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Assessment of Interleukin-10, and Selected Minerals Levels in Patients with SARS-COV-2 in Kirkuk City, Iraq

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ABSTRACT

COVID-19 is an infectious illness resulting from the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with "Coronavirus Disease 2019" as its abbreviated name. Current research examines alterations in CRP, IL-10, ferritin, iron, zinc, calcium, and sodium levels as biomarkers in individuals with COVID-19, comparing them to a control group comprising healthy individuals. This study included a collection of samples from patients diagnosed with COVID-19 and compared them with healthy individuals (control group). The age of the participants ranged from 40 to 60 years. The samples were Gathered over one year the course of one year from various healthcare facilities, including public health centers and private medical clinics located in Kirkuk city, Iraq Biochemical parameters, particularly C-reactive protein, IL-10, ferritin, iron, zinc, calcium, and sodium, were measured using different methods and techniques. The findings indicated a significant elevation in the levels of CRP, IL-10, and ferritin in the serum of SARS-2 patients compared to the control people, while a notable significant decrease in iron, zinc, and calcium and sodium levels was observed. Conclusions: These biomarkers serve as parameters facilitating the early diagnosis of COVID-19 infection. They also assist in assessing the severity and stage of the infection, and can contribute to the treatment strategies for these patients. The alterations in the studied biomarkers might be associated with tissue damage, modifications in the immune system in COVID-19 infected patients, cytokine storms, liver dysfunction, hemophagocytic lymph histiocytosis (sHLH) and or others, however these changes differ from person to other.

Keywords: Covid-19, C-reactive protein, ferritin, IL-10, mineral.

INTRODUCTION

SARS-CoV-2 virus characterized by a halo or corona-as if shape causes Coronavirus disease. The virus was first identified in Wuhan in December 2019 and then spread worldwide to result in Covid-19 pandemic (Gao *et al*., 2020). Despite this origin, the virus rapidly spread among the global population, showing symptoms such as fever, cough, headache, fatigue and respiratory difficulties, with an estimated fatality rate of approximately 3% (Al-Aalim *et al*., 2020).

Various techniques are used to diagnose COVID-19; these include reverse transcription polymerase method (Rtr-PCR), tomographic examination to detect pneumonia and several clinical findings (Abbas *et al*., 2020). Additionally, immunological analyses such are C-reactive protein and IL-10 are used. Studies suggest arise in IL-10 (IL-10) is correlated with unfavorable prognoses in Covid-19 patients (Abbas *et al*., 2019). Furthermore, serum or plasma Ferritin level is directly correlated with the total iron stored. Iron, which plays a protective role against inflammation, is elevated during. The infection and can be used an additional diagnostic tool.

Action and can be used an additional diagnostic tool (AL-Furat, 2020). Moreover, a deficiency of minerals like zinc, calcium and sodium has a significant risk for patients with covid-19 (Prasad, 2020). Essentially, zinc deficiency has been observed to impair interleukin-10 production, consequently affecting Th1 response and its related functions. In addition to hyponatremia and calcium, sodium is one of the most prevalent electrolyte disturbances associated with elevated death averages (Han *et al*., 2020).

The present study aimed to evaluate the correlation between the (IL-10) and some minerals with COVID-19 in patients with COVID-2 in Kirkuk City - Iraq.

MATERIALS AND METHODS

Sample collection

80 blood samples were collected, among which 40 samples were from patients with COVID-19 and 40 samples from healthy patients as control group. The specimens collected from patients with ages of (40-60 years, Sample collection period). The samples were gathered over the course of one year from various healthcare facilities, including public health centers and private medical clinics located in Kirkuk city, Iraq the samples were centrifuged to obtain serum.

Laboratory Analysis

C - Reactive protein

C-reactive protein (CRP) level was determined with VEDA.LAB device, using a method explained by (Ridker, 2003).

IL-10, Ferritin

The level of inflammatory cytokines (IL-10, ferritin), were estimated, according to the ELISA Sandwich approach, the ELISA technique was utilized to measure the quantity of variables. From the Chinese company (Melsin Medical).

Iron and Zinc

The iron and Zinc level were determined using the colorimetric method as described by research method (Afroz *et al*., 2020).

Calcium and Sodium concentration

The Tunisian company Biomagribe, using atomic absorption, atomic emission, and flame emission spectrophotometer measured calcium and sodium concentrations according to a ready-made assay kit.

Statistical Analyses

The results of the entire variables were analyzed using SPSS statistical program, to asses mean standard deviation (SD), and the special differences between all groups were identified using the T. Test.

RESULTS

(Table 1) contains the mean date and S.D of CRP, IL-10, ferritin, iron, zinc, calcium and sodium from patients with COVID-19 and healthy people (control group).

Table 1: The mean ± standard division in the serum of blood in all groups.

Variables	Mean ±S.D		P≤
	Control	Patients	
CRP (mol/L)	6.582±1.344	75.201±15.135	≤0.001
IL10(pg/ml)	3.96±1.26	14.74±3.11	≤0.001
Ferritin (ng/ml)	129.01±45.21	476.54±78.98	≤0.001
Iron (µmol/L)	88.43±23.26	27.92±11.13	≤0.001
Zinc (mg/dl)	6.04±75.32	3.87±30.19	≤0.001
Calcium (mg/dl)	10.56±3.21	6.96±1.27	≤0.001
Sodium (mg/dl)	8.23±4.32	3.72±2.25	≤0.001

The results showed a significant rising at p≤0.001 in (CRP, IL-10, ferritin) levels in the serum of patients infected with COVID-19 compared to healthy group, as shown in Fig. (A, B and C), respectively. Additionally, the results showed a significant reduction in (iron, zinc, calcium, sodium) level in the sera of patients with the infected patients compared to healthy people, as in Fig. (2: A, B, C and D), respectively.

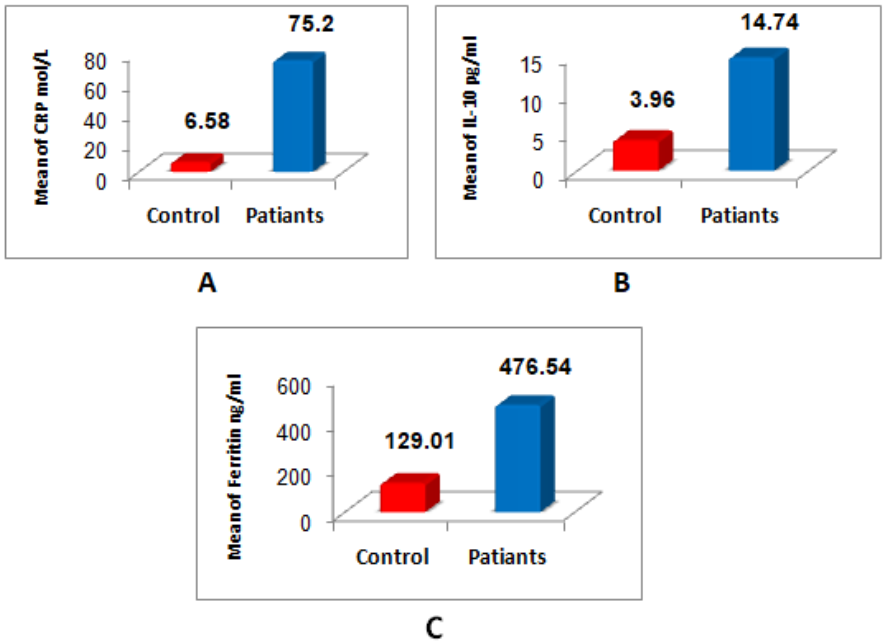

Fig. 1: A- CRP level in serum of groups; B- IL-10 level in serum of groups; C- Ferritin level in serum of groups.

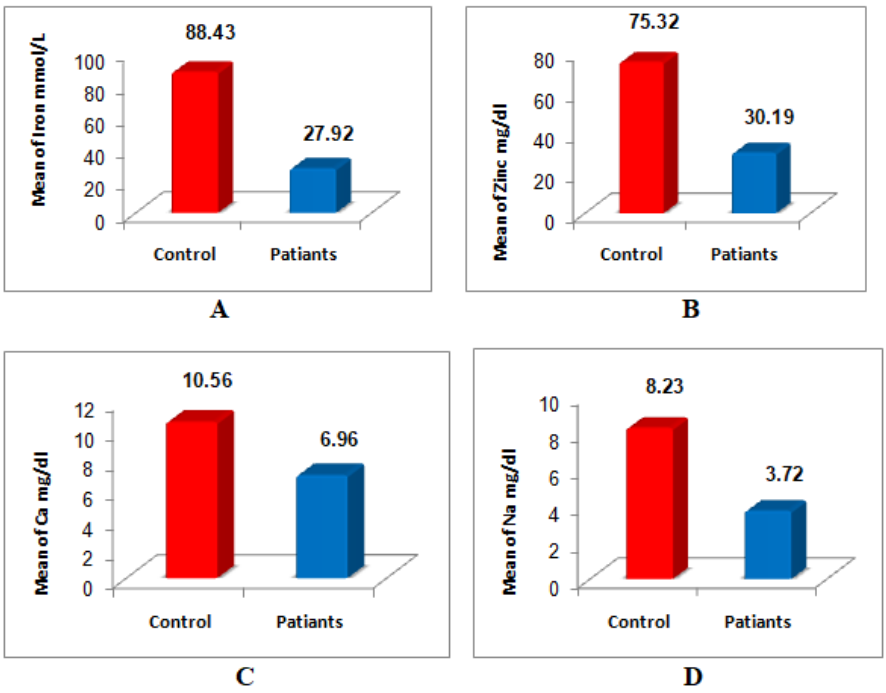

Fig. 2: A- Iron level in serum of groups; B- Zinc level in serum of groups; C- Calcium level in serum of groups; D- Sodium level in serum of groups.

DISCUSSION

The results showed rises in CRP levels are 75.2 in serum of patients and 6.58 mol/L in control Fig. (1: A) as a high of CRP concentration indicates more severe infection and is used as an indicator for the risk of the COVID-19 infection. The results of this study agree with (Li *et al*., 2020), while other research [11] mentioned is in the early stage of infection, CRP concentration is positively associated with lung deterioration and can reflect disease progression, therefore, the CRP is a biomarker closely associated with the progression of infection and rises significantly during the early phase of inflammation (Chan *et al*., 2020).

CRP produces pro-inflammatory cytokines that stimulate apoptosis. An inflammatory state during illness can lead to outcomes like severe organ failure. Various body systems including the Lungs, heart, and other organs are affected by high levels of CRP in patients with developed SARS-COV-2 infection (Hassan and Abbas, 2022).

On the other hand, serum interleukin-10 showed a significant elevated in the patients compared with healthy group (14.74 and 3.96 respectively) as in Fig. (1: B), this result of the study agrees with the results of (Islam *et al*., 2021), therefore the rise in IL-10 can be interpreted as an attempt to reduce the severity of inflammation in patients and reduce tissue damage. Thus, elevations in IL-10 and other pro-inflammatory cytokines have a significant correlation with disease severity worsening (Neidhart *et al*., 2005).

Ferritin likewise showed a significant rise in the serum of COVID-19 compared with healthy people (476.54 and 129.01 respectively), which could be related to immune dysfunction and/or tissue damage in the patients, this results agreed with (Banchini *et al*., 2021), this significant difference in ferritin (p-value less than 0.05) can be a reliable diagnostic marker for predicting the severity of the disease in the patients, however, another study showed that ferritin concentration, which revealed for coronavirus, was within the normal range and were less than (400 ng/Ml) in patients with non-severe disease compared to severe cases (Gómez-Pastora *et al*., 2020). Also, the result showed a low level of iron (27.92 in patients and 88.43 in control group) as in Fig. (2: A) with p-value (0.001), this significant change leads to anemia, while high levels of iron cause excessive oxidative stress that damages cells and various organs of the body (Litton and Lim, 2019).

The level of zinc Fig. (2: B) also showed a decrease in the serum of COVID-19 patients compared with healthy group (30.19 and 75.32 for patients and control groups respectively), as the results of the research agree with (Name and Souza, 2020), this significance is because zinc involved in various cellular processes and possesses and variety of antiviral properties, and its deficiency is linked to decreases in antibodies (Skalny *et al*., 2020), additionally, zinc also affects the secretion of pro-inflammatory cytokines that interfere with antigen-related leukocyte function, thereby suppressing the inflammatory reaction, zinc affects multiple aspects of the immune system (Shankar and Prasad, 1998).

Calcium also showed a reduction in the serum of SARS-2 patients compared with healthy group (6.96 and 10.56 respectively) as depicted in Fig. (2: C), as the results of our study agree with (Alemzadeh *et al*., 2021), this will lead to hypocalcemia (low calcium level in blood), causing prolonged hospitalization, and ICU admission, and elevated D-dimer and rising the mortality in coronavirus patients (Crespi and Alcock, 2020), it is also important to mention the association between Hypocalcemia and risk infection with corona can be explained by the production of pro-inflammatory cytokines. This also results in a higher mortality rate through the interaction between Ca levels in the blood and the immune system (Chan *et al*., 2020).

Sodium also decreased the serum of COVID-19 patients in the control group (3.72 and 8.23), as in Fig. (2: D), the findings of the current research agreed with (Islam *et al*., 2022). Hyponatremia (low levels of sodium in the blood) may be associated with the development of the severity of SARS disease, there are several hypotheses related to the pathophysiological mechanism of hyponatremia in patients with Corona, including; it's association with the syndrome of non-regulation secretion of antidiuretic hormone, due to acute respiratory distress syndrome (Xun, 2019; Werion *et al*., 2020), on the other hand disruption of the normal immune response and massive secretion of pro-inflammatory cytokines can lead to increased secretion of antidiuretic hormone, leading to disease progression (Hassan and Abbas, 2022).

CONCLUSIONS

COVID-19 is an infectious illness resulting from the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), with "Coronavirus Disease 2019" as its abbreviated name. Current research investigates the changes in the levels of CRP, IL-10, Ferritin, iron, zinc, calcium and sodium as biomarkers in COVID-19 patients and compares it with control group (healthy individuals). It was found to be arise in the levels of CRP, IL-10 and Ferritin, in COVID-19 patients and compares it with control. Also, decreased the levels of iron, zinc, calcium and sodium in COVID-19 patients and compared it with control. These changes could be related to the tissue damage, changes in the immunity system due to infection with COVID-19, cytokine storm, Liver dysfunction, hemophagocytic, lymph histiocytosis (sHLH), hypocalcemia, Hypernatremia.

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تقييم مستويات الانترلوكين −10 وبعض المعادن المختارة لدى المرضى المصابين بفيروسSARs-COV-2 في مدينة كركوك، العراق

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الملخص

شملت هذه الدراسة جمع عينات من مرضى تم تشخيصهم بكوفيد−19، ومقارنتها بأفراد أصحاء (المجموعة الضابطة). تراوحت أعمار المشاركين بين 40 و60 عامًا. تم جمع العينات على مدار عام من مختلف المرافق الصحية، بما في ذلك مراكز الصحة العامة والعيادات الطبية الخاصة الواقعة في مدينة كركوك، العراق. تم قياس المعايير البيوكيميائية، وخاصة البروتين التفاعلي -C، والإنترلوكين−10، والفريتين، والحديد، والزنك، والكالسيوم، والصوديوم باستخدام طرق وتقنيات مختلفة. أشارت النتائج إلى ارتفاع كبير في مستويات البروتين التفاعلي -C، والإنترلوكين−10، والفريتين في مصل مرضى SARS-2 مقارنةً بالمجموعة الضابطة، بينما لوحظ انخفاض كبير في مستويات الحديد، والزنك، والكالسيوم، والصوديوم.

تعمل هذه العلامات البيولوجية كمعايير تسهل التشخيص المبكر لعدوى كوفيد−19. كما تساعد في تقييم شدة ومرحلة العدوى، ويمكن أن تساهم في استراتيجيات علاج هؤلاء المرضى. قد تكون التغيرات في العلامات البيولوجية المدروسة مرتبطة بتلف الأنسجة، وتعديلات في الجهاز المناعي لدى مرضى كوفيد−19، وعواصف السيتوكين، واختلال وظائف الكبد، والمتلازمة اللمفاوية البلعومية الدموية (sHLH) أو غيرها، إلا أن هذه التغيرات تختلف من شخص لآخر.

الكلمات الدالة: كوفيد-19، بروتين سي التفاعلي CRP، الفرتيين، انترلوكين -10، بعض المعادن.