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A Study of Serum Ferritin and D-Dimer Levels in a COVID-19 Positive Patient

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Abstract

Purpose- A study of serum ferritin and d-dimer levels in a COVID-19 positive patients.

Materials and methods- The present case study consists of 89 patients, single centered hospital based comparative cross-sectional study.

Results-Overall patients enrolled in the study were more than 40 years of age and almost exclusively males 66 patients (74.2%), 23 females (25.4%). All the patients were asked a detailed history about smoking and pre-existing comorbidities of lung which decreased chances of false positive result of study. The patients with higher HRCT score were found to have deranged d-dimer ferritin levels.

Conclusion-The current study findings suggest that COVID-19 pneumonia may result in clinically relevant alteration in deranged in d-dimer and serum ferritin levels.

Keywords: COVID-19, Ferritin, D-dimer, Pandemic, SARS

1. Introduction

The spread of COVID-19 has taken a pandemic proportion, affecting 10.3million cases causing almost 1, 50,000deathworldwide. Fever, cough, fatigue along with expectoration can be assumed to be the most influential and visible symptoms. There are many other symptoms which include problem of muscle ache,stiffness in chest feeling of nausea, tendency of vomitingetc.Attimes,diarrhea has been found. Headache has also been found in most of the cases**Error! Reference source not found.**. Moreover, bilateral lung lesions alongwith respiratory failure has also been observed in the patients **Error! Reference source not found.**.D-dimer and serum ferritin levels are very important inflammatory markers to monitor. Serum ferritin levels are prognostic factor in COVID-19 patients**Error! Reference source not found.**. A protein which has a special quality of storage is known as Serum ferritin. To know the level of iron the same serum fertinin is used. At the same time Serum ferritin is considered to be seditious indicator further helpful in predicting acute respiratory distress syndrome **Error! Reference source not found.**.COVID-19 infection may cause a hypercoagulable state which further causes marked elevation in COVID-19 associated complications such as stroke, deep vein thrombosis and myocardial infarction.D-dimer levels associate with the illness seriousness and are solid prognostic markers for in-clinic mortality in patients conceded for COVID-19 disease. **Error! Reference source not found.**,**Error! Reference source not found.**. Therefore, it may be mandatory to look for d-dimer levels during hospital stay and after 15 days to avoid thrombotic complication of blood vessels as well as ischemic stroke. Hence, it is important to study inflammatory markers which help with the prognosis and prevention of post COVID syndromes.

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2. Literature Review

In patients with COVID 19 in **Error! Reference source not found.** elevation hypercoagulability due to D-dimer levels has been studied. The goal of this study was to evaluate D-dimer levels in diabetes-free patients as compared with diabetes-free values in COVID-19. In both classes, the peak D-dimer was assessed and comparable with acceptable statistical measures. This study observed a slightly higher level of D-dimer in COVID-19 diabetes patients. Consequently COVID-19 diabetes infection could be more likely to trigger a deteriorating prognosis for hypercoagulable disease.

Care habits of COVID-19 in a review to classify clinical characteristics**Error! Reference source not found.**. In this study, 135 patients in north-east Chongqing obtained and examined epidemiological, clinic features, laboratory data, radiological attributes, medication and clinical performance. The explanatory data were represented by the mean, median and interquartile (IQR) parameters as percentage and frequency, and constant values were characterized. The extreme cases were smaller than moderate cases and had higher Pt, APTT, d- dimer, dehydrogenase dehydrostate, PCT, ALB, C- reactive protein as well as aminotransferase aspartate levels.

Coagulation cascade activation is the typical trait of intravascular transmission and adverse clinical effects in the patients with COVID-19 **Error! Reference source not found.**. The purpose of the study was to study variations in serum D-dimer in patients with and without serious COVID-19. During the study, they carried out a meta-analysis. The combined findings of both trials found that D-dimer levels in individuals with severe COVID-19 were considerably higher. Finally, their systematic study and meta-analysis found that serum D-dimers were substantially higher in patients with extreme COVID-19 than in patients with non-severe variants..

3. Method:

In the present study 89 patients with positive covid-19 status were included during a study period of 4 months.

4. Results

Frequency distribution of age group

In the present study, 8 study participants(9%) were in the age group of more than 70 years. There were 17 study participants(19.1%) were in age group 61-70 years. There were 23 study participants (25.8%) were in age group of 51-60 years. In the present study there were 22 study participants (24.7%) were in age group of 41-50 years. There were 14 study participants (15.7%) were in age group of 31-40 years and 5 study participants(5.6 %) were in age group of 21-30 years.

Table 1: Distribution of cases according to age

Age(yrs)	Number of cases	Percent
21-30	5	5.6
31-40	14	15.7
41-50	22	24.7
51-60	23	25.8
61-70	17	19.1
>70	8	9
Total	89	100

Gender

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In the present study there were 66 males (74.2%) and 23 females (25.8%) with male to female ratio 2.86:1.

Table 2: Distribution of cases according to gender

Sex	Number of cases	Percent
Male	66	74.2
Female	23	25.8
Total	89	100

Distribution of cases according to HRCT-thorax

Out of 89 cases, 16 cases (18%) were found to have 5-10% lung involvement. There were 24cases(27%) with 10-15% lung involvement. A total of 17 cases (19.1%) were found to have 15-25% lung involvement. There were 13 cases (14.6%) with 25-35% lung involvement. There were 16 cases(18%) with 35-50% lung involvement. A total of 3 cases (3.4%) were found to have more than 50% lung involvement.

Table 3: Distribution of cases according to HRCT-thorax

HRCT	Number of cases	Percent
5-10%	16	18.0
10-15%	24	27.0
15-25%	17	19.1
25-35%	13	14.6
35-50%	16	18.0
50-100%	3	3.4
Total	89	100.0

Distribution of parameters according to HRCT-thorax

Out of 89 cases, participants with 5-10 % lung involvement on HRCT-thorax show mean value of ferritin 298.5 ng/ml with standard deviation 202.5 ng/ml and with d-dimer it shows mean value to be 19.3 mg/L and standard deviation 1 mg/L, participants with 10-15 % involvement on HRCT-thorax show mean value of ferritin 154.3 ng/ml with standard deviation of 194.6 ng/ml and with d-dimer it is observed that mean value was 62 mg/L and standard deviation of 46.1mg/L.

Participants with 15-25 % involvement on HRCT-thorax show mean value of ferritin as 155.5 ng/ml and standard deviation 136.4 ng/ml and with d-dimer it was observed that the mean value was 45.1 mg/L and standard deviation was 0.5 mg/L, participants with 25-35% lung involvement on HRCT show mean value of ferritin 98.1 ng/ml and standard deviation of 108.6 ng/ml and with d-dimer it was observed that the mean value was 51.9 mg/L and standard deviation was 102 mg/L, participants with 35-50% involvement on HRCT-thorax show mean value of ferritin as 212.8 ng/ml and standard deviation of 197 ng/ml and with d-dimer it was observed that the mean value was 11.4 mg/L and standard deviation of 39.5 mg/L, participants with 50-100 % involvement on HRCT-thorax show mean value of ferritin as 177 ng/ml and standard deviation of 125.7 ng/ml and with d-dimer it was observed that the mean value was 172.1 mg/L and standard deviation of 149.3 mg/L. From this data we may assume that participants with higher HRCT-thorax involvement show significantly deranged levels of d-dimer and ferritin.

Table 4: Distribution of parameters according to HRCT-thorax

Parameters	HRCT	Mean	SD	F value	p value
S.Ferritin-1	5-10%	298.5	202.9		
	10-15%	154.3	194.6		
	15-25%	155.5	136.4	3.735	0.004*

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	25-35%	98.1	108.6		
	35-50%	212.8	197.0		
	50-100%	177.0	125.7		
dDimer-1	5-10%	19.3	1.0		
	10-15%	62.0	46.1		
	15-25%	45.1	0.5		
	25-35%	51.9	102.0	2.742	0.044*
	35-50%	11.4	39.5		
	50-100%	172.1	149.3		

Note: * significant at 5% level of significance ($p<0.05$)

5. Discussion

According to our study, it may be assumed that d-dimer and serum ferritin levels are very important prognostic inflammatory markers in COVID-19 and also it was observed that patients with a higher lung involvement in HRCT-thorax show significantly deranged levels of d-dimer and serum ferritin levels. COVID-19 causes hypercoagulable state that may result in deranged d-dimer levels. In our current literature it was stated that COVID-19 progress rapidly with increased severity especially in elderly and male patients with pre-existing co morbidities. These patients most commonly present with dyspnea, cough, fever, malaise, myalgia and in severe cases clinical course can progress to acute respiratory distress syndrome (ARDS).

In our study, participants with lung involvement on HRCT-thorax were observed to have raised d-dimer and serum ferritin levels more so in participants with extensive radiological involvement in HRCT-thorax. According to cohort study done in Wuhan, China, done on 676 patients, it was observed that d-dimer and serum ferritin levels were reliable and accurate inflammatory markers among all inflammatory markers.

According to study done by Pan American Health Organization, it was observed that serum ferritin functions to be significantintermediarywhen it comes to immune dysregulation. Reports suggest that in most of the cases the fatality remain intact with cytokine storm syndrome**Error! Reference source not found.**. A number of people who were suffering from diabetes mellitus has shown the increased serum ferritin levels further increasing the probability of fatal complications**Error! Reference source not found.**. It is therefore can be stated that serum ferritin levels and d-dimer levels may be crucial factors in influencing severity of COVID-19.

6. Conclusion

The current study findings suggest that COVID-19 pneumonia results in clinically relevant alteration in deranged in d-dimer and serum ferritin levels. Patients with higher d-dimer and serum ferritin levels show extensive lung involvement in HRCT-thorax.

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