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Platelet Counts on the 1st and 5th Days in Thrombocyte Concentrate (TC) Products

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ABSTRACT

The storage of Thrombocyte Concentrate (TC) products greatly determines the quality of platelets. According to the Minister of Health RI in 2015 about the blood service standards state that platelets can be stored at a temperature of 20°C- 24°C, when stored at room temperature (20°C-24°C) platelets can remain alive and not lose its function. This study aimed to compare levels of platelets countin Thrombocyte Concentrate (TC) products on the 1st and 5th days.The research was conducted using time series design in 16 blood TC samples transfusions from voluntary blood donors who has met the requirements and has passed screening test for Passing Infectious Diseases Blood Transfusion (PMLTD). TC making activities carried out in the Blood Transfusion Unit of Indonesian Red Cross in Padang. Health and examination Platelet count is carried out at the Laboratory Blood Transfusion Unit of Indonesian Red Cross Padang in June 2021. Samples were taken from TC, bag hose and check the platelet count immediately by using a hematological analyzer (Sysmex XP 100), then the rest of the sample is stored in a platelet incubator using an agitator at 22±2°C to counted again on the 5th day. Data were analyzed using a statistical program with a paired T-test, p<0,05 was considered significant. The mean rates of platelet counts were higher on the 1st day than on 5th day (64,62±10,23 x10^3/µL; 51,76±9,33 x10^3/µL; p: 0.00) in thrombocyte concentrate (TC) products. There were significant differences in platelet counts on 1st and 5th days in thrombocyte concentrate (TC) products.

Keywords: *Haematological examination, platelet counts, blood transfusion.*

1. INTRODUCTION

Blood products/ blood components provided by the Blood Transfusion Unit for patient needs include Whole Blood (WB), Packed Red Blood Cells (PRC), Fresh Frozen Plasma (FFP), and Thrombocyte Concentrate (TC). TC is a part of whole blood which contains platelet concentrate which is separated by centrifugation. Platelets have a shorter life span than red blood cells and only last 3-5 days with an agitator [1].

The main indication for platelet therapy is for individuals with symptomatic thrombocytopenia. Thrombocytopenia has many mechanisms, and platelet transfusions are most effective when there is a disturbance in the formation ofplatelets, as occurs in bone marrow aplasia (eg after chemotherapy, or in bone marrow failure). In addition, platelet transfusions are given to patients with thrombocytopenia associated with secondary destruction or peripheral sequestration [2].

Platelets (platelets) are clotting platelets smaller than the other cells and amounts to about 150,000−400,000/mm^3 in adults. Platelets play an important role in blood coagulation mechanism by releasing substance at the site of injury or wound and together with other clotting factors and will form a plait strong protein (fibrin). The function of the coagulation will end with the formation of a platelet plug (platelet plug) that can stop bleeding more [3].

To increase the number of platelets to more than 100,000/mm^3 in patients, it is necessary to do a conventional Thrombocyte Concentrate (TC) transfusion of 6 to 10 bags or 1 bag of platelet apheresis. One unit of Whole Blood (WB) only contains a small amount of TC, around 5,000-10,000/ml [4]. One unit of conventional TC bag has a volume of >40 ml with a platelet count of 60x10^9/ul. While one unit of Plateled apheresis bag has a volume of 100 to 400 ml with a platelet count of 2x10^{11}/ul. TC in the Blood Transfusion Unit of Indonesia Red Cross was stored at a temperature of 20-24°C using mild

agitation in a platelet incubator and the storage time was limited to 5 days.

Research conducted by Ni Kadek Lestariyani, *et al.*, who examined platelet levels in TC on the 1st, 3rd, and 5th days showed an insignificant decrease in platelet levels [5]. Sembai, *et al*., conducted a study with the results of a decrease in platelet levels in TC on days 1 and 5, but the decrease was not statistically significant [6]. The aim of this study was to determine whether there are differences in platelet levels in Thrombocyte Concentrate (TC) products on the 1stand 5th days.

2. MATERIALS AND METHODS

The research was conducted using time series design in 16 blood TC samples transfusions from voluntary blood donors who has met the requirements and has passed screening test for Passing Infectious Diseases Blood Transfusion (PMLTD), namely: Hepatitis B and C, Syphilis and HIV. TC making activities carried out in the Blood Transfusion Unit of Indonesian Red Cross in Padang. Health and examination Platelet count is carried out at the Laboratory Blood Transfusion Unit of Indonesian Red Cross Padang in June 2021. Samples were taken from TC, bag hose and check the platelet count immediately by using a hematological analyzer (Sysmex XP 100) with impedance method, then the rest of the sample is stored in a platelet incubator using an agitator at 22±2°C to counted again on the 5thday.Data were analyzed using a statistical program with a paired T-test then presented in the form of tables and figures.

3. RESULTS AND DISCUSSION

The results of the platelet count of the blood TC sample transfusion with different examination times, i.e. on the first day (shortly after creation) compared to the fifth day is shown in Table 1. Table 1 shows that there are decrease in platelet count after storage the fifth day and the decrease was statistically significant ($p<0.05$).

Based on the research, the mean rates of platelet counts were higher on 1st day than on 5th (64,62x10^{9} unit/mL; 51,76x10^{9} unit/mL; p: 0.00) in thrombocyte concentrate (TC) products. There were significant differences in platelet counts on 1st and 5th days in thrombocyte concentrate (TC) products.

The results of this study are in line with research conducted by Lestari, there was a significant difference between platelet levels on day 1 and day 5 ($p < 0.05$)[7]. This study is also in line with research conducted by Apriliyani, there was a decrease in platelet levels on day 5[8]. Research conducted by Marpaung, *et al*., found an increase in platelet levels on the third day, but decreased on the fifth day of storage[9]. Differences in platelet levels that occur during storage are caused by several factors, namely platelet aggregation formed during centrifugation and preparation of platelet concentrate.

Normal platelets are elliptical or circular in shape, small in size, and irregular in shape. After platelet activation, many pseudopodia are formed. Platelets will be damaged during storage, including reversible changes in shape, lysis, activation, degranulation, and aggregation. The result of metabolism is the accumulation of lactic acid and a decrease in pH. Fulfillment of blood needs, especially TC products, is needed in order to cure disease and restore health. TC is needed by patients suffering from bleeding to prevent and stop bleeding due to a lack of platelet count[10].

The storage process, temperature and pH greatly affect the quality of platelets. During storage of platelets, good agitation is carried out so that the amount of glucose does not decrease much due to metabolism. The important function of platelets is involved in the hemostatic mechanism of the process towards repair of damaged blood vessels. Indications for platelet transfusion include as a therapy for bleeding due to thrombocytopenia, the effect of platelet function and as a prevention of bleeding due to thrombocytopenia such as bone marrow failure[11].

Table 1. Comparison of platelet counts on 1st and 5th days in thrombocyte concentrate (TC) products

Variable	Days		p-value
	1st	5th	
Platelet counts (x10^{3}/µl)	64,62±10,23	51,76±9,33	0.00

4. CONCLUSION

The levels of the platelet in thrombocyte counts was examine on the 1st day and on the 5th day. The mean rates of platelet counts were higher on the 1st day than on 5th day (64,62x10^{3} unit/mL; 51,76x10^{3} unit/mL; p: 0.00) in thrombocyte concentrate (TC) products. There were significant differences in platelet counts on 1st and 5th days in thrombocyte concentrate (TC) products.

REFERENCES

[1] Samad Z, Boyle S, Ersboll M, Vora AN, Zhang Y, Becker RC, et al. Sex Differences in Platelet Reactivity and Cardiovascular and Psychological Response to Mental Stress in Patients With Stable Ischemic Heart Disease: Insights From the REMIT Study. J Am Coll Cardiol 2014;64:1669–78.

[2] Maharani EA, Noviar G. Imunohematologi dan Bank Darah. Jakarta: Pusat Pendidikan Sumber Daya Manusia Kesehatan; 2018.

[3] Samad R, Abdullah AA, AP K, Arif M. Storaging time of thrombocyte on Platelets Count in its Concentrates. Indones J Clin Pathol Med Lab 2014;20:224–6.

[4] Wahidayat P, Adnani N. Transfusi Rasional Pada Anak. Sari Pediatr 2016;18:325–31.

[5] Lestariyani N, Herawati S. Perbedaan Jumlah Trombosit Konsentrat Trombosit pada penyimpanan hari I. III, V di Unit Donor Darah PMI Provinsi Bali/RSUP Sanglah Denpasar. E-Journal Med Udayana 2017.

[6] Sembai H, Samad R, Muhiddin R, Arif M. The relationship of blood group, blood components, and the age of patients with the degree of transfusion reaction at Dr. Wahidin Sudirohusodo, Makassar, Indonesia. Ijbs-Udayana 2019.

[7] Lestari AI. Perbedaan Jumlah Trombosit pada Penyimpanan Sampel Darah Suhu Ruang dan Kulkas Selama 24 Jam. J Vocat Heal Stud 2019;3:59–62.

[8] Apriliyani R, Nazaruddin M, Arsyad M. Perbedaan jumlah Trombosit pada Darah Donor yang disimpan. n.d.

[9] Marpaung E, Setiawaty V, Ritchie NK, Timan IS. Function and Platelet Count in thrombocyte concentrate (TC) during the strorage. Heal Sci J Indones 2015;6:48–52.

[10] Annita, Sri Wahyuni H, Fransisca D. Correlation Between Platelet Counts and MPV Values with Mortality Rates in Acute Ischemic Stroke Patients. Malaysian J Appl Sci 2019;4:51–6.

[11] Suseto S. PENGARUH LAMA MASA SIMPAN TROMBOCYTE CONCENTRATE (TC) TERHADAP KADAR TROMBOSIT DI UTD RSUP FATMAWATI. 2018.