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The Adverse consequence of covid-19 causing liver and kidney dysfunctions

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ABSTRACT

The COVID-19 outbreak is a substantial public health concern around the world. The most common complication of COVID-19 infection is lung damage. However, damage can occur in other organs, including liver, cardiac dysfunction, kidney dysfunction, and intestine disorder. This research aims is to evaluate the function of two main organs in the human body, the liver, and kidney, assess the organ's function by measuring the clinical features and test abnormalities in COVID-19 patients, and to compared with previous publications, and highlighted on adverse of pharmacological utilized in the treatment of covid-19 patients. This study included collcting the blood from 60patients with an average age of (58.718) was admitted between August and December 2021 to Al-Shefa hospital in Al-Ramadi city with a severe infection of SARS-CoV-2, and from 20 as control group. Multiple of liver and kidney biomarker was measured to demonstrated the adverse consequence of (SARS-CoV-2). And shedding light on the influences that occurred on the values of biomarkers of both liver and kidney function.

The clinical measuring of liver function involved Alanine aminotransferase (ALT) (80.308±69.334) aspartate aminotransferase (AST) (60.205±48.013), Lactate Dehydrogenase (LDH) (773.667±437.657), C-reactive protein (CRP) (64.205±37.327), which were significantly high with ($p<0.01$) and Alkaline phosphate (ALP) (404.590±339.462) was significantly high with ($p < 0.009$) and albumin level (2.982±0.629) had decreased with ($p<0.003$) as comparing with control group. The kidney dysfunction was evaluated by Serum levels of urea (76.056±59.827) and creatinine (1.570±0.947), both were highly significant with ($p<0.004$), ($p<0.001$) respectively when compared with control group. percentage level of elevating or reducing in most measured biomarkers in this study was higher than from the previous studies. In this manuscript, we analyzed the adverse consequences of covid-19 developed from the virus itself or the strategy protocol of drugs utilized that might induce liver and kidney damage in COVID-19 Iraqi individuals. in other words, We presented the clinical management aimed at demonstrating the organ damage caused by COVID-19 and anti-COVID-19 pharmacological therapies utilized.

Introduction

SARS-CoV-2 primarily affects the respiratory system, with cough, dyspnea, and fever now the most widely recognized symptoms[1]. In severe circumstances, patients may acquire pneumonia and related complications, such as acute respiratory distress syndrome (ARDS), respiratory failure, septic shock and sepsis, thrombosis, and multi-organ failure, which includes acute kidney damage liver malfunction, and cardiac failure eventually, death[2,3]. In this research, the to focus is more

on liver damage and kidney failure (changing the biomarker's features and clinical characteristics) in covid-19 patients with acute infection. However, it is still unclear whether COVID-19-related impairment or dysfunction of the liver and kidney are caused primarily by a viral infection or by other coexisting reasons such as the use of wrong strategies protocol of treatment like potentially hepatotoxic medicines and the impact of the systemic inflammatory response[4]. Many medicines can impact and impair liver function, some can produce an asymptomatic increase of liver enzymes, in other situations, severe hepatitis may develop, and liver damage may rely on the amount of the drug used. Among the pharmaceuticals that might harm the liver include antibiotics, anti-inflammatory medications, and antiviral medication.

Furthermore, medicines administered during the covid-19 epidemic may contribute to organ damage.[5]. The SARS-cov2 virus enters the host cell via the key site called Angiotensin-Converting Enzyme 2 (ACE2), which is found in the lungs, liver, kidneys, and heart [6,7]. In nutshell, retrospective studies conducted in different countries found that impaired liver and renal functions were linked to an increased chance of having acute COVID-19.

Multiple evidences indicate that the respiratory system is not the sole organ harmed by the Covid-19 pathogen. Kidney damage has also been documented as a frequent complication of this condition, particularly in individuals suffering severe symptoms[8]. According to the most recent statistics, acute kidney diseases (AKD) occurred in 37 percent of COVID-19 patients in New York [9]. History of renal disorders and AKD during hospitalization has been associated with an elevated risk of death[10] However, the abnormalities in kidney function caused by severe acute respiratory syndrome-coronavirus-2 (SARS-CoV-2) infection, as well as its prognostic value and outcome of COVID-19, warrant further investigation. Renal Phenomenon of Acute Kidney Injury (AKI) is the progressive leading cause of kidney failure that occurs within seven days[8]. AKI has been documented in COVID-19 patients. Even though the exact pathophysiology of kidney damage in COVID-19 infection is undetermined, it has been observed that AKI in COVID-19 is linked with sepsis, shock, and multiorgan failure, demonstrating that AKI is caused by extensive tubular necrosis[11]. Previous researchers found that 15.5 percent of patients had raised serum creatinine and 14.1 percent had elevated blood urea nitrogen, respectively[12]. According to the newest study, COVID-19 individuals who had AKI had a 5.3-fold higher mortality risk than those who did not acquire acute kidney injury (AKI)[13].

Previous meta-analysis researches involving 3428 patients from 20 retrospective investigations attempted to determine the relationship between liver malfunction and the severity of COVID-19 illness. It was discovered that liver damage appeared to be more prevalent among people who had bad consequences from COVID-19 infection[14]. Recent studies on COVID-19 syndrome, which demonstrated that the incidence of liver damage varied from 58 % to 78 %, mostly evidenced by high ALT and AST values and linked with slightly reduced albumin levels[15,16]. According to the most recent study, increased serum LDH is a distinct risk marker for death due to COVID-19, or, in other words, raised LDH level upon admission is an independent risk factor for the intensity and mortality of COVID-19[17]. The recent studies demonstrated the relationship between liver damage and COVID-19 effects was investigated by assessment of Alanine aminotransferase (ALT), aspartate aminotransferase (AST), alkaline phosphatase (ALP), and lactate dehydrogenase (LDH) levels in serum were increased over the Upper Limit of Normal in 25.73 %, 49.17 %, 24.21 %, and 55.84 % of patients, respectively[18]. In another recent study [19] " During their admission, 129 (56.3 %) of 228 patients had abnormalities liver function tests, including increased alanine aminotransferase (ALT) (84 [36.8 %]), aspartate aminotransferase (AST) (58 [25.4 %]), and alkaline phosphatase (ALP) (12 [5.3 %]). The peak value of ALP may be a sign of virus-related liver problems, and so this result may be accompanied by an adverse prognosis. The highest ALP levels may be suggestive of a worse ultimatum [20]. CRP was shown to be an independent prognostic factor of an unfavorable outcome, with a sensitivity of 90.5 %, and specificity of 77.6 %, [21]. CRP levels rapidly climb, and the amount of rising is usually related to the degree of covid-19 infection [22].

The purpose of this research is to investigate the clinical features and functionality characteristics of the kidney and liver of the enrolled patients with severe SARS-COV2 infection. Determining the significant correlation and underlying biological mechanisms connecting the liver and kidney performance diagnostics and severe COVID-19 is critical for demonstrating disease pathophysiology, high-risk identifying of this disease, and developing strategies of treatment for the COVID-19 virus.

Material and method

This research is a single-centred clinical study involving the clinical characteristics and laboratory tests of patients with laboratory-confirmed SARS-CoV-2. The analysis covered 60 adult individuals, with an average age (58.718) from 35-75 years, 40 patients infected with severe COVID-19 were admitted to Al-Shefa hospital in Al-Ramadi city, and 20 as control group without infection. data and blood samples were collected from Covid-19 patients hospitalized between August and December 2021.

5 ml blood samples were collected in a gel tube and centrifuge the blood sample for 10 minutes to get

on clear serum. The serum was separated from cells and kept at -20 ^{0}C until use in the assay. The level of biomarkers was determined by using a spin react spin 200E automatic biochemistry analyzer.

Statistical analysis:

In this study the JASP program version (0.8.5.1) was utilizes to find the mean(M), standard deviation (SD) and P value.

Results

The results of this research demonstrated that, all the parameters was measured had been elevated with high clinical significance expect the albumin was reduced also with high clinical significance. The investigation of the liver function by measuring the anomalies in liver tests in SARS-COV2 patients showed elevated liver enzymes and CRP and lowered the albumen levels. The results in (Tables 1 and 2), had shown significantly high for the following biomarkers when compared with control group, ALT 67% high level with (80.308±69.334) ($p < 0.01$), AST 59% elevated level with (60.205±48.013) ($p < 0.01$), CRP 97% high level with (64.205±37.327) ($p < 0.01$) as shown in fig(1), Albumin (ALB) 59% lowered level with (2.982±0.629) ($p = 0.033$) and LDH 74% elevated level with (773.667±437.657) ($p < 0.01$), Alkaline phosphate (ALP) 67% high level with (Mean±SD) (404.590±339.462) ($p < 0.009$) as shown in Fig(2). The clinical parameters of kidney function were evaluated by Serum levels of urea and creatinine. Urea was highly significant with 62% elevated level in infected patients (76.056±59.827) ($p < 0.004$), and creatinine was highly significant with 56% elevated level in infected patients (1.570±0.947) ($p \leq 0.001$) for hospitalized patients afflicted with the acute covid-19 disease when compared with control group as shown in Fig. (1,3) below.

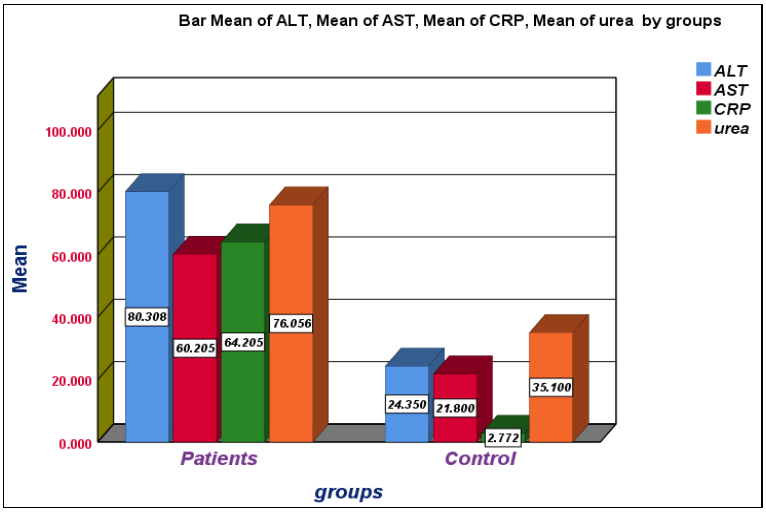

Fig. 1: The bar mean level of AST, ALT, CRP and urea with patient and control groups.

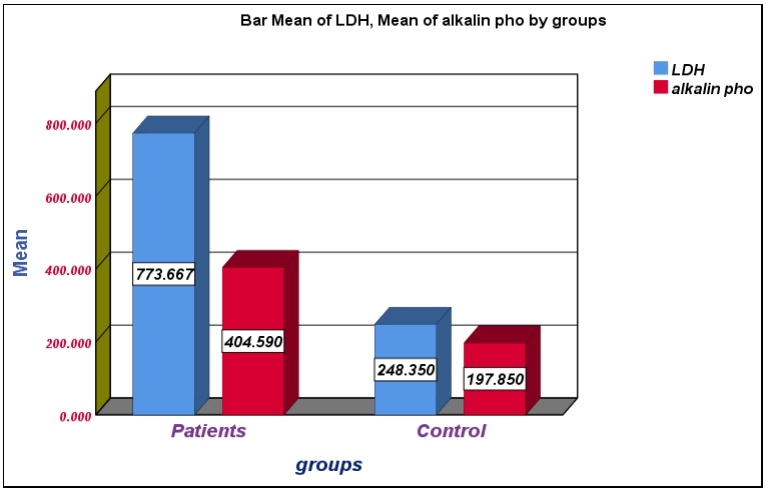

Fig. 2: The level of bar mean for LDH and ALP with patient and control groups.

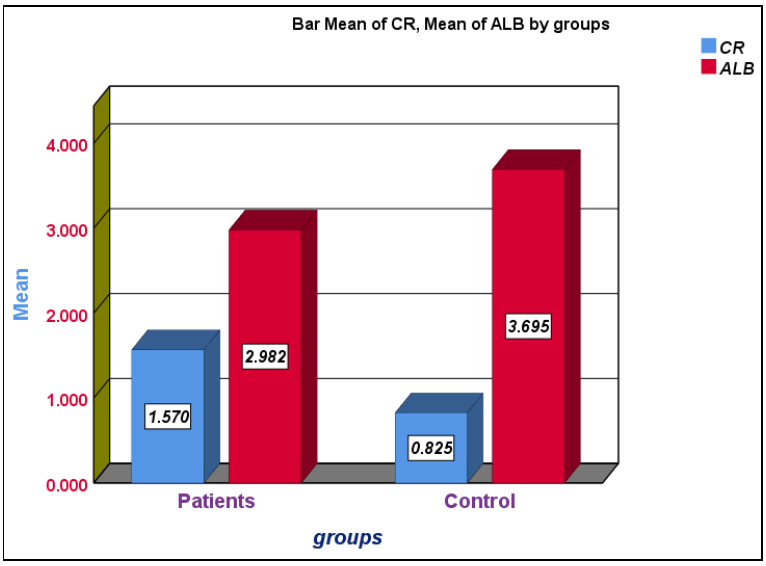

Fig. 3: The level of bar mean for CR and ALB with patient and control groups.

Table 1: Peak Values (P value) of Liver and kidney biomarkers

	t	df	p
Age	-4.652	57	< .001
Cra (mg/dl)	-3.442	57	0.001 [a]
Urea (mg/dl)	-3.040	57	0.004 [a]
ALP (U/L)	-2.707	57	0.009 [a]
ALT (U/L)	-3.575	57	< .001 [a]
AST (U/L)	-3.532	57	< .001 [a]
CRP (mg/L)	-7.325	57	< .001 [a]
ALB (g/dl)	2.188	57	0.003
LDH (U/L)	-5.313	57	< .001 [a]

Abbreviations: Cra, creatinine ; ALP, alkaline phosphatase; ALT, alanine aminotransferase; CRP,C-reactive protein; AST, aspartate aminotransferase; ALB, albumin; LDH, lactate dehydrogenase.

Table 2: Laboratory parameters in COVID-19 patients during hospitalization

	Group	N	Mean	SD	SE
Age	control	20	45.500	9.423	2.107
	patient	40	58.718	10.756	1.722
Cra (mg/dl)	control	20	0.825	0.253	0.057
	patient	40	1.570	0.947	0.152
urea (mg/dl)	control	20	35.100	6.257	1.399
	patient	40	76.056	59.827	9.580
ALP (U/L)	control	20	197.850	29.965	6.700
	patient	40	404.590	339.462	54.357
ALT (U/L)	control	20	24.350	10.049	2.247
	patient	40	80.308	69.334	11.102
AST (U/L)	control	20	21.800	8.883	1.986
	patient	40	60.205	48.013	7.688
CRP (mg/L)	control	20	2.772	1.652	0.369
	patient	40	64.205	37.327	5.977
ALB (g/dl)	control	20	3.695	0.590	0.131
	patient	40	2.982	0.629	0.101
LDH (U/L)	control	20	248.350	67.899	15.183
	patient	40	773.667	437.657	70.081

Abbreviations: "Cra, creatinine ; ALP, alkaline phosphatase; ALT, alanine aminotransferase; CRP, C-reactive protein; AST, aspartate aminotransferase; LDH, lactate dehydrogenase; ALB, albumin for control group".

Discussion

There are a variety of reasons why covid-19 infection causes damage to the kidneys as well as the liver including the following, Covid-19 infectious diseases may be the direct primary cause of liver failure and kidney disease induced by a viral infection of the liver and kidney cells[23]. Consequently, the viral infection may have directly caused the resultant harm due to the outcome of organ damage. On another side, another latest study found that the usage of medicines that may induce hepatotoxicities, such as nonsteroidal anti-inflammatory drugs (NSAIDs), acetaminophen, antibiotics, antiviral, antipyretic drugs, and interferon, was correlated with the severity of SARS-COV2 disease is subjected with impaired liver biomarkers[24][25][26]. A systematic review included 22 related articles showed the adverse of many drugs like tocilizumab, lopinavir (ritonavir), and remdesivir on liver function[4] As a result, the treatment protocol in hospitals must be modified to account for the side effects of the medication may be risk factors for organ dysfunction. This study showed that developed liver functional abnormality by these results, 67% had elevated Alkaline phosphate (ALP) and elevated liver enzyme (AST (59%), ALT (67%), LDH (74%)), and lowered albumin (ALB) (59%) level. The patients had high inflammatory indices was also noticed as evidenced by increased C-reactive protein (97 %). These findings reported the deterioration of liver function during sever covid-19 in hospitalized patients, and are consistent with many previous studies [15, 19,20]. Acute kidney injury (AKI) in severe repertory syndrome patients is suggested by many previous studies [9][12][13], and these studies' observations are in conformity with the findings of this study, where, 62% of patients had increased in urea level, and 56% have elevated in creatinine value. But an increase was found in percentage levels of the liver biomarkers and the percentage levels of creatinine and urea as compared with the previous study. These findings induce the possibility of utilizing the wrong treatment strategy protocol or overdose of medication as reported in the previous study[4,5,24,25,26], and this finding is associated with an elevated risk of death.

Conclusion

COVID-19 incidence enables induce damage directly or indirectly to the liver and kidney by elevating the clinical biomarkers of these organs. The consequence of antiviral and anti-inflammatory medication utilized must be monitoring, there high possibility caused for organ dysfunction. The drug use issue needs more investigation.

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العواقب السلبية لكوفيد-19 تسبب اختلال في وظائف الكبد والكلى

عمر فلاح ابراهيم دهام

مديرية تربية الانبار ، وزارة التربية ، الانبار ، العراق

الملخص

يعد تفشي مرض كوفيد -19 مصدر قلق كبير للصحة العامة في جميع أنحاء العالم. المضاعفات الأكثر شيوعًا لعدوى COVID-19 هي تلف الرئة. ومع ذلك، يمكن أن يحدث تلف في أعضاء أخرى بما في ذلك الكبد و وضعف القلب و ضعف الكلى واضطراب الأمعاء ايضا.

الهدف من البحث: يركز هذا البحث على تقييم وظيفة عضوين رئيسيين في جسم الإنسان هما الكبد والكلى. حيث تم تقييم وظيفة هذة الاعضاء عن طريق قياس السمات السريرية واختبار التشوهات في مرضى COVID-19. وبالمقارنة مع البحوث السابقة ، وسلط الضوء على الآثار الضارة للعقاقير المستخدمة في علاج مرضى كوفيد -19.

الطريقة: أظهر هذا العمل الآثار الضارة لـ (SARS-CoV-2) من خلال تسليط الضوء على تأثير (كوفيد -19) على قيم المؤشرات الحيوية التي تم قياسها لكل من وظائف الكبد والكلى في المرضى الذين تم ادخالهم في إصابة مستشفى الشفاء بمدينة الرمادي بإصابة شديدة بفيروس كورونا.

نتائج البحث: اشتمل القياس السريري لوظيفة الكبد على AST و ALT و LDH و CRP ، والتي كانت مرتفعة بشكل ملحوظ مع ($p < 0.01$) وكان الفوسفات القلوي مرتفعًا بشكل ملحوظ مع ($P < 0.009$) وانخفاض مستوى الألبومين مع ($p < 0.033$). تم تقييم الخلل في وظائف الكلى من خلال مستويات اليوريا والكرياتينين في مصل الدم، وكلاهما كان معنوياً بدرجة عالية (($p < 0.004$، ($p < 0.001$)) على التوالي. حيث كان متوسط عمرالمرضى المصابين بكوفيد-19 هو (58.718). وجدنا نسبة مئوية أعلى في معظم المؤشرات الحيوية في مرضى covid-19 العراقيين مقارنة بالدراسات السابقة.

اصالة البحث: في هذه المخطوطة، قمنا بتحليل العواقب السلبية لفيروس كوفيد -19 التي ممكن ان تتطور بواسطة الفيروس نفسه أو بروتوكول إستراتيجية الأدوية المستخدمة التي قد تؤدي إلى تلف الكبد والكلى لدى الأفراد العراقيين المصابين بفيروس كوفيد -19. بعبارة أخرى ، بينا المشاكل السريرية التي تؤدي إلى إظهار تلف الأعضاء الناجم عن COVID-19 وتأثيرالاضرار الناتجة عن العلاجات الدوائية المستخدمة لمكافحة COVID-19.