



## **Examining Cortisol Hormone and blood parameters in Corona patients and comparing it with healthy people**

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### **Abstract**

COVID-19 is a pandemic caused by SARS-CoV-2 that has infected more than 74 million people. Since the outbreak of COVID-19 in China, the disease has spread rapidly to many other countries. Antioxidants are compounds that protect against cell damage caused by molecules called free radicals. Glutathione protects important cellular components against reactions with oxygen-

containing functional groups such as free radicals and peroxides. The accumulation of free radicals together with a weak antioxidant system leads to oxidative stress, which worsens most respiratory diseases, including COVID-19.

This study was conducted with the aim of investigating cortisol levels and blood parameters in COVID-19 patients. In this experiment, samples were taken from 30 corona patients and healthy people (controls) and their cortisol levels and blood parameters were analyzed by ELISA and Sysmax methods and the results showed that the cortisol level of the patient sample increased and there was a significant difference ( $p < 0.05$ ) with the cortisol level of the control sample. Also, the amount of white blood cells in corona patients did not change compared to healthy people ( $p > 0.05$ ). The amount of RBC blood cells and blood platelets of sick people has decreased and there is a significant difference ( $p < 0.05$ ) compared to healthy people.

**Key words:** enzyme, corona patients, cortisol, blood test

## Introduction

The rapid global spread of SARS-CoV2 or COVID-19 has become a problem for the health system, and identifying people at risk has become a critical challenge. (۵). COVID-19 is transmitted

through respiratory droplets or direct contact and respiratory tract infections. Most cases cause pneumonia, and 15% of cases lead to acute respiratory distress syndrome (ARDS)(۴).

The SARS-CoV2 coronavirus epidemic is characterized by high infection rates and relatively high mortality rates. In most severe cases, the clinical manifestations of the disease in addition to fever, cough and other conditional symptoms - cytokine storm, respiratory failure and finally death. Symptoms of COVID-19 can vary from person to person. Also, symptoms may be different in different age groups (۳). Immunology-based studies are elucidating possible pathophysiological mechanisms of COVID-19 infection that may be useful for developing more efficient management protocols (۶). COVID-19 transmitted to humans is divided into low and highly pathogenic species. However, the infection caused by this virus does not necessarily lead to recognizable symptoms. The low pathogenic COVID-19 infects the upper respiratory tract and causes mild respiratory problems such as a cold. The highly pathogenic form causes more severe problems such as acute respiratory syndrome by infecting the lower airways (۱۶). For laboratory detection of the virus, viral RNA can be detected using RT-PCR from samples of the upper respiratory tract, lower respiratory tract, and blood plasma. This test is currently the gold standard for virus detection (۱۷).

Oxidative stress is caused by an imbalance between the oxidative system in the body, which is mainly composed of free radicals and reactive oxygen systems that neutralize these free radicals and can have several harmful effects (۷). Oxidative stress is involved in some infections, especially those caused by RNA viruses, a family that also includes corona viruses. In general, viral infections increase the production of free radicals and decrease the presence of antioxidants (۱۵).

Cortisol is synthesized by adrenocorticotrophic hormone (ACTH), produced by the pituitary gland in response to stress. Its main mechanism is that it increases blood sugar or hyperglycemia. This increase is caused by the stimulation of hepatic gluconeogenesis, with the support of amino acids resulting from protein catabolism, especially at the level of skeletal muscles, and fat, at the level of adipose tissue. Cortisol is secreted in a normal daily schedule in stress-free environments, with its highest peak in the early morning and its lowest in the evening. Any stress, including news of a pandemic, causes severe stress in people with coronavirus infection (Covid-19). Elevated serum cortisol is an adaptive survival mechanism to stimulate the immune and cardiovascular systems to overcome this stress. It is through the hypothalamus-pituitary-adrenal axis (۹).

The increase in cortisol hormone is one of the most important mechanisms of the body to overcome stress through the hypothalamus, hypophysis, and adrenal glands, which creates adaptive mechanisms in the cardiovascular, metabolism, and immune systems. Important changes of this hormone can also be seen in corona patients, this issue makes it necessary to investigate the effect of corona virus on the amount of cortisol hormone in infected people. Corvid 19 virus, probably like the Sars virus, can cause focal necrosis in the adrenals by infiltrating monocytes, lymphocytes; Also, it probably works through the angiotensin-converting-enzyme expressed in the hypothalamus and pituitary gland, by affecting the hypothalamic-pituitary-adrenal gland pathway and reducing Adrenocorticotrophic hormone; As a result, it can cause primary and secondary hypocortisolism in patients (Babaei et al. 2019). Also, secondary hypocortisolism and low levels of ACTH were detected in a number of corona patients even after recovery (۱۰).

Early laboratory diagnosis plays a vital role in the management of many diseases. Various hematological parameters are currently used to predict outcomes, mortality and guide treatment in patients with SARS-COV-2 (۱۴).

Considering the high prevalence of Corona disease in the world and Iran and the high death rate and on the other hand the lack of facilities and diagnostic kits in hospitals in small cities, the need for rapid diagnostic criteria for these patients In order to start treatment faster, it seems necessary and inevitable. Based on the symptoms applied by global statistics and figures, which include fever (in 43.8% of people during admission and 88.7% of people during hospitalization), dry cough in 67.8% of cases), respiratory disorders, feeling tired and muscle pain in 11 to 14% of cases (diarrhea in 8.3%) are cases, the use of information obtained from blood factors in hospitals that do not have the necessary facilities and equipment, such as CT scan, can help diagnose the disease in the initial stages (۱).

Published research has shown that blood cell count analysis is a simple, cost-effective, and rapid laboratory diagnostic tool for assessing infectious inflammatory responses and severity of COVID-19. High leukocyte and neutrophil count and lymphocyte count, red blood cell count, hemoglobin concentration and lower hematocrit were observed in critical patients at the end of treatment (۱۳).

## statistical analysis

The normality of the data was checked using the Kolmogorov-Smirnov test. The results in the form of mean  $\pm$  standard deviation (SD) for quantitative variables and number (percentage) for qualitative variables showed the intensity of statistical analysis using SPSS software (SPSS Inc.) version 21. A significance level of 0.05 was considered.

## method

The research method is an experimental and laboratory type and the study type is a non-identical control case type. The selection of people with COVID-19, who were diagnosed by testing specialized laboratory results and the approval of a specialist doctor, and voluntarily and voluntarily participated in this research. Then informed consent was obtained from the patient as well as a questionnaire to obtain key variables.

First, in the laboratory, blood samples were taken from 30 patients between the ages of 30 and 50 with COVID-19, and also from 15 healthy control samples, the samples were poured into vials without anticoagulant, and then to separate the serum, to perform tests. Hormonally centrifuged. Also, tubes with EDTA anticoagulants were used to check blood parameters.

Also, in order to carry out biochemical studies, the blood samples of people infected with corona were centrifuged for 15 minutes at a speed of 3000 revolutions per minute and their serum was separated by the spectrophotometric ELISA method from the ideal kit at a wavelength of 450 nm in terms of micrograms per deciliter of Serum was measured And for blood parameters, a cell counter device was used.

## Results

Table 1: Mean cortisol Cortisol(  $\mu\text{g/Dl}$ )

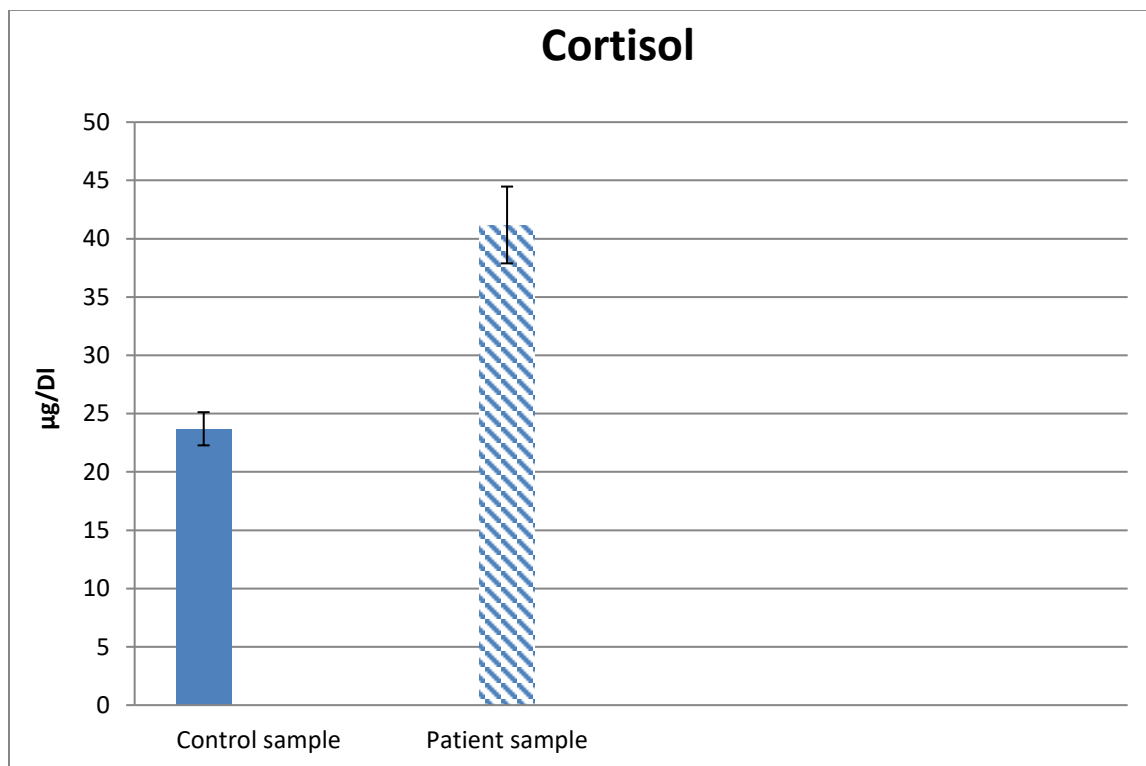


Average patient sample

average (control)

$41.18 \pm 1.12$

$23.7 \pm 1.32$



(Chart 1: Average cortisol Cortisol( µg/Dl) Mean±SD)

According to the above results, statistical analysis shows that the average amount of glutathione changes in the samples is 112.7 compared to the average of the control sample of 239.3 in covid-19 patients, this difference is significant ( $p < 0.05$ ) and the difference is significant. Dar, there is between witness and corona patients (Table1) (Chart 1).



Table 2: Comparison of the average status of hematological indicators in people suffering from covid

Hematology indicators	Control sample	Patient sample
WBC	۴/۷	۴/۷۸
RBC	۱۰۴۱۷	۷۴۵۰
PLT	۳۴۵۰۰۰	۱۵۰۵۹۰

Statistical analysis shows that the amount of white blood cells in corona patients did not change compared to healthy people ( $p>0.05$ ). If the amount of red blood cells and blood platelets of sick people compared to healthy people, there was a significant difference ( $p<0.05$ ). (Table 2)

## Discussion

This study investigated the levels of cortisol, white blood cells, red blood cells and platelets. The cortisol level of the patient sample increased with the control sample and there was a significant difference. Also, the amount of white blood cells in corona patients did not change compared to healthy people. The amount of red blood cells and platelets in the blood of sick people has decreased and there is a significant difference compared to healthy people.

In 1400, Bahrami Kia et al. found that the amount of red blood cells and platelets decreased in corona disease compared to healthy people, which is consistent with the present research. Unfortunately, there is little research on the effects of COVID-19 on the hypothalamic-pituitary-adrenal axis and blood cortisol levels.

T. Tan et al. found in 2020 that people were severely stressed by the announcement of the SARS CoV-2 epidemic, which led to an increase in cortisol levels due to fear of death, causing a doubling of cortisol levels, which increased mortality by 42%. increased. K. W. Choy in 2020 determined that the cortisol level in patients with Covid-19 is higher in these patients. In 2020, Favaloro and Lippi investigated blood transfusions, and in this study, routine hematological comparison of WBC indicators showed a significant increase, and platelets reported a significant decrease after one

week, which is not consistent with the current results regarding WBC, but regarding platelets It is consistent with the present research. Kazancioglu et al. in 2020 indicated that leukocytes and neutrophils decreased while hemoglobin and hematocrit levels decreased in critical covid-19, as well as platelet counts. which is consistent with the present results.

## Conclusions

In summary, there is a significant association between higher cortisol levels and Decrease in RBC blood cells and blood platelets and subclinical COVID-19 infection, which could subsequently increase the risk of COVID-19 infection. Therefore, it is crucial to take note of elevated cortisol levels Decrease in RBC blood cells and blood platelets in patients, as they may indicate a higher severity of COVID-19.

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