

The correlation between Troponin I and Lipid profile parameters In Patients After Healing From COVID-19 : A study in the middle of Iraq.

Naeel Mustafa Mohammed Al-abid^{1*}, Wijdan I. A. Abd-alwahab²

1 University of Samarra, Salah Al-din / College of Applied sciences,

Department of Pathological Analysis

2 University of Samarra / College of Education, Department of Biology

^{1*} naeelmustafa96@gmail.com

² wijdan80@uosamarra.edu.iq

Abstract:

The Coronavirus pandemic is a recent and dangerous sickness, that has affected approximately 100 million individuals globally. It has appeared in many strains and has claimed more than 6.31 million deaths worldwide since 2019 to now. Due to the scarcity of research, the current study sought to establish a correlation between persons after healing from COVID-19 and Lipid profile parameters, as well as to attempt to predict and identify future heart disease in people with hyperlipidemia who had been Healing from COVID-19. The samples were collected 90 from patients (G1: Healthy, G2:cardiac disease, G3: Respiratory disease, And G4: Healing from COVID-19 Groups). The outcome of this research revealed a high significance in the concentration of Troponin I and the levels of Lipid profile. While there was a statistically significant decline in HDL concentration. Finally, The correlation was positive between Tnl and Lipid profile, While the results showed a reverse correlation between Tnl and HDL In both genders. We conclude from the findings of current research that COVID-19, the disease may be to impair the circulatory system, It may cause a heart attack, brain clots, develop into future heart failure, atherosclerosis, or immune system dysfunction.

Keywords: COVID-19, SARS-CoV-2, Troponin I, Cholesterol, Triglyceride.

العلاقة بين أنزيم التروبونين I واختبارات الدهون بالدم في المرضى

بعد الشفاء من كوفيد-19 : دراسة في وسط العراق

نائل مصطفى محمد العبيد^{1*} ، وجدان إبراهيم عباس عبدالوهاب²

1 جامعة سامراء / كلية العلوم التطبيقية - قسم التحليلات المرضية

2 جامعة سامراء / كلية التربية - قسم علوم الحياة

الخلاصة

تعد جائحة كورونا من الأمراض الحديثة والخطيرة والتي أصابت ما يقارب 100 مليون شخص حول العالم ظهرت بعدة سلالات وأدت بأرواح أكثر من 6.31 مليون شخص من العالم 2019 ولغاية الآن، ولقلة الدراسات هدفت الدراسة الحالية إلى إيجاد العلاقة والارتباط بين المصابين كوفيد-19 ومؤشرات دهون الدم ، ومحاولة التنبؤ والكشف المبكر عن الإصابة بأمراض القلب مستقبلاً في الأشخاص الذين يعانون من فرط دهون الدم والمتشافين من كوفيد-19 .

تم دراسة 90 عينة موزعة على أربع مجاميع هي G1: مجموعة السيطرة ، G2: مجموعة المتشافين من كوفيد-19 ويعانون من أمراض القلب ، G3: مجموعة المتشافين من كوفيد-19 ويعانون من أمراض الرئة ، G4: مجموعة المتشافين من كوفيد-19 ولا يعانون من أي مضاعفات.

أظهرت النتائج وجود دلالة إحصائية عند مستوى معنوية $P < 0.05$ وإرتفاع في مستوى أنزيم تروبونين I والكوليستيرول والدهون الثلاثية والبروتينات الدهنية واطى ومنخفضة الكثافة ، في حين يوجد إنخفاض معنوي في تركيز البروتينات الدهنية عالية الكثافة.

بينما أشارت الدراسة إلى وجود ارتباط طردي قوي بين أنزيم التروبونين I ومؤشرات الدهون سابقة الذكر في حين كان الارتباط عكسي قوي مع البروتينات الدهنية عالية الكثافة فقط في كلا الجنسين.

الكلمات المفتاحية: كوفيد-19 ، فيروس كورونا المستجد (سارس-كوف-2) ، تروبونين I ، الكوليستيرول ، الدهون الثلاثية.

1. Introduction

SARS-CoV-2, which causes Coronavirus Disease 2019 (COVID-19), infects respiratory tract cells by receptor-mediated endocytosis after interacting with the angiotensin-converting enzyme receptor 2 (ACE2) protein of Liu *et al.* [1]. Is a new epidemic originating in Wuhan, China[2]. The emergence of severe forms of Interstitial Pneumonia, Which can lead to Acute-Respiratory Distress Syndrome (ARDS), Multi _ Organ Failure (MOF), and mortality, complicates the clinical course of this illness of Mattiuzzi and Lippi[3]. Despite the fact that the virus did not appear to be particularly damaging to the cardiovascular system at the start of the pandemic, other studies have shown that people with a history of cardiovascular disease or cardiovascular risk factors had higher death rates than those without a history of heart disease of Akhmerov and Marbán, Bansal [4,5]. Furthermore, some investigations have demonstrated that COVID19 people who did not possess cardiac disease before to infection may develop heart issues as a result of the infection of Zeng *et al.* [6]. In these individuals, testing Cardiac Troponin, the current Standard-Marker of Myocardial injury, allows for the early identification of heart disease of Park *et al.*[7]. Cardiac troponins have increasingly acquired clinical relevance in the diagnosis, management, and diagnosis of patients with Cardiovascular Disease.

However, Few studies have focused on the importance and concentration of extremely sensitive cardiac troponins in COVID19 patients[8]. The study Iqbal *et al.*[9]. research discovered A case series of COVID-19 patients was discovered to have underlying atherosclerotic cardiovascular disease. Because hyperlipidemia has been described as a co-morbid condition. One of the top five significant risk factors for cardiovascular disease is dyslipidemia. Lipid Profile is total cholesterol, HDL-cholesterol, triglyceride, and calculated LDL Previous research has revealed that high levels of blood total cholesterol (TC), triglycerides (TG), LDL cholesterol, very-low-density lipoprotein (VLDL), low concentration of high-density lipoprotein (HDL-cholesterol), and increasing body mass index (BMI) are significantly associated with cardiovascular disease of Yanli Liu *et al.*[10]. The study's aim is to evaluate the potential link between dyslipidemia and cardiac enzyme in individuals who have recovered from COVID19. and informed on the link between Troponin I and lipid profile.

2. Materials and Methods

After healing, we performed a thorough study of the clinical features and blood routine findings of COVID-19 patients. Troponin I (TnI) was measured using the AFIAS-6 machine and the AFIAS-6 instrument made by Korea. and its original matched reagents were used for TnI testing. also, Lipid Profile is Determined by Cholesterol,

Triglyceride(TG), and high-density lipoprotein (HDL) by utilizing the Biola-bo Kits made by France and using the T80+ UV-Vis Spectrometer Machine made device UK in the serum. while very Low-density Lipoprotein (VLDL) and Low-density Lipoprotein (LDL) were extracted by applying the mathematical equation. The samples were obtained from 90 people at the COVID-19 Epidemic Center between the middle of October 2021 and the middle of January 2022, with 24 cases being non-patients as the control group and 22 cases being serious with Cardiac illness and respiratory disease. COVID-19 After Healing and 22 instances were COVID-19 After Healing.

$$\text{VLDL(mg/dl)} = \frac{\text{Triglycerides}}{5}$$

$$\text{VLDL(mg/dl)} = (\text{Total Cholesterol}) - (\text{HDL-C}) - (\text{VLDL-C})$$

-I performed the groups of control persons according to the following guideline: G1 (coronavirus non-infection and without a vaccine).

-the groups of cardiac Disease Patients: G2 (Healing from COVID-19, Have complications in the Cardiovascular system).

-the groups of Respiratory Disease Patients: G3 (Healing from COVID-19, Have complications in the Respiratory tract).

-the groups of Healing from COVID19 Patients: G4 (healing from COVID-19, without clinical symptoms).

All patients were identified by the Resident Doctor's diagnosis, as well as a Rapid test for Positive / Negative COVID-19 IgG / IgM findings.

Six to eight weeks after the onset of symptoms, sample data were collected from the Epidemic Center. I carefully documented all clinical data and blood processes of patients from admission to discharge.

3. Statistical Analysis

The IBM SPSS 26.0 statistical package apps were used to examine the data. To assess the normality of the data distribution, the Shapiro-Wilk test was utilized. A Duncan test and person test were employed to assess the categorical data of the patients, and a $p < 0.05$ was considered statistically significant level.

4. Results

Tables 1 and 2 outcomes that 33 (37.5%) of COVID-19 healing patients were male and 33 (37.5%) were females, divided into three groups (G2, G3, and G4), whereas 12 (12.5%) of the Control group were male and 12 (12.5%) were female as (G1) group. COVID-19 patients ranged in age from 18 to 75 years old.

4.1 The effect of Coronavirus on Cardiac Enzyme and Lipid Profiles in Males.

The outcomes in table 1 offered indicating there was a statistically significant rise ($P < 0.05$) in the activity TnI, Cholesterol, TG, VLDL, and LDL test which included concentrations

of G2: 0.49 ± 0.05 and G3: 0.11 ± 0.01 respectively, compared to other groups control and healing of COVID-19 G1: $>0.01 \pm 0.00$ and G4: $>0.01 \pm 0.00$ ng/ml respectively in TnI. Cholesterol, which included amounts of G3: 233 ± 6.32 , G2: 220 ± 5 , and G4: 202 ± 3.15 respectively, Compared with the control group G1: 184 ± 2.71 mg/dl. In addition the TG which included concentrations of G2: 205 ± 16.58 , G4: 200 ± 13.91 , and G3: 196 ± 16.99 respectively, Compared with the control group G1: 165 ± 2.64 mg/dl. as well as The VLDL included concentrations of G2: 41 ± 1 , G4: 40.09 ± 0.81 , and G3: 39.13 ± 1.02 respectively, Compared with the control group G1: 32.99 ± 0.53 mg/dl. finally, The LDL included concentrations of G3: 167.39 ± 2.23 , G2: 157.65 ± 1.94 , and G4: 128.08 ± 1.06 respectively, Compared with the control group G1: 92.60 ± 0.60 mg/dl.

While there was a statistically significant decline ($P < 0.05$) in HDL concentrations that comprised G4: 34.33 ± 2.17 , G3: 26.75 ± 3.14 , and G2: 21.35 ± 2.06 respectively, compared to the control group G1: 58.40 ± 2.19 mg/dl.

4.2 The effect of Coronavirus on Cardiac Enzyme and Lipid Profiles in Females.

The outcomes in table 2 offered indicating there was a statistically significant rise ($P < 0.05$) in the activity TnI, Cholesterol, TG, VLDL, and LDL test which included concentrations of G3: 0.09 ± 0.01 and G2: 0.33 ± 0.04 respectively, compared to other groups

control and healing of COVID-19 G1: $>0.01 \pm 0.00$ and G4: $>0.01 \pm 0.00$ ng/ml respectively in TnI. Cholesterol, which included amounts of G4: 193.45 ± 3.50 , G2: 211.55 ± 4.81 , and G3: 227.73 ± 5.32 respectively, compared with the control group G1: 177.67 ± 3.43 mg/dl. In addition The TG which included concentrations of G4: 170.72 ± 4.51 , G3: 183 ± 4.23 , and G2: 195 ± 5 respectively, compared with the control group G1: 158.58 ± 3.46 mg/dl. As well as The VLDL included concentrations of G4: 34.15 ± 0.90 , G3: 36.60 ± 0.85 , and G2: 39 ± 1 respectively, compared with the control group G1: 31.68 ± 0.69 mg/dl. finally, The LDL included concentrations of G4: 129.74 ± 3.06 , G2: 147.24 ± 2.41 , and G3: 164.80 ± 1.43 respectively, compared with the control group G1: 76.50 ± 0.29 mg/dl. While there was a statistically significant decline ($P < 0.05$) in HDL concentrations that comprised G4: 29.57 ± 1.14 , G3: 26.32 ± 3.10 , and G2: 21.23 ± 2.04 respectively, compared to the control group G1: 69.48 ± 2.78 mg/dl.

4.3 The correlation between TnI and Lipid profile in Males and Females.

The outcomes in table 3,4 offered to indicate there was There is a link between TnI and cholesterol, TG, VLDL, and LDL, and a reversal correlation test demonstrates a relationship between TnI and HDL in males and females.

Table 1- The effect of Coronavirus on Cardiac Enzyme (Tnl) and Lipid Profile parameters in Males

Tests Groups	Mean $\pm$ SE					
	(ng/ml) Tnl	(mg/dl) Cholesterol	(mg/dl) TG	(mg/dl) HDL	(mg/dl) VLDL	(mg/dl) LDL
G1	0.01 $\pm$ 0.00< a	184 $\pm$ 2.71 a	2.64 165 $\pm$ a	58.40 $\pm$ 2.19 a	32.99 $\pm$ 0.53 a	92.60 $\pm$ 0.60 a
G2	0.49 $\pm$ 0.05 c	220 $\pm$ 5 c	205 $\pm$ 16.58 b	21.35 $\pm$ 2.06 b	41 $\pm$ 1 b	157.65 $\pm$ 1.94 c
G3	0.11 $\pm$ 0.01 b	233 $\pm$ 6.32 d	196 $\pm$ 16.99 b	26.75 $\pm$ 3.14 b	39.13 $\pm$ 1.02 b	167.39 $\pm$ 2.23 d
G4	0.01 $\pm$ 0.00< a	202 $\pm$ 3.15 b	200 $\pm$ 13.91 b	34.33 $\pm$ 2.17 c	40.09 $\pm$ 0.81 b	128.08 $\pm$ 1.06 b

a,b,c,d: the different letters in the same column mean there are significant differences at P<0.05.

Table 2- The effect COVID-19 on Troponin I and Lipid profile in Females

Tests Groups	Mean ± SE					
	(TnI(ng/ml	(Cholesterol(mg/dl	(TG(mg/dl	(HDL(mg/dl	(VLDL(mg/dl	(LDL(mg/dl
G1	0.01±0.00< a	177.67±3.43 a	158.58±3.46 a	69.48±2.78 a	31.68±0.69 a	76.50±0.29 a
G2	0.33±0.04 c	211.55±4.81 c	195±5 c	23.49±2.04 b	39±1 c	147.24±2.41 c
G3	0.09±0.01 b	227.73±5.32 d	183±4.23 bc	26.32±3.10 b	36.60±0.85 bc	164.80±1.43 d
G4	0.01±0.00< a	193.45±3.50 b	170.72±4.51 ab	29.57±1.14 b	34.15±0.90 b	129.74±3.06 b

a,b,c,d,b,c: the different letters in the same column mean there are significant differences at P<0.05.

Table 3- The correlation between TnI and Lipid profile in Males

Correlation	TnI	Cho	TG	HDL	VLDL	LDL
TnI	1	**0.526	**0.574	** -0.438	**0.569	**0.573
Cho	**0.526	1	**0.840	*-0.350	**0.835	**0.866
TG	**0.574	**0.840	1	*-0.340	**0.999	**0.713
HDL	** -0.438	*-0.350	*-0.340	1	*-0.342	** -0.765
VLDL	**0.569	**0.835	**0.999	*-0.342	1	**0.711
LDL	**0.573	**0.866	**0.713	** -0.765	**0.711	1

***Correlation is significant at the 0.05 level

Table 4- The correlation between TnI and Lipid profile in Females

Correlation	TnI	Cho	TG	HDL	VLDL	LDL
TnI	1	**0.498	**0.770	*-0.367	**0.770	**0.497
Cho	**0.498	1	**0.791	** -0.429	**0.792	**0.832
TG	**0.770	**0.791	1	*-0.314	**1.000	**0.655
HDL	*-0.367	** -0.429	*-0.314	1	*-0.317	** -0.830
VLDL	**0.770	**0.792	**1.000	*-0.317	1	**0.657
LDL	**0.497	**0.832	**0.655	** -0.830	**0.657	1

** **Correlation is significant at the 0.05 level

5. Discussion

COVID19 patients are becoming more common worldwide. It is crucial to analyze clinical, cardiac enzyme, and lipid profiles while monitoring the healing of the COVID19 pandemic. Few studies have looked at the lipid parameters associated with COVID19 healing. As a result, our study focused on cardiac enzymes and clinical parameters such as cholesterol, triglycerides, HDL, VLDL, and LDL, among others. Healthy people, Cardiac disease, Respiratory disease, and COVID 19 Healing Group. There were 90 patients from General Salah Al-din Hospital in Salah Al-din province, Iraq, of which 66 were recovering COVID19 patients with illness problems, and 24 were healthy. COVID19 is more contagious in men than in women, according to previous study. The declined expression of Angiotensin_Converting_Enzyme-2 Receptors for Coronavirus in females explains the continued difficulties following COVID19 healing. Surprisingly, immunological differences between genders are mediated by X chromosomes and sex hormones[11]. Elevated troponin I levels in COVID19 individuals may indicate the severity of the clinical features, which might indicate acute myocarditis. Those predicting an increased risk of heart disease and possibly death[12]. considered Hypercholesterolemia is an important risk factor for chronic inflammation and cardiovascular disease. According to an Epidemiological study, high levels

of cholesterol are positively associated with cardiovascular disease mortality[10]. The high level of LDL accumulation in COVID19 patients causes increased oxidative stress. Furthermore, the intense stimulation may activate monocytes and endothelial cells, thus it can raise the expression of a number of inflammatory markers[13]. This might be because of the cytokine storm and the impairment of bodily function. The pathological findings revealed that COVID19 patients' lung injuries were caused by apoptosis and Endothelial Cell Pyroptosis (ECP)[14]. Hyperlipidemia is a major contributor to the development of endothelial dysfunction, atherosclerosis, and heart attack[15]. Previous research has found apo A-I and HDL are powerful antioxidants and anti-inflammatory substances found in plasma[16]. that individuals with significant TG development and low HDL levels are related to COVID19 development[17-18]. The cause might be ascribed to the virus attacks and destroying cell membranes or because of the effect of drugs. Several individuals with severe COVID19 were receiving corticosteroid treatment, which might explain the increased triglyceride levels[19].

6. Conclusions

the Lipid disorders in the patients after healing from COVID-19, and a rise in Cholesterol, Triglyceride, VLDL, and LDL maybe increase cause atherosclerosis and heart failure or car-

diac attack. the rise of Tnl in cardiac and respiratory groups because of the COVID-19 effect on age. It should also plan further studies to establish whether used therapies affect the clinical course of COVID-19-related atherosclerosis and heart failure or cardiac attack.

7. Ethical conduct of research

This study was conducted out in accordance with research standards, including the permission of the Healthy Ministry's Ethics Committee dated 29/11/2021 and numbered 35/2021036 and the University of samarra dated 1/11/2021 and numbered 1653-07/3.

8. Conflicts of Interest

The authors indicate that there are no conflicts of interest in the publication of this research.

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