern during the last twenty years resulting in fatal human diseases [4].

COVID-19 is caused by SARS-CoV-2. Its first affirmation was in December 2019 in Wuhan (China). In spite the fact that making the efforts to control the COVID-19 disease [5], nerulogic clinical signs (CSs) have been observed for more than 36% of the cases including: headache, stroke, seizure, dizziness, and losing of sense of taste or smell. These cases have CSs that are associated with the COVID-19 virus, and are not yet known. However, common dramatic neurologic CSs like consciousness depressing, stroke, and seizure were reported at final stage cases. Direct and intense associations exist between the nervous CSs and the SARS-CoV-2 infection [6].

The confirmation of COVID-19 infection in the neurological tissues [7], and the cerebrospinal fluid [8], could be achieved through RT-PCR, Immunohistochemistry, and Electron Microscopy.

COVID-19 could utilize the cribriform plate in order to enter into the brain and affected it through making variations in smell and sense. Severe respiratory CSs appear in (60) years and elder persons attacked by SARS-CoV-2 as an implication for Alzheimer's disease (AD) [9].

It is still unknown why some patients become severely ill, while others do not. The suggestion of comorbidities and BMs has been reported for RS [10-13]. Proof is increasing, in the case of critically sick patients, that the characteristics of HI are exist, which containing high serum CRP, hyperferritinemia, PCT, and D-dimer. The results propose a probably decisive function of a cytokine storm in SARS-CoV-2 pathophysiology [14]. Laboratory measurement of BMs are essential in a pandemic in order to predict the severity of COVID-19 infection, because efficient allocation of resources is requested especially in the case of respiratory assist preparedness. In this work, a systematic review and meta-analysis were done in order to examine the relation among different BMs specifically: Serum CRP, serum Ferritin, PCT, D-dimer, and the severity of COVID-19 infection.

Material and Methods

The presented study was performed on Iraqi patients, during the period of January to June 2021. This study included two groups: 50 patients and 50 healthy individuals used as control group.

Collection of samples and detection of SARS-CoV2

Serum samples were collected from patient in Diyala Governorate during the period from January to April 2021. Before serum collection, all patient have been examined by real time PCR technique to detection of SARS-CoV2 present. Throat swap were collected from individuals who visited the hospital. After extracted RNAs were processed to RT-PCR using (Bio-Rad CFX96) instruments (Wondfo, China) in our study.

Biomarkers measurement

The estimation of the levels of the following BMs: IL-6, CRP, LDH, Ferritin, D-dimer, and PCT in study groups has been carried out.

Statistical analysis

The Statistical Analysis System - SPSS program was employed to detect the effect of difference factors on the study. T-test was utilized to compare between means of two studied groups.

Results

The study group involved 50 patients and 50 healthy control. Results in this study showed differences between the two groups according to some BMs.

According to Ferritin test, the current study showed highly significant in the mean concentration of patient's serum (409.70 ± 21.312) (ng/ml) when compared with the mean concentration of the control group (79.88 ± 7.135) (ng/ml) as shown in table 1.

Groups	No	Mean ± Std. Error
Patients	50	409.70 ± 21.312
Control	50	79.88 ± 7.135
T. test	14.675	
p value (P < 0. 05)	**	

Table 1: Ferritin levels (ng/ml) in COVID-19 patients and their control group.

While according to the LDH levels the presented study showed highly significant differences in the mean concentration of patient's serum (410.38 ± 21.050) (U/L) when compared with the mean concentration of the control group (133.72 ± 2.268) (U/L) as shown in table 2.

Groups	No	Mean ± Std. Error
Patients	50	410.38 ± 21.050
Control	50	133.72 ± 2.268
T. test	13.067	
p value (P < 0.05)	**	

Table 2: LDH levels (U/L) in COVID-19 patients and their control group.

Whereas, according to CRP level the study revealed highly significant difference in the mean concentration of patient's serum (22.32 ± 1.970) (mg/dl) when compared with the mean concentration of the control group (2.56 ± 0.140) (mg/dl) as shown in table 3.

Groups	No	Mean ± Std. Error
Patients	50	22.32 ± 1.970
Control	50	2.56 ± 0.140
T. test	10.006	
p value (P < 0.05)	**	

Table 3: CRP levels (mg/dl) in COVID-19 patients and their control group.

On the other hand, the results according to the PCT level demonstrated highly significant differences in the mean concentration of patient's serum (0.02 ± 0.001) (ng/ml) when compared with the mean concentration of the control group (.01 ± .000) (ng/ml) shown in table 4.

Groups	No	Mean ± Std. Error
Patients	50	0.02 ± 0.001
Control	50	.01 ± .000
T. test	7.488	
p value (P < 0.05)	**	

Table 4: PCT Levels (ng/ml) in COVID-19 patients and their control group.

And the results according to IL6 levels also revealed highly significant differences in the mean concentration of patient's serum (0.02 ± 0.001) (pg/ml) when compared with the mean concentration of the control group (.01 ± .000) (pg/ml) show table 5.

Groups	No	Mean ± Std. Error
Patients	50	25.24 ± 2.593
Control	50	1.07 ± .059
T. test	9.319	
p value (P < 0.05)	**	

Table 5: IL-6 levels (pg/ml) in COVID-19 patients and their control group.

In regards to the D-dimer levels, the study showed highly significant differences in the mean concentration of patient's serum (1038.00 ± 136.922) (ng/ml) when compared with the mean concentration of the control group (121.02 ± 7.421) (ng/ml) as shown in table 6.

Groups	No	Mean ± Std. Error
Patients	50	1038.00 ± 136.922
Control	50	121.02 ± 7.421
T. test	6.687	
p value (P < 0.05)	**	

Table 6: D-dimer levels (ng/ml) in COVID-19 patients and their control group.

Discussion

COVID-19 cause respiratory diseases of different severity and to detect the disease early without or with fewer complications, many biomarkers have been conducted in many health institutions around the world, allowing physicians to ensure appropriate clinical surveillance, form supportive interventions, and promote clinical outcomes [15]. These BMs have been accompanied with POs. They could be a potential candidate for RS models for estimating of S-COVID-19 for the purpose of guiding clinical care. Among many BM, lymphopenia, CRP, ALT, thrombocytopenia, LDH, D-dimer, leukocytosis, PCT, and AST, are the most predictive BM of S-COVID-19 [16,17]. There was increasing interest to evaluate the function of new promising BMs like presepsin and MDW, besides

to the traditional biochemical BMs, for quick identification of cases at highly risk of complications [18,19]. This result showed that augmented serum PCT, CRP, IL6, LDH, Ferritin, and serum D-dimer levels were related to an elevated composite PO which includes mortality, S-COVID-19, ARDS, and the necessity for ICU care in individuals infected with SARS-CoV-2. There was no significant modification of the estimated effect of gender, COPD, diabetes, age, and cardiovascular diseases.

Siddiqi and Mehra [20] showed that in the systemic HI stage of COVID-19 a significant rising of inflammatory cytokines and BMs were exist. Examples of these BMs are IL-2, IL-6, and IL-7), CRP, TNF-α, D-dimer, granulocyte-colony stimulating factor, PCT, macrophage inflammatory protein 1-α, and Ferritin. This phase contains the most sever symptoms of the cytokine storm where extreme HI might produce cardiopulmonary collapse and multi-organ failure [20,21].

The major pathophysiological characteristics of the disease could be reflected by several BMs. They have been recognized and related to the risk of occurrence of SD. Lymphopenia is a mark of the infection. Its detection could be since the initial phase of disease. High levels of many inflammatory BMs, including: CRP have been discovered in individuals infected by SARS-CoV-2 and related to an augmented risk of SD, that is identified by cytokine storm. Additionally, the elevation of the cardiac and liver dysfunction BMs has been related to PO. In the presented study the principal biochemical characteristics of COVID-19 and the related BMs alteration outlined [4].

The results of the current study were in good accordance with Huang *et al*. and another study (ref). These studies showed the relation of some BMs to an augmented risk for PO in individuals infected by SARS-CoV-2 [12].

Conclusion

The studied BMs have been accompanied with POs. They could be a potential candidate for RS models for estimating S-COVID-19 for the purpose of directing clinical care.

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