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## **ROLE OF CYTOKINE STORM INDICATORS IN PREDICTING OUTCOMES IN COVID-19-RELATED ACUTE RESPIRATORY DISTRESS SYNDROME**

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**Relevance.** A cytokine storm is a situation where pro-inflammatory signals get out of hand, leading to a flood of cytokines such as IL-6, CRP, and TNF- $\alpha$  in the system. This is one of the main reasons behind COVID-19 and the development of Acute Respiratory Distress Syndrome. During a cytokine storm, the endothelium and blood vessels get damaged, permeability increases, and the alveolar-capillary membrane is compromised, leading to a flood of immune cells into the lungs. All this affects gas exchange and can lead to respiratory failure. The levels of cytokines and their markers can help to ascertain how severe the inflammatory attack is. The levels of these markers tend to increase in proportion to the severity of lung involvement. Thus, cytokine storm markers can help to predict the course of patients suffering from COVID-19-related ARDS.

**Aim:** to evaluate the predictive power of the cytokine storm indicators, namely CRP, IL-6, and TNF- $\alpha$ , with respect to the outcome or survival/death of COVID-19 patients with ARDS, and their utility as prognostic markers

**Materials and methods.** A retrospective study on the outcomes of 35 COVID-19 patients who had developed ARDS. They were divided into two groups depending on the outcome, either recovery or death. Various parameters, including basic demographics, pre-existing conditions, duration of illness, oxygen saturation, PaO<sub>2</sub>/FiO<sub>2</sub> ratio, and CRP, IL-6, TNF- $\alpha$ , and D-dimer, were collected from Sri Lanka from the period of 2022 to 2025. For the purpose of correlation, Pearson's correlation coefficient was used to assess the correlation between cytokines and other parameters, while an independent t-test was performed to analyze the cytokines. The level of significance considered for the results is  $p < 0.05$ .

**Results and their discussion.** The research also revealed evident negative associations with cytokine levels, including IL-6, TNF- $\alpha$ , and CRP, and PaO<sub>2</sub>/FiO<sub>2</sub>. This means that increasing amounts of cytokines directly correlate with more severe hypoxemia. IL-6 was found to have a strong inverse relationship with PaO<sub>2</sub>/FiO<sub>2</sub> ( $r = -0.75$ ,  $p < 0.001$ ). Patients with elevated cytokine markers were found to have poorer prognostic outcomes, including increased mortality rates, while those with lower cytokine levels recovered completely. Increasing amounts of cytokines were also found to correlate with more severe inflammation, increased ventilation requirements, and more severe cases of ARDS related to COVID-19 infection.

**Conclusions.** From the results, it is clear that the cytokine storm biomarkers, such as IL-6, CRP, and TNF- $\alpha$ , have an essential role to play in the prognosis of COVID-19-induced ARDS. When the biomarkers are high, it is associated with a high level of increased illness, death, and breathing difficulties. By observing and focusing on the biomarkers, it is possible to identify the high-risk patients and take necessary actions to prevent cytokine storm-induced inflammation. Further research is, however, necessary to ascertain the applicability.