International Journal of Medical Science in Clinical Research and Review
Online ISSN: 2581-8945
Available Online at http://www.ijmscrr.in Volume 05|Issue 06 (November-December)|2022 Page: 1064-1068

Original Research Paper

Correlation of serum C-reactive protein (CRP) levels and clinical outcomes in patients with COVID-19 in a tertiary care hospital

Authors:

Prof.Dr.K. Suresh(1), Dr. R. Raj Sridhar(2), Dr.J.Razook Fareedh(3) Dr.Saravana kumar(4)

1.Prof. and Head, Department of General Medicine, Sri Venkateshwaraa Medical College Hospital and Research Center, Puducherry.

2.Junior Resident Department of General Medicine, Sri Venkateshwaraa Medical College Hospital and Research Center, Puducherry.

3.Assistant Professor, Department of General Medicine, Sri Venkateshwaraa Medical College Hospital and Research Centre, Puducherry.

4.Junior Resident Department of General Medicine, Sri Venkateshwaraa Medical College Hospital and Research Centre, Puducherry.

Corresponding Author:

*Dr. R. Raj Sridhar , Junior Resident, Department of General Medicine, Sri Venkateshwaraa Medical College Hospital and Research Centre, Puducherry.

Article Received: 04-10-2022 Revised: 24-10-2022 Accepted: 14-11-2022

ABSTRACT:

Background: Severe corona virus disease 2019 (COVID-19) affected patients develop multi-system organ failure, acute respiratory distress and are associated with bad prognosis and increased mortality. Prognostic biomarkers and early diagnostic to determine the risk of developing serious illness is necessary and it justify the need for our study.

Methods: In our retrospective study we analysed 72 patients with COVID-19 at the Sri Venkateshwara medical college and research centre among moderate disease groups. We analysed the importance of the potential serological inflammation indicators in predicting the severity of COVID-19 in patients using nomogram analysis, receiver operating characteristic curves, and univariate and multivariate logistic regression to understand the correlation between the serological biomarkers and duration of hospital stay. **Results:** Patients with positive CRP had significantly higher ($p<0.05$) proportion of severe COVID19 status (97% vs 81% and 63%) on comparison patients having negative CRP. Patients with positive CRP had significantly higher ($p<0.05$) proportion of poor outcome (death) on comparison with patients having negative CRP. **Conclusion:** CRP may be considered as potential biomarker for the prediction of severity of disease in COVID 19 patients on hospitalization.

INTRODUCTION:

In 2019 31st of December, China was first to announce a cluster of novel pneumonia-like illness. The causative organism, severe acute respiratory syndrome coronavirus 2 (SARS-Cov-2), till date these organisms infected more than 4.8 million people worldwide and they had been responsible for more than 318 000 deaths from the deadly virus coronavirus disease 2019 (covid-19) has been reported. C-reactive protein (CRP) is a classic acute phase protein, is the most widely studied systemic marker of inflammation [1]. CRP and its role in severe corona disease has been studied in various studies but complete data on its significance and a prognostic value is not available. Hence, the current study aims to evaluate the correlation between CRP levels and disease progression to provide a reference for the clinical management of COVID-19 patients.

MATERIAL AND METHODS:

Study Design:

The present retrospective study was approved by the Ethics Committee of Sri Venkateshwara medical college and Hospital, Puducherry. have been designated to treat patients with COVID-19. A total of 72 patients May and June 2021. All patients with COVID-19 who enrolled in the recent study were diagnosed according to the Government of India Ministry of Health and Family Welfare Version 6 24.05.21. In other words, all patients with the physician and laboratory confirmed (positive nasopharyngeal/throat swab specimens by reverse transcription-polymerase chain reaction (RTPCR)) COVID-19 infection were included,

Mild group diagnostic criteria:

- Patients presented with high temperature (fever), respiratory symptoms and positive radiological findings for COVID-19 infection.
- Patient having Respiratory rate ≤ 30/min at rest and Oxygen saturation (SpO_2) ≥ 93% on room air.

Moderate group diagnostic criteria:

- Patients presented with general group diagnostic criteria and any one of the following:
- Patient having Respiratory rate ≥ 30/min at rest and Oxygen saturation (SpO2) ≤ 93% on room air.

Severe disease criteria:

Patients from any group presented with any one of the following were categorised to have a severe disease:

1. Oxygen requirement of more than 10 L for 90% saturation.
2. Patient with Multi-organ dysfunction
3. Patient in Shock or use of inotropes.
4. When CRP > 10 mg/L, and D-dimer > 1000 mg/mL and serum ferritin > 1000 ng/mL.
5. Patient with Secondary infection (blood culture or increased procalcitonin).
6. Patient with 50% of lung involvement on either chest X-ray or HRCT.

Exclusion criteria:

1. Any negative detection of novel coronavirus nucleic acid.
2. Any Patients with suspected bacterial pneumonia (confirmed by sputum bacterial culture).
3. Patients with active lung mass(tumours).
4. Patients with heart failure with pulmonary oedema.
5. Patients with interstitial pneumonia (previously diagnosed based on radiological findings).
6. Patients with allergic pneumonia.
7. Patients on immunosuppressive drugs. and all Patient who refuse to be enroll in the study.

All cases were monitored using the clinical data collected until June 2021.

DATA COLLECTION:

Patient medical information from the records were reviewed by an experienced team of clinicians of General Medicine Sri Venkateshwara medical college and Hospital Research Centre data on epidemiological, clinical, radiological findings, laboratory and outcomes were collected using checklist from electronic medical records. Further recorded data of the patient, like demographic characteristics, past medical history, previous medical conditions, signs and symptoms were collected in our study.

STATISTICAL ANALYSIS:

Data was entered in Microsoft Excel and analysis was done by SPSS version 23.0. Categorical variables were expressed in frequency and percentage, continuous variables were expressed using mean and standard deviation. Chi square test was used to test the association between variables and p value less than 0.05 considered to be statistically significant.

RESULTS:

The mean age of the COVID19 patients were 56 ±14.1 years. Majority were in the age group of 41- 60 years. More than half of the patients (53%) were females. Among the COVID19 patients, about 46% and 44% were diabetics and hypertensives respectively. About 3% had coronary artery disease and 10% had hypothyroidism More than half of the COVID19 patients had more than 10 days of stay. About 36% and 42% patients had moderate and severe COVID19. Majority of the patients (83%) showed positivity for C-Reactive protein. About 18% of the patients had bad outcome (death). p value by chi-square test; ^-p<0.05

Table 1: Age and gender of patients with covid19

		Number	Percentage
Age category	≤40 years	9	12.5%
	41-50 years	16	22.2%
	51-60 years	23	31.9%
	61-70 years	10	13.9%
	>70 years	14	19.4%
Gender	Female	34	47.2%
	Male	38	52.8%

The mean age of the COVID19 patients were 56 ±14.1 years. Majority were in the age group of 41- 60 years. More than half of the patients (53%) were females.

Table 2: patients with varies comorbidities with covid19

		Number	Percentage
Diabetes Mellitus	Present	33	45.8%
	Absent	39	54.2%
Systemic Hypertension	Present	32	44.4%
	Absent	40	55.6%
Coronary Artery Disease	Present	2	2.8%
	Absent	70	97.2%
Hypothyroidism	Present	7	9.7%
	Absent	65	90.3%

Among the COVID19 patients, about 46% and 44% were diabetics and hypertensives respectively. About 3% had coronary artery disease and 10% had hypothyroidism.

Table 3: Duration of hospital stay and severity of covid19

		Number	Percentage
Duration of Hospital stay	≤5 days	6	8.3%
	6-10 days	29	40.3%
	>10 days	37	51.4%
Severity of COVID19	Mild	16	22.2%
	Moderate	26	36.1%
	Severe	30	41.7%

More than half of the COVID19 patients had more than 10 days of stay. About 36% and 42% patients had moderate and severe COVID19.

Table 4: Based on c- reactive protein in patients with covid19

		Number	Percentage
C-Reactive Protein	Positive	59	83.1
	Negative	12	16.9

Majority of the patients (83%) showed positivity for C- Reactive protein.

Table 5: Based on outcome in patients of covid19

		Number	Percentage
Outcome	Death	13	18.1
	Recovered	59	81.9

About 18% of the patients had bad outcome (death).

Table 6: Based on the severity and outcome and mortality in covid19 patients

		Outcome		p value*
		Death	Recovered	
Severity of COVID19	Mild	0	16 (100.0%)	**0.002^**
	Moderate	2 (7.7%)	24 (92.3%)	
	Severe	11 (36.7%)	19 (63.3%)	

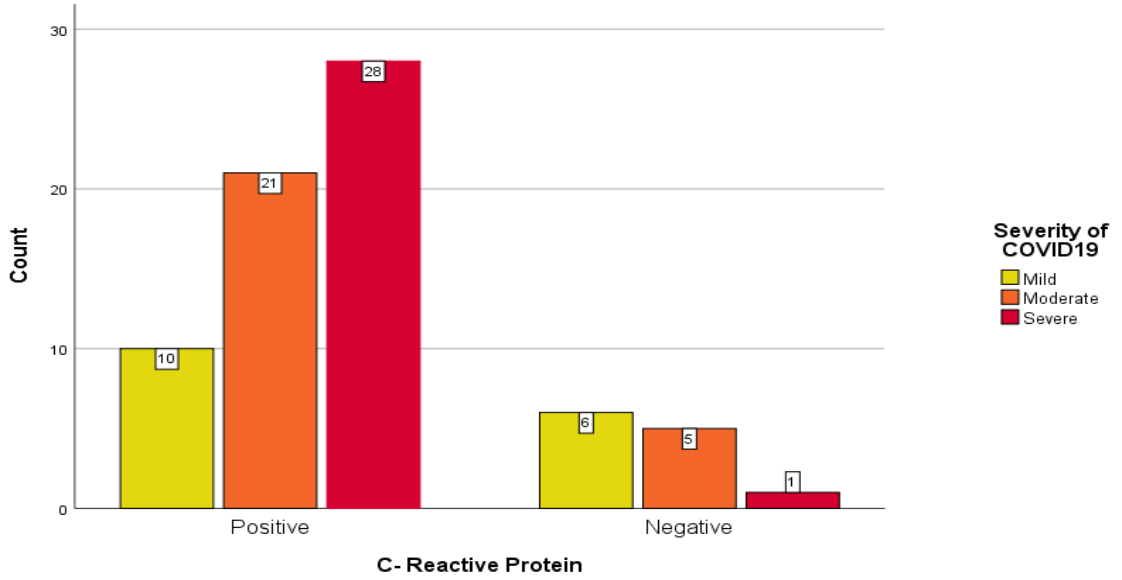
p value by chi-square test; ^-p<0.05

Table 7: comparison of c- reactive protein and severity in patients with covid19:

		Severity of COVID19, n (%)			p value*
		Mild	Moderate	Severe	
C- Reactive Protein	Positive	10 (62.5%)	21 80.8%)	28 (96.6%)	0.013^
	Negative	6 (37.5%)	5 (19.2%)	1 (3.4%)	

***p value by chi-square test; ^-p<0.05**

Figure 1: comparison of CRP positive and CRP negative patients:



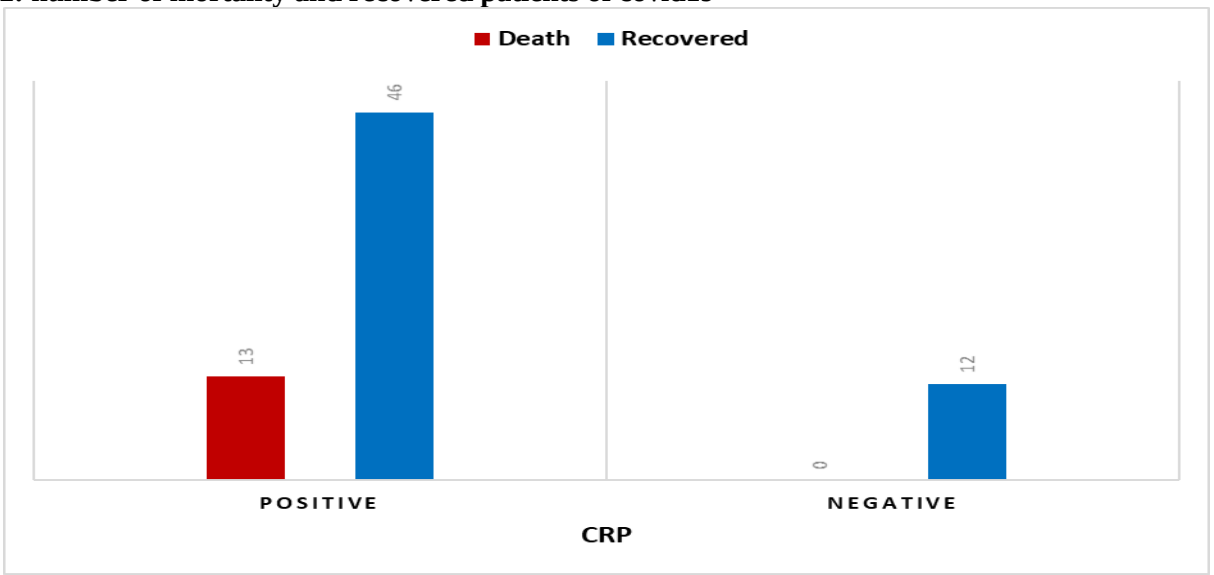
Patients with positive CRP had significantly higher (p<0.05) proportion of severe COVID19 status (97% vs 81% and 63%) on comparison patients having negative CRP.

Table 8: outcome of CRP positive and negative patients:

		Outcome, n (%)		p value
		Death	Recovered	
C- Reactive Protein	Positive	13 (22.03%)	46 (77.97%)	0.027
	Negative	0	12 (100%)	

***p value by chi-square test; ^-p<0.05**

Figure 2: number of mortality and recovered patients of covid19



Patients with positive CRP had significantly higher ($p<0.05$) proportion of bad outcome (death) on comparison with patients having negative CRP.

DISCUSSION:

In the present retrospective study, the clinical characteristics of severe COVID-19 patients were compared with those of non-severe patients and analysed the possible factors associated with disease progression and severity. From Table 1,The mean age of the COVID19 patients were 56 ±14.1 years. Majority were in the age group of 41- 60 years. Which is similar to other study done by Zheng et al [2] . More than half of the patients (53%) were females. Among the COVID19 patients, about 46% and 44% were diabetics and hypertensives respectively. About 3% had coronary artery disease and 10% had hypothyroidism More than half of the COVID19 patients had more than 10 days of stay. About 36% and 42% patients had moderate and severe COVID19 which is similar to study done by Zheng et al [2] and Folson et al [4] Majority of the patients (83%) showed positivity for C- Reactive protein. About 18% of the patients had bad outcome (death). From Table 3 ,More than half of the COVID19 patients had more than 10 days of stay. About 36% and 42% patients had moderate and severe COVID19 which is similar to study done by Petrilli et al [3] and Tan C et al [5] From table 7 and Figure 1 in our study Patients with positive CRP had significantly higher ($p<0.05$) proportion of severe COVID19 status (97% vs 81% and 63%) on comparison patients having negative CRP which is similar to other study done by Zee RYL et al [6] Patients with positive CRP had significantly higher ($p<0.05$) proportion of bad outcome (death) on comparison with patients having negative CPR [table 8 and figure 2]. More than half of the COVID19 patients had more than 10 days of stay. About 36% and 42% patients had moderate and severe COVID19. [table3] results are similar to other previous studies done by Casas JP et al [7]

Limitations and Future Suggestions:

Our study has a short sample size. So, it may lack generalisation. In addition, the retrospective nature of this study and the consequent missing clinical data was another limitation. Hence, further clinical studies with larger sample sizes and multiple CRP level measurements, especially at different duration of treatment, should be performed to confirm our findings.

CONCLUSIONS:

Our results show that serum CRP levels could be used as an essential indicator of the progression and the severity of COVID-19. Further, our study evinces that patients with higher CRP levels should be carefully monitored throughout their disease course.

Conflicts of Interest:

The authors declare that they have no conflicts of interest.

REFERENCES:

1. Pepys MB, Hirschfield GM. C-reactive protein: a critical update. *J Clin Invest* 2003; 111: 1805–12.
2. Z. Zheng, F. Peng, B. Xu, J. Zhao, H. Liu, J. Peng, Q. Li, C. Jiang, Y. Zhou, S. Liu, C. Ye, P. Zhang, Y. Xing, H. Guo, W. Tang, Risk factors of critical & mortal COVID19 cases: A systematic literature review and meta-analysis, J. Infect. (2020).
3 Petrilli CM, Jones SA, Yang J, Rajagopalan H, O'Donnell L, Chernyak Y, Tobin KA, Cerfolio RJ, Francois F, Horwitz LI. Factors associated with hospital admission and critical illness among 5279 people with coronavirus disease 2019 in New York City: prospective cohort study. BMJ 2020;369:m1966.
4. Folsom AR, Lutsey PL, Astor BC, Cushman M. C-reactive protein and venous thromboembolism. A prospective investigation in the ARIC cohort. ThrombHaemost 2009;102:615–619.
5. Tan C, Huang Y, Shi F, et al. C-reactive protein correlates with computed tomographic findings and predicts severe COVID-19 early. J Med Virol. Published online April 25, 2020:jmv.25871. doi:10.1002/jmv.25871
6. Zee RYL, Hegener HH, Cook NR, et al. C-reactive protein gene polymorphisms and the risk of venous thromboembolism: a haplotype-based analysis. *J Thromb Haemost.* 2004;2:1240–3.
7. Casas JP, Shah T, Hingorani AD, et al. C-reactive protein and coronary heart disease: a critical review. *J Intern Med.* 2008;264:295–314.