



Original Article

Estimation of Serum Ferritin, LDH and Some Biomarker in Patients with COVID19 and Their Relation to Severity of Infection

Noor Mohammed AbdulKader^{1,*}, Ammar Lateef Hussein², Israa Hashim Saadoon³, Ahlam Mahmud Abood⁴

¹M.Sc. Medical Biochemistry Stud., Kirkuk Health Directorate, Kirkuk, Iraq

²Ph.D. Medical Biochemistry, College of Medicine, Tikrit University, Tikrit, Iraq

³Ph.D. Medical Microbiology, College of Medicine, Tikrit University, Tikrit, Iraq

⁴FICMS (haematopathology), Tikrit Health Directorate, Tikrit, Iraq

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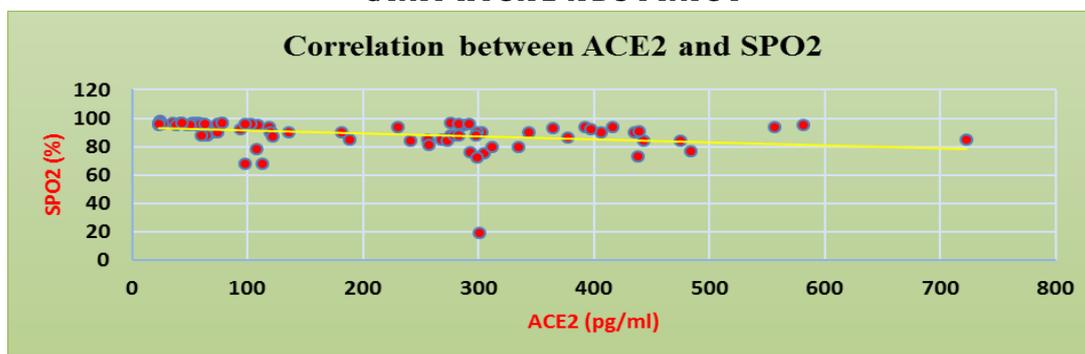
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ABSTRACT

Hyper inflammation is found in severely ill COVID-19 sufferers; corresponding biomarkers may be helpful for risk classification. Our goal was to look at examine the correlation between COVID-19 severity and several biomarkers, such as serum ferritin, D-dimer and C-reactive protein (CRP), procalcitonin (PCT). This study aimed to evaluate the value of the LDH, Ferritin, D-dimer, CRP, Na⁺, and K⁺ as biomarkers in COVID-19 patients. In Tikrit general hospital's isolation unit and Kirkuk general hospital's isolation unit, patients with coronavirus were the subjects of a case-control study from the beginning of January through the end of March 2022. Ninety participants in the study made up the following groups: 30 people who appear to be in good health yet have poor real: 60 COVID-19 patients aged between 13 and 90 years with positive real-time polymerase with moderate symptoms who were admitted to hospital and 20 patients with mild symptoms who were treated as outpatients. Blood samples are taken to measure the levels of these biomarkers LDH, ferritin, D-dimer, CRP, Na⁺, and K⁺, in COVID-19 patients, and compared with the control group, a significant rise in the levels of the biomarkers (LDH, ferritin, CRP, and D-dimer) was seen with means of (261.4 pg/ml, 495.2 iu/l, 394.6 ng/mL, 82.34 mg/l and 165 and there were significant positive associations between ACE2 level and all of these markers, in comparison with control group means (50.07 pg/mL, 288.16 iu/l, 62.6 ng/ml, 4.02 mg/l, 188.93 ng/mL) respectively. The severity of COVID-19 is highly influenced by LDH, D-dimer, CRP, and ferritin. So, these biomarkers play an essential role in the severity of COVID- 19.

GRAPHICAL ABSTRACT



* Corresponding author: Noor Mohammed AbdulKader

✉ E-mail: Email: noor.m@st.tu.edu.iq

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Introduction

Coronavirus 2019 disease (COVID-19) is caused by Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV 2). The new coronavirus was identified in December 2019 as a pandemic from Wuhan, China [1]. Symptoms of COVID-19 can range from a superficial infection to acute respiratory failure syndrome, the chance of hospitalized patients entering the respiratory failure phase is reported to be between 17 and 29% [2]. The severity of the disease varies from asymptomatic and mild to severe, which is mild in 81%, severe in 14% (shortness of breath, hypoxia, or involvement of more than 50% of the lungs on imaging), and 5% severe and critical illness (respiratory failure, shock or dysfunction of several organs) [3]. The mortality rate in this disease is 2.3%. Most fatal cases in elderly patients occur in patients with the underlying diseases (cardiovascular disease, diabetes, chronic lung disease, hypertension, and cancer) [4]. Pneumonia is the most common severe manifestation of infection, characterized in the early stages by fever, cough, shortness of breath, and bilateral infiltration of the chest [5]. At the onset of the disease, the most common clinical features were 99% fever, 40% anorexia, 59% dry cough, 70% fatigue, 35% muscle pain, 31% shortness of breath, and 27% sputum production [6]. This Systematic review study was performed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Selected populations of interest (the emergency condition) attributed to COVID19 terms were considered as the main keywords. Search strings used for the selected conditions are listed in the supplementary Table. In each panel, 2 two independent researchers performed the literature review. The aim of this research was This research aimed to look at the clinical differences between patients who were positive for COVID19, as well as and the apparently healthy subjects who were negative by real-time polymerase chain reaction. This article aimed to investigate the coagulation profile of COVID-19 patients. While our knowledge is limited about COVID-19 immunity, recent cases of reinfection have raised concerns. Cases reported in the

literature were re-infected less than one month after their first infection.

Materials and Methods

This case-control study was conducted in Tikrit General Hospital-isolation Ward/Tikrit City and Kirkuk General Hospital-Isolation Ward for patients infected with the coronavirus. The study included 90 subjects divided into 30 healthy subjects who were negative by real-time polymerase chain reaction "(RT-PCR)" and were used as a control group. Sixty patients aged 13–90 years who were positive for COVID19 by real-time polymerase chain reaction "(RT-PCR)" were included supervision of an expert physician regarding the treatment and observation of the patient's clinical condition. Patients with COVID-19 were 20 patients admitted to a hospital intensive care unit with severe symptoms. Twenty patients with moderate symptoms were hospitalized. Twenty mildly ill patients were treated as outpatients. Clinical examinations were performed on both Patients diagnosed with COVID-19 and have positive RT-PCR results. Any patients who use ACE2 receptor blockers are excluded from study. Each patient was educated about the research's specifics, filled out the questionnaire, and signed out from participating in the study according to Tikrit University /College of Medicine Committee. Tikrit directorate of health has also granted permission to visit Tikrit General Hospital and collect samples from patients were completed. Verbal informed consent was obtained from all patients included in this study, regardless of whether they were considered case controls.

A 5-milliliter blood sample was taken from each patient. Blood was dispensed into test tubes (3 mL gel tube, 2 mL sodium citrate tube). Gel tube samples were centrifuged at 3000 rpm for 10 minutes to obtain serum.

Aliquot 1: Immediate measurement of her D-dimer using a sodium citrate tube requiring plasma.

Aliquot 2: Isolated serum stored at -20°C for subsequent determination of C-reactive protein, ferritin, lactate dehydrogenase, Na^+ , K^+ . The hemolyzed sample was discarded.

Results and Discussion

This study found significant differences ($p \leq 0.05$) in LDH levels between patients (495.28 ± 124.9) and controls (288.16 ± 53.8), respectively, as proven in Table 1.

The present study revealed significant differences ($p \leq 0.05$) in ferritin levels between patients (394.69 ± 337.1) and controls (62.6 ± 29.4), respectively, as shown in Table 2.

The present study revealed significant differences ($p \leq 0.05$) in CRP values between

patients (82.34 ± 113.5) and controls (4.02 ± 3.0), respectively, as shown in Table 3.

The present study revealed significant differences ($p \leq 0.05$) in D-dimer levels between patients (1650.4 ± 2233.2) and controls (188.93 ± 89.3), respectively, as shown in Table 4.

This study found no significant difference ($p=0.937$) in K^+ levels between patients (4.07 ± 0.56) and controls (4.09 ± 0.83), respectively, and no significant difference ($p=0.526$) in Na^+ levels between patients (138.51 ± 4.4) and controls (137.56 ± 7.5), respectively, as shown in Table 5.

Table 1: Comparison of LDH levels among study groups

Study group	Level of LDH Mean \pm SD	<i>P</i> - Value
Patients	495.28 ± 124.9	$p \leq 0.05$
Control	288.16 ± 53.8	

Table 2: Comparison of Ferritin levels between study groups

Study group	Level of Ferritin Mean \pm SD	<i>P</i> - Value
Patients	394.69 ± 337.1	$p \leq 0.05$
Control	62.6 ± 29.4	

Table 3: Comparison of CRP levels between study groups

Study group	Level of CRP Mean \pm SD	<i>P</i> - Value
Patients	82.34 ± 113.5	$p \leq 0.05$
Control	4.02 ± 3.0	

Table 4: Comparison of D-dimer levels between study groups

Study group	Level of D-dimer Mean \pm SD	<i>P</i> - Value
Patients	1650.4 ± 2233.2	$p \leq 0.05$
Control	188.93 ± 89.3	

Table 5: Comparison of K^+ and Na^+ levels between study groups

Study group	Level of K^+ Mean \pm SD	<i>P</i> - Value
Patients	1650.4 ± 2233.2	$P=0.937$
Control	188.93 ± 89.3	
Study Group	Level of Na^+ Mean \pm SD	<i>P</i> - Value
Patients	138.51 ± 4.4	$P=0.526$
Control	137.56 ± 7.5	

There were 60 patients with COVID-19 and 30 healthy subjects without any symptoms. The average hospitalization length of patients with

COVID-19 was significantly higher than the control group, and the abnormal results of LDH were significantly higher among patients with COVID-19 ($p \leq 0.05$) than in the Control group without symptoms. The Mean difference of this parameter was 495.28 U/L (SD, 124.9). The Mean difference of the control group was 288.16 U/L (SD, 53.8); this result showed a significant difference in LDH in patients with severe COVID-19. Patients with COVID-19 were more likely to be admitted to the ICU; a strong correlation has been found between the LDH level, and the pulmonary damage and the severity of the disease [7]. In agreement with Hoseinali Danesh *et al.* 2022 [8], reported high Lactate dehydrogenase was observed high Lactate dehydrogenase in patients with severe COVID-19. The abnormal results of ferritin ferritin results were significantly higher among patients with COVID-19 ($p \leq 0.05$) than in the Control group without symptoms. The Mean difference of this parameter was 394.69 U/L (SD, 337.1). The Mean difference of the control group was 62.6 U/L (SD, 29.4); this result showed a significant difference of in ferritin in patients with severe COVID-19. Ferritin is the "acute phase," which reflects the degree of chronic and acute inflammatory response in the body [9]. Studies report the presence of coagulopathy in severe COVID19 patients [10]. In agreement with the current research results, Verdecchia *et al.* 2020 [11] found that ferritin is related to the severity of the disease in COVID-19 patients. The Mean difference of C-reactive protein was 82.34mg/L (SD, 113.5). The Mean difference of the control group was 4.02 mg/L (SD, 3.0); this result showed a significant difference of in C-reactive protein in patients with severe COVID-19. The C-reactive protein (CRP) is a non-specific acute phase reactor increased in infection or inflammation. C-reactive protein (CRP) was found to be a significantly altered in severe cases with of COVID-19 [12, 13]. In agreement with the current research results, Qinet *et al.* 2020 [14], have revealed significantly higher levels of CRP, a biomarker of disease severity and progression in COVID-19 patients. The Mean difference of D-dimer was 1650.4 U/L (SD, 2233.2). The Mean

difference of the control group was 188.93 U/L (SD 89.3); this result showed a significant difference of in D-dimer in patients with severe COVID-19. D-dimers an early marker for scattered intravascular coagulation, usable in the diagnosis and prediction of the deep venous flow; in COVID-19, with an increase in values in 36% of patients, the level of D-dimer correlates positively with the severity of COVID-19 disease which is considered a prognostic factor for the patient's progression [15]. Guan *et al.* 2020 [16]. Proposed there are a correlation between abnormal D-dimer levels and disease severity in COVID-19 patients. According to the Test of group differences, there were no significant differences were observed between the two types of samples (K^+ , Na^+) for detection of COVID-19 ($P=0.937$) ($P=0.526$).

The findings of the present study present study's findings were strong in relation to concerning the first objective of the study (evaluated evaluating the outcome of Laboratory Tests). Present meta-analysis showed higher LDH, D-dimer, CRP, and ferritin normal sodium and potassium were observed in patients with COVID-19 [17]. There was no correlation between sodium and potassium and severe COVID-19. The results are consistent with common findings in other viral infections, with a recent systematic review showing that the exact cause of death from COVID-19 is not yet known, but multiple. However, multiple organ dysfunction and hypoxia can be causes of death [18]. No correlation has been reported between renal function and disease severity at the time of admission has been reported [19]. In the present study, high-quality studies were used, and one of the strengths of their results was that laboratory analysis of patients with COVID-19 was reported at the time of admission. It is suggested that studies with different populations and comparisons of laboratory results be performed in this field [20].

Conclusion

Evidence showed that at the time of admission of patients with COVID-19, a specific laboratory model can be used to perform relevant tests and make decisions about patients' patient decisions. The laboratory findings in patients with COVID-19 were almost identical to the results of routine laboratory tests for other viral infections. PCR using blood samples was highly sensitive for detecting COVID-19. LDH, D-dimer, CRP, and ferritin play an essential role in the severity of COVID-19.

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Authors' contributions

All authors contributed to data analysis, drafting, and revising of the paper and agreed to be responsible for all the aspects of this work.

Conflict of Interest

The author declared that they have no conflict of interest.

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