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Studying the Effect of COVID-19 on Liver Enzymes and Lipid Profile in Iraqi Recovering Patients

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Abstract

The Covid-19 virus disease has been shown to affect numerous organs and systems including the liver. The study aimed to compare lipid profiles and liver enzyme levels in individuals who had recovered from Covid-19 infection. To achieve the study objectives, liver Aspartate Aminotransferase (AST), Alanine Aminotransferase (ALT), Alkaline phosphatase (ALP), Random Blood Sugar (RBS) and Lipid profile which include cholesterol, High-Density Lipoprotein (HDL), Triglycerides (T.G), Low-Density Lipoprotein (LDL), and Very low-density Lipoprotein (VLDL) were determined.

One hundred twenty serum samples were obtained, of which fifty samples were utilized as the control healthy persons (not affected by COVID) and seventy samples came from COVID-19 patients who had recovered. Liver enzymes showed a significant increase in serum AST, ALT, and ALP between the two groups (p-values) of 0.001. The lipid profile demonstrated notable ariations which showed an increase in cholesterol, TG, LDL, and VLDL., as well as a decrease in HDL level in the recovered patients' group compared to the control (p-values) with a value of 0.001. There were no significant differences in RBS between the recovered patients' group as compared with the control, (p-value) (0.062). Also, body mass index (BMI) and age showed no significant differences. This study concluded that Covid 19 survivors experienced issues with their lipid profiles and liver enzymes.

Keywords: Cholesterol, Lipid profile, Liver enzymes, Random blood sugar, Recovered Covid-19.

Introduction

The most recent pandemic, known as COVID-19, was brought on by the coronavirus known as SRS-CoV-2. The pandemic status of COVID-19 was officially announced by the WHO in March 2020[1,2]. The very infectious viral infection has had a catastrophic effect on the demography of the planet. After the first SARS-CoV-2 infection was reported in late December 2019, the virus swiftly spread over the globe. WHO declared it a global pandemic on March 11, 2020. Since it was first identified as a worldwide pandemic, the COVID-19 virus has wreaked havoc in many nations and caused widespread disruption in many healthcare systems[3].

Even though most patients had a mild influenza-like illness or are asymptomatic, a small percentage of Covid-19 patients had severe pneumonia, multi-organ failure, acute respiratory distress syndrome, or even death. This is even though the majority of patients had a mild influenza-like illness[1]. Under an electron microscope, viruses that contain positive-stranded RNA (+ssRNA) and are referred to be coronaviruses (CoVs) have spike glycoproteins on the envelope, which gives them the appearance of a crown (corona is the Latin word for crown)[4].

It has been shown that the virus may affect various organs and systems, including the

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cardiovascular system, the kidneys, the liver, the nervous system, and the blood system[5,6].

According to the entire genome sequencing findings, SARS-CoV-2 accounts for 82% of its genome arrangement with SARS-CoV. It also shares 50% of its genome succession with the respiratory illness Covid, which is prevalent in the Middle East and Central Asia (MERS-CoV)[7]. Coronaviruses such as SARS-CoV, MERS-CoV, and SARS-CoV-2 cause severe respiratory symptoms in infected individuals[8]. Damage to the liver may occur in as many as sixty percent of people who are infected with the SARS-CoV virus[9]. In a research that was conducted in Iraq, it was shown that the majority of SARS-CoV-2 patients had abnormal liver enzyme activity, which may be associated with viral replication in the liver. This finding is comparable to the previous one[10]. Liver damage has been found in some of the patients who have been diagnosed with MERS-CoV infection[11]. At Wuhan Jinyintan Medical clinic, abnormal alanine aminotransferase (ALT) and aspartate aminotransferase (AST) levels were first noted in 43 (43.4%) of 99 patients infected with SARS-CoV-2[12]. Liver injury was reported in 14.8% to 53.0% of COVID-19 patients throughout at least 12 clinical investigations involving patients from a single site or across several sites[9,13], providing evidence that patients infected with COVID-19 are susceptible to developing liver damage.

It would seem that the SARS-CoV-2 susceptible receptor is an enzyme called angiotensin-converting enzyme 2 (ACE2), which is present in over 80 percent of alveolar lung cells. ACE2 is the host receptor that has been identified as being responsible for viral entrance during the SARS pandemic[14]. Target cells that express ACE-2 receptors interact with coronavirus particles under the same conditions but generate various products, making the impact of these viruses unpredictable[15].

The location of ACE2 in the liver is unusual. Despite not being present in the sinusoidal endothelium, it is highly expressed in the endothelial layer of tiny blood arteries[16]. It was shown that hepatocytes (2.6%) expressed less of the ACE2 cell surface receptor than histiocytes (59.7%). Cholangiocytes and lung type 2 alveolar cells both generate ACE2, suggesting that the liver is a potential SARS-CoV-2 target. Kupffer cells, T lymphocytes, or B lymphocytes were not labeled with ACE2 immunohistochemically[17]. By measuring the precise biochemical markers that indicate liver function tests (ALT, AST, ALP), and lipid profiles, the current study can help to assess the progression of COVID-19 after recovery and prevent problems.

Materials and Methods

Study Subjects:

The current research was conducted on 120 individuals. The age varies from twenty to fifty-five years. 70 samples from COVID-19 belong to patients who have recovered and 50 represent the control group that contains healthy persons (not affected by COVID) with an age range from 20-50 years. The individuals were collected from Yarmok Teaching Hospital and Mahmoudia General Hospital from (July to September 2022). They were classified into two groups: Group 1 contained 70 recovered patients from 19-COVID (51 female and 19 males) Participants who reported a previous diagnosis of liver illness were not included, and Group 2 included 50 (37 female and 13 males) used a control group. Ethical approval was obtained from the relevant institutional review board.

Blood Sample Collection:

The following biochemical investigations have been studied for their Random Blood Sugar (RBS), lipid profile, and serum liver enzymes (ALP, AST, ALT). From each patient, 5 ml of blood was obtained by vein puncture, using 5 ml disposable syringes, and then separated by centrifuge at 3000 rpm for 10 min to collect serum.

Methods:

The instruments of the study and their suppliers in biochemistry liver enzymes (AST, ALT, ALP), Random Blood Sugar (RBS), and Lipid Profile (cholesterol, HDL, T.G) all these parameters, an enzymatic colorimetric approach were utilized with a kit provided by LINEAR Chemicals, SPAIN, Barcelona. While LDL was calculated using the equation LDL-C =cholesterol – (TG/5) – HDL-C, VLDL was also calculated using the equation VLDL-C = TG / 5.

Anthropometric Measurements

By dividing one's weight (in kilograms) by one's height squared, one's body mass index (BMI) is determined (m^2).

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Statistical Analysis

All results were expressed as mean± Standard Error (SE). The data were analyzed via the use of a computerized statistical package for the social sciences (SPSS 25) program. Paired sample t-test was performed for the same group, including between the two groups-values< 0.05 were considered to be statistically significant.

Results and Discussion

The current study was arranged to evaluate some biochemical parameters in the serum sample of recovered subjects after post-infection COVID-19 and apparently healthy control group.

Table 1. Demographic factor distribution in studied groups.

Parameters	Groups	Recovered COVD19 patients	Control	P-value
Age	30-20 yrs.	48%	46%	0.003
	42-31 yrs.	28.5%	28%	0.105
	55-43 yrs.	22.85%	26%	0.543
BMI	Normal	34%	24%	0.0421
	Overweight	65.75	76%	0.0451

Two Independent t-test were used P<0.05.

Table 1, shows the distribution of participants in two groups (Recovered COVID-19 patients 1 and Control) based on their age. The age groups are divided into three categories: 20-30 years, 31-42 years, and 43-55 years. In Group 1, there were a total of 70 participants, while in Group 2, there were a total of 50 participants. The p-value indicates the level of statistical significance between the two groups. Looking at the distribution by age group, it appears that there is no significant difference between the two groups in terms of age. The percentages for each age group are relatively similar between the two groups. The p-values for each age group indicate that there is no statistically significant difference between the two groups in terms of age distribution. However, the death from the 2019 Coronavirus (COVID-19) is more likely happened in those aged 60 and above, which may be indicative of lower mental health among the elderly population during the pandemic[18].

Clinical symptoms appeared in 21% (95% credible interval: 12-31%) of diseases in ages 10 to 19, and 69% (57-82%) of infections in those over the age of 70. In those under the age of 20, the susceptibility to infection was almost half that of people above the age of 20 [19].

The results of the distribution of BMI (Body Mass Index) among two groups of individuals, Group 1 with 70 participants and Group 2 with 50 participants Divided into normal weight and overweight. The p-value indicates the statistical significance of the differences in BMI between the two groups

In Group 1 and Group 2, there were no individuals classified as underweight. In terms of normal weight classification, Group 1 had a proportion of normal-weight individuals (34%) compared to Group 2 (24%). The p-value for this comparison is also statistically significant at 0.0421, while in terms of overweight classification, Group 1 had a proportion of overweight individuals (65.75%) compared to Group 2 (76%). The p-value for this comparison is also statistically significant at 0.0451؛ There is mounting evidence linking obesity to a more severe case of COVID-19 infection and an increased risk of death, according to many studies. After accounting for other factors, clinical research from China on the COVID-19 illness showed that 86% and 142% increased association

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between obesity and a severe infection compared to normal-weight people[20].

It is necessary to obtain anthropometric data for COVID-19 patients, particularly the younger peoples, since obesity may have a crucial role in defining the severity of the disease. Future study should focus on determining whether or not obesity is linked to hospital mortality among COVID-19 patients[21].

Random blood sugar levels showed a non-significant difference between the two groups of recovered subjects and control with P>0.05 as shown in Fig. 1. A previous study showed the RBS levels of COVID-19 patients which were compared before and after their recovery. It was discovered that some members of the group continued to experience persistent hyperglycemia even two months following their recovery[22] Moreover, the AST, ALT and ALP levels showed a significant increase in recovered patients compared with control P<0.05, as shown in Figs. 2,3 and 4, respectively.

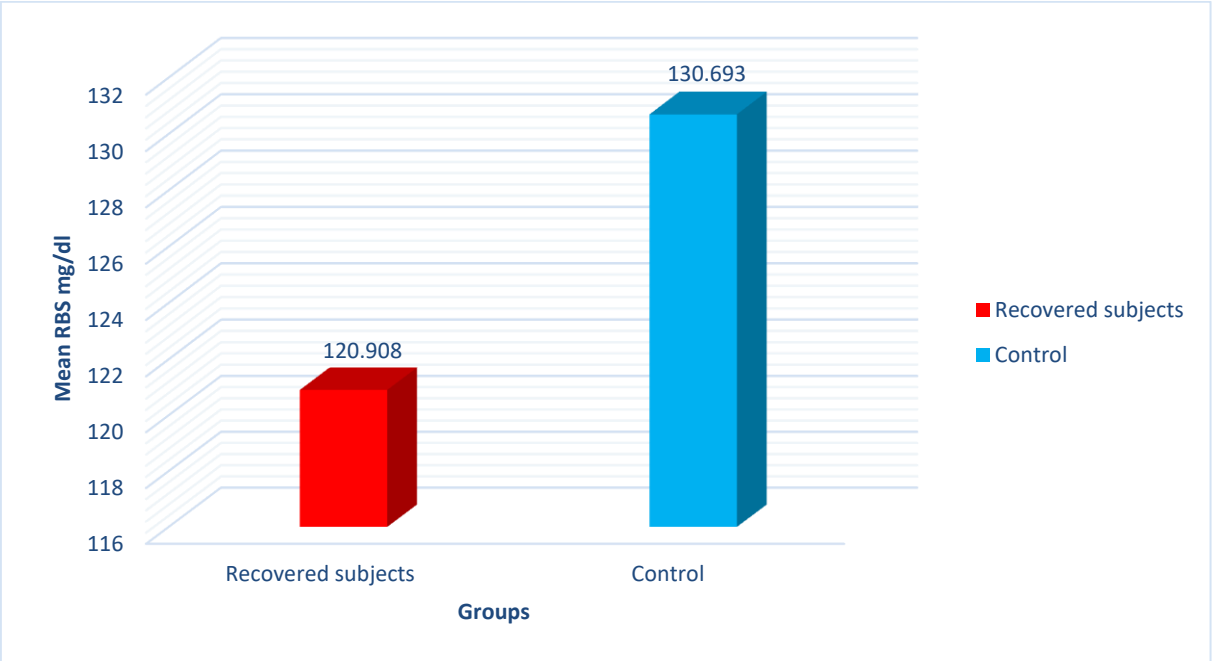

Figure 1. The RBS level in recovered patients and control.

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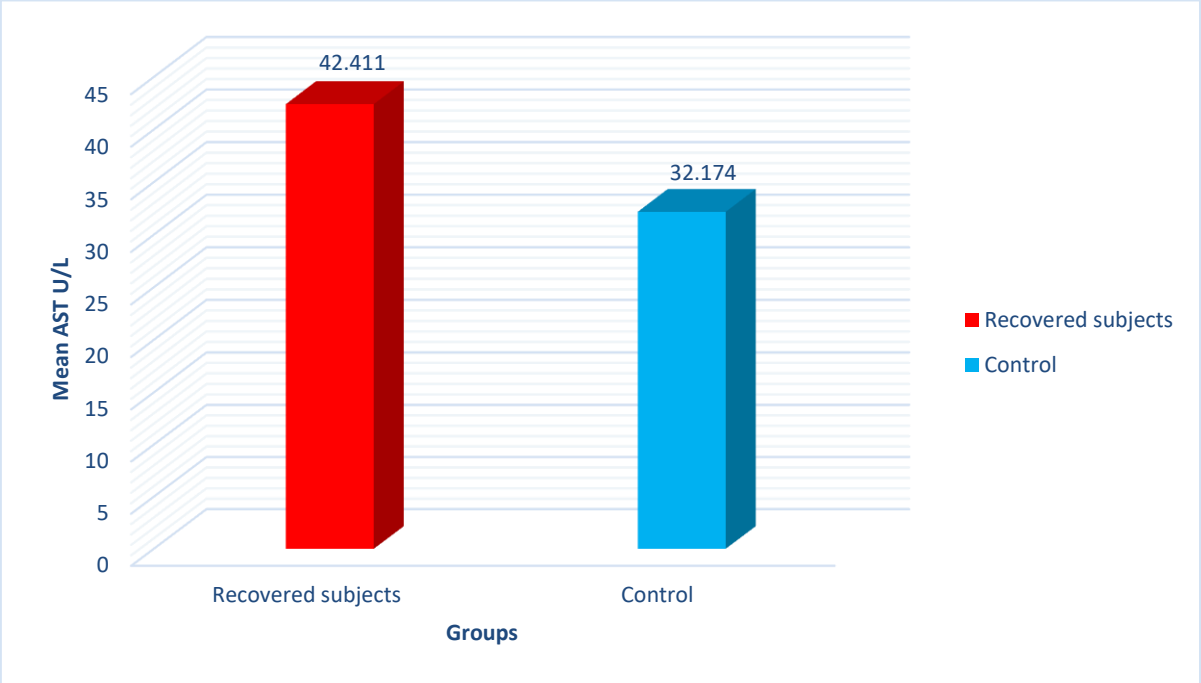

Figure 2. The AST level in recovered patients and control.

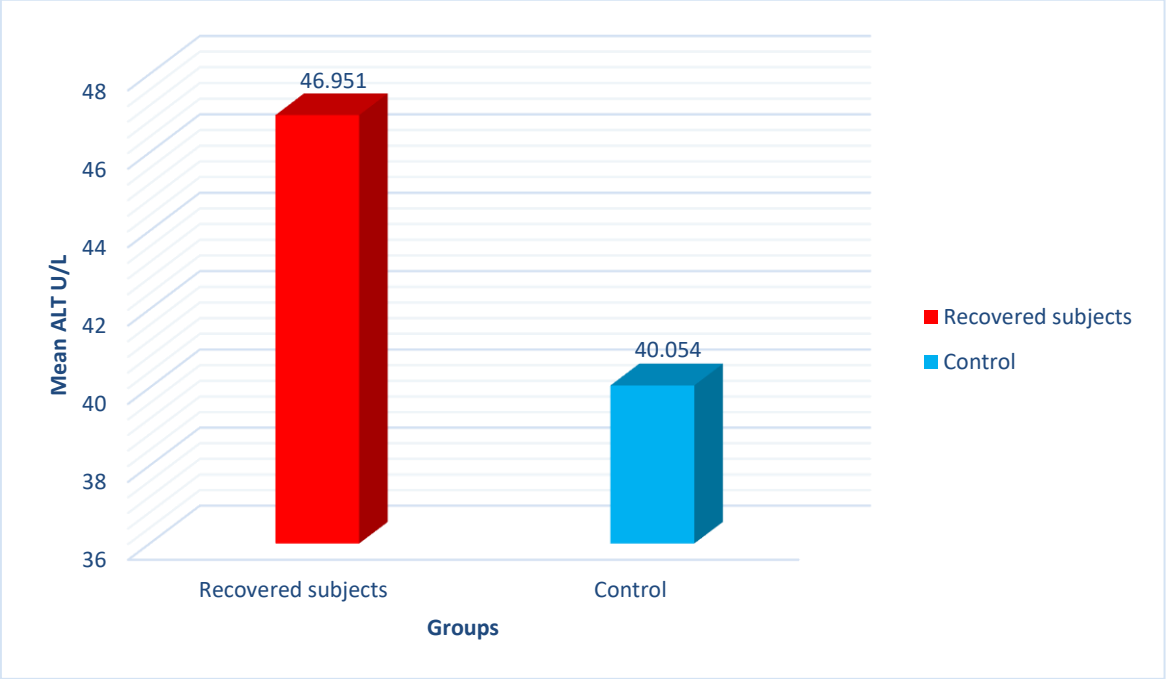

Figure 3. The ALT level in recovered patients and control.

Elevated serum AST and ALT were the most common abnormalities, which indicated hepatocellular damage[23,24]. The elevation of liver functions have been linked with the AST and ALT. Additionally, ALP were noticeably elevated during the COVID-19 healing phase. Data from another study revealed increased levels of the liver enzyme AST, ALP, and ALP in recovered patients[25].

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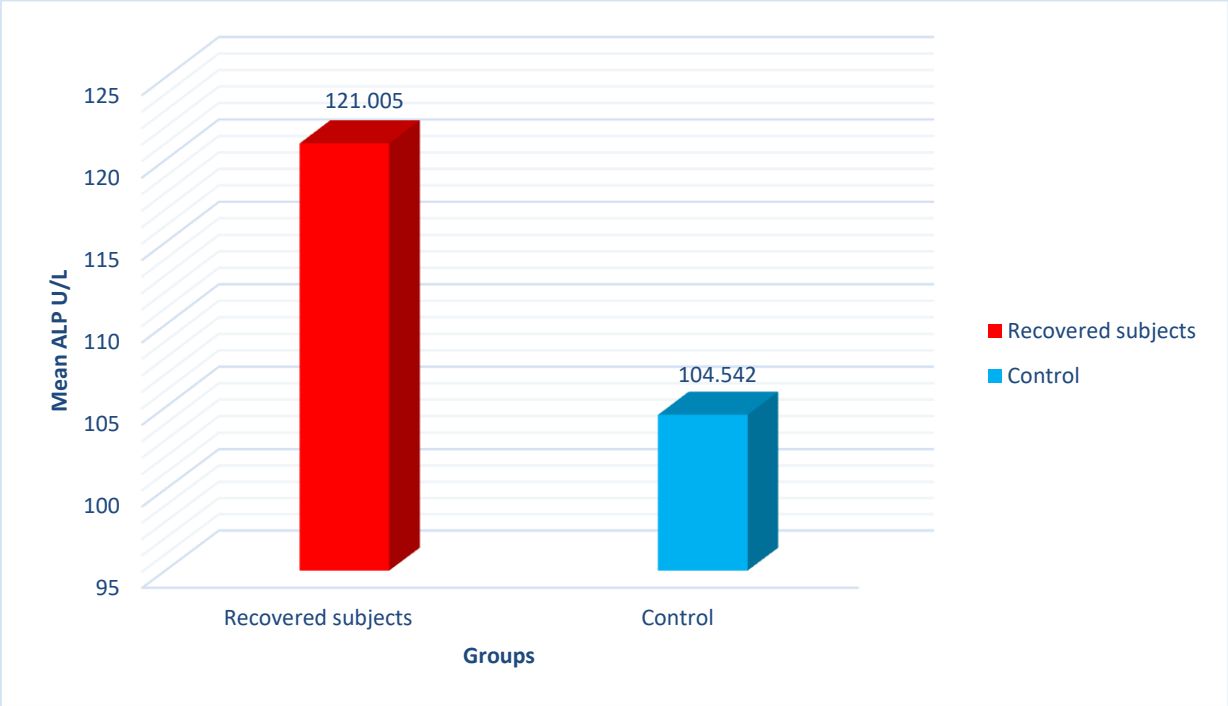

Figure 4. The ALP level in recovered patients and control.

The serum levels of cholesterol, TG, HDL, LDL and VLDL in recovered patients and healthy control are illustrated in Table 2. Our results revealed a significant increase in cholesterol, TG, LDL and VLDL with a significant decrease in HDL in recovered patients compared to control. Researchers investigated the lipid metabolism of recovered individuals many years after they had contracted SARS. They discovered that the levels of TG and cholesterol were substantially higher than in people who had recovered. Statistics revealed substantial differences between the recovered subjects and the healthy controls. The TG was significantly greater following recovery compared to the infection's acute phase[26].

Comparing the recovered subjects with healthy controls, statistically, significant changes were found. Compared to the acute phase of the infection, HDL cholesterol, LDL cholesterol, and TG were considerably higher after recovery [26].

Twelve years after contracting SARS, researchers studied the lipid metabolism of recovered patients and found that TG؛ VLDL, and cholesterol readings were significantly higher than in recovered participants [27]. Many studies have found that patients with COVID-19 infections have lower HDL levels[28]. Hypertriglyceridemia also appeared in patients following a recent COVID-19 incident[29]

Table 2. Lipid profile parameters in recovered patients and control.

Parameters	Groups	Mean± Std. Error	P-value
Cholesterol mg/dl	Patients	***219.287± 1.009***	0.001
	Control	***184.85± 1.009***	
TG mg/dl	Patients	***215.995± 1.063***	0.001
	Control	***189.716± 1.935***	
HDL mg/dl	Patients	***29.396± 0.45***	0.001
	Control	***84.617± 2.061***	
LDL (mg/dl)	Patients	***146.692± 0.899***	0.001
	Control	***62.289± 2.268***	
VLDL(mg/dl)	Patients	***43.199± 0.212***	0.001
	Control	***37.943± 0.387***	

Independent T-test were used at P<0.05.

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Table 3. Correlations Study between biochemical variables in COVID-19 recovering patients.

Parameters	RBS	AST		ALT		ALP		Cholesterol		TG		HDL		LDL		VLDL	
		r	p	r	P	r	p	r	p	r	p	r	p	r	p	r	p
RBS		-0.13	0.25	-0.1	0.39	-0.14	0.21	0	0.98	-0.09	0.45	-0.05	0.67	0.05	0.68	-0.09	0.45
AST				0.6	0	0.67	0	0.67	0	0.61	0	0.27	0.02	0.48	0	0.61	0
ALT						0.53	0	0.43	0	0.43	0	0.13	0.28	0.31	0.01	0.43	0
ALP								0.72	0	0.79	0	0.07	0.57	0.58	0	0.79	0
Cholesterol										0.63	0	0.2	0.097	0.87	0	0.63	0
TG												-0.03	0.79	0.48	0	1.0	0
HDL														-0.3	0.02	-0.03	0.79
LDL																0.49	0

Table 3, represents the correlation study amongst the parameters in recovered patients group. The result showed a positive correlation between biochemical parameters in COVID-19 recovering patients such as between AST and ALT, ALP, cholesterol, TG, HDL, LDL, VLDL. There is also a negative correlation between HDL and LDL

Conclusion

We conclude that some biochemical parameters are important, based on the findings that serum levels of AST, ALT, ALP, cholesterol, TG, LDL, and VLDL were all higher and a decrease in the HDL level in the recovered patients group than control. There were no statistically significant differences between the recovered participants and the control group when comparing the RBS. Those indicators might help clinical decisions to recognize the damage that may affect different organs in the body.

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Authors' Declaration

- Conflicts of Interest: None.
- We hereby confirm that all the Figures and Tables in the manuscript are ours. Furthermore, any Figures and images, that are not ours, have been included with the necessary permission for re-publication, which is attached to the manuscript.
- Authors sign on ethical consideration's approval.
- Ethical Clearance: The project was approved by the local ethical committee in Ministry of Health, Baghdad Health Department / Karkh/ Baghdad/ Iraq, the approval number is 33783 on 27/6/2022.

Authors' Contribution Statement

Z.Z.S. collected samples and, analyzed the results. S.B.M. designed. Analyzed, proofread, and presented ideas of the research S.A. M.'s role in this research was to do analytics and follow-up work.

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دراسة تأثير COVID-19 على إنزيمات الكبد وملف الدهون لدى المرضى العراقيين المتعافين

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الخلاصة

ثبت ان كوفيد-19 يؤثر على العديد من أجهزة وأنظمة الجسم . بما في ذالك الكبد، .كان الهدف من الدراسة تقييم تأثير كوفيد-19 على انزيمات الكبد واختبارات الدهون للأشخاص المتعافين من كوفيد-19 .وسائل تحقيق الهدف تقييم مستويات (ناقل امين الاسبارتيت (AST)، وناقل امين الالانين (ALT)، وانزيم الفوسفاتيز القلوي (ALP)، وسكر الدم العشوائي (RBS) واختبارات الدهون (الدهون الثلاثية (TG) ،الكولستيرول ، البروتين الدهني ذو الكثافة العالية (LDH)، البروتين الدهني ذو الكثافة المنخفضة (LDL)، البروتين الدهني ذوالكثافة المنخفضة جدا (VLDL)، تم جمع 120 عينة ،منها 50 شخص اصحاء ،لم يتعرضوا للفايروس و70 شخصا متعافين من مرض كوفيد-19.
أظهرت أنزيمات الكبد اختلافات معنوية وزيادة في مستويات ناقل امين الاسبارتيت (AST)، وناقل امين الالانين (ALT)، وانزيم الفوسفاتيز القلوي (ALP) بين المجموعتين حيث كانت قيمة p> 0.001 وكذالك أظهر ملف الدهون اختلافات واضحة ، حيث بين زيادة في مستوى الكولسترول ،الدهون الثلاثية ، البروتين الدهني المنخفض الكثافة (LDL)، البروتين الدهني ذو الكثافة المنخفضة جدا (VLDL)، وانخفاض في مستوى البروتين الدهني عالي الكثافة (LDH) في مجموعة الأشخاص المتعافين من كوفيد-19 مقارنة بالأصحاء (p> 0.001).
اما مستوى سكر الدم العشوائي (RBS) فلم يظهر أي فرق معنوي (0.062) (p-value) ،كذالك مؤشر كتلة الجسم BMI والعمر لم يضهر هناك فرق معنوي بين المجموعتين. خلاصة هذا البحث ان الأشخاص المتعافين من كوفيد-19 تسبب لهم اضطرابات في انزيمات الكبد وملف الدهون.

الكلمات المفتاحية: : الكولسترول، ملف الدهون، انزيمات الكبد، سكر الدم العشوائي، المتعافين من مرض كوفيد-19.