Laboratory findings in Coronavirus Disease 2019 (COVID-19)

Koronavirüs Hastalığı 2019 (COVID-19) laboratuvar bulguları

Hayrettin Yavuz*, Hüseyin Aydın

Sivas Cumhuriyet University, Faculty of Medicine, Department of Medical Biochemistry, Sivas, Turkey
Corresponding author: Hayrettin Yavuz, MD., Sivas Cumhuriyet University, Faculty of Medicine, Department of Medical Biochemistry, Sivas, Turkey
E-mail: hayrettin.yavuz@hotmail.com
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ⓘD Hayrettin Yavuz
ⓘD Hüseyin Aydın

ORCID IDs of the authors:
H.Y. 0000-0001-5190-7022
H.A. 0000-0002-3194-830X

SUMMARY

Coronavirus disease pandemic is a public health threat that affects the whole world. Most coronavirus infections are mild in humans. Severe acute respiratory syndrome coronavirus-2 causes coronavirus disease (COVID-19) and coronavirus pneumonia. Many results in coronavirus disease have been obtained in the studies conducted so far. Rapid and effective diagnosis of coronavirus disease is vital. Thus; infected people can be isolated earlier and the spread of the disease can be stopped, and treatment of patients in need of treatment can be started immediately. In this review; the classification of patients, laboratory findings and the causes and results of these findings are mentioned.

It is thought that; this review could help clinicians and researchers for diagnosis, classification, treatment and prognosis of coronavirus disease. In addition, it is also thought that; this review helps to find out a biomarker that could be used in conjunction with computed tomography results for rapid and accurate diagnosis and classification of coronavirus disease.

Keywords: COVID-19, Coronavirus disease, coronavirus pneumonia, laboratory findings

ÖZET

Koronavirüs hastalığı pandemisi, tüm dünyayı etkisi altına alan bir halk sağlığı tehdididir. Çoğu koronavirüs enfeksiyonu, insanlarda hafif seyretmektedir. Şiddetli akut solunum sendromu koronavirüsü-2 ise, koronavirüs hastalığına (COVID-19) ve koronavirüs pnömonisine neden olmaktadır. Şimdiye kadar yapılan çalışmalarda, koronavirüs hastalığı ile ilgili pek çok sonuç elde edilmiştir. Koronavirüs hastalığının hızlı ve etkili tanısı, hayati bir öneme sahiptir. Böylece; hem enfekte kişiler erken izolasyona alınarak hastalığın yayılması durdurulabilir, hem de tedavi ihtiyacı olan hastaların tedavisine hemen başlanabilir. Derlemede hastaların sınıflandırılması, laboratuvar bulguları ve bu bulguların nedenleri ve sonuçlarından bahsedilmiştir.

Bu derlemenin; koronavirüs hastalığının tanısı, sınıflandırılması, tedavisi ve prognozunda, klinisyenlere ve araştırmacılara yardımcı olabileceği düşünülmektedir. Ayrıca derlemenin; koronavirüs hastalığının hızlı ve doğru teşhisi ve sınıflandırılması için, bilgisayarlı tomografi sonuçları ile birlikte kullanılabilen bir biyobelirteç bulunmasına yardımcı olabileceği de düşünülmektedir.

Anahtar sözcükler: Koronavirüs hastalığı, Koronavirüs pnömonisi, COVID-19, laboratuvar bulguları

INTRODUCTION

Coronavirus disease 2019 (COVID-19) pandemic; is a global public health threat that affects the entire world. World Health Organization (WHO), on January 30, 2020, declared COVID-19 "Public Health Emergency of International Concern" [1].

Coronavirus is an enveloped RNA (Ribonucleic Acid) virus, belonging to the Coronaviridae family and the Nidovirales order. Coronavirus is commonly found in humans and other mammals [2].

Most coronavirus infections are mild in humans. However, two betacoronavirus epidemics, Severe Acute Respiratory Syndrome Coronavirus (SARS-CoV) and Middle East Respiratory Syndrome Coronavirus (MERS-CoV) have caused thousands of cases in the past two decades [3, 4, 5].

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) causes COVID-19 and COVID-19 pneumonia [6].

After viruses infect man, immune cells in the human body release cytokines. An ongoing virus infection causes uncontrolled and excessive amplification of inflammatory factors. Thus a cytokine storm occurs. This cytokine storm may lead to multiple organ damage and dysfunction. [7, 8].

Clinical Classification of COVID-19 Pneumonia

A clinical classification has been made for the new coronavirus pneumonia according to the diagnosis and treatment protocol. According to this classification; It is divided into mild, moderate, severe and critical cases [9].

1. Mild Cases: Those with clinical symptoms and no imaging signs of pneumonia.

2. Moderate Cases: Those with fever and those with radiological findings and respiratory symptoms of pneumonia.

3. Severe Cases:

Adult cases that meet at least one of the following criteria:

- Respiratory distress (≥30 breaths / min)
- Low resting oxygen saturation (≤93%)
- Arterial partial oxygen pressure (PaO2) / inspired oxygen fraction (FiO2) ≤ 300mmHg

Those with obvious chest lesion progression within 24-48 hours in chest imaging.

In addition, child cases who meet at least one of the following criteria are considered severe cases:

- Tachypnea (Independent of fever and crying)
- Low oxygen saturation at rest on finger pulse oximeter (≤ 92%)
- Labored breathing, cyanosis and intermittent apnea
- Lethargy and convulsions
- Those with nutritional difficulties and signs of dehydration.

4. Critical Cases:

Cases meeting any of the following criteria;

- With respiratory failure or required mechanical ventilation
- Shock
- Those with other organ failure that require intensive care unit (ICU) [9].

Laboratory Findings

Many results have been obtained in hundreds of studies so far. In the studies conducted, the C-reactive protein (CRP) levels were significantly higher in patients with COVID-19 [10], were significantly associated with the severity of the disease [11], patients with elevated CRP levels were significantly more likely to have severe disease and patients with CRP> 41.8 mg / L were more likely to have severe complications [12], CRP levels were significantly higher in severe patients than those who are discharged, and patients with elevated CRP levels have higher rates of comorbidity and dyspnea. [13] have been reported.

In addition, high sensitive C-Reactive Protein (hs-CRP) levels were significantly higher in patients [11, 14].

In lymphocyte count, statistically significant lymphopenia was reported in patients [10, 15]. It has been reported that; low lymphocyte count is also clearly associated with the severity of the patients [10, 16, 17], critical type patients had lower lymphocyte counts than severe patients [15], patients with poor clinical status had lower lymphocyte counts than those discharged [18], lymphocyte counts of patients who died due to the COVID-19 were significantly lower than survivors [16, 17]. It has also been reported that lymphopenia is a common feature not only of COVID-19, but of all coronavirus infections [19, 20, 21].

Although there are many articles reporting that there are elevated or decreased leukocyte counts in severe patients compared to those discharged patients [18, 22], there are also many articles reporting that leukocyte counts do not have significant consequences related to the disease [10].

There are many studies about interleukins (IL). It has been reported that; Interleukin-6 (IL-6) levels elevated in patients with progressed disease [11, 15, 23], IL-6 levels elevated in all patients [10, 15], patients with IL-6 levels>32.1 pg/mL are likely to have serious complications [12], elevated IL-6 levels was significantly related to the severity of the disease and was significantly higher, especially in those hospitalized in the ICU [17]. In addition, it has been shown in a meta regression that, elevated IL-6 levels are significantly associated with increased mortality rates in patients [24].

There are several publications reporting that IL-2, IL-4, IL-7, IL-10, Tumor Necrosis Factor-a (TNF-a), Granulocyte Colony Stimulating Factor (G-CSF) levels and IL-2 receptor (IL-2R) and soluble IL-2 receptors (sIL-2r) expressions increased in patients and increased significantly in proportion to disease severity [10, 15, 17, 18, 23, 25].

In liver function tests; It has been reported that, there is liver dysfunction more frequently in severe patients than mild patients, there are elevated alanine aminotransferase (ALT), aspartate aminotransferase (AST) and total bilirubin levels in ICU patients [26], and elevated ALT and AST levels in all hospitalized patients [22].

CALL Score Model

It is known that; comorbidity, older age, lower lymphocyte count and higher lactate dehydrogenase (LDH) levels at hospital admission are independent high risk factors for COVID-19 progression.

With these risk factors, a scoring model named CALL (Comorbidity, age, lymphocyte, LDH) has been created. Positive and negative predictive values using a 6-point cut-off value were 50.7% (38.9% - 62.4%) and 98.5% (94.7% - 99.8%), respectively [27].

DISCUSSION and CONCLUSION

The rapid and effective diagnosis of COVID-19 is vital. Because it is necessary to stop the spread of COVID-19 and to isolate infected people earlier, and to start treatment of patients in need of treatment immediately.

This review was prepared to analyze the clinical features of COVID-19 pneumonia and also to investigate the relationship between severity of disease and inflammatory cytokines and some biochemical parameters in the blood.

CRP elevations in patients may be related to inflammation. CRP is a protein belonging to the pentraxin family, which are effector proteins of natural immunity. CRP is synthesized in response to inflammation and tissue damage [28]. Although CRP is a parameter that gives information about disease severity, it can also be used as an indicator of treatment and recovery.

Due to COVID-19, lymphocytes may be apoptosis and phagocyted by immune cells. Thus, lymphopenia may occur in patients. Alternatively, lymphocytes may be stimulated by inflammatory cytokines, penetrated into the blood vessels and accumulated in the tissue. Many studies have shown that lymphopenia is directly related to both disease severity and mortality in these patients. Therefore, lymphocyte replacement might be an important option for treatment.

Considering that the elevated IL-6 levels are directly related to COVID-19 patients, severity of the disease and mortality; It may be considered to include IL-6 in the scoring system in order to understand the progression of the disease, recognize critical patients and classify patients. IL-6 plays a major role in inflammation. In addition, elevated IL-6 levels may be part of a larger cytokine storm. Therefore IL-6 can be a therapeutic target for critical patients. Also, considering that sIL-2R expression is increased in COVID-19 patients, this receptor may also be a therapeutic target in treatment.

In addition, the most common organs affected by COVID-19 are; lung, kidney, heart and liver [15]. This may be due to the impairment of liver function enzymes.

We hope that this review could help clinicians and researchers in the diagnosis, classification, treatment and prognosis of COVID-19. It is also believed that this review may help to find a biomarker that can be used in conjunction with computed tomography results for rapid and accurate diagnosis and classification of COVID-19.

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