ORIGINAL RESEARCH PAPER

Radiology

ASSOCIATION OF CT SEVERITY SCORE WITH INFLAMMATORY BIOMARKERS IN COVID-19 PATIENTS IN RIMS, RANCHI

KEY WORDS: COVID-19; CT severity; D-dimer; IL-6; HRCT.

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ABSTRACT

AIMS AND OBJECTIVES- Our study aimed to find out association between level of inflammatory biomarkers and 25 points CT severity score in COVID-19 patients. **MATERIALS AND METHODS-** Retrospective study was done at our COVID-19 centre. Data were collected from 15th April 2021 to 15th June 2021 in our hospital. Total 180 patients were included in the study who underwent RT-PCR tests and non contrast HRCT scan at presentation. The disease was classified into mild to severe based on lung involvement on HRCT. **RESULTS-** CT severity score was found to be correlated with raised D-dimer, CRP and ferritin levels. **CONCLUSIONS-** Our data suggest that combination of D-dimer with ferritin and other isolated levels of inflammatory markers can aid in assessing the severity of COVID-19 disease and its outcome based on its correlation with radiological severity.

INTRODUCTION

On March 11, 2020 WHO declared a global pandemic of covid-19 caused by SARS CoV2 [1,2]. Covid-19 is highely infectious and has high case fatality in critically ill patients [3]. Disease has wide range of presentation varying from asymptomatic carriers to patient requiring assisted ventilatory support and ICU admissions therefore clinical monitoring and appropriate treatment strategies are essential to improve case fatality [4,5]. The nasopharyngeal swab RT-PCR test is the diagnostic test for disease confirmation but there is small proportion of false negative results reported [6,7]. Initially there is early infectious phase where viral replication occurs and patients presents with asymptomatic to mild to moderate symptoms and detection can be done by RT-PCR. Then it progresses to pulmonary phase affecting lungs, causing pneumonia and dyspnea which can be detected by HRCT. So there comes the role of inflammatory markers which tell the transition and progression of the disease in the patients [8].

A non contrast resolution CT chest imaging has its important role in the early diagnosis especially in the patients with false negative RT-PCR results due to newer variants may go undetected like HV 69/70 [9]. CT severity score helps in monitoring the course of the disease as well as the outcome in covid patients [10,11].

Inflammatory markers commonly used are CRP, LDH, IL-6, D-dimer, S.ferritin etc. CRP level rises at the initial stage and can be used in the early diagnosis of pneumonia [12]. D-dimer is degradation product of fibrin.

HRCT chest and inflammatory markers are useful in predicting course, assessment of severity and response to therapy.

MATERIALS AND METHODS

STUDY DESIGN AND PARTICIPANTS-

This was a retrospective study conducted at RIMS COVID-19 centre, RIMS, Ranchi. COVID positive patients who were admitted above 18 years of age with confirmed diagnosis of COVID-19 by RT-PCR were included in the study, conducted between 15th April 2021 to 15th June 2021. Ethical approval was obtained from research and ethics regulatory committee of the institution.

DATA COLLECTION-

Data were retrieved from the records (BHT) which contained all the details of COVID positive patients. Patients were evaluated on the basis of disease severity, lab investigations and radiology imaging.

HRCT IMAGE ANALYSIS-

The images were evaluated to determine the disease severity from mild to severe in each patient. The scans were first assessed whether positive or negative for typical findings of COVID-19 pneumonia (bilateral, multilobe, posterior peripheral ground glass opacities [13,14]. Severity then was scored in 20 lung segment regions which depends on the visual Assessment of each lobe involved [15,16]. (Figure 1)

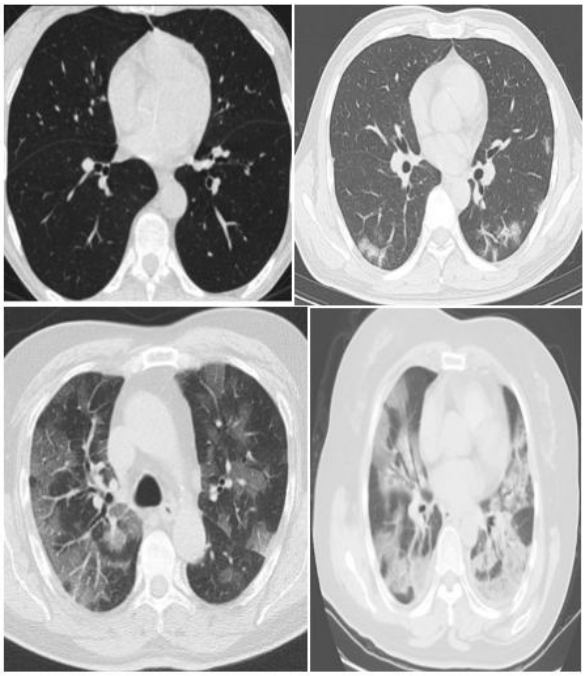

Figure 1: Upper left- normal lung
Upper right- mild lung involvement (CT severity score 1-7)
Lower left- moderate (CT severity score 8-15)
Lower right- severe (CT severity score 16-25)

STATISTICAL ANALYSIS-

Descriptic statics of patients' demographics, clinical and lab results were reported as numbers and p value of <0.05 was considered to be statistically significant.

RESULTS

There were 120 male and 60 female patients of average age 45 years. Following informations been collected: age, gender, presence of comorbidities / risk factors, lab tests including CRP, D-dimer, ferritin levels, lymphocyte count, O2 requirements and final clinical outcomes.

Risk factors included diabetes mellitus, hypertension, asthma, COPD, and CAD and they were found in 145/180 patients.

We found that 105 patients had elevated D-dimer and CRP and both showed significant Association and there was a significant association seen between raised D-dimer and ferritin with severity of lung involvement.

25 patients had raised level of both D-dimer and LDH and 95 patients had raised level of both D-dimer and IL-6 and both had weak association with severity of lung involvement.

Total 56 patients were there with elevated ferritin, out of which 38 patients had non severe lung envolvement and 18 patients had severe lung involvement. On the othere side patients with normal ferritin were total 124 , out of which 110 had non severe lung involvement and 14 had severe lung involvement which showed significant association between level of ferritin and severity of lung involvement.

Total 140 patients were there with raised IL-6, out of which 114 were having non severe lung Involvement and 26 were having severe lung involvement. On the other side , there were 40 patients with normal IL-6 levels, of which 30 had non severe lung involvement and 10 had severe lung involvement, which showed no significant association between levels of IL-6 and severity of lung disease.

Total 148 patients were there with raised CRP, of which 120 were having non severe lung involvement and 28 were having severe lung involvement. On the other side there were 32 patients with normal CRP level, of which 12 had severe lung involvement showing significant association between levels of CRP and severity of lung involvement.(Table 1)

TABLE 1- Association of biomarkers and lung involvement

Biomarkers	No. Of patients	Non severe lung involvement in HRCT	Severe lung involvement in HRCT
D-dimer + CRP elevated	105	60	45
D-dimer + ferritin elevated	68	36	32
D-dimer elevated	140	91	49
D-dimer normal	40	35	5
D-dimer + LDH elevated	25	22	3
D-dimer + IL-6 elevated	95	80	15
Raised ferritin	56	38	18
Normal ferritin	124	110	14
IL-6 elevated	140	114	26
IL-6 normal	40	30	10
CRP raised	148	120	28
CRP normal	32	20	12

DISCUSSION

The WHO advised the use of chest imaging as a part of diagnostic workup of COVID-19 disease whenever there is delayed test results or when there is negative RT-PCR testing but with clinical suspicion of COVID-19 so clinicians and radiologists should work hand in hand[17].

The presence of risk factors, particularly HTN, DM, lung and coronary artery diseases, carry a poor prognosis with even worse outcome with multiple risk factors are present [18,19].

Our results showed that the CRP level has significant correlation with CT severity, suggested that early disease stage can be treated using CRP as a predictive marker of disease progression [20].

Serum ferritin is a vital mediator of immune dysregulation that causes cytokine storm and its level was linked to the severity of the disease and high probability to experience serious complications [21].

D-dimer can be used as a prognostic indicator and raised D-dimer with ferritin in combination are seen in more critical conditions when compared to combination of D-dimer with other inflammatory markers like LDH, CRP or IL-6.

In our study there is no significant association between level of IL-6 and severity of lung involvement.

CT severity score is positively correlated with inflammatory biomarkers in patients with COVID-19 infection.

CONFLICTS OF INTEREST

The authors declare that there are no conflicts of interest.

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