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EVALUATION OF SOME BIOCHEMICAL PARAMETER ON CHRONIC RENAL FAILURE BEFORE AND AFTER INFECTION WITH SARS-COV-2

Haba Muatasim Bakr BAKR
Cankiri Karatekin University
Advisor: Assoc. prof. Dr. Şevki ADEM
Cankiri Karatekin University
Co-Advisor: Prof. Dr. Morning Hussian KORSHEED
University of Kirkuk
Email : habam2@gmail.com

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Abstract:

In the current investigation, the researchers wanted to determine the levels of liver enzyme activity, renal function, and other biochemical parameters in CKD patients who either had or did not have COVID19 infection. At Azadi Teaching Hospital and Al-Jumhuri Hospital, it was stated that a total of one hundred patients were infected with CKD and with or without COVID-19 between the months of December 2022 and January 2023. The investigation was carried out at independent research facilities located in Kirkuk, Iraq. The results showed that the kidney functions of CKD patients, urea and creatinine levels were significantly (P< 0.05) higher in patients without COVID and in patients with COVID when compared to the control group. Concerning the levels of liver enzymes in CKD patients, AST, ALT, and LDH levels exhibited non-significant (P< 0.05) differences in comparison to the control group when comparing patients with COVID and patients without COVID. For electrolytes, S. calcium levels exhibited a significant (P<0.05) decrease in patients who did not have COVID as well as those who had COVID when compared to the control group. When compared to the control group, patients who did not have COVID and patients who did have COVID had significantly higher levels of zinc and phosphorus in their serum (P<0.05). When compared to the control group, patients without COVID and patients with COVID both revealed substantial (P<0.05) decreases in their vitamin D concentrations.

Keywords: liver enzymes, COVID-19, chronic renal disease, vitamin D, electrolytes, kidney functions.

INTRODUCTION

The common cold, Middle East respiratory syndrome, & acute respiratory syndrome are just a few examples of the illnesses that can be caused by coronaviruses, which are a family of viruses that are responsible for a variety of respiratory ailments. In 2019, researchers made the startling discovery that a previously unidentified coronavirus was the culprit behind an outbreak that occurred in China. This virus is related to members of the RNA virus family, which is responsible for the infection of a wide range of animal species [1-2]. All 30,000 nucleotides that constitute constituent parts of the coronavirus genome have been accounted for in this study. In the process of encoding, in addition to the many nonstructural protein molecules (nsp), there are four structural proteins that are involved: nucleocapsid (N), membrane (M), and envelope (E) [1]. Chronic kidney disease, also known as CKD, is a condition that raises a person's risk of passing away if they are exposed to the covid 19 illness during an outbreak. Many studies have shed light on the high occurrence of this infection as well as the damage it might cause in individuals undergoing dialysis. Patients who have chronic kidney disease have a higher risk of developing symptoms of infection as a result of a compromised immune system, pathological inflammation, higher levels of oxidative stress, uremia, and endothelial dysfunction. This increased risk is due to the fact that these factors all contribute to a weakened immune system. Proteinuria, hematuria, and elevated blood levels of urea and creatinine are all markers of kidney impairment, and COVID-19 patients frequently exhibit all four of these symptoms [3]. In addition, a

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meta-analysis indicated that chronic kidney disease (CKD) should be recognized to be a significant risk factor for COVID-19 [4]. According to the findings of Cheng et al. [5], COVID-19 patients were shown to have a high prevalence of kidney illness at admission, as well as a large in-hospital mortality rate. As a consequence of this, it is of the utmost necessity to have a solid comprehension of the risks that are posed to patient groups by the presence of such co-morbidities. So the current study was aimed to estimate the levels of kidney function, liver enzymes (ALT and AST), vitamin D and some trace elements (calcium and phosphorus) in CKD patients whose infected with COVID-19.

MATERIALS AND METHODS

Patients

50 blood samples were taken from men and women with chronic renal failure who were not infected with the Corona virus. The patients' conditions were diagnosed by specialized doctors. Another 50 blood samples were gathered from people with chronic renal failure who were infected with the Corona virus. The cases of the infected were diagnosed by specialized doctors. Diabetics and pregnant women were not included in the sample collection. For the purpose of this research, fifty blood samples were taken from men and women who seemed to be in good health. These participants served as a control group because they did not have chronic renal failure and were not infected with the Corona virus.

Groups of the Study

In Azadi Teaching Hospital & Al-Jumhuri Hospital, it was stated that a total of one hundred patients were infected with CKD and with or without COVID-19 between the months of December 2022 and January 2023. The investigation was carried out at independent research facilities located in Kirkuk, Iraq. In this investigation, the volunteers were divided into three distinct groups:

A. Those who were healthy and did not have chronic renal failure but were not infected with the Corona virus made up Group C.
B. Group A: patients with chronic renal failare, not infected with the Corona virus.
C. Group B: patiens with chronic renal failare and infected with the Corona virus.

Blood Samplings

Before having their blood and urine analyzed, the participants in the study were required to abstain from food for ten to twelve hours. They were stored in EDTA tubes and SST tubes respectively. In order to separate the serum samples, which were kept in Eppendorf tubes, they were centrifuged for ten minutes at a speed of 3,500 revolutions per minute. After the process of collecting the samples was finished, each one was dissolved so that it could be used in the subsequent biochemical study that including measure the levels of urea, creatinine, liver enzymes, vitamin D and some trace electrolytes by using colorimetric method.

Statistical analysis

For the statistical analysis of the data, we utilized the computer applications SPSS version 21 and GraphPad prism version 8 on our computers. The findings of the statistical tests, as well as the bar graphs, were presented as Mean SE. The unpaired T-test, also known as the Mann-Whitney U test, was utilized in order to compare the parameter means of the patient group to those of the control group.

RESULTS & DISCUSSION

Estimated Glomerular Filtration Rate (eGFR)

While other stages of kidney disease were reported, the results of the current study showed that the percentage of patients with renal failure was 99 (90%). Among the patients who were reported to be in the third stage of kidney disease, there were 4 (3.6%). The fourth stage included 4(3.6%)patients, as shown in Table (1).

Table 1. Age groups of in present study

Gender Stages	Mean ± SD	Male	Female	Total
Stage 1	———	———	———	———
Stage 2	128.94±57.04	2(3.4%)	1(1.9%)	3(2.8%)
Stage 3	31.48±3.75	1(1.7%)	3(5.8%)	4(3.6%)
Stage 4	20.74±2.03	3(5.2%)	1(1.9%)	4(3.6%)

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Stage 5	11.84±3.11	52(89.7%)	47(90.4%)	99(90%)
Total	_____	58(52.7%)	52(47.3%)	110(100.0%)

Kidney Functions

Table 2 show some kidney functions in of CKD patients, where urea levels demonstrated significant (P <0.05) elevated in patients without COVID (168.12 ± 34.09) and with COVID (175.82 ±43.62) compared to control group (21.64 ±3.89). creatinine levels demonstrated significant (P <0.05) reduce in patients without COVID (9.92 ± 2.05) and with COVID (10.72 ± 3.95) compared to control group (0.94 ± 0.25).

Table 2. Kidney function in studied groups

Groups Parameter	Control (40)	Patients (110)		P-Value
		Without COVID	With COVID	
Urea mg/dl	21.64 ±3.89	168.12 ± 34.09*	175.82 ±43.62	0.001
Creatinine mg/dl	0.94 ± 0.25	9.92 ± 2.05*	10.72 ± 3.95	0.0001

The amount of urea nitrogen in the blood has been shown to have a direct correlation with the excretory process of the kidney. When CKD is present, the kidney is unable to eliminate urea, which results in increased levels of the waste product in the blood. This failure to excrete urea is due to damage that has occurred within the kidney itself, which has led to tubular necrosis and a loss of the ability to filter. It's also possible for kidney damage to be caused by medications. Because of the decreased rate of renal excretion, the dehydration that is produced by CKD can also lead to an increase in the amount of urea [6]. Patients with chronic kidney disease have decreased renal excretion, tubular secretion, and creatinine degradation, which results in an elevated creatinine level. Moreover, consumption of meat and the use of protein supplements both result in a rise in serum creatinine. Medications that block tubular creatinine secretion and impair the breakdown of creatinase by the stomach are another explanation for a high level of creatinine. A high amount of uric acid is a symptom of chronic kidney disease (CKD), but it can also be caused by other causes that contribute to renal disease. This rise leads to a decrease in glomerular filtration rate (GFR) as well as tubular secretion, which ultimately results in renal insufficiency. This metric determines even the initial asymptomatic phases of chronic kidney disease (CKD), and the fall in GFR signifies the permanent loss of nephrons. It is a reflection of the rate at which exogenous chemicals are cleared out of the plasma and into the urine [7-8].

Liver Enzymes

Table 3 show some kidney functions in of CKD patients, where urea levels demonstrated non-significant (P <0.05) changes in patients without COVID (16.93 ± 6.37) and with COVID (15.47 ± 5.94) compared to control group (21.72 ± 4.05). creatinine levels demonstrated non-significant (P <0.05) changes in patients without COVID (12.84 ± 4.94) and with COVID (14.91 ± 6.84) compared to control group (18.83 ± 3.17). LDH levels demonstrated non-significant (P <0.05) changes in patients without COVID (184.94 ± 31.95) and with COVID (166.94 ± 42.37) compared to control group (157.94 ± 39.12).

Table 3. Liver enzymes in studied groups

Groups Parameter	Control (40)	Patients (90)		P-Value
		Without COVID	With COVID	
AST U/L	21.72 ± 4.05	16.93 ± 6.37	15.47 ± 5.94	0.246
ALT U/L	18.83 ± 3.17	12.84 ± 4.94	14.91 ± 6.84	0.193
LDH U/L	157.94 ± 39.12	184.94 ± 31.95	166.94 ± 42.37	0.289

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According to the findings of the study, there is a statistically significant reduction in serum AST and ALT activity among patients with CKD before and after hemodialysis (COVID), in comparison with the healthy control group. There are a number of potential causes that could result in an abnormally low amount of enzymatic activity when compared to the levels that are considered typical for ALT and AST. While some research link the reason to the presence of inhibitory chemicals to the activity of the enzymes in the uremic media, glomerular lesion also may cause drop in activity level, other studies do not discover explanation to this decline in activity level. Some studies have ascribed the cause to a probable shortage in vitamin B6 (pyridoxal phosphate is a cofactor for both enzymes [9]; other studies have not found a reason for the decline in activity It is possible that the hemodilution and fluid retention that occur as a result of the dialysis process were responsible for the drop in ALT, AST, and ALP activity levels before the dialysis [10-12]. In addition, the LDH isoenzymes test can be used to assist in the localization of injured organs or tissues. It is believed that COVID-19 causes direct liver damage in patients by causing viral hepatitis in addition to immunological reactions involving intrahepatic cytotoxic T cells and Kupffer cells [13]. Han et al. [14] came to the conclusion that either there is a strong link between LDH and lung damage and the severity of the disease, or that the destruction of the heart muscle and liver caused by COVID-19 is due to direct damage from the virus to the target organ rather than hypoxia caused by lung injury.

Electrolytes

Table 4 show some electrolytes in of CKD patients, where calcium levels demonstrated significant (P <0.05) reduce in patients without COVID (5.58 ± 1.58) and with COVID (5.37 ± 0.92) compared to control group (9.52 ± 1.59). S. Phosphorus levels demonstrated significant (P <0.05) elevated in patients without COVID (6.37 ± 1.04) and with COVID (5.41 ± 1.35) compared to control group (3.58 ± 0.58). Phosphorus levels demonstrated significant (P <0.05) elevated in patients without COVID (128.39 ± 21.6) and with COVID (117.39 ± 11.67) compared to control group (78.93 ± 9.45).

Table 4. levels of some electrolytes in studied groups

Groups Parameter	Control (40)	Patients (110)		P-Value
		Without COVID	With COVID	
S. calcium (mg/dl)	9.52 ± 1.59	5.58 ± 1.58*	5.37 ± 0.92	0.0001
S. Phosphorus mg/dl	3.58 ± 0.58	6.37 ± 1.04*	5.41 ± 1.35	0.03
Zinc Ug/dL	78.93 ± 9.45	128.39 ± 21.65*	117.39 ± 11.67	0.001

According to the findings of the current study, the level of calcium was significantly lower in the patients group when compared with the control group. Also, the male participants were significantly more affected than the female participants. Our result is compatible with those findings. Because patients with chronic renal impairment have kidneys that are unable to produce the active form of vitamin D, which is necessary in the process of calcium absorption, a disturbance in the metabolism of vitamin D causes a decrease in the absorption of calcium from the intestine, which in turn causes a decrease in calcium levels. Another reason for the decrease in calcium levels is that patients with chronic renal impairment have a disturbance in the function of vitamin D, which causes a decrease in calcium levels [15]. This result is in line with the findings of Al-Rawi et al. [15], who found that the level of calcium was significantly lower in the patients group (7.73±0.81 mg/dl) compared with the control group (9.35±0.39 mg/dl). Low calcium levels may also be caused by an increase in the amount of phosphorous in the blood, which is inversely proportional to calcium [16]. This means that when the concentration of one of them goes up, the concentration of the other goes down [15].

Vitamin D

Table 5 show some electrolytes in of CKD patients, where vitamin D concentration demonstrated significant (P <0.05) reduce in patients without COVID (8.58 ± 1.63)

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and with COVID (8.12 ± 1.92) compared to control group (21.94 ± 4.04).

Table 5 levels of vitamin D in studied groups

Groups Parameter	Control (40)	Patients (110)		P-Value
		Without COVID	With COVID	
Vit. D (mg/dl)	21.65 ± 4.04	8.58 ± 1.63*	8.12 ± 1.92	0.0001

There was a statistically significant regressive relationship between renal illness and vitamin value. According to D'Aurizio et al. [17], vitamin D deficiency can be caused by a number of factors in addition to diet and sun exposure. These factors include gender, race, age, obesity, and inefficient vitamin D production and metabolism. An inverse link between the degree of albuminuria and the amount of vitamin D was shown by the researches from clinical studies and associated data from the examination survey of the third national health and nutrition examination. These proofs and researches came from clinical studies. Based on these findings, it seems plausible that vitamin D exerts its anti-proteinuric effects via a RAS-angiotensin II-mediated pathway [18].

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