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Homocysteine level in obese people with corona virus patients in Iraq

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***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 thyroid function 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 without a history of thyroid disease. 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. Homocysteine and IL6 levels were determine and compared between the obese COVID-19 and control groups. Results: Homocysteine higher than the normal range of the patients with COVID-19 Compared to the control group. The levels of TSH and serum triiodothyronine (T3) of the patients with COVID-19 were significantly lower than those of the healthy control group. The lower the TSH and T3 levels were, with statistical significance ($p < 0.001$). The degree of the decreases in TSH and T3 levels was positively correlated with the severity of the disease. The thyroxine (T4) level of the patients with COVID-19 was not significantly different from the control group. A relationship between ascorbate (vitamin C) and COVID-19 severity is well known. Conclusions: The Changing TSH and TT3 hormones 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, thyroid hormone, TSH, vitamin C

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Introduction

At the end of 2019The Chinese city of Wuhan experienced the emergence of the coronavirus illness, which has a wide range of symptoms, the most significant of which are fever and shortness of breath. (Kwok et al. 2020) Over 500 million cases were identified in 188 countries and territories, with over 6.26 million deaths as of May 14, 2022. (CSSE, 2022). The SARS-CoV-2-induced COVID-19 has become one of the most urgent issues of our time as a result of the novel extreme severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) spreading throughout the world and the World Health Organization (WHO) declaring a pandemic on March 11, 2020. (Azkur etal., 2020).

Coronaviruses are non-sense positive RNA viruses that cause gastrointestinal and respiratory diseases in animals and humans. (J. Liu et al. 2020) The Nidovirales order's Coronavirinae subfamily of the Coronavirdiae class of viruses, which are enclosed, single-stranded, positive-sense RNA viruses, is what is known as a coronavirus (CoV).(Y. C. Liu, Kuo, and Shih 2020). 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)

Homocysteine It is one of the alpha-amino acids, which contains sulfur in its composition, and it is not included in the formation of proteins, as it is an intermediate product as a result of the transformation of methionine (Met) into homocysteine (Hou and Zhao 2021) The accumulation of homocysteine in the blood is a serious matter and pathological indication, Homocysteine is converted to methionine by methylation reactions, or it can be converted to cystathionine and then to cytosine by transferring the sulfur group, This reaction requires vitamin B12, folic acid, and the enzyme methylenetetrahydrofolate reductase (MTHFR). (Raghubeer and Matsha 2021) Homocysteine appears as a risk factor for cardiovascular disease and stroke Periodically(Chrysant and Chrysant 2018) Studies show that those with severe infection with Covid-19 had high levels of homocysteine in the blood (Carpenè et al. 2022) High levels of Hcy in the blood plasma (>15 μmol/L) is a medical condition Systemic hyperhomocysteinemia (Smith and Refsum 2021) Hypohomocysteinemia (less than 6 μmol/L) occurs in 1-5.0% of Similar to the population, Hcy is also considered an abnormally low concentration of Hcy as a factor Risk to Health Despite the high prevalence of Hcy in dialysis patients A decrease in the blood plasma concentration of Hcy in this patient group is linked to higher hospitalization and mortality rates in terms of maintaining kidneys. (Koklesova et al. 2021)

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 35-65 years old and the mean of BMI to patients 25.55 ± 3.06. 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, patients with a history of thyroid

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 Homocysteine ng/ml and IL-6 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	1224.6±211.63	278.53±84.96	<0.001*

Ferretin ng/mL	829.33±192.81	105.5±43.73	0.005*
Homocysteine ng/ml	655.2±24.6	922.2±15.5	<0.001*
IL-6, pg/mL	9.54±3.20	1.71 ± 0.21	<0.001*

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)).

Reference

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.

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.

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