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International Journal of Clinical Biochemistry and Research

Journal homepage: <https://www.ijcbr.in/>

## Original Research Article

## Prognostic significance of various biochemical markers in Corona virus disease (COVID)-19: A tertiary care hospital study in Kakinada East Godavari district, Andhra Pradesh

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## ARTICLE INFO

## Article history:

Received 22-07-2021

Accepted 28-08-2021

Available online 08-10-2021

## Keywords:

Inflammatory markers

Covid-19

Disease progression

## ABSTRACT

**Background:** This study was conducted on covid 19 patients who admitted in various wards in tertiary care centre (Government general hospital, Kakinada) E.G, Dt, Andhra Pradesh, from the 1st November 2020 to 15th January 2021 before Immunization. And divided in to two groups male and female cases. This study involves estimation of Biochemical profile in all the admitted patients to predict the severity of the covid 19 disease at the time of admission in to the Hospital.

**Aim and Objectives:** To analyse and estimate the serum inflammatory markers like D dimer, Ferritin, C-Reactive Protein, LFT and RFT in Covid 19 patients and evaluate the relationship of inflammatory marker se D-Dimer with other inflammatory markers like Ferritin, CRP and biochemical markers like Creatinine and liver enzymes (OT, PT).

**Materials and Methods:** We retrospectively analysed the Clinical features and lab parameters of 393 cases of Covid-19 admitted to tertiary care hospital GGH Kakinada.

**Results:** Plasma d dimer, serum CRP and ferritin were significantly raised in total covid 19 patients and more increased in males when compared with females. Biochemical parameters like creatinine and liver enzymes also elevated in total cases and more increased in males as compared with females suggest organ dysfunction and systemic inflammation. The most typical finding in patients with COVID-19 coagulopathy is an increased D dimer concentration, and the relationship between D-dimer levels and the other markers of inflammation like Ferritin, CRP in COVID-19 shows disease progression.

**Conclusion:** We conclude that biochemical monitoring of Covid-19 patients helps in identifying critically ill patients even earlier, aiming to reduce mortality and improve the recovery rate.

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## 1. Introduction

Coronavirus disease (COVID-19) is an emerging disease that is spreading rapidly worldwide and threatens the bio security of all countries with the number of cases exceeding 29,000,000 and a death toll of more than 930,000. The United States of America and India are the two most affected countries<sup>1</sup> as of September 17,2020, with a death

toll of 199,746 in the USA and 83,198 in India.

This rapid viral spread has promoted the publication of numerous studies to identify clinical, biological, radiological and genetic predictors for the progression to severe and fatal forms of the disease.<sup>2</sup> Recognition of these predictors will make it possible to stratify the risk and direct the intervention studies to target patients at risk of worsening and progression to death. Demographic (advanced age, male sex), clinical (co morbidities, acute respiratory distress syndrome [ARDS]), and radiological

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predictors have been extensively detailed in different studies, Biological (lymphopenia, hyperferritinemia, serum C-reactive protein [CRP] levels) predictors<sup>3</sup> have been reported but remain mostly un described in the North African region.

Increased levels of several inflammatory biomarkers, including D-Dimer, Ferritin, C-reactive protein, have been found in COVID-19 patients and associated with an increased risk of severe disease, which is characterised by the so-called “cytokine storm”. Also, the increase of renal and liver dysfunction biomarkers has been associated with poor outcome. In this review, we provide an overview of the main biochemical characteristics of COVID-19 and the associated biomarkers alterations.

The objective of our study was to describe the biochemical abnormalities in East Godavari patients with COVID-19 and to identify the parameters that can help distinguish those likely to develop severe COVID-19.

## 2. Materials and Methods

We retrospectively analyzed the Clinical features and lab parameters of 393 cases of COVID-19 admitted to tertiary care hospital GGH Kakinada from the 1<sup>st</sup> November, 2020 to 15<sup>th</sup> January, 2021 before Immunization. And divided in to two groups male and female cases.

The diagnosis of SARS COV-2 infection was confirmed by Real time RT PCR on Throat or nasopharyngeal swabs as per the ICMR guidelines.

### 2.1. Horiba bench top analyzer

Serum is used for the estimation of LFT and RFT on AU480 Chem 2 Beckman coulter fully automated analyze. The study was approved by the Institutional Ethical Committee.

## 3. Results

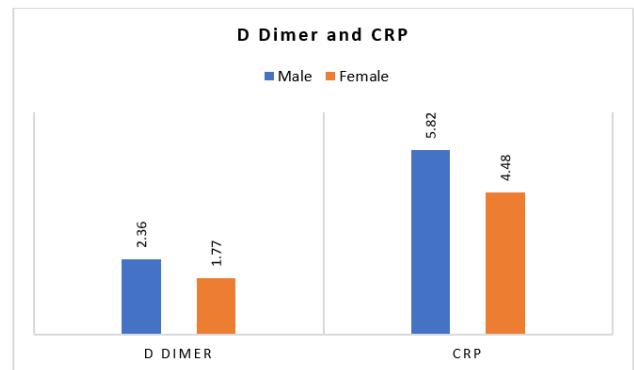
Plasma d dimer, serum CRP and ferritin were significantly raised in both groups of Covid-19 patients but markedly increased in males when compared with females. Serum SGOT, SGPT and ALP also elevated in both male and female groups of COVID-19 patients but more increase in male group patients. Serum creatinine and blood urea are with in normal limits in majority of the COVID-19 patients. Male patients’ values were compared with female group for statistical analysis. All data were expressed as mean SD. statistical analysis was done by student T test. Differences with ‘P’ value less than 0.05 were considered to be statistically significant.

In the present study total 393 cases were included and estimated biochemical parameters like D dimer, Ferritin, CRP, LFT and RFT out of which 212 are male patients and 181 are female patients, these male and female cases were compared.

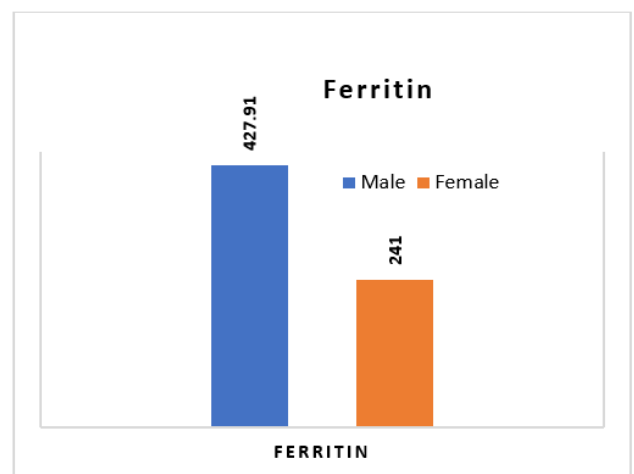
Table 1 shows a significantly higher d dimer, Ferritin, CRP, creatinine in covid-19 male Patients than the covid-19 female patients (P<0.05). Urea total bilirubin, SGOT, SGPT and ALP levels shows no statistically significance in COVID-19 male patients than the female patients (P=0.769).

Table 2 summarises the Pearson correlation coefficient (r value) and p value of D-Dimer and other parameters in the study group.

In Table 2 D dimer is positively correlated with ferritin, creatinine SGOT and SGPT.



**Fig. 1:** Comparison of D dimer and CRP between male and female patients



**Fig. 2:** Comparison of ferritin between male and female patients

## 4. Discussion

The ongoing pandemic of corona virus disease2019 (COVID-19) poses several challenges to clinicians. Timely diagnosis and hospitalizations, risk stratification, effective utilization of intensive care services, selection of appropriate therapies, monitoring and timely discharge are essential to save the maximum number of lives.<sup>4</sup> Clinical

**Table 1:** Levels of different Biochemical parameters in COVID-19 patients admitted in Tertiarycare Hospital

S. No	Parameters	Total cases	Male	Female	P value
1	D dimer	5.367±72.281	2.36±2.82	1.77±2.25	0.0230 *
2	Ferritin	342.12 ±409.805	427.91±432.84	241.07±356.3	<0.0001 *
3	CRP	4.822±6.59	5.82±6.70	4.48±6.61	0.0445 *
4	Urea	35.33±26.3	36.84±28.4	32.8±21.6	0.0797
5	Creatinine	1.31±2.28	1.47±2.71	1.12±1.61	0.0332 *
6	Total Bilirubin	0.97±2.49	0.85±1.22	1.12±3.42	0.7632
7	SGOT	74.35±237.948	77.3±257.35	71.49±213.67	0.8257
8	SGPT	61.37±182.5	71.76±232.14	49.19±96.31	0.2216
9	ALP	70.32±40.3	69.28±29.2	71.55±50.35	0.5785

**Table 2:** Pearson correlation coefficient (r value) D dimer Total cases correlation with

S.No	Parameter	r Value	P value
1	Ferritin	+0.422	< 0.0001
2	CRP	+0.339	<0.0001
3	Creatinine	+0.110	< 0.0001
4	SGOT	+0.131	< 0.0001
5	SGPT	+0.113	< 0.0001

assessment is indispensable, but laboratory markers or biomarkers, can provide additional, objective information which can significantly impact these components of patient care. COVID-19 is not a localized respiratory infection but a multisystem disease caused by a diffuse systemic process involving a complex interplay of the immunological, inflammatory and coagulative cascades. In this study estimate the inflammatory markers like D-Dimer, Ferritin, CRP and Biochemical markers of RFT and LFT in terms of their pathophysiological basis and correlate the D-Dimer with other inflammatory and biochemical markers.

In our study inflammatory markers like D-Dimer is elevated in total cases (5.367± 72.281) and in Males (2.36 ± 2.82) is increased more than the females as compared to Females significantly (1.77 ± 2.25) (p<0.0230). D. Dimer is the fibrin degradation products released upon cleavage of cross-linked fibrin by plasmin.<sup>5</sup> D.Dimer is routinely utilized clinically in diagnosing disseminated intravascular coagulation (DIC) and those with low pretest probability for deep vein thrombosis (DVT) and pulmonary embolism (PE). D-dimer elevation has been reported to be one of the commonest laboratory findings noted in COVID-19 patients requiring hospitalization.<sup>6</sup> Studies have shown that rising D-dimer levels during the course of hospitalization are associated with worst long-term outcomes. The results of this study indicate that D-dimer levels 5.36 mg/ml during hospital stay are a predictor of mortality in COVID-19 patients. Total cases of D-dimer levels positively correlated with other inflammatory marker Ferritin (r+0.422), CRP (+0.339) significantly and biochemical markers like Creatinine (r=+0.110) liver enzymes OT, (r+0.131) PT (r=+0.113) also significantly correlated. In addition, pro-inflammatory cytokines may be involved in endothelial injury, and may activate coagulation

and inhibit fibrinolysis in COVID-19 patients.<sup>7</sup> And also considering that patients with COVID-19 might have increased blood viscosity due to high fever and excessive sweating, hyper coagulable state because of activation of coagulation system,<sup>8</sup> together with the risk factors such as long-term bedridden, obesity and old age, the risk of thrombus is further increased.

Other inflammatory markers like serum Ferritin (342.12±409.805), is elevated in total cases and in males (427.91±432.84) increased more than the females as compared to Females (241.07±356.3) significantly (p<0.0001). Ferritin is a systemic inflammatory marker that can be used to predict the severity and mortality of SARS-COV-2 disease. Ferritin is also a key mediator of immune dysregulation, under extreme hyper ferritinemia which is via direct immunosuppressive and pro-inflammatory effects, which contributing to the cytokine storm<sup>9</sup> and inflammatory storm.

CRP (4.822±6.59) is elevated in total cases and in males (5.82±6.70) increased more than the females and compared to Females (4.48±6.61) significantly (p<0.00001). The increase of CRP levels reflects the extent of the systemic inflammatory syndrome seen in severe forms of the disease, which is accompanied by a massive release of inflammatory cytokines creating a “cytokine storm” responsible for acute tissue damage with the onset of severe ARDS and subsequent multi-systemic failure.<sup>10</sup>

Biochemical markers like BUN is lies within normal limits in total cases and also no significant changes in male and female cases but creatinine is within upper normal limits in total cases (1.31±2.28) but in males (1.47±2.71) (p<0.0332) increased significantly more than the females (1.12±1.61) as compared to Females. Liver enzymes like OT&PT values (74.35±237.9480) (61.37±182.5) slightly

elevated in total cases but in males increased more than the females not significantly. And serum total bilirubin liver enzyme like ALP lies within normal limits and no significant changes in male and female cases.

## 5. Conclusion

The biochemical abnormalities in Covid-19 patients included elevation of inflammatory markers of lime D-Dimer, Ferritin, CRP and impaired Liver and kidney function (elevation of liver enzymes, BUN & Creatinine). Based on the analysis of this study we suggest that altered biochemical parameters of blood may be useful as significant predictors of adverse clinical outcomes in Covid-19 disease.

## 6. Source of Funding

None.

## 7. Conflict of Interest

The authors declare no conflict of interest.

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**Cite this article:** Rajeswari G, Gopal PS, Prasad GBVVS. Prognostic significance of various biochemical markers in Corona virus disease (COVID)-19: A tertiary care hospital study in Kakinada East Godavari district, Andhra Pradesh. *Int J Clin Biochem Res* 2021;8(3):226–229.