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Research Article

Estimation of the biochemical parameters changes in the blood of corona virus patients in iraq to support the timely decision needs

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Abstract: People in every region of the globe are showing rapid signs of infection with the SARS-CoV-2 virus. One patient can transmit the virus to two or three more patients even if they are not showing any symptoms, which is proof of the virus's fast spread. The importance of knowing the values of these signs and ensuring their validity lies in supporting the doctor's decision-making at the right time to control the infection and detect cases that do not show symptoms of infection. As a result, it is simple to isolate infected cases and make the decision to treat them as soon as possible to reduce the risk of infection and disease outbreaks. Therefore, the objective of this paper is to evaluate biochemical parameter changes in the blood of patients with coronavirus. The indicators estimated in the study include CRP, Creatinine, BUN, Sugar, WBC, Cholesterol, HDL, D-dimer, enzymes of liver function, and renal function tests. It is important to know and validate the values of the biochemical parameters to support the timely decision that the clinician needs to make to control infection and detect pathological conditions. Additionally, it is important to determine whether the values fall within the normal level or whether they fall within the level of the control group. Through our research, which describes the pathway for ESR, CRP, RBS, D-Dimer, and Ferritin, it is possible to understand the mechanism that influences the change in the levels of these parameters in patients with Covid-19 and thereby contribute to the early detection of the disease. According to the findings of these tests, there are significant disparities between the patients. Additionally, this study demonstrated that there is a statistically significant gap between the patients and the control group. On the other hand, one of the most important diagnostic markers for Covid-19 sickness is the D-Dimer test in combination with the ferritin test.

1. Introduction

The severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) was first identified in people in December 2019 in the city of Wuhan in China [1]. In the past twenty years, this is the third virus that is fatal to humans. In 2002, the Severe Acute Respiratory Syndrome Coronavirus 1 (SARS-Cov-1) was discovered, and in 2012, the Middle East Respiratory Syndrome Coronavirus (MERS) was discovered. This virus (SARS-CoV-2) appeared in 2019 and is the newest member of the SARS family [2].

The number of people who became infected with the virus from the beginning of the epidemic until May 25 reached 5,370,375 cases, while the number of people who passed away because of the virus was 344,454 cases. These numbers were spread out across 216 different nations, regions, or territories [3]. On March 11, 2020, the World Health Organization announced that SARS-CoV-2 had reached epidemic proportions [1].

Most patients may begin to exhibit signs of a Covid-19 infection anywhere from two to fourteen days after being exposed to the virus. These symptoms can vary from patient to patient but, in general, include fever, exhaustion, and trouble breathing [5, 6]. There is a 6.4% mortality rate among people who are

affected [3, 4]. The fact that the infection of Covid-19 was limited to the lungs and caused acute respiratory distress does not imply that other organs, such as the liver, digestive system, heart, or central nervous system, are not at risk.

As a result, all health institutions, including those that specialize in kidney diseases, have gone into an alert state [7, 8]. An increase in the activity of coagulation may often be seen in patients who have Covid-19, particularly in acute instances. Because of this, clotting factors are eventually depleted, which ultimately results in diffuse microvascular thrombosis. This procedure also aids in the coagulation of blood when hypoxia is present [9].

Since 2019 up till the present, Covid-19 has been the most significant sickness that has captivated every part of the planet, surpassing even the SARS viral epidemic in importance. Patients diagnosed with Covid-19 should focus their attention on the complete blood count (CBC) and coagulation tests as the most important standard diagnostic procedures. Assays (prothrombin time, alanine aminotransferase, creatinine, blood urea, lactate dehydrogenase, ferritin), and factors associated with inflammation (ESR, CRP). Analysis of biochemical parameters is one of the most efficient ways for doctors to evaluate the operational activity of key organs like the heart, liver, and kidneys.

This is because the virus can inflict serious damage to a wide variety of essential organs, including those organs. When a patient is admitted to the hospital ward with an infection, 70–83 percent of them will have lymphopenia [4, 10]. It can be inferred from the above, that there is still a need for more investigation into the biochemical parameters for the Corona virus's patients. Therefore, the objective is to identify biochemical changes in patients with coronavirus i.e. knowing the indicators of high or low CRP levels, creiten, BU, sugar, WBC, S. cholesterol, HDL, D-dimer, liver enzyme, renal function test, etc. The reminder of this paper is structured as follows. Section 2 illustrates the methodology of the paper to achieve the objective. Section 3 will present the results gained along with their discussion. The paper's conclusion is resented in section 4.

2. Methodology

After gaining the patients' agreement, a total of 150 patients with ages ranging from 25 to 101 years were chosen for the study. The severity of these injuries' ranges from mild to severe to critical. This study was carried out in Jalawla General Hospital, more specifically in the epidemiological hall for the tests that were available in the hospital, and laboratory work was carried out in the hospital's laboratories in the clinical biochemistry department. The remaining advanced tests were carried out in a specialized laboratory after samples were withdrawn from patients, separated, frozen, and transported refrigerated to the laboratory in Diyala, which is in Iraq.

Our study uses chemical tests, the fasting blood sugar assay is the test that identifies the quantity of glucose in samples, and the blood sugar chart offers descriptions of blood sugar readings in units of mg/dL. The test that determines the amount of sugar that is present in blood samples is called the fasting blood sugar assay. The patient had a complete blood count done to determine their haemoglobin (Hb) levels as well as their white blood cells (WBC), red blood cells (RBCs), and blood count platelets. Within a few minutes, blood samples were tested using a variety of different methods (Mindray CBC - 2800, USA).

Heart disease, diabetes, high blood pressure, cancer, and asthma are all examples of what are referred to as chronic illnesses. Chronic diseases may last for a lengthy period. In this study, a sample of patients was selected, and then those patients were asked whether or not they had a chronic disease. The researchers have also recorded information regarding the history of the disease, as well as other information regarding the patients, such as their age, gender, and current health status.
Calculating body fat percentage based on an adult's weight in kilograms and height in centimetres may help determine their body mass index. This can be done by providing the adult's weight in kilograms and height in cm (BMI).

CRP test Reagent composition; R1 is the diluent, which is a Tris buffer with a concentration of 20 mmol/L; R2 is latex, which is latex particles coated with goat anti-human CRP; and CAL is the calibrator, which is human serum. When calculating the IL6 concentration, we make use of the interleukin 6 (IL6) determination kit. The calculation is as follows: Insert the IC card into the reader on the analyzer machine, wait for it to finish reading the card, then add fifty microliters of sample to the buffer tube and mix it well. Collect a sample volume of 80 L, put it to the cassette, and then place the tape into the incubator for a period of 15 minutes. When clicking the "Test" button on the analyzer and inserting the cassette into it, the results will appear on the screen and will also be printed out automatically. Print out the results after they have been shown.

Ammonia and carbon dioxide are the products of the hydrolysis of urea by the enzyme urea. Glutamate dehydrogenase is responsible for the conversion of ammonia into glutamate. The cholesterol test (LDL) involves the precipitation of low-density lipoproteins in serum using polyvinyl sulfate, followed by the centrifugation of the precipitate and an examination of the residual cholesterol in the VLDL and HDL that is left over after the process.

The patients were diagnosed using the information provided by the pulmonologist, and the kinds of samples were identified using that information. Ten milliliters of venous blood were collected from each patient and placed in a variety of tubes (Gel tube, EDTE tube, Sodium citrate tube). Before being centrifuged for ten minutes at 3,500 revolutions per minute, blood samples were allowed to coagulate relative to the samples in gel tube for fifteen minutes at room temperature on a rack. After that, the serum was separated from the remaining cells in the sample.

After removing the serum from the tube using a pipette of appropriate size, it was placed on a plain tube and placed in the freezer. The results obtained from analyzing the above tests are presented in the next section. Creatinine, when exposed to alkaline circumstances, will react with picrate ions to generate a complex that is crimson in color. The rise in absorbance that results from complex formation over a period that has been previously determined is directly proportional to the amount of creatinine that is present in the sample.

3. Results and discussion

The results of the study of the parameters are presented in Fig. 1 with the Covid-19 virus, chronic diseases (group A = 1.0000; group B = 1.5570), age (group A = 57.6400; group B = 64.5369), the patient's condition (group A = 0.9200; group B = 1.8993), infection (group A = 45.6692; group B = 2.0000), the results of these parameters indicated that there were significant statistical differences, these findings provide more evidence that it is clinically effective in identifying the condition, particularly in patients of this age. When the statistical analysis was carried out using a significance level of P = 0.05, the averages of IL6, NRL, LYM, and WBC, respectively, were clinically significant and statistically significant. On the other hand, the results of the analysis of serum creatinine and urea levels demonstrated that there were no substantial differences with significance value and that these levels could be affected by Covid disease-19, as shown in Table 1. Since liver and blood variables are directly impacted in Covid-19 patients, our study also demonstrated that the change in the mean levels of NRL, LYM, and WBC, respectively, is of clinical importance and has statistical significance when performing the statistical analysis at P = 0.05, whereas the findings indicate that these variables are diagnostic and can be used as markers to follow up the patient's condition during the period of injury and treatment because there was a significant correlation between the changes in these parameters and the severity of the patient's condition.

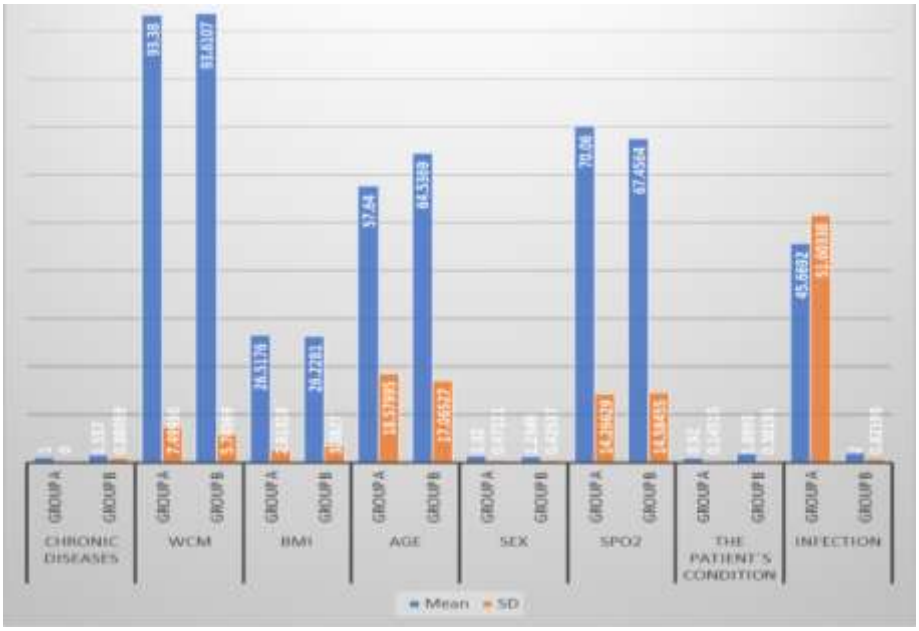

Figure 1. *The mean of WCM, age, sex, and other in patients with Covid-19*

Table 1. *The mean of serum creatinine, urea, IL6, and other in patients with Covid-19*

Test	Groups	N	Mean	Std. Deviation	Std. Error Mean	P
Creatinine	Group A	50	1.3722	.23221	.03284	.137
	Group B	149	1.7782	1.91287	.15671	.012
Urea	Group A	50	58.226	6.05090	.85573	.193
	Group B	149	72.930	79.3321	6.49914	.026
IL6	Group A	50	32.861	5.41968	.76646	.000
	Group B	149	2.9645	5.57981	.45712	.000
NRL	Group A	50	7.0270	1.21568	.17192	.000
	Group B	149	83.414	1.79565	.14711	.000
LYM	Group A	50	5.4970	2.40290	.33982	.000
	Group B	149	7.7589	1.39717	.11446	.000
WBC	Group A	50	3.8566	.62491	.08838	.000
	Group B	149	7.9314	4.56128	.37367	.000

To support the clinician's timely decision to control infection and detect pathological conditions, it is important to know and validate the values of the chemical parameters, as well as determine whether or not they fall within the normal level or level of the control group, it is possible to understand the mechanism that influences the change in the levels of these parameters in patients with Covid 19 and thus contribute to the early detection of the disease through our research, which describes the pathway for ESR, CRP, RBS, D-Dimer, and Ferritin. The results of these tests indicate the presence of highly significant differences between patients. In addition, this finding showed a statistically significant difference between the patients and the control group. On the other hand, the D-Dimer test in conjunction with the ferritin test is one of the most crucial diagnostic indicators for Covid-19 illness

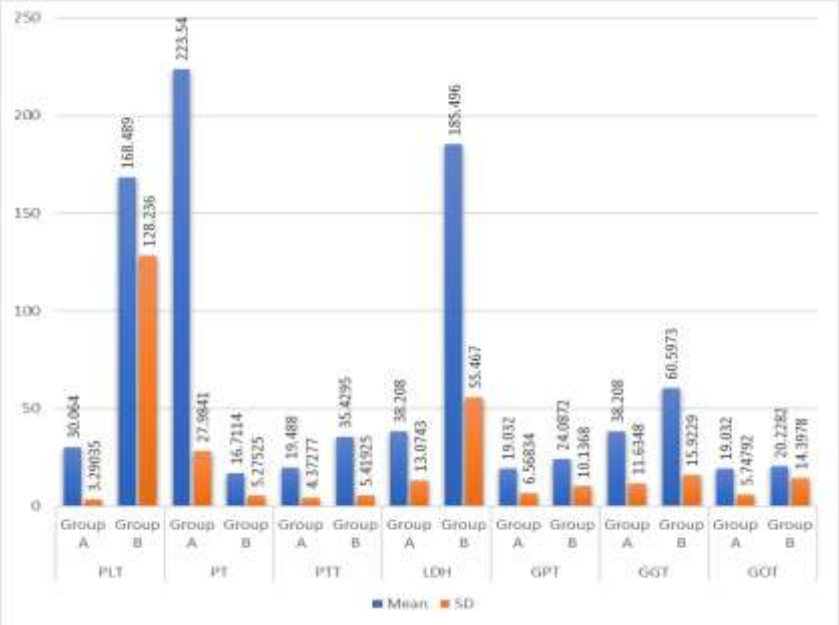

Figure 2 *The mean of PLT, PT, PTT, and other in patients with Covid-19*

4. Conclusion

The objective was to identify biochemical changes in patients with coronavirus i.e. knowing the indicators of high or low CRP levels, creatinine, BUN, sugar, WBC, RBC, PT, PTT, ESR, lymphocytes, S. cholesterol, HDL, D-dimer, interleukin 6, ferritin test, platelets, neutrophils, lactate dehydrogenase, liver enzymes.

An overall meta-analysis with random effects indicated that the severe group had considerably higher serum levels of IL6 compared to the non-severe group. The mean difference between the two groups was + 23.1 pg/mL (95% CI: 12.42-33.79) and the overall effect was 4.24 (P-value 0.001). This was established by analysing the differences in IL6 levels between the two groups. In addition, there is a chance that there are confounding factors that influence the connection between IL6 and the severity of Covid-19, although the nature of these variables is still unknown currently [11].

Patients hospitalized with Covid-19 should have a full complete blood count done every day, along with a manual white blood cell differential, to monitor for numerical and morphologic changes that are indicative of a poor prognosis and indicators of disease progression [12].

The ability to identify clinical indicators or a scoring system that may predict a benefit from hospital admission for individuals diagnosed with Covid-19 can be of significant use to decision-makers working in the health sector. This includes those in their later years, people of the masculine gender, and those who have co-occurring conditions such as diabetes and a history of hypertension. Patients who had Covid-19 had a higher likelihood of being admitted to the intensive care unit if they had higher levels of D dimers (>1.5 mg/dL), urea (>6.5 mmol/L), and troponin (>13.5 ng/mL), according to the results of the ROC and Precision-Recall curves. Patients who are at risk of developing critical Covid-19 and who might require aggressive intervention earlier on in the course of the disease can be identified by these three predictors along with their cut-off values [13].

Author Statements:

- **Ethical approval:** The conducted research is not related to either human or animal use.
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- **Data availability statement:** The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

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