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A Retrospective Study on D-Dimer Level Correlation with CT Scan Changes in COVID Pneumonia in a Tertiary Care Centre ICU

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A B S T R A C T

In the present study evaluated the relationship between D-Dimer level and CT changes in lungs in a group of patients having COVID 19 and admitted in ICU with need for assisted ventilation. This is a retrospective study. The patient informations including the D-Dimer levels and CT scan reports, ICU admission status were obtained from the medical record department and evaluated. Among the 50 patients evaluated 94% had D-Dimer levels elevated than normal. In 98% of patients had CT scan changes in lung parenchyma. In minimal changes in CT scan group 4/5(80%) patients had D-Dimer level elevated. In Moderate severity 27 /28 patients (98%) had elevated D-dimer level. In severe CT scan changes 15/16 (93%) had high D-Dimer level. In one patient (2%) who had no CT scan changes D-Dimer was elevated. D-Dimer levels can serve as bio a marker for lung inflammation and indicate the SARS-CoV-2 pneumonia. It can be used in the triage of patients without delaying for the radiographic examination of lung.

Introduction

In coronavirus disease the elevated D-Dimer level is associated with in hospital mortality (Agapakis *et al.*, 2010; Scherer and Chen, 2016). The most suggested mechanism by which it results is hypercoagulable state. High D-Dimer levels indicate the hypercoagulable state which inturn lead to thrombotic events and mortality (Panigada *et al.*, 2020). It is found from many studies that the D-Dimer level is consistently elevated in SARS-COV-2 pneumonia (Cui *et al.*, 2020). D-Dimer is a marker of inflammation as well be it a local or systemic inflammation (Agapakis *et al.*, 2010). In SARS-COV-2 a marked inflammation is pneumonia.

Involvement of lung tissue is assessed by chest computer tomography commonly (Scherer and Chen, 2016). As D-Dimer level is a bio marker for inflammation it can be hypothesized that its elevated levels can also indicate the presence of pneumonia in SARS-COV-2. In this study we evaluated the

relationship between D-Dimer level and CT changes in a group of patients having COVID 19.

Materials and Methods

This study is a single centre retrospective study conducted at Sree Balaji Medical College and hospital, Chennai. The patients were enrolled from May 1st to June 1st of 2021.

All were confirmed COVID-19cases by RT-PCR testing and were inpatients in COVID ward. They all needed ICU care during their hospital stay due to oxygen requirement. All the patients had undergone radiographic examination of lung at the time of admission or during at some point their hospital stay. Among them the patients who also were tested for d-dimer levels were included in this study.

The patient information including the D-Dimer levels and CT scan reports were obtained from the medical record department. The lung opacities in all of the 20 lung regions were evaluated on chest CT images using a system attributing scores of 0, 1, and 2 if parenchymal opacification involved 0%, less than 50%, or equal to or more than 50% of each region, respectively. The CT severity score was defined as the sum of the individual scores in the 20 lung segment regions, which may range from 0 to 40 points. They were further graded into mild, moderate, severe changes based on the final severity score as the following <=7 is mild, 8 to 17 is moderate, >=18 is severe to classify the lung involvement.

D-Dimer level was tested by mini VIDAS an automated immunoenzymatic assay. Biological reference value is determined as <500 ng/ml. D-Dimer values were tested during the hospital stay were obtained from the medical records

Results and Discussion

Total number of patients included in the study were 50. Demographic information is as per the table 1. Among the total 50 patients 33 (66%) were males and 17 (34%) were female patients. Highest number of patients were in the fifth decade(32%). In 50 patients except one patient(2%) all had lung parenchymal involvement. D-Dimer level elevation was seen in 47(94%) patients. The range of elevation is depicted in the table. 500 to 1000ng/ml was seen in 7(14%) patients. 1000 to 5000 ng /ml was noticed in 15(30%) patients. 5000 to 10000ng/ml was in 11 (22%) patients Among them one patient(2%) had no Ct scan changes. More than 10000ng /ml was noticed in 14 (28%) patients.

In 3(6%) patients it was <500 ng/ml which is of normal range. In minimal changes in CT scan group 4/5(80%) patients had D-Dimer level elevated. In Moderate severity 27 /28 patients (98%) had elevated D-Dimer level. In severe CT scan changes 15/16(93%) had high D-Dimer level. In one patient (2%) who had no CT scan changes D-dimer was elevated.

The total number of patients having Ct scan changes were 49 (98%).Highest number of ct scan changes were seen in the 1000 to 5000 ng/ml of D-Dimer elevated group of patients(30%).When it was >10000 ct scan changes were moderate to severe in 14 (28%) patients.

More number of males (66%) are affected with SARS-cov2 than females (34%).This correlates with the study. The biological differences in the immune systems between men and women exist which may impact our ability to fight an infection including SARS-2-CoV-2. Generally, females are more resistant to infections than men, and this is possibly mediated by several factors including sex hormones and high expression of coronavirus receptors (ACE 2) in men but also life style, such as higher levels of smoking and drinking among men as compared to women (Bwire, 2020). Except in 3(6%) patients D-Dimer levels were eleated in 47(94%) patients. This correlates with the study conducted by Mert Ozen *et al.*, describing as in community acquired pneumonia and in other COPD patients D-dimer functions as a bio marker for disease severity in which the D-Dimer elevation was in (63%) of patients.

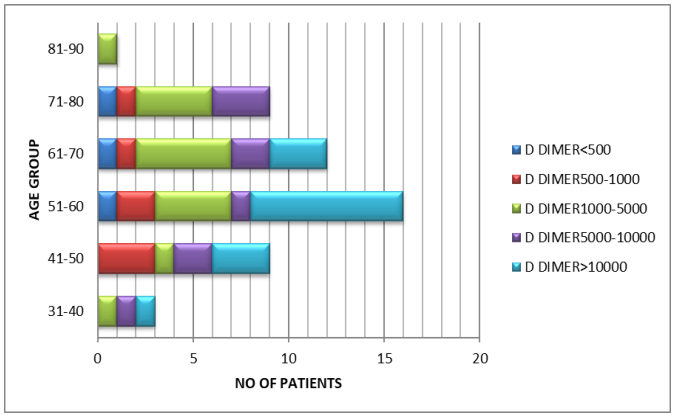
Table.1

Age group	Male (n=33)	Female (n=17)	Total (n=50)
31-40	3	-	3(6%)
41-50	8	1	9(18%)
51-60	9	7	16(32%)
61-70	6	6	12(24%)
71-80	6	3	9(18%)
81-90	1	0	1(2%)

Table.2 D-Dimer and CT scan severity

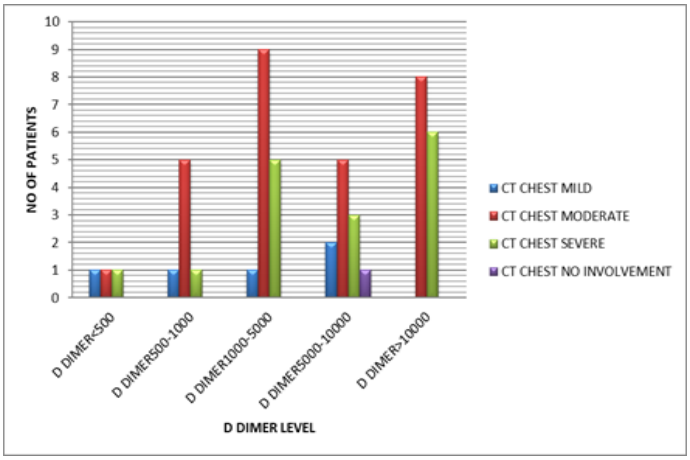
D-Dimer	No of patients(%) N=50	CT scan severity in number of patients(%)			
		Mild (10%)	Moderate (56%)	Severe (32%)	No involvement (2%)
D-Dimer<500	3(6%)	1	1	1	0
D-Dimer500-1000	7 (14%)	1	5	1	0
D-Dimer1000-5000	15(30%)	1	9	5	0
D-Dimer 5000-10000	11(22%)	2	5	3	1
D-Dimer>10000	14(28%)	0	8	6	0

Fig.1 D-Dimer levels in relation to agewise distribution



D-Dimer seems to be elevated in different ranges involving all age groups of the study .Only in 3 (6%) patients it was in <500 ng/ml which is of normal range.

Fig.2 D-Dimer levels and Ct scan changes in total number of patients.



The present study result of total number of patients with D-Dimer levels are higher than this study probably due to the smaller group and the selection patients is based on the patients who were tested both for ct scan and D-Dimer levels. (Ozen *et al.,* 2021)

CT scans can have a very important role in assisting physicians in the management plan and work as an indicator for disease severity and possible outcome. CT severity score is positively correlated with inflammatory lab markers, length of hospital stays, and oxygen requirement in patients with COVID-19 infection (Ghufran Aref Saeed, 2021).

The number of patients requiring artificial ventilation raises with the number patients who had raised D-Dimer levels as per Marijan Bosevski *et al.,* study which shows significant relationship between D-dimer and assistant ventilation. In our study all the patients who had CT scan changes needed assisted ventilation as they all were shifted to one point of hospital stay (Marijan Bosevski, 2021).

CT-SS could be potentially used to expedite triage of patients in need of hospital admission (Yang *et al.,* 2020). When High patient volumes are encountered as in India where we face limited resources patient triage based on CT severity may delay the isolation process which is of at most importance in curbing the spread of infection to others. As far as the aforementioned studies are concerned, the D-Dimer levels of patients with severe conditions were reported to be significantly higher than those of mild and moderate patients.

Given the data in the literature, D-Dimer values are frequently increased in 36–43% of COVID-19 patients. In our study, we observed clinically and radiologically that patients with more extensive pneumonia manifested higher D-Dimer levels. Our results suggest that D-Dimer levels may assist in assessing severity and morbidity in the COVID-19 pandemic as the D-Dimer level play as biomarkers for inflammation of lung parenchyma.

This can be explained further by the fact that Pathological features of COVID-19 include alveolar damage, desquamation of pneumocytes, hyaline membrane formation, pulmonary edema and interstitial mononuclear inflammatory leaks. Disorders in the hemostasis cascade coupled with increased inflammatory load and hyperfibrinolysis lead to elevated D-Dimer levels and greater lung involvement (Ozen *et al.,* 2021).

As per our study the D-Dimer levels serve as bio markers for lung inflammation and indicate the SARS-CoV-2 pneumonia it can be used in the triage of patients without delaying for the radiographic examination of lung. This is of particular use in

places like rural areas where resources are less. Rapid isolation to quarantine facilities with assisted ventilation can be done as most of the patients with D-Dimer elevation will have lung parenchymal involvement and may need assisted ventilatory care.

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