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Lymphocytopenia in COVID-19 patients, where are we now?

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Introduction

Over the outbreak of the new corona virus, called the 2019 novel Corona virus (2019-nCoV), the World Health Organization (WHO) declared a global public health emergency on 30 January 2020 that primarily originated in Wuhan city, in the Hubei province of China.[1] The WHO officially named the disease as corona virus disease 2019 (COVID-19) on 11 February.[2] The WHO and the Centers for Disease Control and Prevention (CDC) of the United States has been confirmed Human-to-human transmission,[3] after three cases of person-to-person transmission evidently found from US,[4] Germany,[5] and Vietnam.[6] Earlier days of COVID-19, most of the patients were suffer from mild to progressive acute respiratory failure leading to septic shock, metabolic acidosis and in severe cases leads to acute respiratory distress syndrome (ARDS) or death. It is necessary to identify risk factors in earlier period for critical patients that could make possible appropriate management care and so reduce the mortality.

In the first study of COVID-19, enrolled 138 confirmed laboratory cases showed the changes of lymphocyte and neutrophil counts, D-dimer levels, increased inflammatory markers were found such as, erythrocyte sedimentation rate (ESR), interleukin-6 and C-reactive protein (CRP).[7] Chen et al.[8] reported in a retrospective study that leukocytosis were found in 24% and leukopenia in 09% patients, Neutrophilia in 38% patients, Lymphocytes and Hemoglobin were below the normal range in many patients, however, Thrombocytopenia were found in 12% patients and Thrombocytosis in 4% patients.

In 21 patients (mostly females) of non-severe COVID-19 infection, the most frequent laboratory abnormalities including elevated level of CRP, Lactate Dehydrogenase (LDH), D-dimer and ESR [9]. Mardani et al.,[10] reported the significant differences of the number and percentage of WBCs Lymphocytes, and Neutrophils between COVID-19 positive and negative patients. They found low WBCs and Lymphocytes in COVID-19 positive cases with higher Neutrophil count. Tian et al.[11] also reported marked Lymphocytopenia.

Another study described more clearly about Lymphocyte count where 40 COVID-19 patients enrolled, there were significantly reduction in Lymphocyte count observed in severely infected 13 patients, while Neutrophil count elevated in mild infected 27 patients. In addition, in severe cases significant decrease in the counts of T cells (CD8+ T cells) as well as elevated levels of Interleukin (IL) including IL-6, IL-10, IL-12 and interferon gamma (IFN-γ) levels in the peripheral blood. The patients who survived and recovered from severe COVID-19 infection, their T cells and cytokine levels were gradually improved. Moreover, in this study they found that Neutrophil-to-CD8+ T cell ratio (N8R) that affects prognosis for severe COVID-19, thus identified as the most powerful prognostic factor. The statistical significant of CD4+ T cells, CD8+ T cells, IL-6, IL-10 between the mild and severe cases, suggesting that the immunosuppression of severe patients with COVID-19 infection was more apparent. In severe cases, the reduction in T cells reaches its peak within first week, then gradually increases in second week, and in third week T cells reduces to comparable levels to that of mild cases. Therefore, significant decrease in T cell count is strongly correlated with the acute COVID-19 infection.[12]

Wan et al.[13] enrolled 123 cases of novel coronavirus pneumonia (NCP) patients (mild 102 and severe 21). They found the significant decrease levels of CD4+ T cells (52.0%) in mild cases, and in severe cases (95.24%); decrease levels of CD8+ T cells in mild cases (28.40%) and in severe cases (61.90%), indicated that T lymphocytes is significant reduced in severe cases when the body is resistant to COVID-19 infection.

Conclusion

As we know that T cells are crucial for innate immune responses overactivity during viral infections. Therefore, loss of T cells during COVID-19 infection may leads to aggravated inflammatory responses.[12] The viral particles spread through the respiratory mucosa, where they infect other cells and induce a cytokine storm that could generate a series of immune responses, as a result drastically changes in WBCs in peripheral blood and immune cells. The significant reduction of lymphocytes and T cells indicates that COVID-19 consumes many immune cells by inhibiting the body's cellular immune function that leads to exacerbations of patients.[14]

Future studies need more workup to demonstrate peripheral blood lymphocytes and T cells and cytokines functions in blank controls and COVID-19 patients as well as in recovered patients from COVID-19 infection to explore diagnostic, prognostic value and its effects on cellular immunity. In addition, multicenter analysis would be productive as number of cases and controls would increases to work up on large-scale data.

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Conflicts of interest

The author reports no conflicts of interest in this work.

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