

**THE ASSOCIATION OF HAEMATOLOGICAL
PARAMETERS
AND DISEASE SEVERITY IN COVID-19 PATIENTS
AT INITIAL PRESENTATION**

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**The Association of Haematological Parameters and Disease Severity In COVID-19
Patients at Initial Presentation**

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ABSTRACT

Background

Coronavirus infection (COVID-19) is a multisystemic disease involving the hematopoietic system, rather than the solely respiratory system. The haematological and coagulation abnormalities are mostly associated with cytokine storm and are usually related to acute respiratory distress syndrome (ARDS) and multiorgan failure leading to more severe disease and mortality. Previous studies have reported inconsistent haematological parameters, especially white blood cell differential counts. Lymphopenia, neutrophilia, and thrombocytopenia were commonly reported to be associated with severe COVID-19 disease. Some studies also reported the clinical utility of biological markers such as neutrophil to lymphocyte ratio (NLR), neutrophil to monocyte ratio (NMR) on lymphocyte to monocyte ratio (LMR) and platelet to lymphocyte ratio (PLR) in predicting disease. Recent evidence has suggested that patients with COVID-19 may also have abnormal coagulation markers and are at higher risk of thromboembolic complications. However, the trend of coagulation markers in different disease severity remains unclear.

Objective

This study aims to determine the association between various hematological parameters and disease severity of COVID-19 at initial presentation.

Method

This study is a single-center, retrospective, cross-sectional study conducted at Selayang Hospital, Malaysia, from January 2020 to June 2021. Two hundred and fifty-seven positive COVID-19 reverse transcriptase-polymerase chain reaction (RT-PCR) subjects with different severity of mild, moderate, severe, and critically ill disease that fulfilled

inclusion and exclusion criteria were included. The Pearson Chi-square test (X^2) was used to analyse categorical data, and the Kruskal-Wallis test was used to analyse the continuous data across a different group of severity.

Results

Of 257 cases, 54 were mild cases, 65 were moderate cases, 116 were severe cases, and 22 were critically ill cases. The values of TWC, absolute neutrophil count (ANC), prothrombin time (PT), activated partial thromboplastin time (APTT), NLR, NMR, and PLR were significantly increased in patients with critically ill disease, while the value for absolute lymphocyte count (ALC) was significantly higher in severe disease presentation ($p < 0.05$). Meanwhile, the value of absolute eosinophil count (AEC) was too low to be detected in severe and critically ill disease presentation. There was no statistically significant value for haemoglobin, platelet count, absolute basophil count (ABC), international normalised ratio (INR), and LMR across the different disease severity groups at initial presentation.

Conclusion

Leukocytosis, neutrophilia, lymphopenia, monocytopenia, eosinopenia, increased PT and APTT levels, high NLR, high NMR and high PLR are associated with severe and critically ill COVID-19 disease at initial presentation.

KEYWORDS

COVID-19, Haematological changes, Disease severity, Leukocytosis, Coagulopathy