



## Original Article

## Platelets and D-dimer as the Biomarkers for COVID-19

Sabrina Rashid<sup>1</sup>, Aqsa Zulfiqar<sup>1</sup>, Ayesha Abdul Sattar<sup>1</sup>, Muhammad Rizwan<sup>1</sup>, Waqar Ali<sup>1</sup>, Arham Ilyas<sup>1</sup><sup>1</sup>University Institute of Medical Laboratory Technology, The University of Lahore, Lahore, Pakistan

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**\*Corresponding Author:**

Sabrina Rashid<sup>1</sup>,  
<sup>1</sup>University Institute of Medical Laboratory Technology, The University of Lahore, Lahore, Pakistan  
[sabrina.rashid@mlt.uol.edu.pk](mailto:sabrina.rashid@mlt.uol.edu.pk)

## ABSTRACT

COVID-19, a highly contagious and rapidly spreading viral infection caused by the new corona virus SARS-CoV-2, was first identified in China. On March 11th, 2020 World Health Organization announced it a pandemic. The novel infection which is still being studied has a wide range of severity, ranging from no symptoms to severe pneumonia that can lead to death **Objective:** To find correlation between D-Dimer and platelets count with the severity of the disease **Methods:** It was a cross sectional study. The duration of the study was 6 months from November, 2020 to May 2021. The study was conducted in University Institute of Medical Laboratory Technology, The University of Lahore. Data of 101 COVID-19 positive patients was obtained from 3 different hospital of Lahore. Hematological and biochemical parameters such as Complete blood count (CBC), D-Dimer, Lactate Dehydrogenase (LDH), Platelet count (PLT) and Ferritin levels were observed. The data was analyzed using Statistical Package for Social Sciences (SPSS) Version 21.0. P-value less than and equal to 0.05 was taken as significant **Results:** PLT count was decreased in severe patients of COVID-19 and was statistically significant (P-value = 0.004) LDH, D-dimer, and Ferritin were increased with severity of disease and they were also statistically significant (P-value 0.005, 0.000, 0.027) respectively **Conclusions:** The platelet count, D-Dimer, LDH and Ferritin levels could act as the biomarker to determine the severity in COVID-19 infection.

## INTRODUCTION

The Corona Virus Disease 2019 (COVID-19) caused by Severe Acute Respiratory Syndrome Corona Virus 2 (SARS-CoV-2) has swiftly evolved into a pandemic since it first emerged in Wuhan, China, in December 2019 [1]. SARS-CoV-2 infection causes a wide range of clinical symptoms that vary in severity; some individuals may be even asymptomatic [2, 3]. COVID-19 causes significant side effects in certain people, including acute respiratory distress syndrome, coagulation malfunction, and death.

Until November 2020, a total of 55 million individuals have been infected all over the world, with about 1.34 million to the fatal sickness [4]. Infection is spread primarily from person to person through respiratory droplets and direct contact happens with infected body fluids or people, when a person touches a virus-infected surface with their hand and then touches their mouth, eye, or nose using the same hand [5]. SARS-CoV-2 vertical transmission has been identified and verified by a positive COVID-19 nasopharyngeal swab. COVID-19 has a median incubation time of 5.2 days, with most patients developing symptoms between 11.5 and 15.5 days. As a result, it has been suggested that those who have been exposed to contamination be quarantined for 14 days

[6]. The symptoms of COVID-19 are mainly fever, cough, exhaustion, shortness of breath, diarrhea, gastrointestinal complications, loss of taste and smell [7]. Patients with severe disease are complicated by pneumonia, acute respiratory failure and disease linked with raised level of D-dimer such as liver cirrhosis, deep vein thrombosis, and pulmonary embolism. The doctors and researchers started to notice the fluctuations found within the levels of D-dimer, neutrophils, lymphocytes, fibrinogen and complete blood count in COVID-19 patients. Nevertheless, the value indexes of these parameters remained unclear [8].

D-dimer is a fragment produced when plasmin cleaves fibrin to breakdown clot COVID-19. Fibrin degradation produces D-dimer as a byproduct. D-dimer has been widely considered as a marker to observe prognosis in the patients with thromboembolism and severity of disease [9]. According to researchers the level of D-dimer when increases from 2000ng/ml may be an indicator of increased fatality rate.

## METHODS :

It was a cross sectional study. The study was conducted in University Institute of Medical Laboratory Technology (UIMLT), University of Lahore. The duration of the study was

6 months from November 2020 to May 2021. A convenient sampling technique was used to collect the data. Data was collected from Shaukat Khanum Memorial Cancer Hospital and Research Centre, Farooq Hospital and University of Lahore Teaching Hospital. Hundred and one (101) confirmed COVID-19 positive males and females were included in the study. Any patient having pneumonia, diseases linked with raised level of D-dimer such as liver cirrhosis, deep vein thrombosis, pulmonary embolism was excluded. Data was entered and analyzed by using Statistical Package for Social Sciences (SPSS) Version 21.0. The Mean ± SD of quantitative variables e.g., WBCs, PLTs, LDH, D-dimer, Ferritin, etc. was calculated. Two sample t-test was applied to compare the mean of groups. A P-value less than and equal to 0.05 was considered statistically significant.

**RESULTS :**

A total of 101 COVID-19 positive patients were included in the study. It comprised of 65 (64.35%) males and 36 (35.64%) females as shown in table 1. According to severity of the symptoms, the patients were categorized into two groups. Group I: Moderately affected COVID-19 patients and Group II: severely affected COVID-19 patients. The Mean ± SD of WBCs in Group I and Group II was 17.88 ± 19.77 and 9.51 ± 9.44 respectively and when they were compared, they showed statistically significant difference with P value of 0.00. A significant difference was seen in PLT count of both groups (P value = 0.004). Decrease in platelet with increase in severity of disease showed more bleeding risks. The Mean ± SD of D-dimer in Group I was 55.22 ± 75.54 and in Group II was 560.18 ± 508.02. When the level of D-dimer was compared between two groups it showed statistically significant difference (P-value = 0.000). This result depicts a clear difference between the values of D-dimer with the change of severity of disease.

Lactate dehydrogenase (LDH) levels increases when the disease is more severe, as the Mean ± SD of LDH among Group I and Group II were 277.13 ± 165.46 and 371.44 ± 202.04, respectively. Serum ferritin levels were also increased with increased disease severity. The Mean ± SD of serum ferritin among the Group I and Group II were 948.89 ± 1966.53 and 1063.07 ± 2559.76, respectively. Both LDH and ferritin showed statistically difference between two groups with P-value 0.015 and 0.027, respectively (table 2).

Gender	No. (%)
Male	65 (64.5)
Female	36 (35.64)

**Table1:** Gender distribution (n=101)

Variables	Severity	No.	Mean±SD	P-value
WBCs	GroupI	32	17.88± 19.77	0.0
	GroupII	69	9.51 ±9.44	00
PLT	GroupI	32	365.72± 199.27	0.0
	GroupII	69	255.36± 128.44	04
LDH	GroupI	32	277.13± 165.46	0.0
	Group II	69	371.44 ±202.04	15
D-DIMER	GroupI	32	55.22± 75.54	0.0
	GroupII	69	560.18± 508.02	00
FERRITIN	GroupI	32	948.89±1966.53	0.0
	GroupII	69	1063.07±2559.76	27

**Table 2:** Comparison of different variables between two groups P value <0.05 was considered statistically significant

**DISCUSSION :**

COVID-19 has spread rapidly around the world, resulting in not only a massive loss of human life but also an economic catastrophe in both established and evolving nations. In severe illness, there is a greater rate of virus and death as compared to non-severe infection [10]. Severe illness prognosis may make hospitalization, anticipation and recovery more efficient. Complications should be avoided, and treatment should be started as soon as possible [11]. To measure the disease severity, simple, readily available, rapid, and cost-effective laboratory findings are required [12]. For this purpose, D-dimer, WBCs, LDH, PLT, and Ferritin could act as an important biomarker in COVID-19 infection, to analyze disease severity and prognosis [13].

In current study the Mean ± SD of WBCs, PLT, LDH, D-dimer, Ferritin among Group I and Group II as shown in table 2 were statistically significant between two groups with P-value 0.000, 0.004, 0.015, 0.000 and 0.027 respectively. The current study is in accordance with the study of Yumeng Yao et al. [13], (2020) who concluded that if the value of D-dimer exceeds 2.0ug/ml, it clearly shows mortality rate in COVID-19 patients. It proves that D-dimer is an effective early marker for disease severity [14]. The study of Guan et al., (2020) is also in agreement with the current study. This study showed that non-survivors had a considerably greater D-dimer (median: 2 µg/ml) than survivors (median: 0.61 µg/ml) [15].

According to previous studies of Gao Y et al., (2020) and Bhadade R et al., (2020), the association between increased D-dimer and disease progression in COVID-19 confirm that patients with severe disease are at increased risk of hyper coagulation as shown in current study [16,17]. These outcomes recommend that high levels of D-dimer in patients with COVID-19 may indicate a risk of coagulopathy and thrombosis [18]. Thrombotic and hemorrhagic events

were common complications in severely infected, confirmed COVID-19 patients [19]. Another study by Zhang et al., (2020) of China, which included 343 patients, proposed D-dimers as an early useful marker for disease severity and predicting patient hospital mortality rate [14]. According to the study of Shah S et al., (2020), D-dimer values showed an increased risk of serious illness in COVID-19 patients [20] as shown in current study.

The current study suggests D-dimer as a predictive marker for early detection of severity in COVID-19 patients. The associations were significant in moderate and severe groups. However, different ranges of D-dimer were used in all studies, it is necessary to find worldwide limits for foreseeing the course of the COVID-19 with severity. In addition, well-managed prospective studies examining other marker strategies with D-dimer may provide much valuable information for predicting disease progression of COVID-19.

## CONCLUSIONS :

According to current study, the WBCs, PLT, LDH, D-dimer and ferritin may act as reliable biomarkers to measure the disease severity and prognosis.

## REFERENCES :

- [1] Zhou P, Yang X-L, Wang X-G, Hu B, Zhang L, Zhang W, et al. A pneumonia outbreak associated with a new corona virus of probable bat origin. *Nature*. 2020, 579 (7798): 270-3. [doi.org/10.1038/s41586-020-2012-7](https://doi.org/10.1038/s41586-020-2012-7)
- [2] Guan WJ, Ni ZY, Hu Y, et al. Clinical characteristics of corona virus disease 2019 in China. *N Engl J Med*. 2020, 382(18): 1708-1720. [doi.org/10.1001/jamanetworkopen.2020.5619](https://doi.org/10.1001/jamanetworkopen.2020.5619)
- [3] Lippi G and Favaloro EJ. D-dimer is associated with Severity of Coronavirus Disease 2019: A Pooled Analysis. *Thrombosis and Haemostasis*. 2020, 120(5):876-8. [doi.org/10.1055/s-0040-1709650](https://doi.org/10.1055/s-0040-1709650)
- [4] Worldometer COVID-19 Corona Virus Pandemic. 2020, <https://www.worldometers.info/coronavirus/>, [doi.org/10.4324/9781003142089-22](https://doi.org/10.4324/9781003142089-22)
- [5] Huang Y, Wang X, Li L, Ren J, Zhao Y, Hu L, Zhang G, Fan J, Xu X, Gu et al., Clinical features of patients infected with 2019 novel coronavirus in Wuhan, China. *Lancet (London, England)*. 2020, 395 (10223) 497-506. [doi.org/10.1016/S0140-6736\(20\)30183-5](https://doi.org/10.1016/S0140-6736(20)30183-5)
- [6] Wu Y, Mei S, Ye C, Zou X, et al. Epidemiology and transmission of COVID-19 in 391 cases and 1286 of their close contacts in Shenzhen, China: a retrospective cohort study. *Lancet Infect Dis*. 2020. [doi.org/10.1016/S1473-3099\(20\)30287-5](https://doi.org/10.1016/S1473-3099(20)30287-5)
- [7] Tang N, Li D, Wang X, Sun Z. Abnormal coagulation parameters are associated with poor prognosis inpatients with novel coronavirus pneumonia. *J. Thrombosis Hemostasis: JTH*. 2020, 18(4):844-7. [doi.org/10.1111/jth.14768](https://doi.org/10.1111/jth.14768)
- [8] Zhou F, Yu T, Du R, Fan G, Liu Y, Liu Z, et al. Clinical course and risk factors for mortality of adult inpatients with COVID-19 in Wuhan, China: a retrospective cohort study. *Lancet (London, England)*. 2020, 395(10229): 1054-62. [doi.org/10.3410/f.737524760.793572955](https://doi.org/10.3410/f.737524760.793572955)
- [9] Borges do Nascimento I, Cacic N, Abdul Azeem H, von Groote T, Jaya RU, et al. Novel coronavirus infection (COVID-19) in humans: A scoping review and meta-analysis. *J. Clin. Med*. 2020, 9:941. [doi.org/10.2139/ssrn.3550028](https://doi.org/10.2139/ssrn.3550028)
- [10] Russell C, Parajuli A, Gale H, Bulteel N, Schuetz P, Jager C, et al. The utility of peripheral blood leucocyte ratios as biomarkers in infectious diseases: A systematic review and meta-analysis. *J. Infect*. 2019, 78. [doi.org/10.1016/j.jinf.2019.02.006](https://doi.org/10.1016/j.jinf.2019.02.006)
- [11] Lauer SA, Grantz KH, Bi Q, et al. The incubation period of coronavirus disease 2019 (COVID-19) from publicly reported confirmed cases: estimation and application. *Ann Intern Med*. 2020, 172(9):577-582 Available at: <https://www.ncbi.nlm.nih.gov/pubmed/32150748>
- [12] Sun S, Cai X, Wang H, He G, Lin Y, Lu B, et al. Abnormalities of peripheral blood system in patients with COVID-19 in Wenzhou, China. *Clinica Chimica Acta, International*. 2020, 507: 174e80. [doi.org/10.1016/j.cca.2020.04.024](https://doi.org/10.1016/j.cca.2020.04.024)
- [13] Yao Y, Cao J, Wang Q et al., D-dimer as a biomarker for disease severity and mortality in COVID-19 patients: a case control study. *Intensive Care*, 2020, 8: 49. [doi.org/10.1186/s40560-020-00466-z](https://doi.org/10.1186/s40560-020-00466-z)
- [14] Zhang L, Yan X, Fan Q, Liu H, Liu X, Liu Z et al., D-dimer levels on admission to predict in-hospital mortality in patients with COVID-19. *J. Thrombosis and Hemostasis*, 2020, 18(6): 1324-1329. [doi.org/10.1111/jth.14859](https://doi.org/10.1111/jth.14859)
- [15] Guan WJ, Ni ZY, Hu Y, Liang WH, Ou CQ, He JX, et al., Clinical Characteristics of Coronavirus Disease 2019 in China. *N Engl J Med*. 2020, 382: 1708-1720, [doi.org/10.1142/9789811222078\\_0027](https://doi.org/10.1142/9789811222078_0027)
- [16] Gao Y, Li T, Han M, Li X, Wu D, Xu Y, et al. Diagnostic utility of clinical laboratory data determinations for patients with the severe COVID-19. *J. Med. Virol*. 2020, 92, 791-796. [doi.org/10.1002/jmv.25770](https://doi.org/10.1002/jmv.25770)
- [17] Bhadade R, Harde M, deSouza R, Kasbe A, Deshpande C, Dave S et al. Appraisal of critically ill COVID-19 patients at a dedicated COVID hospital. *J. Assoc. Phys. India*, 2020, 68(9): 14-19, 2020. [doi.org/10.1101/2021.04.23.21256009](https://doi.org/10.1101/2021.04.23.21256009)
- [18] Wu YP, Wei R, Liu ZH, Chen B, Lisman T, Ren DL et al.

Analysis of thrombotic factors in severe acute respiratory syndrome (SARS) patients. *Thromb. Haemost.* 2006, 96(1): 100-101. [doi.org/10.1036/1097-8542.616740](https://doi.org/10.1036/1097-8542.616740)

- [19] Harmouch F, Shah K, Hippen J T, Kuma, A and Goel H. Is it all in the heart? Myocardial injury as major predictor of mortality among hospitalized COVID-19 patients. *J. Med. Virol.* 2020, 93(2): 973-982. [doi.org/10.1002/jmv.26347](https://doi.org/10.1002/jmv.26347)
- [20] Shah S, Shah K, Patel SB, Patel FS, Osman M, Velagapudi P, et al. Elevated D-dimer levels are associate with increased risk of mortality in coronavirus disease 2019: a systematic review and meta-analysis. *Cardiol Rev.* 2020, 28(6):295-302. [doi.org/10.1097/CRD.0000000000000330](https://doi.org/10.1097/CRD.0000000000000330)