



D-DIMER LEVELS IN HOSPITALISED COVID-19 PATIENTS AND ITS CORRELATION WITH COURSE OF THE DISEASE

Pathology

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ABSTRACT

Introduction: COVID-19 infection is caused by SARS-CoV2 virus, declared as pandemic by world health organization in March,2020. Infection is characterized by severe acute respiratory syndrome along with intravascular hemolysis and coagulopathy. D-dimer is one of many markers used to assess intravascular hemolysis and coagulopathy. In this study, we have used D-dimer as marker to correlate with the course of disease in COVID-19 patients.

Aims And Objectives:

1. To correlate D-dimer levels with course of disease in COVID-19 patients.
2. To assess D-dimer levels in COVID-19 patients with good prognosis.
3. To assess D-dimer levels in critically-ill COVID-19 patients.
4. To correlate D-dimer levels with mortality of COVID-19 patients.

Materials And Methods :

A prospective study was done over period of 6 months from June,2021 to December,2021 during which 200 cases of RTPCR (Reverse Transcriptase polymerase Chain Reaction) – positive patients were studied for D-dimer levels in central laboratory of MGM's medical college and Hospital, Navi Mumbai. A venous blood is used in plain vacutainer which is analysed under au-380 biochemistry analyser and D-dimer levels are recorded. **Observation And Results:** 200 cases were studied in our study, out of which 81.5% cases were having high D-dimer. Out of 200 cases, 41.5% of cases were critically ill admitted in intensive care unit (ICU) and out of which in 10.5% cases death occurred. **Discussion:** In our study majority i.e. 81.5% of COVID-19 patients had increase in D-dimer levels, which established the significance of correlation of D-dimer levels with course of diseases in terms of severity, prognosis and mortality. COVID-19 infection can cause intravascular hemolysis and coagulopathy. D-dimer is a biomarker to assess abnormal coagulation and hypercoagulable state. Thus, d-dimer can be used to correlate with the disease outcome in COVID-19 infection. **Conclusion:** D-dimer can be used as predictive biomarker to correlate with the disease outcome in terms of severity, prognosis and mortality in COVID-19 patients.

KEYWORDS

INTRODUCTION:

COVID-19 infection is caused by SARS-CoV2 virus, started from Wuhan city of China as epidemic then it was declared as pandemic by world health organization in March,2020. Infection is characterized by severe acute respiratory illness with some cases showing intravascular hemolysis and coagulopathy. D-dimer is one of many marker used to assess intravascular hemolysis and coagulopathy.

Studies have reported an increase in D-dimer and fibrinogen concentrations in the early stages of COVID-19 disease, 3 to 4-fold rise in D-dimer levels is linked to poor prognosis.¹ Increase in D-dimer in Covid-19 infection is attributed to deranged haemostasis, which is often observed in patients with COVID-19 who show an increased incidence of altered haemostasis manifesting more towards a prothrombotic state.³

Pulmonary intravascular coagulopathy is principally responsible in activating a state of systemic intravascular coagulation with consequent involvement and damage to multiple organs with lethal sequelae of multi-organ failure, which has often been responsible for a spike in enormous fatality rate across the world.²

In this study we have used D-dimer to correlate with the course of disease in COVID-19 patients.

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MATERIALS AND METHODS:

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OBSERVATION AND RESULTS:

We studied 200 cases in our study for D-dimer in COVID-19 virus infected patients. Out of 200 cases 163 patients were having high D-dimer value while 37 cases were having D-dimer within normal range. The normal range of D-dimer is less than 500 ng/mL while more than equal to 500 ng/mL is considered as higher D-dimer.

Table 1: Distribution Of D-dimer In Hospitalised Covid-19 Patients:³

D-DIMER (ng/mL)	NO OF CASES	PERCENTAGE
<500	37	18.5 %
≥500	163	81.5 %
TOTAL	200	100 %

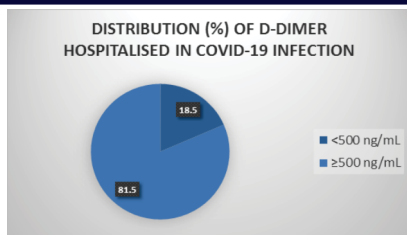


Figure 1: Distribution (%) Of D-dimer In Hospitalised Covid-19 Infection

We observed that not all patients having high D-dimer were in intensive care unit (ICU) but also were in wards. Out of 200 patients, 117 patients were in ward while 83 patients were in ICU. Out of 83 ICU patients 79 patients were having high D-dimer and only 04 ICU patients were having normal D-dimer. However, out of 117 cases that were present in ward, 84 patients were having high D-dimer and 33 patients were having normal D-dimer value.

Table 2: Distribution Of D-dimer In Icu And Ward Patients:

D-DIMER (ng/mL)	ICU	WARD
<500	04	33
≥500	79	84
TOTAL	83	117

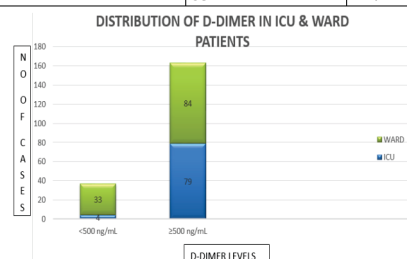


Figure 2: Distribution Of D-dimer In ICU & Ward Patients

We also studied the correlation of D-dimer with mortality and we found that out of 200 cases, 21 cases (10.5%) died. Out of these 21 cases 15 cases were having high D-dimer and 06 cases were having normal D-dimer levels.

Table3: Association Of D-dimer With Covid-19 Related Mortality:

D-DIMER (ng/mL)	NO OF DEATHS	PERCENTAGE
<500	06	28.6 %
≥500	15	71.4 %
TOTAL	21	100%

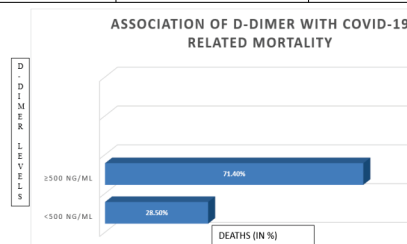


Figure 3: Association Of D-dimer With Covid-19 Related Mortality

DISCUSSION:

D-dimer is product of fibrin degradation (fibrinolysis) which circulates in blood plasma at low concentration. Since activated blood coagulation and consequent fibrinolysis is associated with increased plasma D-dimer concentration, D-dimer has proven a clinically useful biomarker of thrombotic disease.⁴ The most established utility of the D-dimer test is in the investigation of patients suspected of suffering venous thromboembolism (deep vein thrombosis) and its sequelae, primary embolism. D-dimer is almost always increased in those with deep vein thrombosis or primary embolism and so normal values are used to exclude the diagnosis. Also critical illness such as kidney disorders, liver disorders, heart failure, multiorgan dysfunction, death, are associated with higher D-dimer. It is observed that D-dimer value is lower at admission which increases gradually in later days of illness.

However, an elevated D-dimer cannot be used as diagnostic marker for venous thromboembolism or primary embolism because of low specificity. There are many other conditions associated with thrombosis such as (abnormal blood coagulation, coagulopathy) as COVID-19 in our study, consequently leading to elevated D-dimer levels.

Table 4: Increases D-dimer Levels In Hospitalised Covid-19 Patients

STUDY	Salabai et al	Gupta et al	Panigada et al	Tang et al	Nahum et al	Guan et al	Present study
D - DIMER	Increased	Increased	Increased	Increased (18% cases)	Increased	Increased (69.4% Cases)	Increased (82% cases)

The present study is in concordance with the Salabai et al, Gupta et al, Panigada et al, Tang et al, Nahum et al, Guan et al studies.

Table 5: Normal D-dimer Levels In Hospitalised Covid-19 Patients

STUDY	Arentz et al	Fan et al	Tang et al	Present Study
D-DIMER	Normal	Normal	Normal (82% of cases)	Normal (18% of cases)

Tang et al in their study showed that D-dimer were high in 18% of cases while it was normal in 82% of cases,⁸ however, in our study D-dimer was high in 82% of hospitalized COVID-19 positive patients and normal in only 18% of cases.

Table 6: D-Dimer In Covid-19 Positive Patients With Poor Prognosis

STUDY	Huang et al	Wang et al	Wu et al	Present Study
D-DIMER	Increased	Increased	Increased	Increased (95% of cases)

Guan et al in their study showed that Patients presented with elevated D-dimer more : 69.4% severe cases presented elevated D-dimer more frequently.¹⁰

Huang et al in their study showed that Patients necessitating ICU care presented with higher D-dimer levels with median d-dimer 2400 ng/mL than non-ICU patients.¹³

Table 7: D-Dimer In Cases With Covid-19 Related Mortality

STUDY	Wang et al	Present Study
D-DIMER	Increased	Increased (71.4% deaths)

Wang et al in their study showed that ICU cases presented with higher D-dimer level vers non-ICU cases. Longitudinal increase was noted in non-survivors in this study.¹⁴

Wu et al in their study showed that Higher D-dimer level was associated with ARDS (Acute Respiratory Distress Syndrome) development and poor survival.^{15us}

Zhou et al in their study showed that higher D-dimer was associated with poor prognosis.¹⁶

Lippi et al in their study showed that D-dimer values were considerably higher in COVID-19 patients with severe disease than in those without.¹⁷

CONCLUSION AND SUMMARY:

D-dimer was elevated in majority of COVID-19 positive cases and those with poor prognosis. Thus, D-dimer can be used as predictive biomarker to correlate with the disease outcome in terms of severity, prognosis and mortality in COVID-19 patients.

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