

A RETROSPECTIVE STUDY OF ROLE OF SERUM FERRITIN AS A PROGNOSTIC MARKER IN COVID-19 PATIENTS, IN A TERTIARY CARE CENTRE IN INDORE DISTRICT, STATE M.P.

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Abstract

Background: Ferritin is a key mediator of immune dysregulation, especially under extreme hyperferritinemia, via direct immune-suppressive and pro-inflammatory effects, contributing to the cytokine storm. In several studies, it was found that individuals with severe and very severe COVID-19 exhibited increased serum ferritin level, being serum ferritin in the very severe COVID-19 group significantly higher than in the severe COVID-19 group

Method: All patients had a positive polymerase chain reaction (PCR) test results. Patients with the history of comorbidities such as Hypertension (HTN), Diabetes Mellitus (DM), Chronic obstructive pulmonary disease (COPD), Asthama, Heart failure, Chronic renal Failure (CRF) were included. The clinical and laboratory findings including haemoglobin, wbc counts, differential counts, liver function tests, c-reactive protein (CRP), ferritin and interleukin -6 (IL-6) were obtained from the database.

Results: A total of 38 patients were included in the study. The median age of study population was 52.5 years (13-90) and 65% of patients were male. Patients in the severe group were significantly older and had a higher frequency of hypertension, diabetes mellitus, coronary heart disease, heart failure and chronic renal failure as compared to the patients with the mild group. In addition frequency of dyspnea was higher in the severe group. It was observed that the serum ferritin levels of those patients who fell in the serious category were found significantly raised. P value for Serum Ferritin and Category (serious/mild) is 0.048 which is less than < 0.05 .

Conclusion: Hence it was concluded that there was a strong association between increased serum ferritin levels and the severity of the disease. Early analysis of ferritin levels in patients with covid 19 might effectively define the severity of disease.

Keywords: Serum, Ferritin, Covid & Marker.

Introduction

Covid-19 has rapidly spread all over the world and has infected millions of people. It binds to Angiotensin Converting Enzyme-II (ACE-II) receptor and causes not only respiratory tract infections but affects all the systems of the body[1]. The disease causes sepsis, septic shock and multiple organ dysfunction syndrome by triggering a broad inflammatory process which may require mechanical ventilatory support if the course of the disease worsens. Since the exact pathophysiological mechanism is not very clear, no reliable marker is yet available to predict the prognosis or the course of progression[2&3]. However it is clear that Ferritin is a key mediator of immune dysregulation, especially under extreme hyperferritinemia, via direct immune-suppressive and pro-inflammatory effects, contributing to the cytokine storm. In several studies, it was found that individuals with severe and very severe COVID-19 exhibited increased serum ferritin level, being serum ferritin in the very severe COVID-19 group significantly higher than in the severe COVID-19 group

However recent data have shown that patients with covid 19 have decreased haemoglobin and increased serum

ferritin. A study conducted in the USA has established that ferritin levels were high in 5700 patients hospitalised for covid 19. Anemia and hyperferritinemia are strong factors for mortality[4].

Aim: To investigate whether serum ferritin levels can predict the severity of COVID -19.

Objectives: 1. To determine the serum ferritin levels of the patients admitted in Index Medical College and Research Centre with Positive RT-PCR results.

2. To Find Other Comorbidities which may affect the prognosis of the patients.

3. To Study and Correlate the role of Serum Ferritin levels as a predictable and a reliable prognostic marker in assessing the severity and the outcome of the disease.

Materials and Methods:

This study was initiated with a retrospective design that enrolled patients hospitalised at Index Medical College Hospital and Research Centre, Indore between December 2020 and February 2021. All patients had a positive

polymerase chain reaction (PCR) test results. Patients with the history of comorbidities such as Hypertension (HTN), Diabetes Mellitus (DM), Chronic obstructive pulmonary disease (COPD), Asthama, Heart failure, Chronic renal Failure (CRF) were included. The clinical and laboratory findings including haemoglobin, wbc counts, differential counts, liver function tests, c-reactive protein (CRP),

ferritin and interleukin-6 (IL-6) were obtained from the database. Patients were divided into 2 groups where patients admitted to ICU were as entered in the first group (serious category) and the patients admitted in the wards were in the second group (mild group).

Result:

Table 1: Age Distribution

S. No.	Age	No.	Percentage
1	13-30	03	07.89
2	31-50	12	31.57
3	51-70	18	47.36
4	71-90	05	13.18

A total of 38 patients were included in the study. The median age of study population was 52.5 years (13-90) and 65% of patients were male.

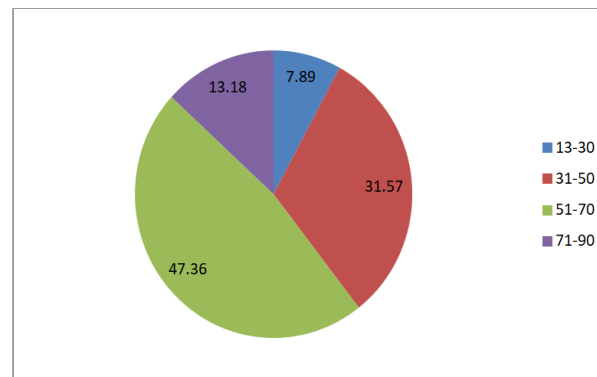


Figure 1: Age Distribution

Table 2: Gender Distribution

S. No.	Gender	No.	Percentage
1	Female	13	34.21
2	Male	25	65.79

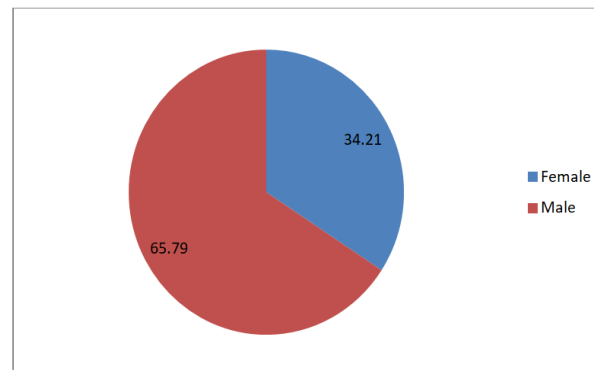
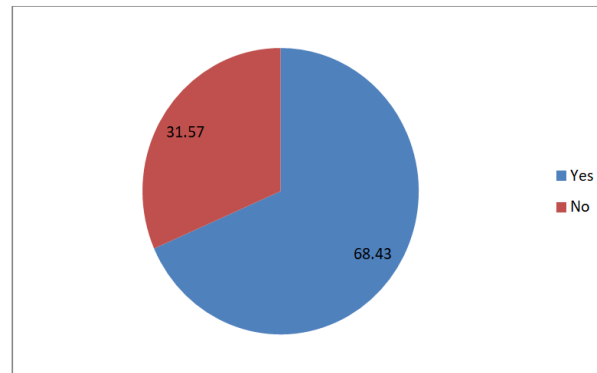


Figure 2: Gender Distribution

Table 3: Dyspnea

S. No.	Dyspnea	No.	Percentage
1	Yes	26	68.43
2	No	12	31.57

In addition frequency of dyspnea was higher in the severe group. Moreover hospital stay, mechanical ventilation support rate and duration were significantly higher in the severe group.

**Figure 3: Dyspnea****Table 4: Comorbidity**

S. No.	Comorbidity (ies)	No.	Percentage
1	HTN	04	10.56
2	COPD	03	7.89
3	COPD, DM	01	2.63
4	CRF, Asthama	01	2.63
5	CRF, DM,HTN	01	2.63
6	DM	03	7.89
7	DM, COPD	01	2.63
8	HTN, COPD	03	7.89
9	HTN, DM	04	10.52
10	None	17	44.73

Patients in the severe group were significantly older and had a higher frequency of hypertension, diabetes mellitus, coronary heart disease, heart failure and chronic renal failure as compared to the patients with the mild group. Leukocyte count, neutrophil count, CRP, ferritin, IL-6 and neutrophil/lymphocyte (N/L) ratio were significantly higher, whereas albumin was lower than the mild group.

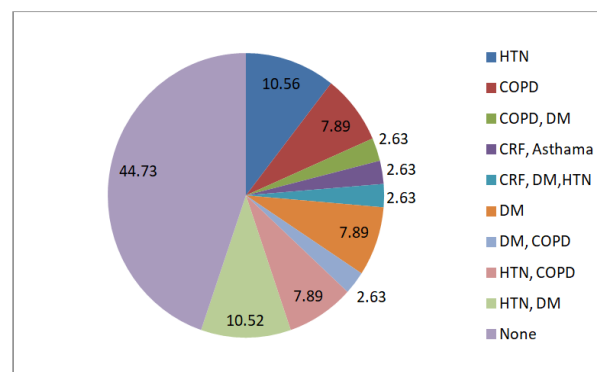
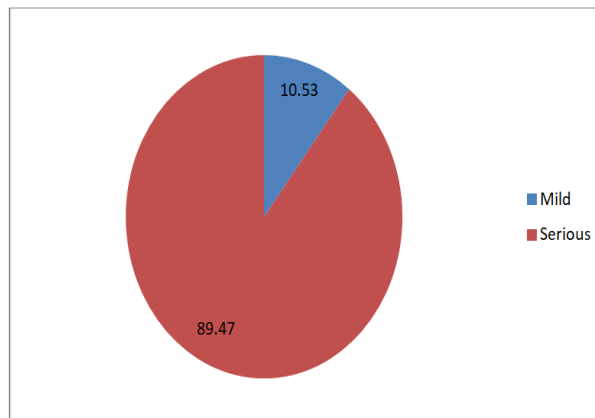
**Figure 4: Comorbidity**

Table 5: Category (Serious/Mild)

S. No.	Category (serious/mild)	No.	Percentage
1	Mild	04	10.53
2	Serious	34	89.47

**Figure 5: Category (Serious/Mild)**

P value for Serum Ferritin and Category (serious/mild) is 0.048 which is less than < 0.05 and significantly associated.

Discussion:

This study showed that comorbidities including diabetes mellitus, hypertension, heart failure, chronic renal failure and asthma may play important roles in the disease severity[5]. Dyspnea was found to be most prominent symptom in the patients of severe group. It was also found that the elderly covid 19 patients in their 50s and 60s tended to have more severe disease than the younger patients[6]. Additionally the fatality rate was higher in elderly population which is explained by higher associated comorbidities with the advancing age. It was found that patients with covid 19 have increased levels of serum ferritin which was attributed to the inflammatory process[7]. Current research suggests that higher ferritin levels can be detected during an acute phase response and may also play an important role in inflammation regarding development of cytokine storm[8&9]. Moreover it was found that ferritin levels increases with the increasing severity. Furthermore Zhou et al revealed that hospital death rate was higher in patients with serum ferritin levels $>300\text{ng/ml}$ than in patients with serum ferritin levels $<300\text{ng/ml}$. Cao et al demonstrated that a cut off value of ferritin level $>272.5\text{ ng/ml}$ predicted disease severity on admission with a sensitivity of 96% and a specificity of 70%.

Conclusion:

Hence it was concluded that there was a strong association between increased serum ferritin levels and the severity of the disease. Therefore ferritin holds a crucial role as a simple complementary tool for guiding the clinical decision and treatment.

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