

## Significance of Hematological Parameters and Biochemical Markers in Severe Forms of Covid-19

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### Abstract

SARS-CoV-2 is a new virus that affects the human population, about which not all the details are known, and for which the research is ongoing. Several common in vitro diagnostic tests have been implicated in the unfavorable progression of COVID-19, providing potentially important prognostic information.

According to some synthesis studies, the progressively low values of the lymphocyte / leukocyte ratio, and progressively increased of the neutrophil / lymphocyte and neutrophil / platelets ratios, correlate with the more severe evolution of COVID-19. The existence of a number of lymphocytes <20% on day 10-12 indicates a pre-severe condition, and a number of <5% on days 17-19 indicates a critical one.

D-dimers are the most important prognostic element in monitoring patients with severe forms of COVID-19. Elevated levels of D-dimers compared to the reference biological interval observed at hospitalization of patients with COVID-19 and their marked increase, up to 3-4 times the initial value, were associated with increased mortality, which probably reflects the activation of coagulation in infection / sepsis, cytokine storm and imminent organ failure.

Increasing ALT values by more than 5 times the reference biological interval increased the risk of mortality of patients with COVID-19 by seven times. High levels of AST compared to the biological reference range were observed in both patients with non-severe COVID-19 disease as well as in a double the number of patients with severe disease.

The value of serum creatinine at hospitalization is a predictor of the death of hospitalized patients for COVID-19. More frequent measurements of serum creatinine are recommended in the management of COVID-19 to improve the early detection of renal lesions in patients with COVID-19.

At patients confirmed with COVID19, elevated levels of highly sensitive troponin I (hs-cTnI) were observed during hospitalization, and more than 50% of those who died had a significantly higher concentration of hs-cTnI compared to the biological interval of reference.

Hyperferritinemia has been associated with an increased severity of COVID-19 disease, because of elevated ferritin levels compared to the reference biological range, the so-called "cytokine storm" is developed which can be fatal for half of COVID-19 patients, especially for the elderly.

Lactate dehydrogenase (LDH) has been associated with altered outcomes in patients with viral infections. In an American study (n = 1532 COVID-19 patients), the association between elevated LDH levels (that were measured as soon as possible after hospitalization) and the severity of the disease in patients with COVID-19 was assessed. Elevated LDH levels were associated with a 6 fold increase in the chance of developing severe symptoms and a 16 fold increase in mortality in patients with COVID-19. C-reactive protein (CRP) is part of the acute phase plasma proteins. COVID-19 increases CRP. This seems to correlate the severity and prognosis of the disease. Studies have found low levels of PCR in patients who do not require oxygen therapy (mean 11 mg / L,) compared to patients who have become hypoxemic (mean 66 mg / L).

**Keywords:** hematological parameters, biochemical markers, severe evolution of COVID-19

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## Introduction

SARS-CoV-2 is a new virus that has appeared in the human population, not all the details about it are known, and research is ongoing. Therefore, because SARS-CoV-2 behaves similarly to SARS and MERS, certain details during the infectious process are deduced from the study of those viruses. Coronaviruses belong to the family Coronaviridae, order Nidovirales. Coronaviruses have dimensions of 65–125 nm in diameter and contain as nucleus material isolated RNA, with dimensions of 26 - 32kbs in length. The subgroups of the coronavirus family are alpha (a), beta (b), gamma (c) and delta (d) coronavirus.

SARS-CoV-2 is a virus that is transmitted through contact with the respiratory fluids of an infected patient: when he coughs, sneezes or speaks, he releases small drops of fluid, which contain the virus. They form aerosols and deposit on various surrounding surfaces. Subsequently, if another person inhales air containing aerosols or touches contaminated surfaces and then touch their face, eyes, mouth or nose, the virus enters the airways.

The virus is composed of an RNA molecule, surrounded by a series of structural and functional proteins. Known structural proteins are protein S (or spike - which leads to the characteristic appearance), protein M (membrane), protein E (envelope), protein N (nucleocapsid). The S protein has the role of attaching to receptors in human cells and facilitates the fusion of viral content with the cell. In the case of SARS-CoV-2, the receptor is the angiotensin converting enzyme (ACE2), which is found in large quantities in the respiratory