

## **Is There a New Way to Unravel the Novel Coronavirus? (Monitoring Coagulation Parameters in COVID-19 Patients)**

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**Received:** September 30, 2020; **Published:** November 25, 2020

**DOI:** 10.31080/ecprm.2020.09.00735

### **Abstract**

Knowledge of the features of this novel virus and clinical outcomes are limited. Currently, there is no vaccine or specific antiviral therapy available to prevent or treat COVID-19. The only tools at hand are limited to basic preventive measures. Unraveling the mystery of the virus and its effect on the human body has proved elusive. Researchers continue to consider and investigate numerous parameters to find a timely cure; thus far, without success. However, recent research suggests an association between abnormal coagulation parameters and clinical outcomes in COVID-19 patients and that, perhaps, anticoagulation therapy should be administered to enhance outcomes, ameliorate comorbidities, and reduce mortality rates.

**Keywords:** *D-dimer; Heparin; Fibrinogen; Pneumonia; Prothrombin Time; Thrombosis*

### **Abbreviations**

APPT: Activated Partial Thromboplastin Time; COVID-19: Coronavirus Disease 2019; DIC: Disseminated Intravascular Coagulation; FDP: Fibrin Degradation Product; NCP: Novel Coronavirus Pneumonia; PT: Prothrombin Time; PTT: Partial Thromboplastin Time; SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus 2

### **Introduction**

Coronavirus disease 2019 (COVID-19) has been a clinical management challenge globally. Understanding the features of this novel virus and clinical outcomes is bounded. The disease is primarily spread person-to-person during close contact via respiratory droplets expelled by coughing, sneezing, and talking. Typical symptoms include fever, cough, shortness of breath, and hyposmia (loss of smell) [1].

No vaccine or specific antiviral therapy is available, leaving limited preventive measures, such as social distancing, wearing face masks, hand-washing, and self-isolation [1]. Hallmark complications include pneumonia and acute respiratory distress syndrome. Recently, specific studies of COVID-19 revealed an association with coagulation disorders: elevation in fibrin degradation products (FDPs), such as fibrinogen and D-dimer [2,3].

Tang, *et al.* (2020) investigated coagulation features of patients with novel coronavirus pneumonia (NCP), determining that abnormal coagulation parameters are associated with poor prognoses in NCP patients [4]. This retrospective study analyzed conventional coagulation results and outcomes in 183 patients with confirmed NCP in Tongji Hospital, Wuhan, China. The findings indicated that abnormal coagulation, especially marked elevation of D-dimer and FDPs, is associated with NCP-related deaths [3,4].

### Discussion

The appearance of severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) that lead to COVID-19 has brought a challenging clinical scenario for most healthcare providers. Periodic recommendations and management strategies have been proposed since the beginning of this pandemic; however, there is no standard medical treatments or procedures for infected patients to ensure their recovery.

Practical knowledge about this viral infection is limited, and no virus-specific preventive measures, treatments, or vaccines are available. Comorbidities, including hypertension, diabetes mellitus, cardiovascular disease, chronic lung disease, cancer, chronic kidney disease, and obesity, predispose COVID-19 patients to more severe outcomes and increased mortality rates [5].

COVID-19 can affect any age group, but symptomatic disease in children is uncommon, with severe disease presentation even less so. Nevertheless, COVID-19 can adversely affect previously healthy younger individuals [1,6].

The spectrum of symptoms can range from mild pneumonia to acute respiratory distress syndrome, necessitating intubation in most patients and resulting in poor clinical prognoses [3–5,7]. Moreover, clinical data have shown thrombotic complications as the cause of death in a significant number of patients [8]—even in those whose respiratory failure was thought to be the reason for not surviving.

According to Tang (2020), 71% of COVID-19 deceased patients met the criteria for disseminated intravascular coagulation (DIC), in contrast to only 0.6% in patients who survived. Non-survivors had significantly elevated D-dimer and FDPs and longer prothrombin times (PTs) than survivors on admission [4].

The development of DIC is thought to be due to a high viral burden, leading to sepsis. DIC (and sepsis) lead to multisystem organ failure caused by the activation and consumption of clotting factors and platelets, presenting as diffuse thrombosis with concurrent bleeding diathesis [3,4]. Unlike the commonly seen pattern of DIC from bacterial sepsis or trauma, the degree of partial thromboplastin time (PTT) elevation is less than that of prothrombin time (PT) and the thrombocytopenia is typically mild [4]. Nonetheless, prophylactic low molecular weight heparin is recommended for all hospitalized COVID-19-infected patients despite an abnormal coagulation panel in the absence of active bleeding [3,4]. However, no data indicate a decrease in mortality in patients with severe COVID-19 infection and elevated D-dimer and prophylactic low molecular-weight heparin.

Newer recommendations include monitoring coagulation panels, including PT, activated partial thromboplastin time (APPT), platelet count, D-dimer, and fibrinogen, in COVID-19-admitted patients [9,10]. Worsening of these parameters might indicate declining patient-status and the need for further or even entirely different management.

### Conclusion

Is there actually an association between abnormal coagulation studies, especially marked increases in D-dimer and FDPs, and novel coronavirus-infected patients' clinical outcomes? Moreover, should these coagulation panels be monitored in COVID-19 patients, and anticoagulation therapy administered?

The development of coagulation disorders, including overt DIC, is a frequent finding in critically-ill patients infected with SARS-CoV-2. Increased mortality rates appear associated with abnormal coagulation parameters and the related poor prognosis with coronavirus

infection. Also, there seems to be a positive correlation between the degree of D-dimer, FDPs, and mortality among infected patients (in the limited studies to date).

If an association exists between COVID-19 and coagulation disorders, the management and treatment of COVID-19-infected patients could and should change—to include the measurement and monitoring of these coagulation parameters and using them as prognostic indicators. However, this association has not been fully established by evidence-based research; further studies and trials with larger populations need to be conducted.

### Conflict of Interest Statement

The authors declare that this paper was written in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest.

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**Volume 9 Issue 12 December 2020**

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