A Study Correlating CT Severity and Serum Ferritin of Covid 19 Positive Patients Attending Tertiary Care Center, Salem

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Abstract

Introduction:

Covid-19 was considered a pandemic by the World Health Organization and of global concern. Computed tomography was considered an important and sensitive tool in finding the severity of the disease. Cytokine storm which is an inflammatory response is studied to find out the progression of disease or infection with serum ferritin as one of the markers. The study was aimed to find the correlation between the CT severity score of Covid 19 Positive patients and Serum ferritin levels.

Methodology:

This study was done in Vinayaka Mission Kirupananda Variyar Medical College and Hospital,Salem, Tamil Nadu in the Internal Medicine Department from the period of August 2020 to September 2020. All the Covid positive patients of all age groups of both sexes with or without comorbidity were included.Patients having Non-Covid Pneumonitis were excluded. After getting ethical committee clearance data was collected using the Patients' information sheet and analysis was done using SPSS 23. p-value <0.05 was considered statistically significant.In our study, the mean age was 50.66 years±14.15 and male115(76.7%) were more compared to females.

Results:

The mean value of Serum ferritin in males was260 more compared to that of female. The level of Serum ferritin increased with higher CTSSS scoring and their association was found to be significant(r=0.81).

Conclusion:

Serum Ferritin plays a pivotal role in acute stage inflammation.Iron metabolism increases in the Covid-19 infection

Keywords: Computed tomography,Serum Ferritin,COVID-19,Cytokine storm, and Pneumonitis

Introduction

Severe acute respiratory syndrome coronavirus2(SARS-CoV2), caused Coronavirus disease in 2019 which was pandemic and considered as global importance as it spread to more than 140 countries within a short period.[1] It is considered one of the highly contagious diseases. As of statistics 2021, the number of new cases and the death caused by the disease kept on increasing.[2] The spectrum of the disease differs from mild to severe starting from a mild cold and cough later can end in acute respiratory

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distress syndrome. The real-time reverse transcriptase-polymerase chain reaction of the viral nucleic acid from the nasopharyngeal swab or oropharyngeal swab is considered the gold standard test.[3]Computed Tomography (CT) was used to find out the severity level in the COVID-19 patients. There are many scoring systems used to find the level of lung involvement. The most common presentation of the COVID-19 patients was ground-glass opacity with the subpleural distribution.[4,5]CT is one of the most sensitive tests to find out the early parenchymal changes, disease progression and to rule out other diseases like acute heart failure and pulmonary thromboembolism.[6]In some studies, they have stated that an abnormal inflammatory response develops due to viral infection which leads to multiorgan failure and also death. Many studies have stated that there are some laboratory abnormalities noted in the COVID-19 patients like elevated levels of C-reactive protein(CRP), Lactate dehydrogenase(LDH), D-Dimer levels, and Serum Ferritin, etc.[7-10] Thus inflammatory markers are used to monitor sepsis in clinical practice. It is also noted that iron metabolism is noticed in infections, haematological and immunological disorders.[11-13] Serum Ferritin is a key mediator of immune dysregulation and was at an extremely elevated level contributing to cytokine storm. Hyperferritinemia is associated with high mortality and increased admission to the intensive care unit.This study aimed to find out the association between Serum Ferritin level and CT severity of the disease.

Methodology:

The study was done in VinayakaMission Kirupananda Variyar (VKMV) Medical College and Hospital,Salem,Tamil Nadu in the Internal Medicine Department for a period of 3 months from August 2020 to September 2020.All those patients who have given consent for the study and fulfilled the inclusion criteria wereincluded in the study.All those patients who were tested positive for Real-time Polymerase chain reaction through nasopharyngeal swab were included in the study.Those withNon-Covid Pneumonitis, have diagnosis of Cancer, Pregnancy women and Paediatric cases were excluded from the study. With the patient's permission blood was drawn and the following blood parameters were seen like Complete Blood Count,Liver Function Test,Renal Parameters,D-dimer test,Serum Ferritin test, and

Serum LDH levels were tested.CT chest and Echocardiogram (ECG) were taken regularly for all patients.The CT scan was taken in the supine position.Two radiologists with more than 5 years of experience give the CT values.The scoring was given out of 25. In case of any mismatch in the CT results the senior-most was taken as the result.After obtaining Institutional Ethical Committee Clearance,data was collected like their baseline characteristics like Name,Age,Sex,Comorbid status,Saturation, and CTseverity scoring was taken from their patient information sheet.Once the data was collected,it was entered in MS excel Windows 10.Statistical analysis was done by SPSS 23. The continuous variable was expressed in terms of Mean and Standard deviation.Categorical variables were expressed in terms of numbers(percentages). Association between continuous variables was done by Pearson correlation.p-value <0.05 was considered statistically significant.

Results:

In our study, the mean age was 50.660 ±14.15 with a minimum age of 18 years and maximum age of 84 years.Male preponderance(76.7%) was noticed in our study.34.7% of our study participants have Diabetes Mellitus which is followed by Hypertension 27.3% which in turn by Hypothyroidism 4%. The most common complaint noticed in our study was fever among 64.7%, followed by Cough and cold in 60.7% which in turn followed by body pain 38.7%. The CT severity score in our study ranged from 1 to 22 with a mean of 9.95±4.75.Serum Ferritin levels ranged from 15 to 1007 with a mean value of 261±191.32.In our study association was noticed between CT scoring severity and the serum Ferritin level which was statistically significant.The association between CT severity scoring and Serum Ferritin was good as it is 0.81.

Discussion:

Covid -19 disease burdened us with morbidity and mortality which is due to respiratory failure,ARDS, and sepsis.In the study, there is a male preponderance of 115(76.7%) which is more than the Rehab et alstudywhere 138 were male(55.2%).[14]The most common comorbidity in our study is Diabetes Mellitus 52(34.7%) followed by Hypertension 41(27.3%) which is vice versa to the above study where Hypertension is more 42(35.5%) followed by

Diabetes mellitus 16(13.5%). The median cut-off of Serum Ferritin was 209 which is lesser than the FillippoBanchini et al[15] studies where the median cut-off is 674 double the normal cut-off 300. In our study, we find a correlation between Serum ferritin and CT scoring. Similarly, Brandtneretal[16]in his study stated that Serum ferritin correlated with the SOFA score stating that an increase in Serum ferritin level occurs in disease severity conditions.Even Zeng et al study states that with ferritin levels we can classify covid severity.The mean value of the Serum ferritin is 280.65 in males which is more than females. A similar finding was also noted in Goldheberet al study.[17]We know that iron accumulation occurs in two forms:one is hyperexpression of Transferrin receptor 1 which internalizes transferrin and hepcidin expression.Hepcidin inhibits iron ions expulsion blocking ferroportin,a siderophore of the cells.Jiang et al[18]too stated that in ICU patients he noted high hepcidin associated with mortality.Kell et al[19] stated that it is a direct indicator of cellular damage.The main limitation of the study it is a single-center study and it excludes pediatric and pregnancy patients,so the generalizability of the study is not possible.Secondly, Serum ferritin also increases in certain non-covid conditions like Obesity,inflammation,persons who consume alcohol daily,Liver diseases,Leukaemia,Hodgkin's lymphoma,Porphyria, and also in genetic conditions like hemochromatosis.

Conclusion:

Though Serum ferritin is considered as one of the acute phase proteins,its role in inflammation is not clear,that is why it is not used routinely.Iron metabolism role in covid-19 infection is increasing.Thus, in our study, we state that as there is an association between serum ferritin and CTSSS we highlight that further multicentric studies can be done to throw light on the usage of serum ferritin as a biomarker in the COVID-19 infection.

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Table 1: Baseline characteristics of the study participants (N=150)

Baseline characteristics	Number(N)	Percentage (%)
Age		
<20	2	1.3
21-40	33	22
41-60	80	53.3
61-80	32	21.3
>80	3	2
Gender		
Male	115	76.7
Female	35	23.3
Comorbidities		
Diabetes Mellitus	52	34.7
Hypertension	41	27.3
Asthma	5	3.3
Hypothyroidism	6	4

Cardiovascular disease	7	4.7
Symptoms at the time of admission		
Fever	97	64.7
Cough and Cold	91	60.7
Throat pain	6	4
Body pain	58	38.7
Breathlessness	56	37.3
Loose stools	11	7.3
Headache	22	14.7
Loss of taste	10	6.7
Loss of smell	3	2
Loss of appetite	1	0.7

Table 2: CTSSS and Serum Ferritin Presentation in the study

	Mean	**SD**	**Median**	**Minimum**	**Maximum**
CT SSS	9.95	4.75	10	1	22
Serum Ferritin	261	191.32	209	15	1007

Table3: Association between CT scoring severity and the Serum Ferritin level

Pearson's Correlation test		**CT severity**	**Serum LDH level**
CT severity	Correlation coefficient	1.000	.810
	Sig (2 tailed)		.000
	N	150	150
Serum Ferritin level	Correlation coefficient	.810	
	Sig (2 tailed)	.000	.000
	N	150	150