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Correlation of D-dimer with the Severity of COVID-19 in a Sample of Iraqi Patients in Diyala Governorate

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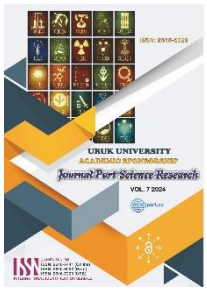
Abstract The novel coronavirus disease (COVID-19) is an infectious disease that results in acute respiratory infection or the so-called novel coronavirus (SARS-CoV-2). At the end of 2019, the Corona virus spread rapidly in almost all countries, which led to the imposition of measures of complete distancing and social distancing. Activation of intravascular coagulation is a common feature of disseminated intravascular coagulation in patients with covid-19. To find out if there is a clot inside the blood vessels (DIC) or if there is a clot inside the lung (pulmonary embolism) of the affected person, this is done by detect level of (D-dimer) in the serum of patients. This study was conducted to investigate the relationship between D-dimer and disease severity in Iraqi patients infected with (SARS -CoV-2) . Samples were collected from Baladruze General Hospital / Diyala and the confirmed epidemiological hall (Al-Shaheed Mortada). The total number of the sample is (100) samples, 50 of which are from people in critical condition in quarantine halls and 50 samples are from healthy people not infected with covid-19 to determine the level of D-dimer. The results of the statistical analysis showed a significant difference in the level of (D-dimer) between infected and non-infected peoples, that the mean D-dimer was 3,0977 ± 2,81828 in the infected peoples, and mean D-dimer among non-infected people, 0.2560 ± 0.13611 with high significant ($p < 0.0001$). It was concluded that there is a relationship between (D-dimer) and disease severity, and it can be used as an indicator of disease progression, taking into account some cases in which the D-dimer level is elevated.



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Keywords: *D-dimer, COVID-19, fibrinolysis*

1. INTRODUCTION

D-Dimer is a product of fibrin degradation (fibrinolysis) that in health circulates in blood plasma at low blood concentration. Since activated blood coagulation and consequent fibrinolysis is associated with increased plasma D-dimer concentration, D-dimer has proven a clinically useful biomarker of thrombotic disease (Lorente *et al*., 1993). Covid-19, the pandemic disease caused by infection with the novel virus, SARS-CoV-2 (severe acute respiratory syndrome coronavirus-2) can now be added to the already extensive list of conditions that may be associated with elevated D- dimer (Huang *et al*., 2020).

The discovery that D-dimer may be elevated in covid-19 was first reported by physicians in Wuhan, China where the epidemic started. A study of 191 patients with covid-19, who were hospitalized in Wuhan during January 2020 at the outset of the pandemic, revealed that D-dimer was elevated in many of these patients infected with covid -19 (Cevik *et al*., 2020).

The most common pattern of abnormal coagulation observed in patients hospitalized with covid-19 is characterized by elevations in fibrinogen and D-dimer levels (Chen *et al*.,2020). D-dimer is the principal breakdown fragment of fibrin and is used as a biomarker of fibrin formation and degradation (Adam *et al*.,2009). Numerous studies have shown that D-dimer is a valuable marker of activation of coagulation and fibrinolysis (Weitz *et a*l., 2017).

Healthy individuals have low levels of circulating D-dimer, whereas elevated levels are found in conditions associated with thrombosis (Weitz et al., 2017). D- dimer has been extensively investigated for the diagnosis, monitoring, and treatment of venous thromboembolism (VTE) for which it is used routinely (Bockenstedt *et al*., 2003). D-dimer levels are also elevated in conditions of chronic inflammation, such as active malignancy, rheumatoid arthritis, sickle cell disease, and asthma (Naik et al., 2016)

In the setting of covid-19, D-dimer has been reported to be higher in subjects who are critically ill or those who expire (Levi et al.,2020). However, the incidence of outcomes across different D-dimer levels both at clinical presentation and during the course of hospitalization are not well characterized. In addition, the trajectory of D-dimer in subjects with covid-19 remains unexplored. Given that widespread. micro thrombi have been observed in covid-19 in multiple organ systems (Wichmann et al., 2020).

2. MATERIALS AND METHODS

Samples were collected from Baladruze General Hospital /Diyala Governorate and the confirmed epidemiological hall

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(Al-Shaheed Mortada). The total number of samples is (100) samples, 50 of which are for severe ill people in quarantine halls, and 50 samples for healthy people non infected with covid-19 to determine the level of D-dimer as control. Samples were collected in the period August/ 2021 from people who were infected with Corona and in a severe condition and under artificial respiration in the halls of confirmed quarantine. Information regarding the medical history and physical examinations of selected participants with confirmed infection and their condition was also obtained critical. A 5 ml syringe and needle were used to collect 3 ml of whole blood sample from the pre-arm vein into a plain sodium citrate tube after cleaning the vein puncture site. The plasma was separated immediately after taking the sample and kept in the refrigerator freezer in the laboratory, where (D- dimer Rapid Test Kit) was used, by (Fincare device).

3. RESULTS AND DISCUSSION

In this study Table (1) showed group statistical analysis of age according to case and control, the results showed that no significant between two groups (P = 0.422), mean and SD in patients and healthy control (57.04 ± 12.683; 55.50 ± 13.992) respectively. The reason for the appearance of this result is because the selection of patients and healthy subjects was based on matching.

Table (1): *The group statistical analysis of age according to case and control*

Group Statistics					
	Subject	N	Mean	SD	*P.value
Age	Case	50	57.04	12.683	0.422
	Control	50	55.50	13.992	
SD: Standard deviation; *: p value less than 0.05 (significant)					

Table (2) showed groups statistical analysis of oxygen saturation (SPO2%) according to case and control, that case with SPO2 % 80.24 ± 9.652 and control 98.44 ± 1.431 with high significant (p < 0.0001). These results agree with (Pan et al., 2020), who showed that patients in the severe cases had a lower SPO2 than patients mild or moderate cases.

Table (2): *The group statistical analysis of SPO_2% according to case and control.*

Group Statistics					
SPO_2%	subject	N	Mean	SD	*P. value
	case	50	80.24	9.652	**<0.0001**
	control	50	98.44	1.431	
SD: Standard deviation ; *: p value less than 0.05 (significant)					

Table (3) showed group statistical analysis of Temperature: Celsius according to case and control, that case temperature 38.648 ± 0.9175 and control temperature 36.876 ± 0.5670 with significant (p <0.0001). This agree with Regular high fever in covid-19 is considered to be an indicator of severe infection. In a study of 201 patients in Wuhan, high fever (>39°C0) was associated with a higher likelihood of acute respiratory distress syndrome (Wang *et al.*,2020). This suggests although fever is the most common symptom in covid-19 patients, the absence of fever at the time of initial screening does not exclude covid- 19 (Gul *et al*., 2021).

Table (3): *The group statistical analysis of Temperature: Celsius according to case and control.*

Group Statistics					
Temperature: Celsius	Subject	N	Mean	SD	*P.value
	Case	50	38.648	0.9175	**<0.0001**
	Control	50	36.876	0.5670	
SD: Standard deviation; *: p value less than 0.05 (significant)					

Table (4) showed group statistic's analysis of D-dimer level in case and control used in study with case 3.0977 ± 2.81828 and control 0.2560 ± 0.13611 with significant (p <0.0001). These results agreed with (Alonso-Fernández et al., 2020). which show original studies involving large numbers of patients with severe and critically covid-19 was considered, and the results showed D-Dimer levels were found to be higher in severity patient. Baseline D-dimer levels were associated with covid-19 severity and could be related to disseminated intravascular coagulation (DIC).

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Table (4): *The group statistics analysis of D-dimer level in case and control used in study.*

Group Statistics					
	Subject	N	Mean	SD	* P.value
D-dimer	Case	50	3.0977	2.81828	**<0.0001**
	Control	50	0.2560	0.13611	
SD: Standard deviation; *: p value less than 0.05 (significant)					

According to the findings, this study concluded:

1. D-dimer is commonly elevated in patients with covid-19. D-dimer levels correlate with disease severity and are a reliable prognostic marker for in-hospital mortality in patients admitted for covid-19.

2. Higher levels of D-dimer are associated with low levels of oxygen saturation.

3. Increasing D-dimer levels are associated with a worse state. Based on this results, it is plausible that this measurement may serve as a useful biomarker to monitor acomplicated clinical course of the disease for patient infected with covid-19.

Recommendations

1. The risk of infection with the Coronavirus begins in the ages above 34 years, and treatment must be given to remove or reduce clots in the person infected with covid-19.

2. To prevent thrombosis, the oxygen level in the body must be maintained and the

patient's condition monitored when infected with covid-19 to prevent lung clots, which are the main cause of death.

3. The relationship between D-dimer with severity patients infected with covid-19 needs more study and cannot be relied upon only to observe the state of disease development.

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