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**RESEARCH ARTICLE**

# Evaluation of CRP and D-dimer of Confirmed COVID-19 patients at a Tertiary Care Hospital, Correlation with Comorbidity

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## ABSTRACT

Since the COVID-19 outbreak started in 2019 in China, several types of research have been done on this disease But the outcome was not always satisfactory. As frequent changes occur in one's genome, signs and symptoms of this disease vary in different variants. Many investigations have been employed for the detection of COVID-19 infection. Of these, D-dimer and CRP are used to evaluate the presence of systemic response against coronavirus insult. To evaluate whether CRP and D-d-imer levels are significantly higher in COVID-19 patients with respiratory manifestations compared to those with non-respiratory symptoms. 80 male patients were selected randomly, and divided into 2 groups; 40 patients presented with severe respiratory distress symptoms, and 40 presented with symptoms other than respiratory features (mostly gastric symptoms with high fever). CRP and D-dimer tests were done and data were used for subsequent statistical analysis. There was a significant difference in the level of both CRP and D-dimer between patients with dyspnea and those with no respiratory manifestation of COVID-19. In conclusion, a high level of both CRP and D-dimer is a highly suggestive respiratory insult and future complication of COVID-19.

***Keywords:*** COVID-19; C-Reactive Protein; D-Dimer; Respiratory Manifestations; Comorbidity

## 1. Introduction

The COVID-19 pandemic, caused by the novel severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), has posed an unprecedented challenge to global public health. Since its emergence, the virus has spread rapidly across continents, resulting in millions of infections and a substantial number of deaths[1]. COVID-19 presents with a wide spectrum of clinical manifestations, ranging from asymptomatic infection to severe pneumonia, acute respiratory distress syndrome (ARDS), multi-organ failure, and death. One of the most critical and life-threatening complications of COVID-19 is severe respiratory involvement, characterized by hypoxemia, extensive lung damage, and systemic inflammatory responses, which can ultimately lead to

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multi-organ dysfunction[2]. The high infectivity and variable clinical course of the disease make early identification of high-risk patients a vital component of effective clinical management and resource allocation.

Biomarkers have emerged as essential tools in predicting the severity and prognosis of COVID-19. Among these, C-reactive protein (CRP) and D-dimer have been extensively studied due to their ability to reflect underlying inflammation and coagulation abnormalities[3]. CRP is an acute-phase protein produced by the liver in response to pro-inflammatory cytokines, particularly interleukin-6. Elevated CRP levels in COVID-19 patients indicate systemic inflammation and correlate strongly with disease severity[4]. Higher CRP values have been observed in patients with severe respiratory compromise, extensive pulmonary involvement on imaging, and those requiring intensive care support. This makes CRP a valuable marker not only for disease monitoring but also for predicting clinical outcomes and guiding therapeutic decisions[5].

D-dimer, a fibrin degradation product, serves as a sensitive indicator of hypercoagulability and thrombotic events. COVID-19 is associated with a pro-thrombotic state, leading to microvascular and macrovascular thrombosis, which contributes to respiratory failure, myocardial injury, stroke, and other systemic complications[6]. Elevated D-dimer levels have been consistently linked with worse clinical outcomes, increased need for mechanical ventilation, and higher mortality rates. In addition, D-dimer elevation can reflect ongoing intravascular coagulation, helping clinicians identify patients at risk of severe complications even before clinical deterioration becomes apparent[7].

Comorbidities such as hypertension, diabetes mellitus, cardiovascular disease, chronic kidney disease, and obesity have been shown to exacerbate the severity of COVID-19 infection. Patients with pre-existing health conditions often exhibit higher levels of inflammatory and coagulation markers, which can further complicate the clinical course. Monitoring CRP and D-dimer levels in these patients provides valuable prognostic information, enabling early interventions such as anticoagulation therapy, intensive monitoring, and timely escalation of care[8].

The integration of laboratory biomarkers with clinical assessment has become crucial in the management of COVID-19, especially in resource-limited settings. While radiological imaging and advanced diagnostic tools play a role, simple, readily available, and cost-effective tests like CRP and D-dimer offer significant advantages for risk stratification. Serial measurement of these markers can help track disease progression, identify complications early, and guide clinicians in tailoring individualized treatment plans. This study aims to evaluate the levels of CRP and D-dimer in confirmed COVID-19 patients and to investigate their correlation with underlying comorbid conditions.

## 2. Methodology

This study was conducted as a descriptive cross-sectional investigation from 1st November to 30th December 2020 at the Bangladesh Institute of Health Sciences (BIHS) General Hospital, under the supervision of the Bangladesh University of Health Sciences (BUHS). Data were collected from 120 confirmed COVID-19 patients, including information on their clinical profiles and laboratory measurements of C-reactive protein (CRP) and D-dimer levels. The study population included an equal number of male and female patients, with 60 males and 60 females.

Patient demographic information, comorbid conditions, and clinical symptoms were recorded systematically. Comorbidities assessed included diabetes mellitus, hypertension, cardiovascular disease, kidney disease, dyslipidemia, and respiratory complications such as shortness of breath. Laboratory

measurements of CRP and D-dimer were performed following standard protocols to evaluate inflammatory and coagulation status in the patients.

Patients were stratified according to age and the presence of comorbidities to analyze correlations between CRP and D-dimer levels and disease severity. All data collection and laboratory analyses were conducted under appropriate biosafety measures, ensuring accuracy, reliability, and confidentiality of patient information throughout the study.

## 3. Results

Table 1 summarizes the demographic profile and underlying comorbidities of the 120 COVID-19 patients, equally distributed between males and females. A large majority of patients (88.3%) were aged over 40 years, with a slightly higher proportion among males. Diabetes (30.8%) and hypertension (29.2%) were the most common comorbid conditions, followed by heart disease (18.3%) and kidney disease (12.5%). The distribution of comorbidities was comparable between male and female patients, indicating a relatively balanced gender-wise clinical profile.

**Table 1.** Demographic and Clinical Characteristics of COVID-19 Patients

| Characteristic | Total (N=120) | Male (N=60) | Female (N=60) |
|---|---|---|---|
| Age > 40 years | 106 (88.3%) | 54 (90%) | 52 (86.7%) |
| Diabetes | 37 (30.8%) | 19 (31.7%) | 18 (30%) |
| Hypertension | 35 (29.2%) | 18 (30%) | 17 (28.3%) |
| Heart Disease | 22 (18.3%) | 12 (20%) | 10 (16.7%) |
| Kidney Disease | 15 (12.5%) | 8 (13.3%) | 7 (11.7%) |
| Dyslipidemia | 11 (9.2%) | 6 (10%) | 5 (8.3%) |

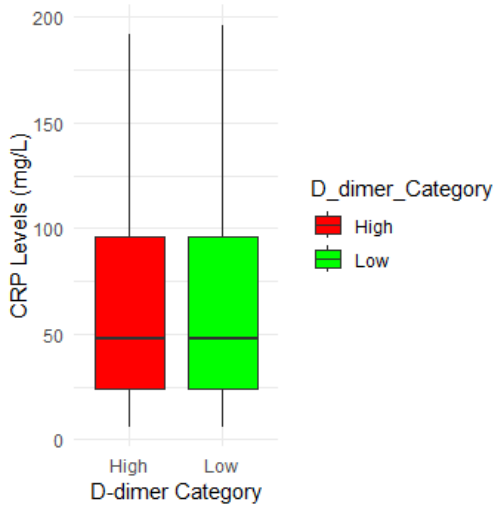


**Figure 1.** Gender Distribution

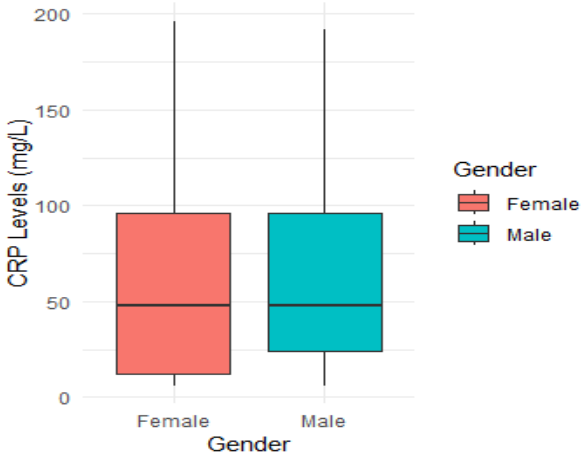


**Figure 2.** CRP level by D-dimer category.

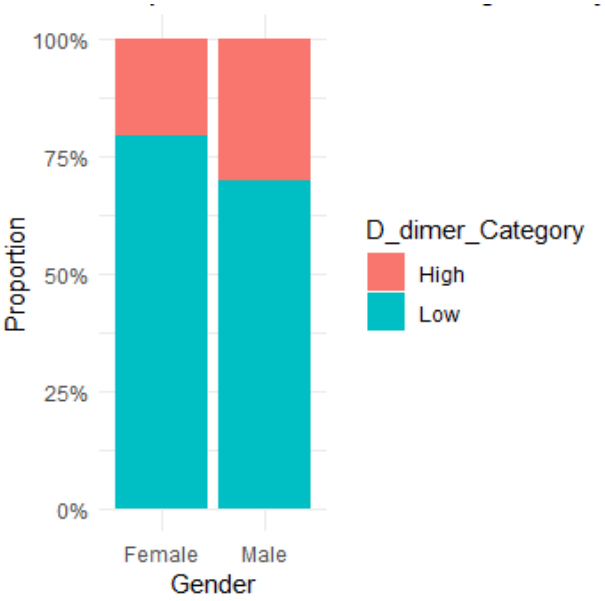


**Figure 3.** Distribution of D dimer among **gender**

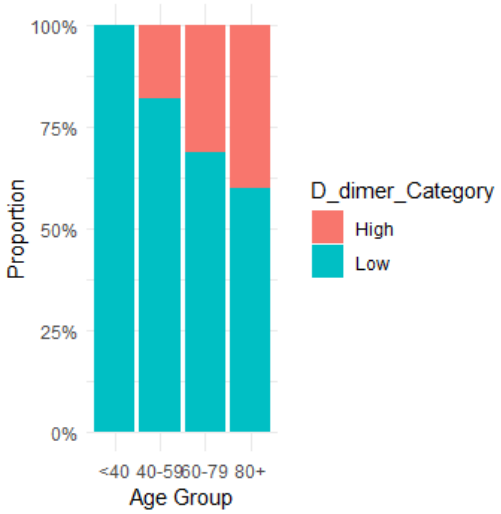


**Figure 4.** Distribution of D dimer among age group

Table 2 demonstrates that inflammatory (CRP) and coagulation (D-dimer) markers were elevated across all comorbid groups. The highest mean CRP and D-dimer levels were observed in patients with kidney disease and heart disease, suggesting more severe inflammatory and thrombotic responses in these conditions. Patients without comorbidities showed comparatively lower CRP and D-dimer levels, indicating a milder systemic response to COVID-19. Overall, the findings suggest that the presence of comorbidities is associated with increased inflammatory and coagulation activity in COVID-19 patients.

**Table 2.** CRP and D-dimer Levels by Comorbidity

| Comorbidity | Mean CRP (mg/L) | Mean D-dimer (ng/dl) |
|---|---|---|
| Diabetes | 67.35 ± 65.21 | 2184.59 ± 2015.73 |
| Hypertension | 71.43 ± 68.54 | 2301.17 ± 2156.82 |
| Heart Disease | 82.18 ± 72.36 | 2567.45 ± 2314.91 |
| Kidney Disease | 88.80 ± 75.62 | 2789.33 ± 2456.78 |
| Dyslipidemia | 63.27 ± 61.84 | 2078.91 ± 1987.45 |
| No Comorbidity | 52.16 ± 57.39 | 1876.24 ± 1834.67 |

# 4. Discussion

This study highlights the demographic characteristics, comorbidity burden, and inflammatory–coagulation profiles of hospitalized COVID-19 patients, with particular emphasis on CRP and D-dimer levels. The findings are broadly consistent with observations reported in similar COVID-19 cohorts worldwide and provide further evidence on the role of age and comorbidities in disease severity.

In the present study, the majority of patients were older than 40 years, supporting the widely reported observation that increasing age is a major risk factor for severe COVID-19. Older individuals tend to have reduced immune regulation and a higher prevalence of chronic diseases, which may contribute to exaggerated inflammatory responses following SARS-CoV-2 infection. The nearly equal gender distribution in this cohort and the comparable prevalence of comorbidities between males and females suggest that, in this population, baseline clinical risk factors were balanced across sexes[9].

Diabetes and hypertension emerged as the most common comorbid conditions, followed by cardiovascular and kidney diseases. This pattern aligns with global clinical data indicating that metabolic and cardiovascular disorders are frequently observed among COVID-19 patients. These conditions are known to be associated with chronic low-grade inflammation and endothelial dysfunction, which may predispose patients to more severe disease manifestations once infected[10].

The analysis of inflammatory and coagulation markers revealed markedly elevated CRP and D-dimer levels across all comorbidity groups. Patients with kidney disease and heart disease showed the highest mean values for both markers, suggesting a stronger inflammatory response and increased thrombotic tendency in these groups. Similar trends have been reported in other clinical studies, where renal and cardiovascular comorbidities were linked to severe systemic inflammation, coagulopathy, and poorer clinical outcomes[11].

Patients without comorbidities demonstrated comparatively lower CRP and D-dimer levels, indicating a milder inflammatory and coagulation response. This finding supports the concept that underlying chronic diseases amplify the host response to COVID-19, potentially leading to cytokine-mediated tissue damage and

hypercoagulable states. Elevated D-dimer levels, in particular, have been widely associated with disease severity and thromboembolic complications, reinforcing the importance of coagulation monitoring in high-risk patients[12, 13].

## 5. Conclusion

The results of this study are consistent with existing evidence that age and comorbidities significantly influence inflammatory and coagulation pathways in COVID-19. The findings underscore the clinical importance of early risk stratification using simple laboratory markers such as CRP and D-dimer, especially in patients with pre-existing chronic diseases. Such markers may aid clinicians in identifying patients at higher risk of severe disease and guiding timely therapeutic interventions.

## Conflict of interest

The authors declare no conflict of interest

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