Original Article

Lymphocyte as a predictor of prognosis of COVID-19 patients: A hospital-based study

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Abstract

Introduction: Lymphocytopenia has emerged as a simply obtained laboratory value that may correlate with prognosis. In this study we aim to study absolute Lymphocyte count after clinical recovery. **Method and material:** Observational study was conducted in Covid dedicated Hospital in Mizoram. Absolute lymphocyte count is obtained from the differential leucocyte count of the patients. The obsolute Lymphocyte count at the time of hospital admission is compared with the Absolute Lymphocyte count at the time of hospital discharge after the patient obtained clinical recovery. **Result:** Absolute Lymphocyte Count at the time of admission has a mean of 2004.48 and standard deviation of 1204.868. Absolute Lymphocyte Count at the time of discharge has a mean of 1943.68 and standard devaiton of 842.228. Pearsons correlation coefficientis showed that there is positive correlation between the variables (Correlation coeffiecient = .325). Also, the correlation is statistically significant ($P < 0.05$). Paired Sample t-test showed there is no statistical significant difference between Absolute Lymphocyte Count- at the time of admission and at the time of discharge ($P > 0.05$) at 95% Conficence Interval. **Conclusion:** Our study showed that Absolute Lymphocyte count had no signicant difference at the time of hospital admission and after clinical recovery.

Keywords: Absolute lymphocyte count, clinical recovery, COVID-19, hospital admission

Introduction

Coronavirus belongs to a huge family of viruses, leading to a heterogeneous group of disorders, from common cold to life-threatening diseases. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is an under-investigation strain of coronavirus that causes coronavirus disease 2019 (COVID-19), for which no effective treatment has been found until now.[1] The host innate and adaptive immune responses play an important role in resisting the progression and prognosis of COVID-19,[2] indicating the close relationship between peripheral lymphocyte counts (PLCs) and the occurrence and progression of COVID-19. It is known that lymphocytopenia, defined as an absolute lymphocyte count (ALC) <1000 cells/μL, occurs in COVID-19 and may correlate with increased disease severity.[3] Given the novelty of this virus, how the immune system deals with it is largely unknown. There is a growing list of publications indicating that the assessment of lymphocyte subset counts, such as CD4 and CD8 T cells, B cells, and NK cells, may provide prognostic information for COVID-19 disease severity and convalescence when considered in conjunction with other clinical information. Recent studies have shown that lymphopenia with cytokine storm syndrome is found frequently among patients with COVID-19. These features could reveal that the adjusted immune system plays a key role in determining disease progress.[4] With this knowledge, we aim to conduct this study in

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Received: 17-10-2023 **Revised:** 16-12-2023
Accepted: 30-12-2023 **Published:** 28-06-2024

Access this article online

Quick Response Code:

Website: http://journals.lww.com/JFMPC

DOI: 10.4103/jfmpc.jfmpc_1699_23

How to cite this article: Biakhlupuii C, Vanlalpeka J, Lalrinpuia B, Laltlanzovi, Devi KG, Hrahsel L. Lymphocyte as a predictor of prognosis of COVID-19 patients: A hospital-based study. J Family Med Prim Care 2024;13:2609-11.

Mizoram. In our study, we aim to follow-up on the ALC among hospitalized COVID-19 patients till they recover from the disease.

Objective

To examine the ALC after clinical recovery.

Review of Literature

A recent meta-analysis reported by Huang *et al.* showed that lymphopenia correlates with several poor patient outcomes, including mortality, acute respiratory distress syndrome (ARDS), intensive care unit (ICU) care, and severe diseases.[5] Other groups have found that patients with persistent lymphocytopenia during the COVID-19 disease course may be more likely to have severe outcomes. This is interesting, given that persistent lymphocytopenia is associated with poor outcomes after diagnosis with sepsis. Drewry *et al.* (2014),[6] hypothesized that this could be due to an anti-inflammatory response in later stages of sepsis. Numerous studies confirmed that the increased proinflammatory cytokines play a critical role in the induction of lymphopenia. In addition to antiviral activity, IFN α/β can have antiproliferative, proapoptotic, and expression of cytokines and cytokine receptors, causing immune modulation, particularly specific T CD8+ against viruses (Dierckx *et al.*, 2017 and Wandrer *et al.*, 2016).[7,8] It should be mentioned that cytokines might not be the only cause of lymphopenia. Multiple mechanisms might work together to cause lymphopenia. SARS-CoV-2 might directly attack the lymphocytes or destroy lymphoid organs. Indeed as patients with severe phenotype of COVID-19 have elevated blood lactic acid levels, lymphopenia could be due to such metabolic molecules (Tan *et al.* 2020).[9]

Materials and Method

An observational study was conducted in COVID-19-dedicated hospital in Mizoram. Data are collected from the medical record system and laboratory data at the time of admission and at the time of discharge. ALC is then obtained from the differential leucocyte count of the patients. Using the following calculation:

Absolute lymphocyte = WBC count × 1000 × percent lymphocyte (expressed as a decimal), we can determine the ALC per mcL. Institutional Ethics Committee (IEC) of Zoram Medical College approved this study.

Inclusion criteria

COVID-19-positive patients over 18 years were admitted to Zoram Medical College from August to October 2021 and received complete treatment.

Exclusion criteria

1. Patients who had a history of cancer, immunodeficiency disease, underlying hematological malignancies, or who had been receiving radiation exposure.
2. Those patients who succumbed to SARS-CoV-2 infection during their hospital treatment were not included in the study.

Limitation

Follow-up of the patient is difficult unless patients come back with complications.

Result

In the study, there is a total of 50 patients. The categorical variable is represented using frequency and percentage. Continuous variables are represented using mean and standard deviation. Out of 50 patients, there are 23 (46%) males and 27 (54%) females. The mean age is 42.86 years with a standard deviation of 20.549. ALC at the time of admission has a mean of 2004.48 and a standard deviation of 1204.868. ALC at the time of discharge has a mean of 1943.68 and a standard deviation of 842.228, [Table 1].

For finding the correlation between ALC at the time of admission and ALC at the time of discharge, Pearson's correlation coefficient is used. It is found that there is a positive correlation between the variables (correlation coefficient = 0.325). Also, the correlation is statistically significant ($P < 0.05$), [Table 2].

For the test of significance of the mean for ALC—at the time of admission and at the time of discharge, a paired sample *t* test is used. It was found that there is no statistically significant difference between ALC—at the time of admission and at the time of discharge ($P > 0.05$) at 95% confidence interval, [Table 3].

Discussion

Several studies have shown that lymphocytopenia determines the severity of COVID-19. With the limitation of the study

Table 1: Descriptive analysis for gender, age, absolute lymphocyte count at the time of admission and absolute lymphocyte count at the time of discharge

Variable	Frequency (Percentage)	Mean±Std. Deviation
Gender		
Male	23 (46%)	
Female	27 (54%)	
Age		42. 86±20.549
Absolute Lymphocyte Count		
At the time of admission		2004.48±1204.868
At the time of discharge		1943.68±842.228

Table 2: Paired samples correlations for absolute lymphocyte count

	n	Correlation	Sig.
Pair 1			
At the time of admission and at the time of discharge	50	0.325	0.021

Table 3: Paired samples test for absolute lymphocyte count

	Paired Differences					*t*	df	Sig. (2-tailed)
	Mean	Std. deviation	Std. error mean	95% Confidence Interval of the Difference				
				Lower	Upper			
Pair 1								
At the time of admission—At the time of discharge	60.800	1225.515	173.314	−287.488	409.088	0.351	49	0.727

to predict the prognosis of the disease, we aimed to observe the change in lymphocyte count after clinical recovery of hospitalized patients. In the present study, Pearson's correlation coefficient is used to find the correlation between ALC at the time of admission and at the time of discharge, which shows a positive correlation between the variables. Whereas, for the test of the significance of the mean for ALC at the time of admission and at the time of discharge, a paired sample *t* test was used. Paired *t* test shows that there is no statistically significant difference between ALC at the time of admission and at the time of discharge. The drawbacks of this study were that the duration of hospital stay was not similar for all the patients and further follow-up was not possible unless the patient came back to the hospital.

Conclusion

Our present study shows that there is no significant difference at the time of hospital admission and clinical recovery. The outcome of ALC after clinical recovery may vary depending on the immunity status of the individual. We may have a satisfactory result if our study is conducted along with the assessment of lymphocyte subset counts such as CD4 and CD8. Moreover, due to the short period of hospital stay in some of the patients (less than a week), follow-up of the patient is not done after hospital discharge. Due to this limited duration of our study, our present study of ALC cannot be used as a tool for prognosis in COVID-19.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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