



## STUDY OF LYMPHOCYTOPENIA AS AN ASSOCIATED FACTOR WITH SYMPTOMS AND SEVERITY OF DISEASE IN COVID-19 PATIENTS

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**ABSTRACT** **INTRODUCTION:** In December 2019, a case of pneumonia of unknown origin was reported in Hubei Province, China. The causative agent was found to be a novel enveloped betacoronavirus, now known as SARS-CoV-2. One of the features of SARS-CoV-2 is the global reduction of peripheral T lymphocytes and impaired immune response during acute infection. **AIMS AND OBJECTIVES:** To study the role of lymphocytopenia in COVID-19 patients and its association with appearance of symptoms and severity. **MATERIALS AND METHODS:** **Inclusion criteria:** COVID-19 positive patients by RTPCR. **Exclusion criteria:** Patients whose WBC total count was less than 4000. **RESULTS:** In symptomatic COVID-19 positive patients 36% had lymphocytopenia. In asymptomatic COVID-19 patients lymphocytopenia is not found. **CONCLUSION:** Lymphocytopenia is an effective and reliable indicator of onset of symptoms and severity of disease in COVID-19 patients. This could help to identify and prioritise those patients who require admission into ICU ward.

**KEYWORDS :** COVID-19, SARS-CoV-2, Pandemic, Lymphocytopenia, RTPCR Test.

### INTRODUCTION

In December 2019, a case of pneumonia of unknown origin was reported in Hubei Province, China.<sup>1</sup> The causative pathogen, isolated from human airway epithelial cells, was found to be a novel enveloped betacoronavirus,<sup>2</sup> now known as Severe acute respiratory syndrome corona virus-2 (SARS-CoV2). The disease was named COVID-19. Though it shares phylogenetic similarity with SARS-CoV, it is the seventh member of the family of coronaviridae to infect humans.<sup>3</sup> Given the rapid spread of COVID-19 and the steep rise in morbidity and mortality it caused, the World Health Organization (WHO) declared it as a pandemic on 11th March, 2020.<sup>1,4-6</sup>

Lymphocytes and their subsets play an important role in maintenance of immune system function. As with immune diseases and other infectious disease, virus infection can lead to dysregulation along levels and strata of lymphocyte subsets.<sup>7</sup> Adaptive immune responses develop precise and powerful immunity against viruses. The adaptive immune response to viral infections is exerted through the effector function of cytotoxic T lymphocyte (CTL) response<sup>8</sup> which specifically recognize and kill virus infected cells and/or release inhibitory antiviral soluble factors. Thus, a sharp increase in CTL count is expected in patients with SARS-CoV-2 infection. However, unlike the conventional immune responses against viruses, SARS-CoV-2 infection is accompanied with T cell lymphopenia, with a rapid decrease in both CD4 and CD8 T cell subsets.<sup>9,10</sup> Another report, indicated a reduction in number of CD4+ and CD8+ T cells in the peripheral blood of SARS-CoV-2-infected patients, similar to patients with SARS-CoV, and was associated with concomitant hyperactivated T cells shown by high proportions of CD4-restricted HLA-DR (3.47%) and CD38 (CD8 39.4%) double-positive populations.<sup>11</sup>

One of the features of SARS-CoV-2 infection is the global reduction of peripheral T lymphocytes and impaired immune response during acute infection. Doing WBC total count and differential count is essential to identify the risk cases and giving effective treatment to prevent morbidity and mortality in COVID-19 patients.

The potential underlying mechanisms could plausibly include, (1) The virus might directly infect lymphocytes, resulting in lymphocyte death as lymphocytes express coronavirus receptor ACE2 and may be a direct potential target of viruses, (2) Infiltration of T cells and subsequent trapping in the lower respiratory tract as well as immune cell death, (3) The virus might directly destroy lymphatic organs. Acute lymphocyte decline might be related to lymphocytic dysfunction, and the direct damage of novel coronavirus virus to organs such as thymus and spleen cannot be ruled out.

### AIMS AND OBJECTIVES

The present study designed to study the significance of lymphocyte count in COVID-19 patients and its association with appearance of symptoms and severity.

### MATERIALS AND METHODS

The present study was done in 50 symptomatic and 50 asymptomatic patients who were admitted with RTPCR test positive in S.V.R.R.G.G. Hospital, Tirupati.

- **Inclusion criteria**
- COVID-19 positive patients by RTPCR test.
- Patients age more than 20 years

### Exclusion criteria

- Patients whose WBC total count was less than 4000.
- Patients who have haematological disorders.

### RESULTS

A comparative study of lymphocyte count was done between 50 asymptomatic and 50 symptomatic COVID-19 positive patients. All these patients were tested as positive for COVID-19 by RTPCR test.

S.No.	Type of patients	No. of patients with Lymphocytopenia	Percentage
1.	Asymptomatic COVID-19 patients	0	0%
2.	Symptomatic COVID-19 patients	18	36%

In all patients WBC total count and differential count was done. Lymphocytopenia is defined as Lymphocyte percentage less than 10 in differential count. In 50 members of asymptomatic patients, lymphocytopenia was not observed. In another group 50 patients were taken who had symptoms and admitted in COVID-19 ICU ward. In 50 members of severely symptomatic patients it was observed that 18 patients had lymphocytopenia (36%).

### DISCUSSION

This study was done in a tertiary care hospital, S.V.R.R.G.G. Hospital, Tirupati where 100 patients were selected. Among these 50 patients were asymptomatic and 50 patients were symptomatic. In all 50 asymptomatic patients WBC total count and lymphocyte count were normal. Among another 50 symptomatic patients lymphocytopenia was found in 18 patients (36%). These patients had various symptoms like fever, cough, body pains, throat pain, breathlessness and tiredness. In this symptomatic group few patients were admitted in general

COVID ward, who are not in need of oxygen supplementation. Remaining symptomatic patients were admitted in COVID ICU ward who required oxygen supplementation.

In this study lymphocytopenia was not found in asymptomatic patients, whereas lymphocytopenia was found in 36% of symptomatic patients. This study is comparable with other following studies where lymphocytopenia was found as an associated factor in symptomatic and severe COVID-19 patients.

Lymphopenia has been reported in various types of viral diseases such as SARS, MERS and RSV. In the study of Cui et al on SARS, incidence of lymphopenia observed was 84%, CD4 T cells decreased in 100% of patients, CD8 T cells decreased in 87% of sample population.<sup>12</sup> In the study conducted by Assiri et al on MERS, lymphopenia occurred in 34% of patients.<sup>13</sup> Huang et al and Yang et al have documented lymphopenia to occur in 85% of critically ill patients with COVID 19.<sup>14,15</sup> The presence of lymphopenia in severe COVID-19 was confirmed by Wang et al, who reported a median lymphocyte count of 800 cells/mm in ICU patients, with non survivors exhibiting persistent lymphopenia.

## CONCLUSION

Lymphocyte count can easily be obtained at the time of admission in the hospital. Lymphocytopenia is an effective and reliable indicator of onset of symptoms and severity of disease in COVID-19 positive patients. During this pandemic, evaluation of lymphocyte count could help to identify and prioritise those patients who require/will shortly require admission into ICU ward. These measures will be helpful in preventing morbidity and mortality of COVID-19 positive patients.

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