

Conference Paper

Laboratory Examinations of Employees of Muhammadiyah University General Hospital of Malang Infected With COVID-19

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Abstract.

COVID-19 can symptomatically and asymptotically affect patients. Asymptomatic cases have become a particular concern for public health in the COVID-19 pandemic. One of the simple tests for COVID-19 is the complete blood count that can predict systemic inflammation and disease severity. The description of laboratory tests in asymptomatic COVID-19 patients is rarely reported. This study aimed to compare the laboratory test results of both symptomatic and asymptomatic COVID-19 employees of the Muhammadiyah University General Hospital of Malang. Data were taken from medical records. Diagnoses of COVID-19 were confirmed by nasopharynx-oropharynx PCR swab. Patient characteristics included age, gender, and values of hemoglobin, leukocytes, neutrophils, lymphocytes, platelets, NLR and CRP from two different groups: symptomatic and asymptomatic infected employees. There were 104 COVID-19 infected employees at the hospital from April 2020 to February 2021. Female infected employees (52.9%) were more numerous male infected employees. Employees aged 21-30 years accounted for 53.84% of the total cases. The numbers of symptomatic and asymptomatic employees were 10 employees (9.6%) and 94 employees (90.4%), respectively. There was a significant difference between the symptomatic and asymptomatic groups in the numbers of lymphocytes ($p = 0.03$) and CRP ($p = 0.046$). There were no significant differences in the other laboratory results. Lymphopenia and increased CRP numbers more often occurred in the symptomatic group compared to the asymptomatic group. Therefore, these parameters can be an indicator for predicting disease severity. However, further research is needed with a bigger sample.

Keywords: COVID-19, symptomatic, asymptomatic, Muhammadiyah University General Hospital of Malang

1. Introduction

The SARS-CoV-2 outbreak occurred in Wuhan, China at the end of December 2019 and quickly spread to other cities and countries [1]. COVID-19 can affect patients, symptomatically and asymptotically. Asymptomatic cases have become a particular concern for public health to overcome the COVID-19 pandemic[2]. COVID-19 can cause

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various symptoms, starting from mild symptoms (fever, cough, sore throat, nausea, vomiting, diarrhea, muscle aches) to severe symptoms such as severe shortness of breath/ARDS (Acute Respiratory Distress Syndrome) and other complications of multiple organ failure [3].

One of the simple tests for COVID-19 screening is complete blood count that also could be a marker of systemic inflammatory reactions and predict disease severity. White blood cells (leukocytes), neutrophil to lymphocyte ratio (NLR), platelets, and hemoglobin are markers for systemic inflammatory reactions and often predict disease severity. During the asymptomatic phase or incubation period, patients may show abnormalities in complete blood counts where leukopenia can occur and is a predictor of early identification of COVID-19 [4].

The description of laboratory tests on asymptomatic COVID-19 patients is still rarely reported. This study was aimed to compare the laboratory test result on both symptomatic and asymptomatic COVID-19 employees of The Muhammadiyah University General Hospital of Malang.

2. Material and Method

This study is an observational retrospective and descriptive study using data from Muhammadiyah University General Hospital of Malang employees who were confirmed positive for COVID-19 from April 2020 to February 2021. The inclusion criteria were employees with a history of close contact with COVID-19 patients and has been confirmed positive for COVID-19 proven by positive PCR swab results on nasal and nasopharyngeal swab specimen examination used RT-PCR. The exclusion criteria were employees that showed negative nasal and nasopharyngeal PCR swab on the first and second swab (COVID-19 discarded criteria). The collected data were age, gender, and routine blood laboratory results such as hemoglobin, leukocytes, neutrophils, lymphocytes, platelets, neutrophils to lymphocytes ratio (NLR), C-Reactive Protein (CRP) that divided into two groups (Symptomatic and Asymptomatic). Statistical analysis was processed using SPSS version 25.

3. Results and Discussion

There were 104 employees who were confirmed positive for COVID-19 where 49 (47.1%) employees were male and 55 (52.9%) employees were female. There were found various ages of employees, starting from 21 years as the youngest age to the oldest of

50 years. Age group with the largest number was between 21-30 years (56 employees). There were 10 symptomatic employees (9.6%) and 94 (90.4%) asymptomatic employees.

TABLE 1: Characteristics of Employees who were Confirmed Positive COVID-19.

Variables		Number (%)
Age	21-30	56 (53,84%)
	31-40	42 (40,38%)
	41-50	6 (5,76%)
Gender	Male	49 (47,1%)
	Female	55 (52,9%)
Symptom	Symptomatic	10 (9,6%)
	Asymptomatic	94 (90,4%)

Routine blood laboratory results (hemoglobin, leukocytes, platelets, neutrophils, lymphocytes, NLR) and complete CRP were obtained from all COVID employees. The supporting examination data are the average, minimal value, and maximal value of each symptomatic and asymptomatic group.

From the comparison of the average laboratory tests results, there was a statistically significant difference between the symptomatic and asymptomatic group in lymphocytes value ($p=0.03$). The average value of lymphocytes in the symptomatic group (1746 or 24.84%) is lower than asymptomatic group (2427 or 31.47%). In the comparison of CRP value, there was also a significant difference between the two groups ($p=0.046$). The mean value of CRP in the symptomatic group (25.32) was higher than the asymptomatic group (6.61). Other laboratory parameters (Hb, leukocytes, neutrophils, platelets, NLR) showed no significant difference between the two groups.

Based on table 2, it was found that the average value of lymphocytes in the symptomatic group was lower than in the asymptomatic group. Lymphopenia as a marker of the severity of a disease is not only specific to COVID-19 patients. Lymphopenia has been used to predict other viral pneumonias such as influenza [5]. The mechanism by which lymphopenia is associated with the disease severity is still unclear. Several hypotheses explained that this correlation may occur due to several mechanisms: direct infection of lymphocytes, destruction of lymphatic tissue, inflammation that causes lymphocyte apoptosis, or inhibition of lymphocytes by metabolic disorders such as lactic acidosis [6].

CRP is a protein that is produced by the liver. It will increase in response to an inflammatory reaction. The CRP mean value in the symptomatic group was higher (25.32) than the asymptomatic group (6.61). COVID-19 patients with high CRP value should be monitored and treated adequately even though respiratory function indicators

TABLE 2: Results of Laboratory Examinations of Employees who were Confirmed Positive COVID-19.

Variables	Number	Mean	Minimal Value	Maximal value	P Value
Hemoglobin	104	14,13	10	19,6	0,126
Symptomatic	10	14,98	10,9	19,6	
Asymptomatic	94	14,04	10	17,6	
Leukocytes	104	7693	3.680	14.910	0,791
Symptomatic	10	7734	3.680	11.360	
Asymptomatic	94	7306	3.700	14.910	
Neutrophils (%)	104	4671 (60,39%)	1849 (37,2%)	9.408 (84,6%)	0,93
Symptomatic	10	4897 (65,79%)	2.223 (54,2%)	8.705 (84,6%)	
Asymptomatic	94	4.647 (59,82%)	1.894 (37,2%)	9.408 (54,2%)	
Lymphocytes (%)	104	2361 (30,83%)	888 (9,9%)	7.129 (89%)	0,03
Symptomatic	10	1746 (24,84%)	888 (9,9%)	2.983 (33,4%)	
Asymptomatic	94	2427 (31,47%)	978 (14,7%)	7.129 (89%)	
Platelets	104	308.942	58.000	467.000	0,173
Symptomatic	10	280.500	159.000	430.000	
Asymptomatic	94	311.968	58.000	467.000	
NLR	104	2,25	0,6	8,5	0,06
Symptomatic	10	3,2	1,6	8,5	
Asymptomatic	94	2,12	0,6	5,4	
CRP	104	8,41	5	200	0,046
Symptomatic	10	25,32	5	200	
Asymptomatic	94	6,61	5	45,21	

are not included in the criteria as severe cases. Hemoglobin level in both symptomatic and asymptomatic groups were not significantly different as stated by the study from Chowdury, where most of the patients had normal complete blood counts and Lactate Dehydrogenase (LDH) value on admission to the hospital [7].

The number of platelets obtained in this study were also not significantly different between the two groups. Platelets can be used as one of the prognostic indicators of COVID-19 patients. A meta-analysis of 7,613 COVID-19 patients revealed that COVID-19 patients with severe disease had lower platelet count than those with mild symptoms. In addition, in patients who died, the platelet count was much lower than in survivors [8].

The incidence of thrombocytopenia in viral infections can be associated with various causes. Thrombocytopenia generally occurs due to increased clearance/destruction of platelets. Platelets can be activated by viral antigen-antibody complexes or the body's inflammatory response. Activated platelets are more easily cleared from the circulation by the reticuloendothelial system [9]. Viruses can also interact with megakaryocytes and reduce platelet synthesis [10].

The obtained leukocyte level in this study was not significantly different between the two groups. In Huang's meta-analysis, leukocyte value can be used as a predictor of disease severity. In general, patients with more severe clinical symptoms generally have higher leukocyte value in comparison to the group of patients with milder symptoms [11]. High leukocyte level is often present in patients with severe clinical symptoms because damaged lung cells can induce innate inflammation in the lungs, which is mostly mediated by pro-inflammatory macrophages and granulocytes [12]. Neutrophils are the most abundant immune cells in human blood. Neutrophils make up about 50-70% of all leukocyte components. In addition to functioning as the first response to deal with infection, neutrophils have important homeostatic functions that are also involved in chronic inflammatory diseases [13]. Neutrophilia has been described as an indicator of severe respiratory symptoms and a poor prognostic rate in patients with COVID-19 [14]. However, in this study, the mean neutrophil value between the symptomatic and asymptomatic groups was still within normal limits and did not differ significantly. This could probably happen because the symptomatic group have not experienced severe symptoms.

The obtained mean NLR value in the symptomatic group was higher than in the asymptomatic group: 3.2 and 2.12, respectively. However, the difference of NLR value between the two groups was not statistically significant. The NLR value can be used to predict the severity of the disease in the future. In Liu's study, NLR was the most important prognostic factor, followed by age. Based on the NLR analysis rate and age stratification, the incidence of severe illness in patients with NLR > 3.13 and aged > 50 years was 50% compare to patients with NLR < 3.13 and aged > 50 years was 9.1%.

The symptomatic and asymptomatic COVID employees are treated in a separate isolation building that has been prepared in the hospital environment. There are several strategies in the process of preventing transmission of COVID-19 patients [15]. Identifying and isolating COVID-19 patients as early as possible, both with symptoms and without symptoms, is very important to control the transmission of COVID-19 [16].

4. Conclusion

This study showed that lymphopenia and increased CRP occur more in the symptomatic group compared to the asymptomatic group. Therefore, these variables can be an indicator to predict the severity of COVID-19. However, further research is needed with a wider sample.

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