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Physiological Characteristics in Patients Following Severe COVID-19 Recovery

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Abstract

This study investigates hematological changes in patients recovering from severe and non-severe COVID-19, focusing on leukocyte, lymphocyte, and monocyte counts. Two age groups were examined: 30-40 and 46-50 years. In the 30-40 group, severe cases showed a leukocyte count of 6.68±0.37 *10^9 cells/L during the disease, rising by 26% post-recovery. In the 46-50 group, severe cases had a leukocyte count of 5.78±0.65 *10^9 cells/L, with a 19.2% increase after recovery. Lymphocyte and monocyte counts were initially below normal but rose to near-normal levels post-recovery, indicating immune system recovery. The study emphasizes the need to monitor these hematological parameters during the recovery phase for better management of post-COVID patients. Future research should explore the long-term implications of these findings to enhance patient care strategies.

Keywords

COVID-19, Comorbidities, Respiratory Disease

Introduction

COVID-19, caused by SARS-CoV-2, has had a devastating impact on the global population, resulting in over 6.64 million deaths worldwide. The virus continues to cause disease, with many countries experiencing multiple waves of outbreaks. To date, seven types of coronaviruses have been found to infect humans [3]. COVID-19 is associated with increased mortality in individuals over 65 years old and those with comorbid conditions such as cardiovascular diseases, chronic respiratory diseases, cancer, and diabetes [1]. Hematological alterations, including lymphocytopenia [2,7], neutrophilia [3], eosinopenia [8], and mild thrombocytopenia [4], have been observed in COVID-19 patients. Quantitative changes in peripheral leukocytes and hematopoietic elements are being studied to determine whether COVID-19 is associated with fatal outcomes as an early signal in patients [5,6]. Eosinophils, considered antiviral cells in many ways [5], may play a significant role in the immune response to SARS-CoV-2 infection. Therefore, studying these hematological parameters is crucial for developing effective therapeutic strategies. Understanding these hematological changes can aid in early diagnosis and management of COVID-19, potentially improving patient outcomes and benefiting the medical sciences.

Materials and Methodology

The study aimed to review categories of individuals at high risk of severe COVID-19. It involved identifying risk groups, categorizing the clinical forms of COVID-19, and determining potential comorbidities associated with the virus. Data were collected retrospectively from case histories of participants who recovered from COVID-19, excluding those with chronic comorbidities. Functional and hematological parameters were measured post-recovery. Blood samples were taken under sterile conditions, and leukocyte counts were performed using a BM 1800 biological microscope with a Goryaev camera. The samples were treated with a 3-5% acetic acid solution stained with methylene blue. Cytometric studies followed standard procedures for precise leukocyte counting. Study participants volunteered without compensation, and all research was conducted according to ethical guidelines, ensuring participant anonymity. The study included individuals without chronic diseases who had recovered from COVID-19, while those with pre-existing conditions were excluded to focus on the physiological changes directly related to the virus.

Results

The study analyzed the leukocyte counts in two age groups of COVID-19 patients: 30-40 years and 46-50 years. In the 30-40 age group, the average age was 36.64±2.13 years. During the disease, leukocyte counts in severe cases were 6.68±0.37 *10^9 cells/L, and in non-severe cases, they were 6.47±0.41 *10^9 cells/L, indicating leukocytopenia compared to the control group ($P<0.05$). By the 4th week post-recovery, leukocyte counts rose by 26% in both groups, reaching 9.01±1.22 *10^9 cells/L and 8.79±0.41 *10^9 cells/L, respectively.

In the second group (46.1±1.87 years), severe cases showed leukocyte counts of 5.78±0.65 *10^9 cells/L, and non-severe cases had counts of 7.08±0.81 *10^9 cells/L ($P<0.05$). Leukocyte levels increased by 19.2% in severe cases and by 19.7% in non-severe cases by the 4th week, indicating a recovery trend.

Table 1: Leukocyte Count

Group (Age)	Leukocytes During Disease (10^9 cells/L)	Leukocytes After 4 Weeks (10^9 cells/L)	% Increase
30-40 (Severe)	6.68 ± 0.37	9.01 ± 1.22	26%
30-40 (Non-Severe)	6.47 ± 0.41	8.79 ± 0.41	26%
46-50 (Severe)	5.78 ± 0.65	8.75 ± 1.78	19.20%
46-50 (Non-Severe)	7.08 ± 0.81	9.15 ± 0.68	19.70%

Lymphocyte and Monocyte Analysis

Lymphocyte counts during the disease were below normal, at 0.93±0.11 *10^9 cells/L and 1.03±0.18 *10^9 cells/L (P<0.01), but rose to near-normal levels post-recovery. Monocyte levels were slightly elevated during the disease, and they significantly increased post-recovery in both groups, indicating immune system recovery.

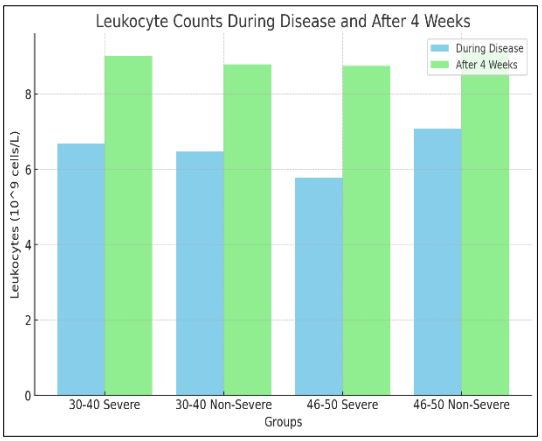

Figure 1: Leukocyte Counts During Disease and After 4 Weeks

Discussion

The results indicate a significant increase in leukocyte counts post-recovery in both age groups, with a 26% rise in the 30-40 age group and around 19% in the 46-50 age group. This aligns with the known immune response, where leukocytes increase during recovery to compensate for the initial leukocytopenia observed during severe COVID-19 cases. The rise in monocytes further suggests immune activation, which is crucial for fighting infection. These findings underline the importance of monitoring hematological parameters during the recovery period, as they provide valuable insights into the body's immune response and recovery process.

Conclusion

This study aimed to analyses the hematological changes in patients recovering from severe and non-severe COVID-19. Two age groups were studied: 30-40 and 46-50 years. Leukocyte counts during the disease were significantly lower than normal, indicating leukocytopenia, particularly in severe cases (6.68 ± 0.37 *10^9 cells/L in the 30-40 group and 5.78 ± 0.65 *10^9 cells/L in the 46-50 group). However, by the fourth week post-recovery, leukocyte levels increased by 26% in the younger group and about 19% in the older group. The study highlights the importance of tracking leukocyte and monocyte levels during the recovery phase. These findings could inform clinical recommendations for better post-COVID management, focusing on immune recovery. Future research should explore the long-term implications of these hematological changes to improve patient care and recovery strategies.

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Note: All the tables and figures in this chapter were made by the author.