

CHANGES IN PLATELET COUNT, MEAN PLATELET VOLUME, PLATELET DISTRIBUTION WIDTH, AND PLATELETCRIT IN PULMONARY TUBERCULOSIS SEVERITY

Fatimah S¹, Soemarsono J²

¹Pulmonary Hospital, Karang Tembok, Surabaya

²Department of Clinical Pathology, Faculty of Medicine, Airlangga University, Surabaya

ABSTRAK

Tuberkulosis (TB) paru merupakan masalah utama kesehatan masyarakat di Indonesia. Tuberkulosis adalah suatu keadaan yang umum tetapi kepustakaan mengenai perubahan hematologis yang berhubungan dengan tuberkulosis masih jarang. Penelitian ini bertujuan untuk memberikan informasi tentang perubahan hematologi pada infeksi tuberkulosis paru terutama perubahan jumlah platelet, mean platelet volume (MPV), platelet distribution width (PDW), dan plateletcrit (PCT) terhadap tingkat radiologi pada penyakit tuberkulosis paru. Enam puluh pasien TB paru yang didiagnosis berdasarkan sputum positif dan atau radiologis menunjukkan gambaran TB paru. Subyek terdiri dari 15 TB paru dengan gambaran radiologis lesi minimal (stadium 1), 21 TB paru dengan gambaran radiologis moderate advanced (stadium 2), 24 TB paru dengan gambaran radiologi far advanced dimasukkan dalam penelitian analitik ini. Nilai rerata trombosit pada TB stadium 1 lebih rendah signifikan daripada stadium 2 dan stadium 3. Nilai rerata jumlah trombosit dan PCT pada TB stadium 1 lebih rendah daripada stadium 2 namun tidak signifikan ($p > 0,05$). Nilai MPV, PDW pada TB stadium 1 lebih tinggi daripada stadium 2 dan 3 namun tidak signifikan. Nilai rerata jumlah trombosit dan PCT TB stadium 1 lebih rendah signifikan daripada stadium 3. Jumlah trombosit dan PCT signifikan lebih tinggi pada pasien TB paru dengan derajat keparahan yang lebih tinggi. (FMI 2014;50:34-36)

Kata kunci: tuberkulosis paru, jumlah trombosit, rerata volume trombosit, luas distribusi trombosit, plateletcrit.

ABSTRACT

Tuberculosis is a major public health problem in Indonesia. Tuberculosis is a common condition but the literature about the hematological changes associated with tuberculosis is rare. This study aims to provide information about changes in platelet count, mean platelet volume (MPV), platelet distribution width (PDW) and plateletcrit (PCT) for pulmonary tuberculosis disease severity. 60 patients with pulmonary TB diagnosed by positive sputum test and/or chest X Ray. Comprising 15 patients with minimal/mild lesion on chest X Ray (stage 1), 21 patients with moderate advanced chest X Ray (stage 2), 24 patients with far advanced chest X Ray (stage 3) were included in this analytical study. Mean value of platelet count in TB stage 1 were significantly lower than stage 2 and stage 3. Mean value of platelet count and PCT in TB stage 1 were lower than stage 2 but not significantly ($p > 0.05$). MPV and PDW value in stage 1 were higher than stage 2 and stage 3 but not significantly. Mean value of platelet count and PCT in TB stage 1 were significantly lower than stage 3. Platelet count and PCT value were significantly higher in pulmonary TB patients with a higher severity disease. (FMI 2014;50:34-36)

Keywords: pulmonary TB, platelet count, mean platelet count, platelet distribution width, plateletcrit

Correspondence: Fatimah S, Pulmonary Hospital, Jl. Karang Tembok 39, Surabaya, E-mail: fatiqo76@yahoo.co.id

INTRODUCTION

Tuberculosis (TB) is a disease that has long been known and is still a major cause of death in the world. The prevalence of TB in Indonesia and other developing countries is quite high. Nearly 10 years, Indonesia is placed on the third ranks worldwide in terms the number of TB patients. Data based on the World Health Organization (WHO) in 2007 showed the number of TB patients in Indonesia was around 528,000 patients, on the third place after India and China. To date, the current criteria for the diagnosis of pulmonary tuberculosis are sputum specimens examination within 2 days. Diagnosis of pulmonary TB in adults is confirmed by the existence of TB myobacterium, Acid Resistant

Bacillus (ARB). At the national TB program, the existence of myobacterium primarily diagnosed by microscopic sputum examination. Other tests such as chest x-ray, culture, and sensitivity test can be used to support the primary diagnosis (Ministry of Health, Republic of Indonesia 2006).

Previous researchers of pulmonary TB disease have conducted that reversible peripheral blood disorder is generally associated with pulmonary TB disease. Platelets play a role in the inflammatory response. Changes in platelet counts, particularly during bacterial infection may be associated with the severity of infection and mortality. Increased platelet counts have

been reported to correlate with the severity of acute phase reactants and TB.

The concept of relationship between hematologic abnormalities and mycobacterial infections come from an understanding of immunology mycobacterial infection. However, the literature on hematological changes associated with TB is still minimal (Yaranal et al 2013). Thus, beside clinical and radiological findings, platelet count and indices can be used in order to determine the activity of TB (Sahin et al 2012). This study aims to provide information about changes in hematology in pulmonary tuberculosis infection, especially changes in platelet count, mean platelet volume (MPV), platelet distribution width (PDW), plateletcrit (PCT) toward radiological or severity level of pulmonary TB disease.

MATERIAL AND METHODS

This study was an observational study. Total 60 patients with pulmonary TB patients who entered Surabaya Pulmonary Hospital from January to May 2013 included in this study. Pulmonary TB patients were diagnosed based on clinical symptoms, the discovery of Acid Resistant Bacillus (ARB) in sputum examination, and/or radiological features in accordance with pulmonary tuberculosis. Patients with diabetes mellitus or HIV were excluded from this study. The patients were classified based on the severity of the disease by looking at chest x-ray image. Pulmonary tuberculosis with a broad infiltrates overview of the pulmonal not exceeded the area bounded by the median line, apex, second frontal ribs, and there were no hole found is called pulmonary TB stage 1 (minimal lesion/mild). Pulmonary tuberculosis with a broad infiltrates overview of pulmonal not exceeded one lobus and if there is a hole (cavity) did not exceed 4 cm in diameter is called pulmonary TB stage 2 (moderate advanced). Pulmonary tuberculosis with a broad infiltrates overview of pulmonal more than one lobus, so the overall diameter exceeded 4 cm is called pulmonary TB stage 3 (far advanced). All statistical analyzed using SPSS version 2.0 software. Oneway Anova test was used for comparisons between groups. Independent t-test used to compare the results of the laboratory values of each group.

RESULTS

Means value of platelet count and PCT (Plateletcrit) had significant differences at each stage ($p < 0.05$). Platelet count and PCT of patients at stage 1 were significantly lower than patients at stage 2 and 3. Also, platelet count

and PCT of patients at stage 2 were significantly lower than patients at stage 3. MPV (Mean Platelet Volume) and PDW (Platelet Distribution Width) values of TB patients at stage 1 were higher than thus on stage 2 and 3 but not significant ($p > 0.05$). So did the MPV and PDW values of TB patients at stage 2 were higher than patients at stage 3 (Table 1).

Table 1. Means value of thrombocyte counts and thrombocyte indices on TB patients at stage 1, stage 2 dan stage 3

	Stage 1 (n = 15)	Stage 2 (n = 21)	Stage 3 (n = 24)	<i>p value</i>
Thrombocyte	236.13	263.48	319.83	0.017*
MPV	7.027	6.710	6.679	0.289
PDW	15.840	15.810	15.742	0.774
PCT	0.16380	0.17352	0.21137	0.022*

*Significant value ($p < 0,05$)

MPV, Mean Platelet Volume; PDW, Platelet Distribution Width; PCT, Plateletcrit.

Means platelet count, MPV, PDW, and PCT comparisons at each stage. All parameters of TB patients at stage 1 had no significant differences with thus on stage 2 ($p > 0.05$). Platelet count and PCT of TB patients at stage 1 were lower from thus at stage 2, whereas MPV and PDW values were higher. Platelet count of TB patients at stage 1 had significant ($p < 0.05$) differences from thus at stage 3. Platelet count and PCT of TB patients at stage 1 were lower from thus at stage 3, whereas MPV and PDW values were higher but not significant ($p > 0.05$). PCT value of TB patients at stage 2 had significant ($p < 0.05$) differences from thus at stage 3. PCT value and platelet count of TB patients at stage 2 was lower than thus at stage 3, whereas MPV and PDW values were higher but not significant ($p > 0.05$) (Table 2).

Table 2. Means value of platelet count and thrombocyte indices comparison at all stage

	Stage 1-2 (<i>p value</i>)	Stage 1-3 (<i>p value</i>)	Stage 2-3 (<i>p value</i>)
Thrombocyte	0.301	0.002*	0.063
MPV	0.174	0.139	0.887
PDW	0.823	0.512	0.614
PCT	0.539	0.007*	0.043*

*Significant value ($p < 0.05$)

MPV, Mean Platelet Volume; PDW, Platelet Distribution Width; PCT, Plateletcrit.

In this study, obtained 13,3% thrombocytosis. There were 8 TB patients with the amount of platelet count was more than 400 ribu/ μ . Distributed as 3 TB patients at stage 2, and 5 TB patients at stage 3

DISCUSSION

Thrombocytes play a role in inflammatory respond, include in protection against bacteria. Thrombocytes also remain as pulmonal immune cell and participated in pathogenesis of several pulmonal diseases. Thrombocytes have a role in inflammatory respond toward mycobacterium, so that could form microvascular thrombosis around TB lesion. That mechanism can prevent the distribution of mycobacterium infection on pulmonal (Rahman 2010). Various inflammation cell, cytokine, and mediator involved in granulomatosa lesion formation on TB.

From many types of cytokine, interleukin-6 (IL-6) was known for its ability increased platelet count (Rahman 2010, Unsal et al 2005). Increasing platelet count on patients before given any therapy will turn to normal after given TB therapy (Rahman 2010, Tozkoparan et al 2007). Theory stated above explains significant differences on platelet count in this research, they are plateled count of TB patients at stage 3 is higher than thus at stage 1 (according to level of severity of thorax radiological imaging) (Rahman 2010).

Increasing platelet count generally appeared on many chronic inflammation diseases, like pulmonary TB. Mechanism in increased platelet production within inflammation still unclear, but it is corelated with increasing the number of small megakaryocytes in the bone marrow. Generally, there is contradictive relationship between platelet count and platelet volume (Van der Lelie & Von dem Borne 1986, Baynes et al 1987). This fact gives an explanation about the association between MPV and platelet count in this research. In this research, MPV value on TB patients at stage 3 was lower than thus at stage 1 and 2 (Baynes et al 1987).

CONCLUSION

Thrombocyte count and PCT is significantly higher among pulmonary TB patients with higher severity, while MPC and PDW values are lower in these patients, but it was not significant.

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