

## THE SEVERITY OF COVID-19 IS ASSESSED FROM D-DIMER AND PLATELET LEVELS

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### ABSTRAK

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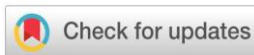
COVID-19;  
Severity;  
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#### Abstract:

This research was conducted with purpose to analyse the association between D- dimer and thrombocyte levels for severity of COVID-19. Researchers used cross sectional method on 57 COVID-19 patients at the private hospital in Surakarta on the period June to September 2021. Data were taken using total sampling with patients who fulfil the criteria and using Spearman test to analyse the association between D-dimer and platelet levels on the severity COVID-19. The characteristics of the respondents studied were an average age was 57 years, male is more dominant than female with a total of 35 (61.4%), the average severity of respondents was seriously ill (with an average oxygen saturations of 89.39%), the dominant D-dimer level of the respondent is increased with an average of 1699.4 ng/ml, and the dominant platelet level of the respondent was normal with an average of 281.360/ $\mu$ l. Results of the analysis with spearman test obtained significance (p-value) 0.560 for the association between D-dimer and severity of COVID-19, while for the association between platelets and severity of COVID-19, significance (p-value) 0.475 were obtained. From the results can be drawn the conclusion there is no association between D-dimer or platelet levels on the severity of COVID-19 disease.

#### Abstrak:

Penelitian ini dilakukan dengan tujuan untuk menganalisis hubungan antara kadar D-dimer dan trombosit dengan tingkat keparahan COVID-19. Peneliti menggunakan metode potong lintang pada 57 pasien COVID-19 di salah satu rumah sakit swasta di Surakarta pada periode Juni hingga September 2021. Data diambil dengan teknik total sampling dengan responden yang memenuhi kriteria dan dianalisis menggunakan uji korelasi spearman untuk menganalisis hubungan antara kadar D- dimer dan trombosit terhadap tingkat keparahan COVID-19. Karakteristik responden yang diteliti rata-rata berusia 57 tahun, jenis kelamin laki-laki lebih dominan dibandingkan perempuan dengan jumlah 35 (61,4%), rata-rata tingkat keparahan yaitu sakit berat (dengan rata-rata SpO2 89,39%), kadar D-dimer dominan meningkat dengan rata-rata yaitu 1699,4 ng/ml, dan kadar trombosit dominan normal dengan rata-rata yaitu 281.360/ $\mu$ l. Hasil analisis dengan uji spearman didapatkan signifikansi (p-value) 0,560 untuk hubungan D-dimer dan tingkat keparahan COVID-19, sedangkan untuk hubungan trombosit dan tingkat keparahan COVID-19 didapatkan hasil signifikansi (p-value) 0,475. Kesimpulan yang dapat diambil dari penelitian ini yaitu tidak terdapat hubungan antara kadar D- dimer maupun trombosit terhadap tingkat keparahan penyakit COVID-19.



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## INTRODUCTION

Three years on, the world has been hit by the COVID-19 pandemic. Although several times the pandemic in various countries began to subside, then there was a new wave of pandemics due to the emergence of new variants of SARS-CoV2. In addition, today COVID-19 remains a global health issue because no anti-COVID-19 drug has been found [1]. As of September 30, 2022, more than 614 million cases have occurred globally at the world level. As of October 1, 2022, the Government of Indonesia has announced more than 6,400,000 confirmed cases of COVID 19 nationwide, and more than 1,600 active cases and 158,122 deaths [2]. Various new variants of the SARS-CoV2 virus such as Alpha, Beta, Delta, and Omicron variants have also been found to infect populations in various regions in Indonesia with a high risk of transmission [3]. It is reported that *the overall case fatality rate* (CFR) for COVID-19 is 2-3% [4]. The severity level of COVID-19 is classified with 5 levels, including: asymptomatic, mild, moderate, severe, and critical (marked with ARDS). The severity of COVID-19 can be affected by conditions of hypertension, diabetes, thrombosis, pneumonia and obesity [5].

In the study of Ozen, found that D-dimer elevations were detected in 63.3% of patients, and these D-dimers tended to increase due to worsening clinical conditions in hospitalized patients with severe pneumonia in the ICU room [6]. D-dimer, the degradation product of fibrin crosslinking, is a marker of hypercoagulability and thrombosis [7]. Increased levels of D-Dimer is one of the abnormal laboratory components found in people with COVID-19. D-dimer is also used as a parameter to identify severe COVID-19 patients in the course of the disease [6] [12].

In a study by Simanjuntak *et al* in Ambon City on 150 COVID-19 patients, it was found that 42 people (28%) had severe

severity and 45 people (30%) had thrombocytopenia. With these findings, it is explained that there is a significant correlation between platelet count and clinical severity of COVID-19 patients [12]. People with COVID-19 who experience thrombocytopenia are associated with serious organ damage or physiological decompensation. SARS-CoV2 virus infection can cause cytokine storms, which will trigger the destruction of progenitor cells which causes decreased platelet production which leads to thrombocytopenia [13]. On the other hand, infection with the SARS-CoV2 virus can also increase immune complexes and autoantibodies. This makes platelets destroyed as target organs by the immune system. The increase in platelet destruction results in thrombocytopenia [13].

## RESEARCH METHOD

The study was conducted by referring to observational analysis methods with a cross-sectional design. The population comes from COVID-19 patients who are hospitalized at a private hospital in Surakarta from June to September 2021 and the sampling method is carried out by applying total sampling techniques and meeting points in the inclusion criteria. The inclusion criteria are COVID-19 patients who are confirmed positive from PCR results and undergo hospitalization, and are at least 18 years old. The research instrument uses medical record data by looking at independent and bound variables.

The independent variable consists of D-dimer and platelet levels, while the dependent variable is the severity of COVID-19 disease which is assessed from oxygen saturation (SpO2). Other data recorded include date of birth, hospital admission date, age and gender. In data analysis, the spearman test is applied to see the correlation between independent variables and variables bound to a numerical scale.

**RESULTS AND ANALYSIS**

Based on the results of the distribution of respondent characteristics, it is known that as many as 57 respondents became samples in the study, the average age of respondents was 57 years with the most dominant age in the range of 46-55 years as many as 19 respondents followed by the age range of 56-65 years as many as 18 respondents. As for gender, 35 of the 57 respondents were men who hints that males are more dominant than females. Level the most dominant severity in the severely ill group was 27 respondents with SpO2 < 93%, while the average SpO2 was 89.39%. D-dimer levels were found to increase in almost all respondents, namely as many as 52 respondents with an average D-dimer level of respondents of 1699.43 ng / mL. Meanwhile, in terms of platelets, it was found to be dominant in the normal range (150-450 103 / μl), which was 38 respondents with an average platelet respondent of 281.36 103 / μl.

**Table 1.**  
**The Spearman Correlation Test**  
**Spearman rho correlations**

		SpO2	D-dimer
SpO2	Correlation Coefficient	1.000	-0.079
	Sig. (2-tailed)	.	0.560
	N	57	57
D-dimer	Correlation Coefficient	-0.079	1.000
	Sig. (2-tailed)	0.560	.
	N		57

In the *spearman correlation test*, obtained the sig value. 0.560 for D-dimer levels and COVID-19 severity, meaning that between D-dimer and COVID-19 severity is not related. Similarly, spearman tests for platelets and COVID-19 severity show *sig values*. 0.475 which means there is no significant correlation between platelets and the severity of COVID-19.

**DISCUSSION**

The study, which involved medical record data of COVID-19 patients at a private hospital in Surakarta, showed that D-dimer levels were not significantly related to the level of COVID-19 severity. This result is similar to Akbar *et al* 's research which states that there is no correlation between D-dimer levels and COVID-19 severity levels at Kaliwater Hospital Jember [14]. Elevated levels of D-dimer are associated with inflammatory ractions (cytokine storms) in patients. Massive inflammation of tissues, especially alveoli, causes imbalance of coagulation and fibrinolysis in these tissues which has an impact on the activation of the fibrinolysis system and eventually an increase in D-dimer [12]. SARS-CoV-2 infecting a person can increase the risk of hypercoagulation, therefore D-dimer levels become One of the parameters of the severity of occurrence hypercoagulation in the body of people with COVID-19 [15]. The unrelated variables in this study can occur because not all COVID-19 patients are checked for D-dimer levels, so the subjects involved in this study as respondents or samples are very limited to be able to represent the population. Unrelated D-dimer can also occur because in the samples studied, D-dimer levels are almost entirelyelevated.

The hyperinflammatory process that occurs in all COVID-19 patients causes injury to the tissue which will cause the coagulation process. This event causes thrombin production and fibrinolysis processes to increase resulting in increased levels of D-dimer [16]. Bivariate test results also show that platelets and COVID-19 severity are not related. These results are in line with Ozenen *et al* 's study which revealed that the value of MPV (*mean platelet volume*) are not correlated with the level of severity disease in research by Baihaqi and Rumaropen also revealed that the majority of COVID-19 patients have normal platelet counts, thus this causes the association between platelet

levels and length of hospitalization to be insignificant [18]. Thrombocytopenia has been found in people with COVID-19. This is possible because through three mechanisms, namely decreased platelet formation, increased destruction (destruction) of platelets and increased use of thrombocytes in injured or injured tissue [11] [13] Conversely, other studies actually explain that there is a mechanism that triggers an increase in platelet count through cytokine storm events. Cytokines such as IL-3 and TPO are involved in the stimulation of megakaryocyte differentiation which results in an increase in platelet count in the blood [19]. Unrelated platelet COVID-19 severity levels can occur because platelets in the majority of study subjects are in the normal range. Regulation of platelet activity in COVID-19 patients varies, causing variations in platelet count in COVID-19 patients, some have low, normal, and even high platelet counts [20].

## CONCLUSION

Based on the research that has been carried out, it is concluded that between D-dimer and platelets is not significantly related to the severity of disease in COVID-19 patients. For this reason, researchers suggest that future studies will be carried out in order to carefully develop this research from methods and external factors that can affect the severity of COVID-19 by adding more varied variables.

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