



Section 1. Clinical Medicine

DOI: 10.29013/EJBLS-23-3-3-7



D-DIMER DYNAMICS AND INFLAMMATION PARAMETERS IN THE FIRST DAYS OF HOSPITALIZATION IN PATIENTS WITH COVID-19

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Cite: Hasa A., Barbullushi A., Kolic E., Xhixha A., Nake, A. (2023). *D-Dimer Dynamics and Inflammation Parameters in the First Days of Hospitalization in Patients With Covid-19. European Journal of Education and Applied Psychology 2023, No 3.* <https://doi.org/10.29013/EJBLS-23-3-3-7>

Abstract

The article provides data on the study of D-dimer dynamism, inflammation parameters and morphological blood parameters (neutrophil and lymphocyte) in 32 patients hospitalized with covid-19. The aim of the present study was an evaluation of inflammation, coagulation and fibrinolysis biomarkers and their possible associations with the severity and the prognosis of covid-19 disease.

Keywords: covid-19, inflammation parameters, d-dimer, morphological blood, neutrophil, lymphocyte, hospitalization

Introduction

CoV-19 is an infectious disease caused by acute respiratory syndrome coronavirus 2 (SARS-CoV-2). Named as the most significant global health crisis since the era of

the influenzae pandemic of 1918. After the first cases of this predominantly respiratory disease reported in Hubei Province, Wuhan, China in December 2019, SARS-CoV-2 quickly had a worldwide distribution in a

short period of time, thus being declared by the WHO as a pandemic on March 11, 2020. Since the moment of the declaration as a pandemic, COVID-19 has affected many countries around the world, significantly affecting the health systems.

Materials and methods

The size of the samples taken in the study during this period is composed of 32 patients of the age groups; 20–30 years, 31–60 years and >61 years. The laboratory tests included in the study are inflammation parameters; ferritin, fibrinogen, PCR and D-dimer as a coagulation parameter as well as morphological blood parameters; leukocyte, neutrophil and lymphocyte. For the measurement of these laboratory tests, venous blood was obtained through the phlebotomy procedure. For the measurement of D-dimer and fibrinogen, plasma obtained through the centrifugation of venous blood taken with Na citrate laboratory tube in the ratio 9:1, the measurement was performed on the STA COMPACT MAX apparatus. For the measurement of ferritin and CRP, serum obtained through the centrifugation of venous blood taken with a gel tube, the measurement was performed on the cobas e411 apparatus. A tube with K3EDTA anticoagulant was used to measure blood morphology, the measurement was performed on the Erba Elite 580 device. The statistical analysis procedures used in this study are described as follows; all statistical analysis was performed in SPSS (Statistical Package for Social Sciences, Version 26.0). Descriptive data on the laboratory tests obtained in the study were processed. Correla-

tions between different parameters obtained in the study were evaluated. In all cases, a value of $p \leq 0.05$ was considered statistically significant. The results were presented in absolute value and in percentage and were illustrated through tables and graphs.

Results

The data of the study showed that among the individuals included in the study, 59.4% are men and 40.6% are women, of which 3.1% are aged 20–30, 21.9% are aged 31–60 and 75% at age > 61 years. 68.8% turned out to be in serious condition and 31.2% in non-serious condition. The average values of the studied laboratory parameters in the first days of hospitalization varied as follows; d-dimer resulted with an average of 1.62(0.13–20), ferritin 1172.58 (76.1–1547.22), fibrinogen 484.83 (162–1792.04), CRP 5.19 (0.23–46.59), leukocyte 10.19 (1.28–29.98), neutrophil 81.7–51.7 96.60) and lymphocyte 11.65 (0.2–37.90). Ddimer has a positive linear relationship with ferritin $r=.029$, $p=0.09$. Fibrinogen has a negative linear relationship with Ddimer $r=-0.10$, $p=0.55$. Ddimer has a positive linear relationship with CRP $r=.041$, $p=0.01$. Ferratin has a positive linear relationship with CRP $r=0.06$, $p=0.73$. Fibrinogen has a positive linear relationship with CRP $r=0.39$, $p=0.02$. A significant lymphopenia, leukocytosis and neutrocytosis are observed. Neutrophil has a negative linear relationship with lymphocyte $r= -0.96$, $p=0.00$. There is a statistically significant relationship between age and disease severity but not between gender and disease severity.

Table 1. Spearman’s correlation analysis of neutrophil and lymphocyte.

		Neutrophil	Lymphocyte
Spearman’s rho	Neutrophil		
	Correlation Coefficient	1.000	-.967**
	Sig. (2-tailed)	.	.000
	N	32	32
	Lymphocyte		
	Correlation Coefficient	-.967**	1.000
	Sig. (2-tailed)	.000	.
	N	32	32

In (table 1) Spearman’s correlation analysis regarding neutrophil and lymphocyte is

presented. From the correlative analysis we draw the following conclusions: the neutro-

phil has a negative linear relationship with the lymphocyte $r = -0.96$. Significance is .00.

Table 2. Spearman's correlation analysis of inflammation parameters

		The average value of Ddimer in the four days of hospitalization	The average value of Ferritine in the four days of hospitalization	The average value of Fibrinogen in the four days of hospitalization	The average value of CRP in the four days of hospitalization
Spearman's rho	The average value of Ddimer in the four days of hospitalization	1.000	.299	-.108	.418*
	Correlation Coefficient				
	Sig. (2-tailed)	.	.096	.556	.017
	N	32	32	32	32
	The average value of Ferritine in the four days of hospitalization	.299	1.000	-.120	.061
	Correlation Coefficient				
	Sig. (2-tailed)	.096	.	.512	.739
	N	32	32	32	32
	The average value of Fibrinogen in the four days of hospitalization	-.108	-.120	1.000	.398*
	Correlation Coefficient				
	Sig. (2-tailed)	.556	.512	.	.024
	N	32	32	32	32
	The average value of CRP in the four days of hospitalization	.418*	.061	.398*	1.000
	Correlation Coefficient				
	Sig. (2-tailed)	.017	.739	.024	.
	N	32	32	32	32

Table 2. shows Spearman's correlation analysis. From the correlative analysis we draw the following conclusions: Ddimer has a positive linear relationship with ferritin $r = .029$. Significance is .09. Ddimer has a negative linear relationship with fibrogen $r = -.010$. The significance is .55. Ddimer has a positive linear relationship with PCR $r = .041$. Significance is .01. Ferratin has a positive linear relationship with PCR $r = .06$. The significance is .73. Fibrinogen has a positive linear relationship with PCR $r = 0.39$. Significance is .02.

Discussions and conclusions

The infectious disease of COVID-19 has already spread around the world. Most infected patients manifest it with mild symptoms and

a good prognosis, but some of them develop severe disease that can lead to death. From the studies there is no effective therapy for COVID-19. Therefore, it is essential to identify diagnostic markers that allow accurate monitoring of disease progression, because effective early interventions are essential measures to reduce mortality. There is much evidence to suggest that inflammatory responses play a critical role in the progression of COVID-19, and several markers have the potential to be used to accurately track and predict the severity and fatality of COVID-19 disease (Razu Rahman, S., Arif Binte, Y.T, T., Sh, I. S. Islam, Shariful Mohammed, H. Abrha, Gesesew and Ward, P. 2021).

The hematological profile of patients with COVID-19 showed differences between

severe and moderate cases. While hemoglobin, hematocrit and platelet count did not differ between these two groups, white blood cells and their differential count appeared to play an important role in terms of disease severity. We found that in severe cases, white blood cells were significantly increased compared to non-severe cases. More specifically, subjects with severe COVID-19 showed higher percentages of neutrophils and lower percentages of lymphocytes (Mardani, R., Namavar, M. E., Ghorbi, Z. Shoja, F. Zali, K. Hooman, M. Aghasadeghi Reza, S. Sadeghi Amir, S. Sabeti, I. Darzam Alavi, N. Ahmadi and Nasab Mousavi Dawood, S. 2022).

Lymphopenia has been concluded to be a characteristic of COVID-19 and to be useful in differentiating between COVID-19 pneumonia and non-COVID-19 pneumonia. Studies show that the decrease in lymphocytes is mainly caused by the depletion of T-lymphocyte subsets. Mainly T-helper and T-suppressor cells, and the presence of lymphopenia in patients with COVID-19 suggests significant inflammation and tissue damage. Our findings show that absolute lymphocyte counts are lower in severe cases (Mardani, R., Namavar, M. E., Ghorbi, Z. Shoja, F. Zali, K. Hooman, M. Aghasadeghi Reza, S. Sadeghi Amir, S. Sabeti, I. Darzam Alavi, N. Ahmadi and Nasab Mousavi Dawood, S. 2022). The results of our study showed the presence of lymphopenia and a significant relationship with the patient's health condition. A significant relationship between health status and leukocytes resulted. Neutrophils were found to have a significant relationship as well. A statistically significant relationship was found between neutrophil and lymphocyte.

CRP is a systemic marker of the acute-phase response to inflammation, infection, and tissue damage, which can be used as an indicator of inflammation. Previous studies have shown that CRP levels can be used to diagnose patients with COVID-19 and to predict the outcome of the infection (Razu Rahman, S., Arif Binte, Y.T, T., Sh, I.S. Islam, Shariful Mohammed, H. Abrha, Gesesew and Ward, P. 2021).

From the results of our study, an increased mean of CRP, ferritin, fibrinogen and dimer was observed and the degree of increase varied based on the severity of the patient's health condition.

Studies have shown that D-dimer is predictive of serious illness and death due to SARS-CoV-2 infection, and thus provides support for early triage of patients with COVID-19 presenting to the hospital emergency and for monitoring patients during the first week of hospitalization (E. M. D. A. G. O. Sayit, A. T., 2021).

Based on the studies conducted regarding the progress of ferritin in patients with covid, it was concluded that there is a significant correlation with the severity of the disease. D-dimer and ferritin had a particularly significant correlation between them (Sukrisman, L., Sinto, R., and Priantono, D. 2021).

Our found a significant correlation between fibrinogen and CRP, a significant correlation between dimer and CRP, no significant correlation was found between dimer and ferritin. Ddimer did not show a significant correlation with fibrinogen. No significant correlation was observed between ferritin and fibrinogen.

In conclusion we can say that the inflammatory markers can help doctors monitor and assess the severity and prognosis of COVID-19.

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submitted 22.08.2023;

accepted for publication 20.09.2023;

published 8.10.2023

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