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HYPERFERRITINEMIA: A PREDICTOR OF MORBIDITY AND MORTALITY IN COVID-19 INFECTION

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ABSTRACT

Aim: To study the levels of Serum Ferritin in predicting severity in COVID-19 patients. **Methods:** A retrospective study was conducted among 270 RT-PCR confirmed COVID-19 patients who were admitted and treated from July 2020 to November 2020 with relevant laboratory data. **Results:** Of the 270 patient records, studied 212 (78.5%) showed serum ferritin levels less than 1000 ng/ml, of which 7 patients (3.3%) required ICU care and 6 patients died (2.8%). In the range of S.ferritin of 1000-1999 ng/ml there were 47 patients (17.4%) of which 10 (21.2%) required ICU care and 2 died (4.2%). Serum ferritin levels of 2000 and more was found in 11 patients (0.04%), of which 7 required ICU care (63.6%) and 5 died (45.4%). Raised ferritin levels showed increased mortality and morbidity irrespective of other factors.

KEYWORDS: Ferritin, COVID-19, hyperferritinemia.

INTRODUCTION

COVID-19 pandemic has engulfed enormous assets of the world. In COVID-19 the inflammatory cytokine storm has been recognized as one of the primary causes of death and is defined by the excessive release of pro-inflammatory cytokines. Active ferritin production by macrophages and cytokines may lead to hyperferritinemia, which in turn, might promote the production of several pro-inflammatory (IL-1β) and anti-inflammatory cytokines (IL-10). Hyperferritinemia by itself could be a potential risk factor as it could be a mediator of further inflammation and potentially harmful free radical formation.

One study has reported that both ferritin and IL-6 concentrations showed higher values in non-survivors in comparison to discharged patients throughout the clinical course, and increased as the patient deteriorates [1]. This study aims at identifying serum ferritin levels as an effective biomarker of morbidity and mortality in COVID-19 infection.

METHODS AND MATERIALS

An institution based study was conducted at the Government Kilpauk Medical College & Hospital from July 2020 to November 2020. The source population was all the patients admitted at KMC with a confirmed diagnosis of COVID-19 using RT-PCR. With these criteria, a total of 270 COVID-19 patients were identified. Data was extracted from the records at admission, follow up and discharge. Data was organized according to three ranges of serum ferritin levels and analyzed.

RESULTS

Of the 270 patient records studied 212 (78.5%) showed serum ferritin levels less than 1000ng/ml, of which 7 patients (3.3%) required ICU care and 6 patients died (2.8%). In the range of S.ferritin of 1000-1999 ng/ml there were 47 patients (17.4%) of which 10 (21.2%) required ICU care and 2 died (4.2%). Serum ferritin levels of 2000ng/ml and more was found in 11 patients (0.04%), of which 7 required ICU care (63.6%) and 5 died (45.4%).

S.Ferritin (ng/ml)	Total number of patients	Number of patients requiring ICU care	Number of patients expired
0-999	212(78.5%)	7 (3.3%)	6 (2.8%)
1000-1999	47 (17.4%)	10 (21.2%)	2 (4.2%)
2000 and more	11 (0.04%)	7 (63.6%)	5 (45.4%)

DISCUSSION

A significant proportion of people with raised ferritin levels irrespective of the levels of IL-6 and their comorbidities have shown increased mortality and morbidity. The cytokine storm has been considered one of the main culprits in COVID-19 severity. The cytokine storm is characterized by high fever, cytopenias (especially lymphopenia), pulmonary involvement (mainly ARDS), and elevated biomarkers such as C-reactive protein (CRP), lactate dehydrogenase (LDH), interleukin-6 and ferritin. Ferritin is an acute phase reactant which is raised in a number of inflammatory conditions.

COVID-19 has been suggested to be a part of the hyperferrritinemic spectrum by some [3]. SARS-CoV-2 leads to stimulation of infiltrating macrophages that can promote hyperinflammation, characterized by increased levels of IL-6, TNF-α, IL-1β, ferritin and subsequent possible lung fibrosis. The increased ferritin production allows adequate storage of iron and deprives the pathogen of iron. Labile iron in the cell contributes to the formation of reactive oxygen species that further promote tissue damage and fibrosis.[5]

One study highlighted the importance of recognizing hyperferritinemia in COVID-19 and suggested that for critically ill patients in the ICU, intravenous deferoxamine would provide sufficient and rapid iron chelation to ameliorate the cytokine storm, whereas in less severe cases an oral chelator could prevent the development of excessive inflammatory response. Further larger adequately powered double-blind randomized trials will be required before the administration of iron chelators to patients with severe COVID-19 infection is routinely advocated.[2]

Hence Serum Ferritin levels should be monitored and measures to decrease it might prove beneficial in reducing the severity of the disease.

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