

Compass in COVID-19 Illness: Disseminated Intravascular Coagulation/Sepsis-induced Coagulopathy Scoring in Predicting Severity

Kapil G Zirpe¹, Shrirang N Bamne²

Keywords: COVID-19, COVID-19 infection, COVID-19 mortality, D-dimer, Pulmonary embolism, Sepsis.

Indian Journal of Critical Care Medicine (2021): 10.5005/jp-journals-10071-24061

Coronavirus disease-2019 (COVID-19) pandemic and its fear continues even today, though percentage of mortality following its infection has decreased. Unfolding of disease course and their severity markers are, being discussed, studied in trials. This will be useful for treatment intervention and prognostication.

Coagulopathy in sepsis is probably developed as protective mechanism of body, as it limits microorganism diffusion through circulatory system.¹ As the infection severity, virulence outnumbers, leading to uncontrolled and imbalanced level of coagulopathy, which proportionate to organ dysfunction. Thus, we should evaluate proper timing of anticoagulation in COVID/sepsis, which can decrease the incidences of multi-organ dysfunctions from coagulopathy.

Coagulopathy is one of the well-known COVID illness-related complications, which may range from mild to severe, causing venous as well as arterial thromboembolism. Important causative factors in thromboembolism in COVID-19 illness, viz. endothelial injury, complement activation,² increased level of von Willebrand factor (vWF), fibrinogen, platelet, play important role in arterial as well as venous thromboembolism.^{3,4} Incidences of coagulopathy are increased in COVID pneumonia illness compared to pneumonia from other etiological agents. Coagulopathy severity can be measured in the form of disseminated intravascular coagulation (DIC) scoring system or sepsis induced coagulopathy (SIC) score. Difference between two is related to presence or absence of few parameters, viz. fibrinogen level, D-dimer level, and sequential organ failure assessment (SOFA) score.

D-dimer, SOFA score being used for evaluation as well as disease severity scoring not only with COVID-19 illness, also in others.⁵⁻⁸

Raised D-dimer in sepsis is closely related to organ dysfunction and outcome. In addition to intravascular coagulopathic process in COVID illness, rise in D-dimer can be related to intra-alveolar fibrinous exudate breakdown. This rising D-dimer can be differentiated clinically, laboratory investigations and by radiological imaging support, to know whether it is related to increase in alveolar opacities. After all rising D-dimer beyond thousands indicative of progression of severity of COVID illness.

Retrospective analysis of coagulopathic parameters, SIC/DIC scoring within 3 days of hospital admission, with incidences of pulmonary embolism (PE), mortality, progression of illness done in tertiary care hospital of AIIMS, Rishikesh, from March 2020 till December 2020.⁸

Though both, DIC score and SIC score, showed its proportionate correlation with severity of COVID illness, change in SIC score

¹Department of Neuro Trauma Unit, Grant Medical Foundation, Pune, Maharashtra, India

²Department of Neuro Trauma Intensive Care, Grant Medical Foundation, Ruby Hall Clinic, Pune, Maharashtra, India

Corresponding Author: Kapil G Zirpe, Department of Neuro Trauma Unit, Grant Medical Foundation, Pune, Maharashtra, India, Phone: +91 9822844212, e-mail: kapilzirpe@gmail.com

How to cite this article: Zirpe KG, Bamne SN. Compass in COVID-19 Illness: Disseminated Intravascular Coagulation/Sepsis-induced Coagulopathy Scoring in Predicting Severity. *Indian J Crit Care Med* 2021;25(12):1333-1334.

Source of support: Nil

Conflict of interest: None

showed more reliable change in progression of COVID illness severity. SIC and DIC score ≥ 1 as cutoff for predicting severe COVID illness with better sensitivity for SIC score. SIC and DIC score found to have correlation with mortality. SIC score is more sensitive for predicting mortality. However, mortality contributed by multiple factors, viz. bacterial and fungal infections, PE, details regarding same—whether there was a concomitant bacterial infection present during admission, or development of secondary bacterial and fungal infections, was not mentioned, including anticoagulant treatment and other interventions for PE.

DIC scoring was more sensitive for predicting PE compared to SIC scoring, but SIC shows significant association with PE probability.

SIC score is formed of coagulation parameters along with SOFA score. SOFA score itself is calculated score of six organ system functional parameters, which might have increased strength and reliability of SIC scoring system.

Overall D-dimer known for predicting the possibility of underlying disease, its severity, something found for predicting severity of COVID-19 illness. Higher the value, means more severe will be disease. D-dimer levels were significantly higher in nonsurvivors. As D-dimer is originated from underlying hyperinflammation, coagulopathy, alveolar dysfunction (from fibrinous exudate), it presents severity of disease, which translated in the prediction of mortality.

Hyperglycemia causes endothelial injury, precipitation of acute lung injury/acute respiratory distress syndrome (ARDS) and thus inflammation. In this study, D-dimer was found to

be higher in diabetics compared to nondiabetics, though statistically not significant difference. While D-dimer was found to be statistically significantly raised in hypertensive, compared to nonhypertensive.

Study have proposed ROC cutoff value of DIC score and SIC score more than equal to 1 and D-dimer more than 1315 ng/mL for severe disease. DIC score ≥ 1 , SIC score ≥ 2 , and D-dimer ≥ 600 ng/mL for PE; and DIC score and SIC score ≥ 1 , and D-dimer level ≥ 990 ng/mL for mortality prediction⁸. Cutoff values may help in COVID-19 illness patient management, in the form of triaging of patient, whether to be shifted under intensive care or to be managed in ward.

ORCID

Kapil G Zirpe  <https://orcid.org/0000-0002-8140-727X>

Shrirang N Bamne  <https://orcid.org/0000-0003-1128-4793>

REFERENCES

1. Scarlatescu E, Tomescu D, Arama SS. Sepsis-associated coagulopathy. *J Crit Care Med (Universitatea de Medicina si Farmacie din Targu-Mures)* 2016;2(4):156–163. DOI: 10.1515/jccm-2016-0024.
2. Magro C, Mulvey JJ, Berlin D, Nuovo G, Salvatore S, Harp J, et al. Complement associated microvascular injury and thrombosis in the pathogenesis of severe COVID-19 infection: a report of five cases. *Transl Res* 2020;220:1–13. DOI: 10.1016/j.trsl.2020.04.007.
3. Zhou Y, Lu K, Pfefferle S, et al. A single asparagine-linked glycosylation site of the severe acute respiratory syndrome coronavirus spike glycoprotein facilitates inhibition by mannose binding lectin through multiple mechanisms. *J Virol* 2010;84(17):8753–8764. DOI: 10.1128/JVI.00554-10.
4. Keragala CB, Draxler DF, McQuilten ZK, Medcalf RL. Haemostasis and innate immunity—a complementary relationship: a review of the intricate relationship between coagulation and complement pathways. *Br J Haematol* 2018;180(6):782–798. DOI: 10.1111/bjh.15062.
5. Xiao K, Xie L. The value of D-dimer on illness surveillance and prognosis evaluation of sepsis: a retrospective study. *Chest* 2016;149(4):A169. DOI: 10.1016/j.chest.2016.02.175.
6. Tee YS, Fang HY, Kuo IM, Lin YS, Huang SF, Yu MC. Serial evaluation of the SOFA score is reliable for predicting mortality in acute severe pancreatitis. *Medicine* 2018;97(7):e9654. DOI: 10.1097/MD.00000000000009654.
7. Dai H, Zhou H, Sun Y, Xu Z, Wang S, Feng T, et al. D-dimer as a potential clinical marker for predicting metastasis and progression in cancer. *Biomed Rep* 2018;9(5):453–457. DOI: 10.3892/br.2018.1151.
8. Kapoor M, Panda PK, Saini LK, Bahurupi Y. A Retrospective Analysis of Disseminated Intravascular Coagulation Score and Sepsis Induced Coagulopathy Score in Prediction of COVID-19 Severity. *Indian J Crit Care Med* 2021;25(12):1357–1363.