



STUDY OF SERUM FERRITIN LEVEL AS AN INDICATOR OF SEVERITY OF THE DISEASE IN COVID-19 PATIENTS

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ABSTRACT

INTRODUCTION: In December 2019, many cases of acute respiratory illness with unknown aetiology were detected in Wuhan city, China. Later it was named as COVID-19 which is caused by severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). Later it became as pandemic and spread to the whole world. Its presentation varies from asymptomatic, mildly symptomatic to severe form. In severe COVID-19 patients mortality is very high. For early detection of severity of the disease, investigations like serum ferritin, c-reactive protein, d-Dimer, LDH and CT scan chest are helpful. Estimation of serum ferritin level is one of the best early indicator of severe COVID-19, to prevent morbidity and mortality. **AIMS AND OBJECTIVES:** To study the serum ferritin levels in COVID-19 patients, to know the severity of the disease. **MATERIALS AND METHODS: INCLUSION CRITERIA:** Patients positive for COVID-19. **EXCLUSION CRITERIA:** Asymptomatic COVID-19 patients. **RESULTS:** Among 50 COVID-19 patients 12 patients had normal serum ferritin levels (24%). But 8 patients had mild serum ferritin level elevation (16%). In 30 patients serum ferritin levels were highly elevated (60%). **CONCLUSION:** Estimation of serum ferritin level is one of the investigation to know early, the severity of COVID-19, to prevent morbidity and mortality.

KEYWORDS : Serum Ferritin, COVID-19, SARS-CoV-2, RTPCR Test.

INTRODUCTION

In December 2019, many cases of acute respiratory illness with unknown aetiology were detected in Wuhan city, in the Hubei province of China. Later the causative agent was known as severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2). On March 11th, 2020, World Health Organisation declared it as pandemic and the disease was named as COVID-19 (corona virus induced disease in 2019). While most patients with COVID-19 infection develop only mild or uncomplicated illness, apparently 14% develop severe disease that requires hospitalisation and oxygen support and 5% require admission to intensive care unit.¹

Scientists have found five medical indicators in the blood of COVID-19 patients which are associated with higher death rate, findings that can help physician better predict clinical outcomes of those infected with the novel coronavirus. These indicators are serum ferritin, c-reactive protein, Lactate Dehydrogenase (LDH), d-Dimer and Interleukin-6 (IL-6). The normal range for serum ferritin is 20-250g/l for adult males and 10-20g/l for adult females. Ferritin is a key mediator of immune dysregulation, especially under extreme hyperferritinemia, via direct immune suppression and pro-inflammatory effects, contributing to the cytokine storm.² Many individuals with diabetes mellitus exhibit elevated serum ferritin levels,^{3,4,5} and it is known that they face a higher probability to experience serious complications from COVID-19.⁶ On this basis we want to conduct this study to know the serum ferritin as an indicator of the severity of the disease in COVID-19 patients.

The inflammatory cytokine storm has been recognised as the primary cause of death,⁷ which is defined by the excessive and uncontrolled release of pro-inflammatory cytokines, as has been reported in other infections caused by pathogenic corona viruses⁸. Hyperferritinemia (serum ferritin >400g/l, was observed in patients with severe disease. Macrophages, which produce cytokines and account for the majority of the immune cells in the lung parenchyma, might be responsible of the secretion of the serum ferritin.⁹

AIMS AND OBJECTIVES

- To study the serum ferritin levels in severe COVID-19 patients

- To know the severity of disease.
- Comparison of serum ferritin levels with severity of the disease in COVID-19 patients.

MATERIALS AND METHODS

In this study 50 patients who are admitted in COVID-19 ICU ward in SVRRGG hospital, Tirupati were included. All these patients were tested positive for SARS-CoV-2 by RTPCR test.

INCLUSION CRITERIA

- Patients positive for COVID-19 by RTPCR test.
- Patients admitted in COVID-19 ICU ward.
- Patients age > 18 years.

EXCLUSION CRITERIA

- Asymptomatic COVID-19 patients
- Mildly symptomatic COVID-19 patients
- Patients age < 18 years.
- Patients whose hemoglobin < 12 gm/dl.

RESULTS

Table: Serum ferritin levels in severe COVID-19 patients

S.No	Serum ferritin level (g/l)	No. of patients	Percentage
1	<230	12	24%
2	230-400	8	16%
3	>400	30	60%

In this study normal range of ferritin levels are taken as 10-120g/l for adult females and 20-250g/l for adult males. In our study, 50 patients of COVID-19 were taken. All these are tested positive for SARS-COV-2 by RTPCR. All these patients were admitted in COVID-19 ICU ward. All these were severely sick and need of oxygen supplementation. We divided these 50 patients into three categories depending upon the serum ferritin levels. If serum ferritin level was <230g/l, then it was considered as normal range. If serum ferritin level was between 230 and 400g/l, then it was considered as mild elevation. Serum ferritin level >400g/l, is considered as high elevation.

In this study among 50 patients, 12 patients had normal serum ferritin (<230g/l) levels [24%]. But 8 patients had mild elevation of serum ferritin (230-400g/l) levels [16%]. In 30 patients serum ferritin levels (>400g/l) were highly elevated [60%].

DISCUSSION

Some studies have found elevation of IL-6, LDH, c-reactive protein, d-Dimer and serum ferritin in severe COVID-19 patients. This study was done to know the association of serum ferritin levels with the severity of the disease in COVID-19 patients. We selected 50 severe COVID-19 patients for this study. Severity of the COVID-19 was measured by patients who had shortness of breath and in need of oxygen supplementation. Severity is also measured by patients who were admitted in COVID ICU ward. Among 50 patients, 16 were females and 34 were males. Age of these patients varies from 40-70 years. For all these patients investigations like complete blood count, blood sugar, liver function tests, renal function tests, chest X-ray, CT scan chest, serum ferritin, LDH, d-Dimer and c-reactive protein were done.

It can be observed that the concentration of serum ferritin are generally within normal range in patients with non-severe disease.¹⁰ In our study, among 50 patients 12 patients had normal serum ferritin levels (24%), and 8 patients had mild elevation of serum ferritin (16%). But 30 patients of severe COVID-19 investigations showed highly elevated serum ferritin levels (60%). This study is comparable with the following other studies. Chen et.al., analysed the clinical characteristics of 99 patients, in which 63 of them had ferritin levels above the normal range.¹¹ Tao Liu et.al., study shows that serum ferritin levels were closely related to the severity of COVID-19.¹² In one study with 20 COVID-19 patients, it was found that individuals with severe and very severe COVID-19 exhibited increased serum ferritin levels.¹³

CONCLUSION

Estimation of serum ferritin level is one of the investigation easily available in many hospitals. Serum ferritin is one of the reliable indicator to know the severity of the disease in COVID-19 patients. In our study serum ferritin levels were elevated in majority of severe COVID-19 patients. It is better to know the severity of the disease, as early as possible, to prevent morbidity and mortality from COVID-19. For this estimation of serum ferritin levels in COVID-19 patients is helpful.

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