Journal Homepage: -www.journalijar.com

INTERNATIONAL JOURNAL OF ADVANCED RESEARCH (IJAR)

Article DOI:10.21474/IJAR01/13919
DOI URL: http://dx.doi.org/10.21474/IJAR01/13919

RESEARCH ARTICLE

C-REACTIVE PROTEIN/ALBUMIN RATIO AND NEUTROPHIL-LYMPHOCYTE RATIO AS PREDICTORS OF COVID-19 SEVERITY

Dr. M.V. Madhav[1], Dr. Y. Sirisha[2] and Dr. V. Anjaneya Prasad[3]

1. Professor, Department of General Medicine Dr. PSIMS &RF.
2. Associate Professor, Department of Internal Medicine Dr. PSIMS &RF Chinnoutpalli, Gannavaram, Andhrapradesh.
3. HOD & Professor Department of Internal Medicine, Dr.PSIMS &RF Chinnoutpalli, Gannavaram, Andhrapradesh.

Manuscript Info

Manuscript History
Received: 10 October 2021
Final Accepted: 14 November 2021
Published: December 2021

Abstract

Coronavirus disease 2019 (COVID-19) was announced in early December 2019. By genome sequencing, the virus was recognised. From Wuhan City, the virus spread globally. The pandemic situation was declared by the World Health Organization.The first case of COVID-19 in Indiawas reported in Kerala on January 27, 2020.The clinical features varied with disease severity. Most COVID-19 patients have non-severe manifestations and show a good prognosis. However, patients with severe disease may progress to pulmonary dysfunction, multiple organ dysfunction, and death. COVID-19 related to a considerable mortality rate in older patients and cases had other morbidities. Studies suggested that the inflammatory storm is a common finding in other coronaviruses.Similarly, increases in the inflammatory markers like C-reactive protein (CRP),ferritin,interleukin-6 (IL-6) and were described in COVID-19 (1). Albumin levels decreased in the inflammatory conditions; reduced levels were confirmed in severe COVID-19 patients. Hypoalbuminemia and high CRP/albumin ratio were previously linked to the mortality of various clinical conditions as critically ill patients.To avoid the unnecessary or inappropriate utilisation of the healthcare resources, early prediction of the severity of COVID-19 will be helpful. Severity prediction will also improve the prognosis by reducing the mortality rate.Thus, this study aimed to evaluate the role of inflammatory markers in estimating the severity and predicting the prognosis of COVID-19. This study hypothesised that elevated values of CRP/ albumin ratio and the neutrophil-lymphocyte ratio at the time of COVID-19 diagnosis are associated with COVID-19 severity and mortality.

Corresponding Author:- Dr. Prudhvi Krishna Nukala
Address:- Postgraduate in Department of Internal Medicine, Dr.PSIMS &RF Chinnoutpalli, Gannavaram, Andhrapradesh.

Introduction:-

Coronavirus disease 2019 (COVID-19) was announced in early December 2019. By genome sequencing, the virecognisedgnized. From Wuhan City, the virus spread globally. The pandemic situation was declared by the World Health Organization. The first case of COVID-19 in Indiawas reportedto Kerala on January 27, 2020.

The clinical features varied with disease severity. Most COVID-19 patients have non-severe manifestations and show a good prognosis. However, patients with severe disease may progress to pulmonary dysfunction, multiple organ dysfunction, and death. COVID-19 related to a considerable mortality rate in older patients and cases had other morbidities. Studies suggested that the inflammatory storm is a common finding of coronaviruses viruses.

Similarly, increases in the inflammatory markers like C-reactive protein (CRP),ferritin,interleukin-6 (IL-6) and were described in COVID-19 (1). Albumin levels decreased in the inflammatory conditions; reduced levels were confirmed in severe COVID-19 patients. Hypoalbuminemia and high CRP/albumin ratio were previously linked to the mortality of various clinical conditions as critically ill patients.

To avoid the unnecessary or inappropriate utilisation of the healthcare resources, early prediction of the severity of COVID-19 will be helpful. Severity prediction will also improve the prognosis by reducing the mortality rate.Thus, this study aimed to evaluate the role of inflammatory markers in estimating the severity and predicting the prognosis of COVID-19. This study hypothesised that elevated values of CRP/ albumin ratio athe nd neutrophil-lymphocyte ratio at the time of COVID-19 diagnosis are associated with COVID-19 severity and mortality.

Materials & Methods:-

This is a retrospective, cross-sectional observational study done in DR.PSIMS&RF in May 2021. Around 300 COVID RT-PCR, positive patients were assigned to mild, moderate and severe groups equally according to ICMR guidelines

Inclusion Criteria

Patients diagnosed with COVID-19 of age >18 years by RTPCR.
Mild disease SpO2->93 on room air.
Moderate disease SpO2- 90% to <=93% on room air
Severe disease SpO2- <90% on room air.

Exclusive Criteria

Age <18 years.

Results:-

A total of 300 COVID patients were included in the study. The patients were equally distributed among the mild, moderate and severe groups. There is a significant difference between the CRP/Albumin ratio (p=0.00001) and the neutrophil-lymphocyte ratio (p=0.00001) among soft and medium groups.

There is a significant difference in the neutrophil-lymphocyte ratio (p=0.000215) among moderate and severe groups.

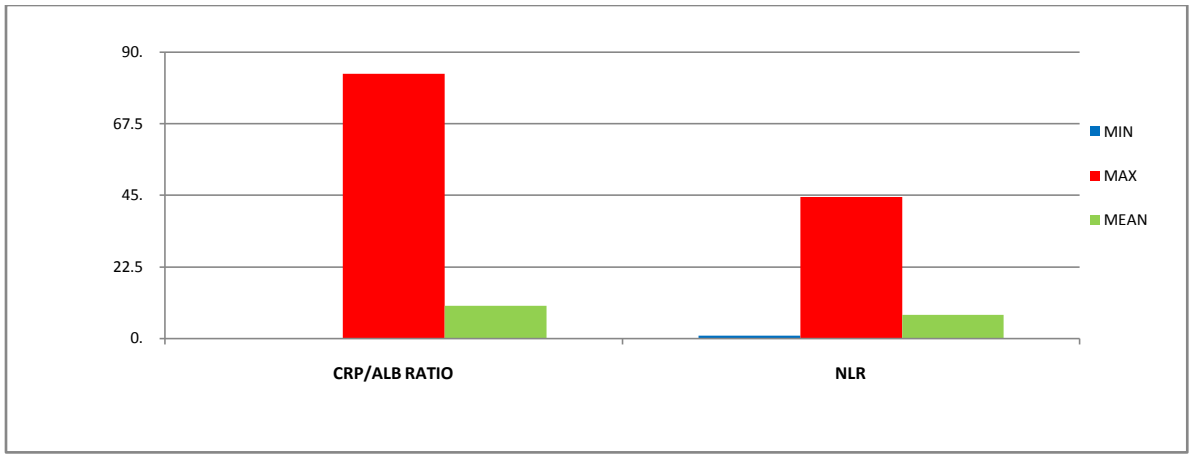

FIG 1:- Minimum,maximum, and mean values of CRP/Albumin ratio and NLR.

There is no significant difference between moderate to severe groups for CRP/Albumin ratio (p=0.1486).
There is a significant difference between the mild and severe groups between the CRP/Albumin ratio (p=0.00neutrophil-lymphocy lymphocyte ratio (p=0.00001)

The mean value for CRP/albumin ratio is 5.106, 11.467 and 13.368 in mild, moderate and severe groups, respectively. The mean value for NLR is 3.899, 7.456 and 11.206 in mild, moderate and severe groups.

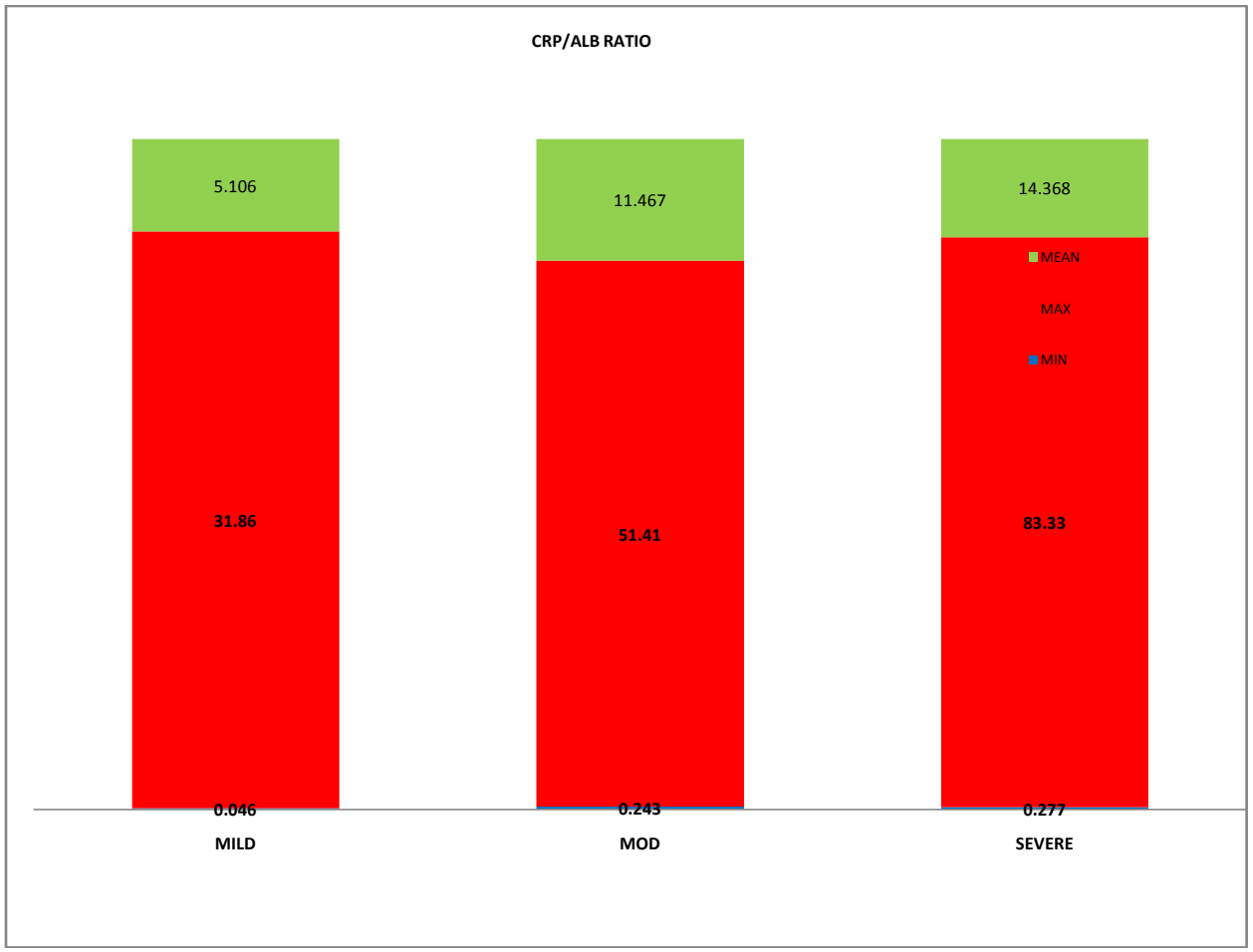

Fig 2:- The minimum, maximum, and mean values of CRP/Albumin of each group.

There is a significant difference between the mean values of the mild, moderateand severe groups in terms of the CRP/albumin ratio, making it a vital laboratory parameter in early recognition of severity and helpful in the early initiation of treatment.

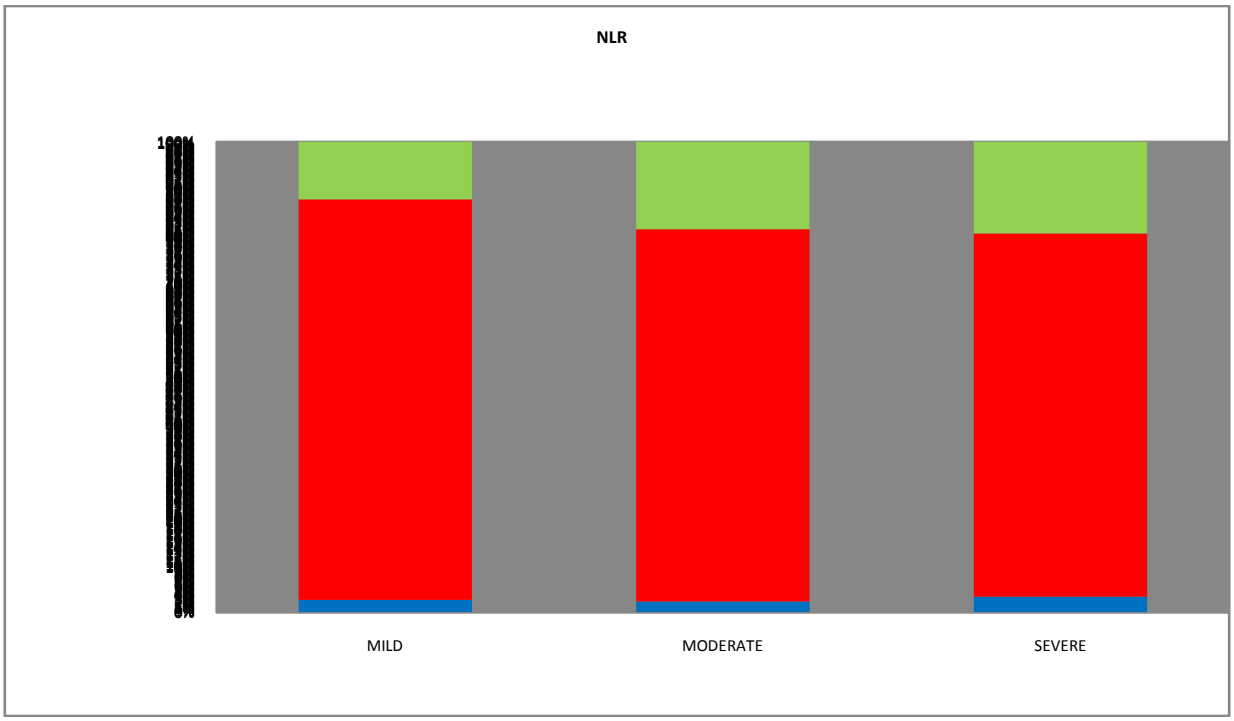

Fig 3:- The minimum, maximum, mean values of NLR in each group.

There is a significant difference between the mean values of the mild, moderate and severe group in terms of the NLR, making it avital laboratory parameter in early recognition of severity and helpful in early initiation of treatment.

Discussion:-

This study aimed to evaluate the role of laboratory markers at the time of diagnosis in estimating the severity and predicting the prognosis of COVID-19. This study showed that severe patients had significantly higher CRP/albumin ratio values NLR. The albumin levels decreased in the severe ones.

CRP is considered a sensitive biomarker of infection, inflammation, and tissue damage. During the acute inflammatory responses, the CRP level increases rapidly. CRP is suggested as an efficient marker in assessing COVID-19 severity. Albumin is a negative acute-phase reactant protein. This study revealed that CRP/Albumin was associated with disease severity. The inflammatory reaction plays a prominent role in the pathophysiology of COVID-19. The proinflammatory cytokine increased in the peripheral blood of the patients. Significant hypoalbuminemia is detected in severe COVID-19 patients.(2)

The CRP/albumin ratio was studied previously as a prognostic marker in critically ill patients with infections and malignancy. This study showed severe covidin patientwithad high CRP/albumin ratios. However, albumin and CRP levels alternation may be due to the associated chronic illness (4).

So, the CRP/albumin ratio could be a significant independent prognostic factor for COVID-19 mortal...

The neutrophils are one of the human body's vital immune cells. When pathogenic microorganisms invade the body, immune cells tend to rapidly chemotactically gather to the infection site and play the role of host defence and immune regulation(3). When the body's neutrophils are significantly reduced, the body's immunity is compromised, and thus the risk of infection is increased considerably. Lymphocytes are the primary effector cells of the human immune response.

The number of lymphocytes in the body is closely related to the body's immunity and defence system against pathogenic microorganisms and is negatively correlated with the degree of inflammation. NLR encompasses two types of leukocyte subtypes, reflecting the balance of the body's neutrophil and lymphocyte count levels and the degree of systemic inflammation(5). More accurately, it reflects the balance between the severity of the inflammation and the body's immunity status and is thus considered an important marker of systemic inflammatory response.

As per the results, we believe that NLR can be used as a warning signal for rapidly deteriorating COVID-19 infection and can provide us with a specific objective basis for the early identification of severe COVID-19 pneumonia

The current study had some limitations. First, this study was a single centre study, so further studies must include multiple centreswith many participants. Second, this study design was a cohort that lacked a control group. Lastly, the changes in the levels of the markers over time were not part of this study design, so further studies are recommended to assess their dynamic change. Future studies are suggested to confirm this study's results.

Conclusion:-

1. CRP/albumin ratio seems to be a valuable biomarker in evaluating the severity of covid-19.
2. High levels of the biomarkers require more attention that will enable better management.
3. Even though the results gathered in our study suggests that there is some predictive value in predicting disease severity, those parameters were also altered in other inflammatory diseases and hence can affect the outcome.
4. CRP/Albumin ratio &NLR seem to be valuable biomarkers in evaluating the severity of COVID-19.

References:-

1. El-Shabrawy M, Alsadik M, El-Shafei M, Abdelmoaty A, Alazzouni A, Esawy M et al. Interleukin-6 and C-reactive protein/albumin ratio as predictors of COVID-19 severity and mortality. The Egyptian Journal of Bronchology. 2021;15(1).
2. Hu Y, Sun J, Dai Z, Deng H, Li X, Huanet al.t al (2020) Prevalence and severity of coronavirus disease 2019 (COVID-19): a systematic review and meta-analysis. J Clin Virol 127:104371.
3. Gong J, Ou J, Qiu X, Jie Y, Chen Y, Yuan L eet al.(2020) A tool to earlypredict severe coronavirus disease 2019 (COVID-19): a multicenter study using the risk nomogram in Wuhan and Guangdong, China. Clin Infect Dis 71(15):833–840.
4. Aziz M, Fatima R, Lee-Smith W, Assaly R (2020) The association of low serum albumin level with severe COVID-19: a systematic review and meta-analysis. Crit Care 24:255
5. Tatum D, Taghavi S, Houghton A, Stover J, Torah E, Duchesne J. Neutrophil-to-Lym- phagocyte Ratio and Outcomes in Louisiana Covid-19 Patients. Shock (Augusta, Ga). 2020.