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Potential Role of Biochemical Markers as an Early Indicator for the Severity of COVID-19 Disease

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Abstract: ***The 2019 corona virus disease (Covid-19) has a high fatality rate and great infectivity. Patients with Covid-19 are susceptible to abrupt decline and life-threatening consequences. Therefore, identifying laboratory biomarkers is necessary in order to classify high risk patients. The main goal of the study is to examine various biochemical parameters such as, C-Reactive Proteins (CRP), serum ferritin, serum lactate dehydrogenase (LDH), serum procalcitonin, IL-6 and D-dimerin patients with severe and non-severe Covid-19 cases and to identify the most effective biomarker to predict the disease severity.***

Keywords: COVID-19 disease, biomarkers, C-reactive protein, Ferritin, D-dimer, Procalcitonin, Lactate dehydrogenase. IL-6

1. Introduction

COVID – 19 caused by SARS-CoV2 was declared a global pandemic on March 11, 2020 by World Health Organization. [1] The COVID-19 condition is complicated by its unexpected clinical course, which can quickly progress and result in serious and deadly consequences. Effective biomarkers would be useful in screening, patient classification, clinical care, and the avoidance of major consequences due to the rapid disease development. [2] D-Dimer, serum Ferritin, CRP, IL-6, and LDH, Procalcitonin are among the biomarkers frequently examined to gauge the severity of COVID-19 illnesses. D-Dimer is a fibrin breakdown product and a hypercoagulability marker. Its increased levels have been observed to correlate to COVID-19's disease development. [3] According to many studies, CRP levels in Covid-19 patients have been increased dramatically in initial stages even before CT resultsand is an indication of lung deterioration and progression. [4]

With severe Covid-19 infections, which can manifest as a severe form of interstitial pneumonia and frequently progress into acute respiratory distress syndrome, it is expected that LDH (isozyme 3), which is found in lung tissue, will be produced in greater amounts in the blood. Therefore, elevated LDH may be a sign of a serious illness. [5] This virus triggers the release of several cytokines, including IL-6, from immune systems. IL6 is a very efficient cytokine that has both anti-inflammatory and pro-inflammatory properties. It helps the host defend against infections, but when it is produced in excess when resisting a virus, it can cause a severe acute inflammatory reaction known as a cytokine storm. [6] It have also been observed the haem degradation product called Ferritin is also elevated in patients with severe Covid-19 disease. The main goal of the study is to examine various biochemical parameters in patients with severe and non-severe Covid-19 cases and to identify the most effective biomarker to predict the disease severity.

2. Methods

The study is retrospective type. Study population was selected from department of Medicine and patients≥18 years of age positive for COVID-19 diseases by RT-PCR were stratified into two groups depending on their severity. COVID-19 patients not requiring hospital admission were excluded from the study. Patients with mild to moderate illness who needed ward hospitalization were put in one group, while those with severe illness who needed ICU care were put in another group. Laboratory Information System (LIS) data on patient investigation outcomes was gathered and statistical analysis was done.

3. Result

The results of the laboratory study revealed that the ICU patients had significantly higher values of inflammatory markers such as CRP, Ferritin, LDH, Procalcitonin, D-Dimer and IL-6 than the Non ICU patients.

Table 1: Inflammatory Markers associated with COVID- 19

SL NO	Inflammatory Markers	ICU cases	Non ICU cases	P value
1.	CRP (mg/L)	128	39	≤0.001
2.	Ferritin (ng/ml)	465	269	≤0.001
3.	Procalcitonin (ng/ml)	0.24	0.05	≤0.001
4.	LDH (IU/L)	1000	613	≤0.001
5.	IL-6 (pg/L)	160	66	≤0.001
6.	D-dimer (ng/ml)	1119	665	≤0.001

Table 2: Related studies associated with Inflammatory Markers in assessing Covid-19 disease severity

References	Year	Study type	No. of patients	Inflammatory markers	Findings
Jose Maria Et. al	2020	Observational study	146	IL-6, CRP, PCT, D-Dimer, Ferritin, LDH	Serum levels of IL-6 can predict disease severity.
Minal M Pore Et. al	2021	Retrospective study	231	CRP, Ferritin, LDH, PCT	LDH and CRP were superior to Ferritin and LDH.
Ibrahim Y Hakkim Et. al	2021	Cohort study	153	CRP, Ferritin, LDH, PCT, D-Dimer	Shows significant elevation of all these markers in severe illness.
MarimuthuEt. al	2021	Retrospective study	221	Ferritin, LDH, PCT, D-Dimer, IL-6	IL-6 and D-Dimer were more superior in predicting hospital mortality rate
Marija MilanEt. al	2022	Retrospective study	195	PCT, D-Dimer, IL-6, Ferritin, CRP	PCT has the highest C-index to predict in Hospital mortality in Covid-19 patients.
Amit kumar Et. al	2022	Retrospective study	500	D-Dimer, IL-6, Ferritin, CRP, LDH	Significant elevation of all biomarkers.
Nyana Devang Et. al	2022	Cross sectional study	190	CRP, Ferritin, LDH	LDH and Ferritin can predict mortality in severe Covid-19 patients.

4. Conclusion

We studied how different biochemical indicators affected the severity of COVID-19 and the relative potency of the markers. According to our research, serum ferritin and PCT were not as good at predicting the severity of COVID-19 as LDH and CRP. One can determine COVID-19's severity at early stages by monitoring the various levels of common biochemical markers, which will ultimately enhance prognosis. In this region, patients with COVID-19 can use inflammatory markers (LDH, CRP, PCT, and ferritin) as useful guidelines for assessing disease severity.

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