How to Cite:
Judi, H. F., Ali, M. M., & Abduljawad, A. R. (2022). Apolipoprotein B level in corona virus patients in Iraq. *International Journal of Health Sciences*, *6*(S8), 5541–5546. https://doi.org/10.53730/ijhs.v6nS8.13529

Apolipoprotein B level in corona virus patients in Iraq

Huda Falah Judi
Department of Chemistry, College of Science, University of Kufa, Iraq

Muntadher Mohammad Ali
Department of Chemistry, College of Science, University of Kufa, Iraq
Corresponding author email: muntadhar.aljalal@uokufa.edu.iq

Ahmed Ridha Abduljawad
Department of Chemistry, College of Science, University of Kufa, Iraq

***Abstract*---**Background: Since the outbreak of the coronavirus disease 2019 (COVID-19) caused by severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) in December 2019, it has affected >200 countries, areas, or territories in 6 continents. At present, whether COVID-19 has an effect on thyroid function is unclear. The aim of this study was to evaluate Apolipoprotein in iraqi patients with COVID-19 . Methods: Clinical features, laboratory results, and real time PCR were reviewed for 60 patients with laboratory-confirmed COVID-19. They were admitted to the Al-Sadr Teaching Hospital; Iraq between September and December 2021. Healthy participants who underwent routine physical checkups and non-COVID-19 patients the study as the control group. Apolipoprotein B and Fibrinogen levels were determine and compared between the COVID-19 and control groups. Results: Fibrinogen protein B lower than the normal range of the patients with COVID-19 Compared to the control group. The levels of Apolipoprotein of the patients with COVID-19 were significantly lower than those of the healthy control group. The lower the Fg and ABOB levels were, with statistical significance ($p < 0.001$). Conclusions The Changing fibrinogen and apolipoprotein B in the blood of people with Coronavirus may have a role in the infection and the life cycle of the virus.

***Keywords*---**COVID-19, SARS-CoV-2, fibrinogen, apolipoprotein, vitamin C.

Introduction

Coronaviruses are positive-sense single-stranded RNA enveloped viruses non-segmented have the largest RNA viral genome with genome dimensions of about 26–32 kilo bases, it is a diverse viral group that infects a wide variety of wildlife such as bats, camels, cattle, and birds. Types of COVID viruses are transmitted directly, from an infected human to a health human, and indirectly, by handling COVID-positive animals. Once the virus enters the human body, it can cause neurological illnesses which may lead to death as it damages vital systems such as the hepatic, respiratory and nerve systems, and the gastrointestinal tract (Sofi et al., 2020). Human coronaviruses (HCoVs) such as SARS-CoV-2, with a new structural architecture recently diagnosed consist mainly of four parts start with nucleocapsid comprised of genome RNA and phosphorylated nucleocapsid (N) protein , spike glycoprotein trimmer (S) ,envelope glycoprotein (E) and the membrane glycoprotein (M)(Kayode et al., 2021). The novel coronavirus severe acute respiratory syndrome-related coronavirus 2 (SARS- CoV-2) appeared in late 2019 in China (Rando et al., 2021).

The World Health Organization (WHO) reported, in 2020, this new disease is a Public Health Emergency of International Concern and declared it was a pandemic on March 11 from the same year. SARS-CoV-2 has infected large number of patients mostly leading to death. The main way for spread between people is by respiratory droplets and the most common clinical symptoms upon infection with COVID-19 are fever, fatigue, shortness of breath, and dry cough with some clinical laboratories result such as lymphopenia ,elevated the level of d-dimer and ferritin and lower in WBC level. Millions of people infected COVID-19 had a developed case leading to acute respiratory distress syndrome (ARDS) and organ failures such as heart failures. Damage to the heart causes many types of diseases and conditions such as heart attack and heart coagulation (L.-Y. Wang et al., 2021).

Coronaviruses are encapsulated by favorable circumstances RNA viruses have spike-like projections on their surface and range in diameter from 60 nm to 134 nm, giving them a crown-like appearance. then the time coronavirus, behind the electron microscope (Singhal 2020) Humans and other mammals are frequently infected with coronaviruses, which are mammals and members of the Nidovirales order and the Coronaviridae family. (Huang et al. 2020). Thrombosis is the formation of a blood clot inside a blood vessel, obstructing the flow of blood through the circulatory system critical situation in the arterial diseases. It is a critical situation in the arterial diseases which causes stroke and myocardial infarction consider a cause for morbidity and mortality (Furie & Furie, 2008). Patients with COVID-19 showed elevated levels of coagulation markers (Gorog et al., n.d.) because COVID-19 infection is a thrombo-inflammatory disorder in this case the primary prothrombotic called ‘COVID-19-associate coagulopathy’ this is associated with the inflammatory response against SARS- CoV-2 and the complex interactions between covid-19 with immune, coagulation pathways at local and systemic levels and inflammatory systems which are involved in development of micro- and macrovascular thrombosis (Thomas, n.d.).

Fibrinogen is a procoagulant protein (Huang et al., 2022) molecule that consists of two outer D domains with elongated 45 nm structures each domain connected by a coiled-coil segment to its central E domain, each molecule comprised of two sets each set consists of three polypeptide chains termed Aa, Bb and c by five symmetric disulfide bridges. These three polypeptide chains joined together in the N-terminal E domain, Aa-chain consists of 610 while Bb-chain 461 and the major c-chain form cA, 411 residues, in liver hepatic parenchymal cells start the primary synthesized of Fg as a response to IL-1 and IL-6 derived stimulation (İlker Hayıroğlu et al., 2020)

Disturbances in the folate-dependent remethylation of Hcy to Met are linked to high Hcy. The main water-soluble vitamin B9, folic acid, functions as a coenzyme in the synthesis process. DNA and cellular renewal (Román, Mancera-Páez, and Bernal 2019). Studies have shown that there is a close correlation between high levels of homocysteine and coronary artery disease and risks, and that homocysteine has a relationship with obesity and weight gain, where the relationship is positive, that it was found to be high in obese people. (Wang et al. 2021)

Materials and Methods

One hundred Iraqi patients with COVID19 participated in the present study. Only 65 patients satisfied all biochemical analysis tests. Their ages ranged between 30-55 years old and the mean of BMI to patients 24.22 ± 4.11. The random blood glucose and HbA1c were 130.12 ± 20.14 mg/dl and 6.08 ± 0.8% respectively. These patients were registered as COVID19 at Al, Sadr General Hospital" in Najaf city-Iraq and a"Al , Hakim General Hospital" in Najaf city-Iraq within January to April period. The patients diagnosis was established by clinical symptoms, PCR and biochemical test. The present study excluded the patients with hypertension, those with endocrinitis infection and inflammation, heart diseases and also the patients from non-Arabic ethnic group.

Thirty people were selected as a control group. Their age were comparable to that of patients and the mean of BMI equal 22.94 ± 3.15. The means of random blood glucose and HbA1c were 101.9 ± 11.18 mg/dl, 5.03 ± 0.63% respectively. The people with anemic or having an obvious systemic diseases were excluded. Body Mass Index (BMI) was classified by the World Health Organization. Weight and height were measured according to WHO guidelines. Using WHO guidelines, BMI was calculated as weight/height^2 (Kg/m^2). Obese individuals were defined as having BMI more than 30 kg/m^2, whereas normal individuals had a BMI of 18-25. Five milliliters of venous blood samples were drown using a disposable needle and plastic syringes from each patient and control subject. Blood divided into two anticoagulant tubes and gel tubes. The blood in gel tube was left at room temperature for 15 minutes for clotting, centrifuged 3000 Xg for 5 minutes, and then serum was separated and transported into new disposable tubes.

The student T-test was employed to assess differences in scale variables between diagnostic categories and analysis of contingency tables (x2-test) was used to check associations between nominal variables. Associations among variables were computed using Pearson's product-moment and Spearman's rank-order

correlation coefficients. All tests were 2-tailed and a p-value of 0.05 was used for statistical significance. All statistical analyses were performed using IBM SPSS windows version 25, 2017.

Results and Discussion

The COVID-19 patients had a mean age of 58.3 ± 11.5 years old male and they did not differ statistically from COVID-19 or healthy subjects in age or gender
We found that levels of Fibrinogen mg/dl and APOB were lower in COVID-19 patients than healthy group ($p < 0.001$).

Parameters	Mean±STD Patients	Mean±STD Controls	P-Value
D.dimer ng/mL	3474.6±253.22	278.53±84.96	<0.0001*
Ferretin ng/mL	990.42±302.09	105.5±43.73	0.0004*
APOB (g/L)	0.7±0.12	2.23±0.83	0.17
Fibrinogen mg/dl	350±30.5	507±40	<0.001*

where the patient are covid-19 infection and covid-19 is an inflamation case we can observe an increasing in fg level, Fibrinogen is a positive acute-phase reactant associated with excessive inflammation in COVID-19 patients. It has been found the levels of fibrinogen and its degradation products increasing in patients with COVID-19 compared to healthy patients and increasing elevation of fg level as increase the severity of COVID-19 infection (Ulloque-Badaracco et al., 2022).

(Fg) is a very important protein could sensitively reflect the inflammation (C. Fan et al., 2021) and fibrinogen biosynthesis is increased during inflammation the fg concentrations can exceed 7 g/L (fg normal concentration ranges in plasma is 1.5–3.5 g/L and the half-life of 3–5 days)(Lymperopoulos et al., 2021). From the chart we can observe the elevation of fg in COVID-19 patients with heart disease more than both COVID-19 patients and healthy control patients. Among the patients the median age (IQR) was 66.5 years and they were frequently comorbidities including hypertension (64.6%) and heart disease (42.7%).

The COVID-19 is an infectious illness that has caused a pandemic worldwide. As a novel type of disease with high infectivity and mortality, the pathophysiology of COVID-19 has not been fully studied. A number of studies have reported severe and complex effects of COVID-19 in several human organs and systems including respiratory, immune, digestive, circulatory, hepatic, renal, and hematological systems (6). However, whether COVID-19 affects human thyroid function remains unknown. Here, we report the influence of COVID-19 on thyroid function. We found that COVID-19 patients presented with lower levels of TT3 and TSH than healthy subjects while their TSH levels were considerably lower than non-COVID-19 pneumonia patients. We also observed that thyroid dysfunction in COVID-19 patients may recover without thyroid hormone replacement within 30 days. This seems to mimic the pattern seen in patients with non-thyroidal illness (NTI).

Furthermore, even though the disease severity was matched, we still found the TSH level of COVID-19 patients was significantly lower than that in non-COVID-19 pneumonia patients. This suggests thyroid function abnormalities in COVID-

19 patients cannot be totally explained by NTI, possibly because of the attack of SARS CoV-2 virus. The wide distribution of COVID-19 nucleic acid in respiratory tract, saliva, feces, and breastmilk indicates that direct viral attack to the target cells may be an alternative reason (15–17). Angiotensin-converting enzyme 2 (ACE2) is a receptor providing the main entry site for SARS-CoV to invade human cells, and this in turn facilitates direct damage of virus through the course of infection (18, 19). Li et al. recently reported that ACE2 was highly expressed in the thyroid (20), suggesting that the thyroid gland may be a potential target for direct attack of COVID-19. Our study showed that thyroid dysfunction tended to be associated with viral nucleic acid cleaning time, indicating virus infection and replication may account for the abnormal thyroid hormones. However, our study also showed that disease severity, which may influence the viral nucleic acid cleaning time, was associated with thyroid dysfunction, thus the true relationship of thyroid function and viral nucleic acid cleaning time need to be further studied. With an exponential increase in COVID-19 infection rate and mortality in an ongoing global pandemic, researchers, clinicians, and government agencies are focusing on repurposing drugs with known safety profiles (Zhang L, Liu Y (2020)). Previously known beneficial outcomes following high doses of vitamin C therapy in clinical studies have made this vitamin a frontline candidate for possible COVID-19 treatment. Also, there are very limited side effects and patients have high tolerability to ascorbic acid high doses (Padayatty SJ, et al. (2004)).

References

Azkur, Ahmet Kursat, Mübeccel Akdis, Dilek Azkur, Milena Sokolowska, Willem van de Veen, Marie Charlotte Brüggen, Liam O'Mahony, Yadong Gao, Kari Nadeau, and Cezmi A. Akdis. 2020. "Immune Response to SARS-CoV-2 and Mechanisms of Immunopathological Changes in COVID-19." *Allergy: European Journal of Allergy and Clinical Immunology*. Blackwell Publishing Ltd. https://doi.org/10.1111/all.14364.

Carpenè, Giovanni, Davide Negrini, Brandon M. Henry, Martina Montagnana, and Giuseppe Lippi. 2022. "Homocysteine in Coronavirus Disease (COVID-19): A Systematic Literature Review." *Diagnosis* 0 (0). https://doi.org/10.1515/dx-2022-0042.

Chrysant, Steven G., and George S. Chrysant. 2018. "The Current Status of Homocysteine as a Risk Factor for Cardiovascular Disease: A Mini Review." *Expert Review of Cardiovascular Therapy*. Taylor and Francis Ltd. https://doi.org/10.1080/14779072.2018.1497974.

Hou, Huimin, and Huiying Zhao. 2021. "Epigenetic Factors in Atherosclerosis: DNA Methylation, Folic Acid Metabolism, and Intestinal Microbiota." *Clinica Chimica Acta*. Elsevier B.V. https://doi.org/10.1016/j.cca.2020.11.013.

Huang, Chaolin, Yeming Wang, Xingwang Li, Lili Ren, Jianping Zhao, Yi Hu, Li Zhang, et al. 2020. "Clinical Features of Patients Infected with 2019 Novel Coronavirus in Wuhan, China." *The Lancet* 395 (10223): 497–506. https://doi.org/10.1016/S0140-6736(20)30183-5.

Koklesova, Lenka, Alena Mazurakova, Marek Samec, Kamil Biringer, Samson Mathews Samuel, Dietrich Büsselberg, Peter Kubatka, and Olga Golubnitschaja. 2021. "Homocysteine Metabolism as the Target for Predictive Medical Approach, Disease Prevention, Prognosis, and Treatments Tailored to

the Person." *EPMA Journal*. Springer Science and Business Media Deutschland GmbH. https://doi.org/10.1007/s13167-021-00263-0.

Kwok, See, Safwaan Adam, Jan Hoong Ho, Zohaib Iqbal, Peter Turkington, Salman Razvi, Carel W. le Roux, Handrean Soran, and Akheel A. Syed. 2020. " Obesity: A Critical Risk Factor in the COVID -19 Pandemic ." *Clinical Obesity* 10 (6). https://doi.org/10.1111/cob.12403.

Lee J.I., Burckart G.J. Nuclear factor kappa B: important transcription factor and therapeutic target. *J. Clin. Pharmacol.* 1998;38(11):981–993.

Liu, Jing, Sumeng Li, Jia Liu, Boyun Liang, Xiaobei Wang, Hua Wang, Wei Li, et al. 2020. "Longitudinal Characteristics of Lymphocyte Responses and Cytokine Profiles in the Peripheral Blood of SARS-CoV-2 Infected Patients." *EBioMedicine* 55 (May). https://doi.org/10.1016/j.ebiom.2020.102763.

Liu, Yen Chin, Rei Lin Kuo, and Shin Ru Shih. 2020. "COVID-19: The First Documented Coronavirus Pandemic in History." *Biomedical Journal*. Elsevier B.V. https://doi.org/10.1016/j.bj.2020.04.007.

Padayatty SJ, Sun H, Wang Y, Riordan HD, Hewitt SM, Katz A, et al. (2004). Vitamin C pharmacokinetics: implications for oral and intravenous use. *Annals of Int Med*, 140:533-537

Raghubeer, Shanel, and Tandi E. Matsha. 2021. "Methylenetetrahydrofolate (Mthfr), the One-Carbon Cycle, and Cardiovascular Risks." *Nutrients* 13 (12). https://doi.org/10.3390/nu13124562.

Román, Gustavo C., Oscar Mancera-Páez, and Camilo Bernal. 2019. "Epigenetic Factors in Late-Onset Alzheimer's Disease: MTHFR and CTH Gene Polymorphisms, Metabolic Transsulfuration and Methylation Pathways, and B Vitamins." *International Journal of Molecular Sciences* 20 (2). https://doi.org/10.3390/ijms20020319.

Singhal, Tanu. 2020. "A Review of Coronavirus Disease-2019 (COVID-19)." *Indian Journal of Pediatrics*. Springer. https://doi.org/10.1007/s12098-020-03263-6.

Smith, A. D., and H. Refsum. 2021. "Homocysteine – from Disease Biomarker to Disease Prevention." *Journal of Internal Medicine*. John Wiley and Sons Inc. https://doi.org/10.1111/joim.13279.

Wang, Jinxiang, Dingyun You, Huaping Wang, Yanhong Yang, Dan Zhang, Junyan Lv, Sufeng Luo, Rui Liao, and Lanqing Ma. 2021. "Association between Homocysteine and Obesity: A Meta-Analysis." *Journal of Evidence-Based Medicine* 14 (3): 208–17. https://doi.org/10.1111/jebm.12412.

Zhang L, Liu Y (2020). Potential interventions for novel coronavirus in China: A systematic review. *J of Med Vir*, 92:479-490.