

Original Research Article

<https://doi.org/10.20546/ijcmas.2023.1203.009>

## The Study of Correlation between CRP, D Dimer, Ferritin and CBC Values in Covid Positive Patients and their Severity

R. Rathiesh<sup>1</sup> and Rajesh Sengodan<sup>2\*</sup>

<sup>1</sup>Government Mohan Kumaramangalm Medical College, Salem, Tamil Nadu, India

<sup>2</sup>Department of Microbiology, GMKMCH, Salem, Tamil Nadu, India

\*Corresponding author

### ABSTRACT

#### Keywords

Pneumonia, acute respiratory distress syndrome (ARDS), multi-organ failure and canevendie

#### Article Info

**Received:**  
06 February 2023  
**Accepted:**  
24 February 2023  
**Available Online:**  
10 March 2023

A small proportion of pneumonia patients develop severe pneumonia, acute respiratory distress syndrome (ARDS), multi-organ failure, and can even die. Comorbidities and laboratory markers have been proposed for risk stratification. There is mounting evidence that in critically ill patients, there are characteristics of hyperinflammation, which consist of elevated serum C-reactive protein (CRP), D-dimer, and hyperferritinemia. This lab values helps in clinical decision-making and reduction of the use of critical care in Aim and objective: Assess the patients severity and his/her prognosis infected with COVID positive patients. Materials and methods: This study was conducted as a prospective study done in RT PCR positive patients by analyzing c reactive protein, D dimer, Serum ferritin. Results: Most of the patients admitted in COVID intensive medical care unit shows elevated hyperferritinemia, elevated C reactive protein, D dimer, neutrophil lymphocyte ratio compared to RT PCR positive asymptomatic and patients with mild symptoms. This study shows that increase in serum ferritin, C reactive protein, D dimer values will helps in predict the patients need for ventilator support and were the patient could develop thromboembolic complication.

### Introduction

Coronavirus disease-2019 (COVID-19) is an infectious disease that has been declared a global public health emergency by the World Health Organization (WHO). The majority of patients with COVID-19 have a mild influenza-like illness or may be asymptomatic, a small proportion of patients develop severe pneumonia, acute respiratory distress

syndrome (ARDS), multi-organ failure, and canevendie. The reason why some individuals become critically ill, while others do not, remains an unsolved puzzle. Comorbidities and laboratory markers have been proposed for risk stratification. There is mounting evidence that in critically ill patients, there are characteristics of hyperinflammation, which consist of elevated serum C-reactive protein (CRP), D-dimer, and

hyperferritinemia (Liao *et al.*, 2020; Lu *et al.*, 2020). These findings suggest a possibly crucial role of a cytokine storm in COVID-19 pathophysiology. COVID-19 has three escalating severity levels. Symptoms such as the flu may appear at an early stage, primarily as a result of viral infection and viral pneumonia, and patients may be hospitalized for an extended period of time or placed on a ventilator. Pulmonary inflammation and coagulopathy, which can occur consecutively but are commonly overlapping, are also characterized during the second stage. In addition, the development of acute respiratory distress syndrome and a poor clinical course involve increased levels of inflammatory biomarkers, such as C-reactive Protein (CRP), ferritin and d-dimer. Finally, fibrosis is the third stage of the disease. Two respiratory phenotypes; low and the high elastance type can be distinguished in patients who require mechanical ventilation (Ian Huang. 2019; Berger, *et al.*, 2020).

In suspected COVID-19 cases, chest CT is strongly indicated for both initial assessment as well as follow-up in the predominant involvement of the respiratory system. Chest x-ray have a low diagnostic value in early stages, although CT results can occur before the onset of the symptoms. In addition, CT results in few instances have proven to be diagnostic with an initial false- negative result with real-time reverse-transcriptase polymerase chain reaction (RT-PCR). Reliable laboratory diagnosis is one of the main concerns for facilitating public health actions (Sahu *et al.*, 2020; Pourbagheri-Sigaroodi *et al.*, 2020).

RT-PCR is used routinely to detect causal viruses from respiratory secretions in acute respiratory infection. Ferritin is an iron storage form; it is one of the biomarkers of inflammation. In bacterial or viral infection, an increase in ferritin occurs due to iron release in the endoplasmic reticulum and to a decline in its transport capacity due to spleen and liver damage. D-dimers are multiple peptide fragments synthesized as a result of cross linked fibrin degradation mediated by plasmin. Its level would elevate in any process that involve production and breakdown of fibrin, such as acute infections,

surgery and acute or chronic inflammatory states. Thus, the continuous seeking for markers associated with the course of the disease can aid to better diagnostic accuracy, probably may also explore the severity of the disease. Such attempts may help clinical decision-making and reduction of the use of high cost techniques for diagnosis such as RT-PCR and CT scanning.

The main aim and objectives of this study to Assess severity of the disease in COVID infected patients early. Role of the following inflammatory markers such as CRP, ferritin, D dimer and complete blood count in diagnosing the severity and prognosis of COVID in intensive care unit patients

## **Materials and Methods**

Type of the study-Prospective and cross-sectional study

Place of study-Tertiary care hospital, GMKMCH, Salem.

Study period-3 months (august 2022- October 2022)

Sample size-100

### **Inclusion criteria**

Patients admitted with fever, cough, sore throat, dyspnoea, muscle aches and loss of smell or taste who were positive for COVID confirmed by RT PCR

Patients who have complete lab reports for present illness and those who gave consent for further laboratory investigations.

### **Exclusion criteria**

Patients with incomplete laboratory records or has medical history of renal failure, liver failure, active tumour, active infection other than COVID, pregnant women were excluded from study.

Patients didn't give consent for study and further

laboratory investigations.

## **Results and Discussion**

A total of 102 out of 127 patients matched my criteria and taken into study which includes 68 male and 34 females.

24 out of the total 102 were sick consisting of 15 male and 9 female. Among those most them had comorbidity like diabetes mellitus Type 2 and hypertension.

### **Comorbidity in Critically Ill Patients**

Patients with Diabetic were 18 & hypertension patients were 14

11 patients who had both diabetes & hypertension.

Patients with both comorbidities suffered more than patient with single or no co morbidities.

Patient without co morbidities gone for ventilator support are two patients only.

46 out of the total needed oxygen support.

In that 32 were kept for observation, they show no signs and symptoms of developing complication and their lab investigations were under normal values.

A total of 102 COVID positive patients most of the patients show elevated following lab values CRP, ferritin, D dimer, NLR values

Analysis of all patients revealed that CRP was above 0.5 mg/dL in 75% of patients, ferritin was above 300mg/dl in 73% patients, and D-dimers were above the threshold of 500µg/dl in 73% of the cases.

Lymphocyte and monocyte count, and neutrophil to lymphocyte ratio (NLR) was examined. Moderate monocytosis (500-1000 absolute monocyte count) was observed in 44% of the cases, and severe

monocytosis(>1000 absolute monocyte count) was found in 3.1 % cases

Lymphopenia occurred in 46% of patients.

Mean platelet volume (MPV) and platelet distribution width (PDW) were examined in all patients which didn't show any correlation in severity of COVID patients.

Several pro-inflammatory cytokines and chemokines were observed in the bloodstream and target tissue of COVID-19 patients.

Ferritin is widely known as an acute phase reactant and as a mediator for severe COVID-19 immunological dysfunction. Ferritin may therefore be an active agent not only in a cytokine storm but also a signal of the inflammatory environment. Ferritin is an acute phase reactant, and, as such, is typically raised in any inflammatory response. To assess for the most typically seen cytokine storm syndromes laboratory findings include a complete blood count, serum ferritin levels, and liver function tests. Most medical facilities provide these test. Ferritin is an acute protein that increases in response to a wide range of inflammatory conditions, including malignancies, overload of iron, and liver or kidney diseases. Global studies aimed to better understand the pathophysiology of the disease and to analyze how specific laboratory markers help in the COVID-19 process. Recent results revealed that patients with COVID-19 had lower haemoglobin levels and higher levels of ferritin (Velavan *et al.*, 2020; Kaftan *et al.*, 2021). Anaemia accompanies hyperferritinemia, no matter what underlying diseases are present. When ferritin levels begin to rise, a time bomb of inflammation is likely to be present. Patients with COVID-19 have reported that inflammatory processes also produce high levels of ferritin. In severe cases serum ferritin levels were substantially. Patients with poor composite result showed that ferritin was higher in non-survivor groups and sub- group findings showed a higher ferritin level.

**Table.1**

Patients	Male	Female	Total
Critically ill	15	9	24
Oxygen support	31	15	46
Observation	20	12	32

**Table.2**

Co morbidities	Present	Absent
Hypertension	14	8
Diabetes mellitus	18	4
Both	11	2

**Table.3**

Parameters	Lab values	No. of patients with elevated lab values
CRP (mg/dL)	>0.5%	76
Ferritin (mg/dl)	>300mg%	73
D-dimers (µg/dl)	>500µg/dl	73
NLR		50
Monocytes (K/µL)	>500	48
Lymphocytes		46

**Fig.1**

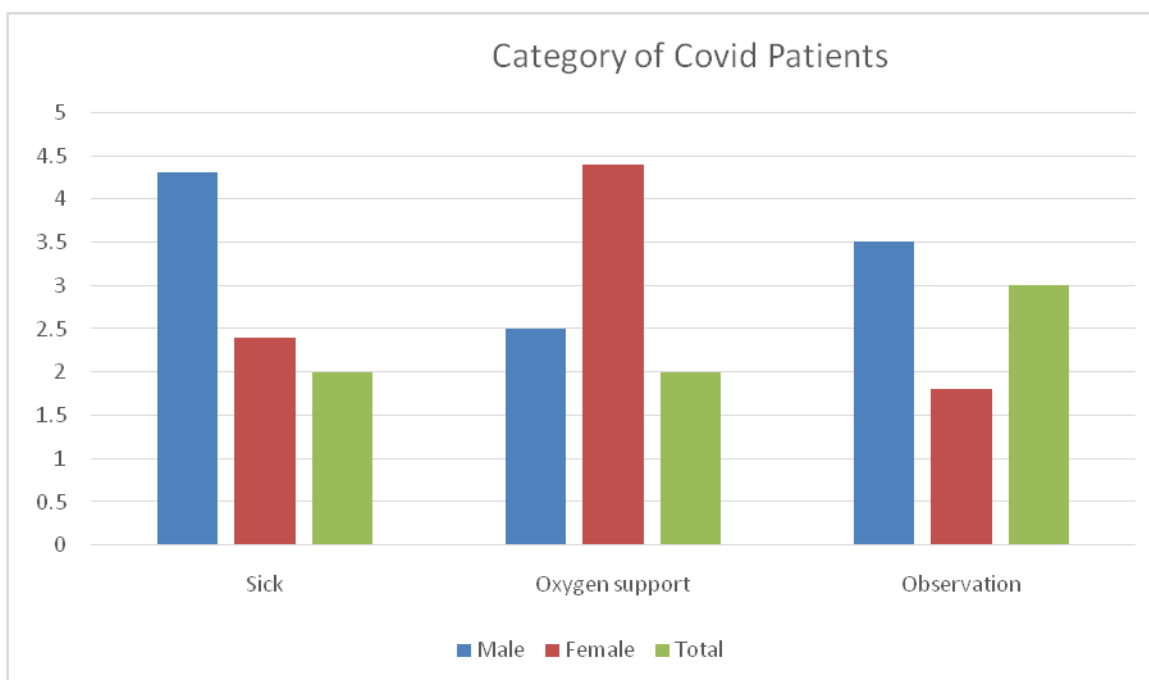
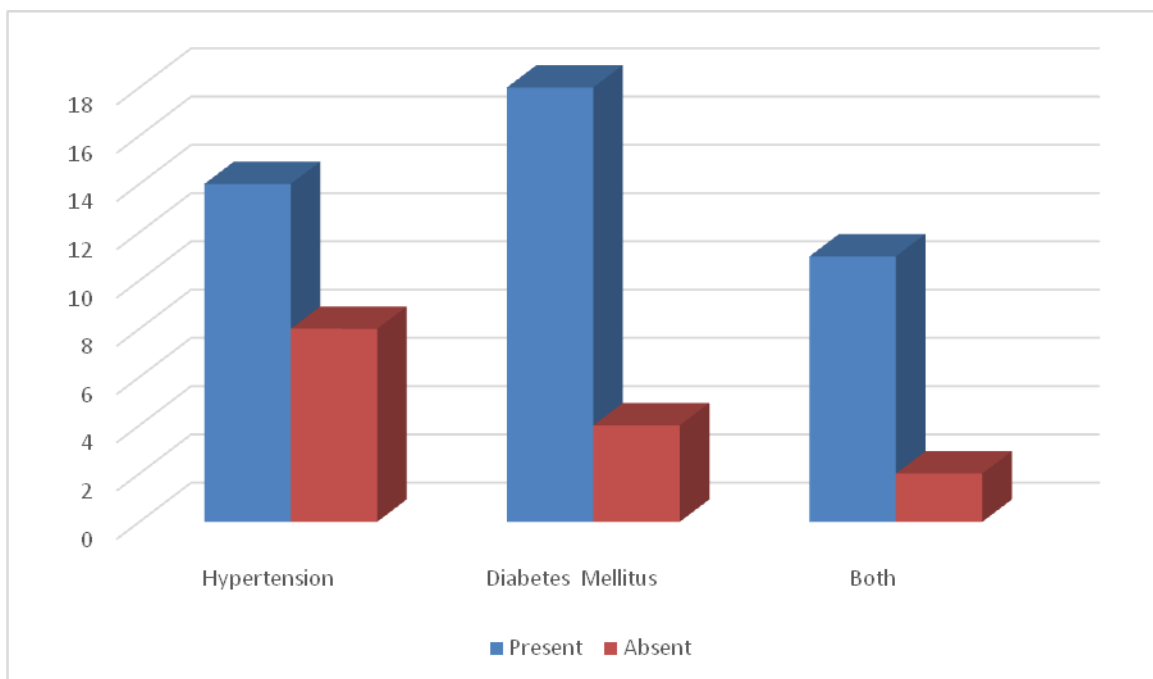


Fig.2



Similar studies conducted in other institutions found that higher fibrin-relevant (d-dimer and fibrin degradation product) levels were significantly associated with non-surviving COVID-19 patients when compared to survivors, as was the use of low molecular heparin in severe SARS-CoV-2 infected patients with elevated D-dimer or sepsis-induced disseminated intravascular coagulation. Increased D-dimer levels may be a good predictor of COVID-19 severe and fatal cases in hospital admission. Similar study has shown that D-dimer has a discriminatory capacity in patients with and without serious COVID-19 forms but does not have mortality data. Several studies have shown that ferritin in hospitalized patients has a considerable elevation, but typically not a particular marker for hemophagocytic lymphohistiocytosis.

### D-DIMER

D-dimer is the main fibrin disintegration fragment and is used in the synthesis and degradation of fiber as a biomarker. Healthy people have modest levels of d-dimer in circulation while high levels are detected in thrombosis-related diseases. For the

diagnosis, surveillance and treatment of venous thromboembolism, for which d-dimer is commonly employed, extensively investigated. Many studies have demonstrated that D-dimer is a good marker for coagulation and fibrinolysis activation. Berger *et al.*, (2020) investigation found that abnormal d-dimer levels were often detected with COVID-19 admission and were associated with an increased risk of critical disease, thrombotic events, acute renal injury, and death. D-dimer comes from cross-linked fibrin synthesis and lysis and is responsible for coagulation activation and fibrinolysis. COVID-19 has been reported to be connected with hemostatic anomalies, and significantly high amounts of D-dimer in non-survivors have been recorded. D-dimer is one method to spot thrombotic-state. After the creation of the clot, the fibrinolytic system breaks down the mesh. By activating the plasmin enzyme, the D-dimer consists of two D fragmentations of the fibrin. This shows that the bloodstream has demolished fibrin. D-dimer is a coagulation and fibrinolysis activation system. The d-dimer test is commonly used in clinical practice to rule out deep vein thrombosis and pulmonary embolism and to confirm the diagnosis

of disseminated intravascular coagulation. D- dimer level is one step in thrombosis detection used in patients. In early stage of COVID-19 disease studies have shown an increase in d-dimer levels. The increase of d-dimer levels by 3 to 4 times is related to poor forecasts. Increasing d-dimer levels in COVID-19 individuals could also be triggered by underlying conditions such as diabetes, cancer, stroke, and pregnancy. In the control and management of COVID-19 the measurement of d-dimer and coagulation parameters at an early stage of the disease can also be important. Patients with COVID-19 were reported to have a hypercoagulable state, with 71% of patients who died from COVID-19 having satisfied the DIC criteria. In this context, this means that a total of 71% of patients who died from COVID-19 met the DIC threshold, with the remaining 29% falling short. Furthermore, venous thromboembolism occurred in 25% of patients with severe COVID-19, and in 30% of those patients, pulmonary embolism was identified. COVID-19 individuals with ischemic stroke have also raised D-dimer levels in their blood.

Huang *et al.*, (2019) found from 11 previous studies that an increased d- dimer was related with an increase in composite poor outcome [RR2.93 (2.14–4.01),  $p < 0.001$ ]. Furthermore, subgroup analysis revealed that an elevated D-dimer was linked to an increased risk of mortality. This review focused on a few biochemical parameters, such as serum ferritin, CRP and d-dimer.

This journal concludes as COVID-19 infectious disease plays a major role in CRP, Serum ferritin and D-dimer, complete haemogram tests apart from RT-PCR test. The severity of the disease will be efficiently determined with early ferritin levels analysis in patients with COVID-19. D- dimer can be used as a biomarker in the COVID-19 patients by measuring the d-dimer levels and analyse the mortality and severity. Serum ferritin and d-dimer tests should be included in the future studies to predict the severity in the patients diagnosed with COVID-19 disease. Coagulopathy is a non-negligible complication and potentially important

cause of death in patients with critical COVID-19. Dynamically monitoring haematological and coagulation parameters, such as neutrophil to lymphocyte ratio, platelet count, D-dimer, and prothrombin time might provide a reliable and convenient method for classifying and predicting the severity and outcomes of patients with COVID-19. The SIC scoring system might be a useful tool for physicians to assess and manage critically ill patients

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**How to cite this article:**

Rathiesh, R. and Rajesh Sengodan. 2023. The Study of Correlation Between Crp, D Dimer, Ferritin and Cbc Values in Covid Positive Patients and their Severity. *Int.J.Curr.Microbiol.App.Sci.* 12(03): 66-72. doi: <https://doi.org/10.20546/ijcmas.2023.1203.009>