Original Article

DOI: 10.7860/JCDR/2023/57267.17754

Recovery Period for Attaining Baseline Haematological Parameters after Plateletpheresis Donation- A Cohort Study

Transfusion Medicine Section

KEYURI B PATEL[1], KAILASH INANIYA[2], DHARTI PRAVIN PADHARIA[3]

ABSTRACT

Introduction: Plateletpheresis provides the advantage of collecting a large volume of platelets, equivalent to a platelet count of 20-40×10^9 in a single unit. The risk of postdonation anaemia is reduced as the red cells are reinfused into the donor. Plateletpheresis affects the donors, haematological parameters and their period for reaching the baseline is important.

Aim: To analyse the recovery of haematological parameters to baseline among apheresis platelet donors.

Materials and Methods: A cohort study was conducted at the Department of Pathology, Pramukh Swami Medical College, Gujarat, India from April 2020 to September 2021. The study included 40 plateletpheresis procedures, which were performed according to manufacturer's manual and standard operating procedure. The donor's samples were assessed on immediate postdonation, on second, seventh, and 14th postdonation day. The age, weight, height of patient, Haemoglobin (Hb) concentration, Total Leucocyte Count (TLC), and platelet were also noted. Paired t-test was applied for the comparison of pre and post plateletpheresis values of haematological parameters. The p-value <0.05 was considered statistically significant. Data analysis was done with the help of Statistical Package for Social Sciences (SPSS) Version 15.

Results: All donors selected for plateletpheresis were males (100%) with mean age of 32.3 years. Post plateletpheresis, the platelet count reached the baseline on the 14th day whereas, the total White Blood Cells (WBC) count and Hb reached the baseline on the seventh day. The donors who were preobese were maximum in number and the duration of procedure was comparatively lower in them.

Conclusion: The platelet count reached the baseline by the 14th day while the other haematological parameters reached the baseline by the seventh day. Therefore, a minimum interval of seven days would suffice to ensure the baseline return of the haematological parameters in the best interest of the donor's health.

Keywords: Haematocrit, Platelet count, Platelet distribution width, Platelet large cell ratio

INTRODUCTION

Plateletpheresis, also known as thrombapheresis or thrombocytapheresis is the process by which a therapeutic adult dose of platelet concentrate is produced from a single donor using an automated cell separator equipment called the apheresis machine [1,2]. It is an absolutely aseptic procedure and it drastically reduces the chances of bacterial contamination as well as the risk of Transfusion Transmissible Infections (TTIs) and allo-immunisation from multiple donor exposures by avoiding the need to pool single donor platelet concentrates from 4-6 donors, with an additional advantage of collecting a large volume of platelets of about 20-40×10^9 in a single unit [3].

The American Association of Blood Banks (AABB) guidelines mandate an apheresis product to have a count of more than 3×10^{11} platelets/bag in at least 90% of the products [4]. The donor is permitted to donate platelets at a minimum interval of 48 hours, not more than twice a week, and not more than 24 times a year [5]. The WBC count of the apheresis product must be less than 5×10^6/unit and the red cell contamination should be less than 0.5 mL as per AABB Standards [4]. The transfused dose of platelets determines the platelet increment in a patient that successively depends on the platelet yield. The risk of postdonation anaemia is reduced as the red cells are re-infused into the donor. The quality of the apheresis product and the donor safety is the most important factor, which will decide therapeutic benefit to patients [6]. Any adverse event in a healthy donor can compromise the morale of other voluntary donors, thus interrupting the blood supply chain which will in turn severely compromise general patient care. As only a few centres have regular donor follow-up and routine quality programs [7], therefore there is a need to evaluate the time period required to attain the baseline haematological parameters after plateletpheresis.

The postdonation platelet count, Hb, Haematocrit (Hct), and TLC have shown significant changes. Some studies have reported an increase in postdonation Hb, Hct, and WBC count [8,9], while others have described a fall in these parameters after donation [10,11]. Therefore, parameters should be evaluated so that the effect on the donor health can be assessed.

Several studies have shown conflicting reports on the effects of repeated platelet pheresis donation on the donor. some have documented increased thrombopoietic activities [12,13] while others reported a progressive reduction in platelet count [14-16], and no clinically significant thrombocytopenia and/anaemia was documented. Some studies [12-14,16] have demonstrated that within a short period after apheresis, the number of platelets significantly decreased, but the platelets stored in the spleen will be immediately released to the peripheral blood through compensatory mechanisms of the body, leading to more stimulation of bone marrow haematopoietic stem cells to quickly differentiate and transform into mature megakaryocytes, which are detached and enter the blood circulation. Therefore, about 4-6 days following platelet apheresis, the number of platelets can usually be restored to pre-procedure levels [15]. Single plateletpheresis may result in a loss of 25–50% of circulating platelets, but the spleen usually restores this. Therefore, donors who have undergone plateletpheresis are not typically found to have significant thrombocytopenia [17]. As a result, thrombocytopenia's clinical findings are rare. It has been noted that plateletpheresis decreases platelet count, which activates thrombopoiesis to produce new platelets for peripheral circulation. Following platelet collection, the activation of the thrombopoiesis will result in a brief elevation in the serum thrombopoietin level [18]. Plateletpheresis is a safe procedure with few risks, but donors

may occasionally experience discomfort due to symptoms related to citrate poisoning and other unfavorable occurrences. Hence, to promote donor retention, it is critical to identify and stop the occurrence of plateletpheresis-related adverse events as soon as possible [18,19].

This study would help in establishing the time period for attaining baseline haematological parameters to determine the interval between two consecutive plateletpheresis procedures. The aim of the study was to analyse the return of haematological parameters to baseline among plateletpheresis donors on immediate postdonation day, second, seventh and 14th postdonation day.

MATERIALS AND METHODS

The present study was a Cohort study conducted at Department of Pathology, Pramukh Swami Medical College, Gujarat, India from April 2020 to September 2021. The study included 40 plateletpheresis donors from a NABH accredited Shree Krishna teaching hospital, AD Gorwala blood center, of the Central Diagnostic Laboratory. The study was approved by the Institutional Ethics Committee before the enrolment of individuals and the approval letter number being IEC/HMPCMCE/115/ Faculty/12/65/2020.

Sample size calculation: The sample size was calculated on the basis of previous year data of number of plateletpheresis procedures performed at AD Gorwala Blood Centre. A total of five samples were collected from each donor which included the predonation, immediate postdonation (Day 0), second, seventh and 14th postdonation day.

Inclusion criteria: Healthy donors were selected based on the criteria which included age ≥18 years, Hb ≥12.5 gm/dL, weight ≥50kg, platelet count ≥ 150×10^9/L, and those who were serologically negative for Transfusion Transmitted Infections (TTIs) such as Human Immunodeficiency Virus (HIV), Hepatitis B Virus (HBV), Hepatitis C Virus (HCV) and syphilis.

Exclusion criteria: Any donor who failed to provide their Ethylenediaminetetraacetic Acid (EDTA) samples on the second, seventh or 14th day, and those on aspirin or Non-Steroidal Anti-Inflammatory Drugs (NSAIDs) were excluded from the study

For optimal platelet harvesting, donors having a central prominent vein in both the arms, were selected. Donors were screened and selected based on the criteria as laid down by the NACO guidelines [20] for routine donation and platelet count in addition. According to the NACO guidelines [20], for apheresis at least 48 hours interval after plateletpheresis shall be kept (not more than 2 times a week, limited to 24 in one year). The plateletpheresis procedure was carried out using the Spectra Optia® apheresis system.

Study Procedure

The predonation sample was taken in plain vacutainer with Ethylenediaminetetraacetic acid (EDTA), for testing of complete blood count and for the TTI, respectively. After the procedure, the post plateletpheresis sample was collected within 15 to 30 minutes of completion of the procedure. The donor was then given refreshments and observed for any adverse reactions. The donor was then called and requested to come to blood centre on the second, seventh and 14th day for the collection of the samples at these intervals. Each sample was collected in EDTA and was analysed for TLC, Hb, Hct, platelet count, Platelet Distribution Width (PDW) and Platelet Large Cell Ratio (P-LCR) on the automated haematology analyser Sysmex XN series 350/550. The platelet count and Hct were the parameters used to decide whether a single or double unit procedure was to be carried out. Single unit procedures had a yield of $3.5\text{-}4.0\times10^{11}$ per unit and double unit procedures had a yield of $6.0\text{-}7.0\times10^{11}$ per unit [21]. The procedure duration for both single and double units was recorded.

The Body Mass Index (BMI) was derived from the donor's weight and height measurements and was categorised into normal (18.5-22.9 kg/m²), overweight (23-24.9 kg/m²), pre-obese (25-25.9 kg/m²) and obese (>30 kg/m²) [22]. The effect of BMI on the duration of the procedure for both single and double units was also analysed.

STATISTICAL ANALYSIS

This analysis was done with the help of software SPSS Version 15. Comparison of the predonation and postdonation (including the immediate postdonation, second, seventh and 14th day) data was done by applying the paired t-test. The p-value <0.05 was considered statistically significant. Further analysis was done to find out the recovery time period to reach back to baseline level of the haematological parameters.

RESULTS

The demographic details of the plateletpheresis donors are given in [Table/Fig-1]. All donors selected for the plateletpheresis procedure were males (100%) with mean age of 32.3 (21-53) years. The effect of predonation platelet count and BMI on the duration of the procedure is summarised in the [Table/Fig-2,3], respectively.

Parameters	Apheresis donors (N=40)
Males	100%
Mean age±SD (Year)	32.3±8.9
Age range (Years)	21-53
Mean weight±SD (Kg)	77±7.5
Weight range (Kg)	64-95
Mean height±SD (meters)	1.73±0.06
Height range (meters)	1.62- 1.86

[Table/Fig-1]: Demographic profile of included patients.

Predonation platelet ($\times10^3$/uL)	Number of donors	Single unit ($3.5\text{-}4.0\times10^{11}$ per unit) Duration of procedure (in minutes)		Number of donors	Double unit ($6.0\text{-}7.0\times10^{11}$ per unit) Duration of procedure (in minutes)
Count		Mean	SD		Mean
200-250	7	67.14	8.34	2	81.00
250-300	8	53.25	5.06	6	69.00
300-350	4	51.25	3.40	6	67.17
350-400	2	50.50	19.09	2	63.50
400-450	2	35.00	2.83	1	66.00

[Table/Fig-2]: Effect of platelet count on the procedure duration for single and double yields.

The parameters that showed a statistically significant increase in pre- and immediate postdonation values were TLC (p-value <0.05), PDW (p-value <0.05) and P-LCR (p-value <0.05); while a statistically significant decrease were found in Hb (p-value <0.05), Hct (p-value <0.05) and platelet count (p-value <0.05) [Table/Fig-4].

Body mass index Kg/m²	Number of donors	Single yield Duration of procedure (in minutes) Mean	SD	Number of donors	Double yield Duration of procedure (in minutes) Mean	SD
Normal (18.5-22.9)	2	54.5	9.19	1	71.00	-
Overweight (23-24.9)	8	60.75	10.37	8	74.75	12.06
Pre-obese (25-29.9)	13	52.07	12.05	6	71.33	7.66
Obese (≥30)	0	0	-	2	65.5	9.19

[Table/Fig-3]: Effect of Body Mass Index (BMI) on the procedure duration for single and double units.

Parameters	Timepoints	Mean±SD	p-value
Total leucocyte count (cells/µL)	Pre SDP	8.38±2.03	0.001
	Post SDP	10.06±2.48	
	Day 2	8.33±1.42	0.898
	Day 7	8.48±1.76	0.814
	Day 14	8.46±1.92	0.856
Haemoglobin (g/dL)	Pre SDP	14.15±0.91	0.024
	Post SDP	13.68±0.98	
	Day 2	14.05 ±0.90	0.620
	Day 7	14.16±0.82	0.958
	Day 14	14.19 ±0.85	0.838
Haematocrit (L/L)	Pre SDP	41.62±2.45	0.021
	Post SDP	40.3 ±2.60	
	Day 2	41.69±2.23	0.909
	Day 7	41.98 ±2.24	0.595
	Day 14	41.68±2.23	0.909
Platelet count (/micro L)	Pre SDP	298.15±56.36	<0.001
	Post SDP	221.8±50.74	
	Day 2	248.95±49.18	0.001
	Day 7	293.52±49.60	0.696
	Day 14	306.52±55.67	0.51
Platelet distribution width	Pre SDP	9.34±1.16	0.001
	Post SDP	10.45±1.23	
	Day 2	10.56±1.25	<0.001
	Day 7	9.40±1.15	0.685
	Day 14	9.35±1.16	1
Platelet large cell ratio	Pre SDP	18.27±4.95	<0.01
	Post SDP	22.09±4.90	
	Day 2	20.90 ±5.01	0.017
	Day 7	19.16±4.95	0.413
	Day 14	18.32±4.99	0.927

[Table/Fig-4]: Comparison of various haematological parameters at different time points of plateletpheresis donation (n=40).
Paired t-test is used; *p-value <0.05 was statistically significant
SDP: Single donor platelet; Pre-SDP: Predonation; Post-SDP: Postdonation; SD: Standard deviation

The maximum number of plateletpheresis procedures were carried out on donors having a BMI in the range of 25-29.9 kg/m^2 i.e., the pre-obese. The procedure duration was also lowest (52.07±12.05 minutes) in this range of BMI for single unit procedures, while for the double unit procedures, the obese group (BMI of ≥30) showed the least procedure duration [Table/Fig-3].

Comparison of various haematological parameters at different time intervals of pre and postdonations were evaluated [Table/Fig-4]. In 24 (60%) of the donors, the TLC reached the baseline on the second post plateletpheresis day. On the seventh day, it was either equal or higher than the baseline value for all the donors. The Hb values returned to their baseline by the second day in 29 donors (72.5%). While on the seventh day the Hb values were at their baseline (100%) for all the remaining donors. This states that the Hb levels returned to their baseline maximum by the seventh day postdonation. It was also observed that in 21 donors (52.5%), the Hct reached the baseline by the second day post plateletpheresis, while for the rest of the donors it reached the baseline by the 7th day postdonation.

As far as platelet count was considered, in majority of the donors it reached to the baseline on 14th day post plateletpheresis, and in only one donor (2.5%) it reached the baseline on the second postdonation day; while platelet count of 12 (30%) donors reached the baseline on 7th day and 21 (52.5%) donors on 14th day i.e., overall, 34 (85%) of the donors reached their baseline maximum by the 14th day. Six donors (15%) were such whose platelet count reached ≥98.21% (98.68±0.42 %) of their predonation platelet count on 14th day. The mean PDW remained high even on the second day postdonation. It reached the baseline in 32 (80%) donors by the 7th day postdonation while the rest reached their baseline on the 14th postdonation day. The mean P-LCR values remained high till 7th postdonation day though it reached it baseline in 7 donors (17.5%) on the 7th day and for the rest of the donors it reached baseline on the 14th postdonation day.

DISCUSSION

The present study aimed at analysing the recovery of haematological parameters to baseline among plateletpheresis donors. A statistically significant rise in TLC, PDW and P-LCR, while a statistically significant decrease in Hb, Hct and platelet count was observed immediately after donation. The platelet count reached the baseline by the 14th day while the other haematological parameters reached the baseline by the seventh day. Love E et al., who tried to establish postdonation ranges that could be utilised when reviewing the suitability of donors for subsequent donations on 112 plateletpheresis donors, found a significant reduction in postdonation platelet count [9]. Similar findings were recorded by few other authors also [13,21-24]. Although, the American Association of Blood Banks (AABB) recommended a 2 day deferral for repeat plateletpheresis [4], Nomani L et al., in India could not ascertain this as they found platelet counts less than 100×10^9/L in 2.8% (2/72) donors, immediate post procedure [25]. But, the present study found immediate postprocedure mean (×10^9/L) of 221.8±50.74 (151-362×10^9/uL) and no donors in the present study had a platelet count post procedure of <150×10^9/uL.

There are no available data on 7 day post plateletpheresis studies but, the present study showed good platelets recovery at day 7th and that was greater than 90% of the predonation values. This could be due to platelets regeneration and recovery from platelets stores and organs that pool platelets such as the spleen and the bone marrow. The present study showed an initial statistically significant decrease in Hb and Hct values immediate postdonation, which is different from the findings of Love E et al., in which there was an initial increase in Hb and Hct of the donors [9]. However, other studies showed similar findings to the present study [10,11,23,24], results of some of the other studies have been tabulated in [Table/Fig-5] [9-11].

Parameters (Postdonation)	Love E et al., (1993) [9]	Suresh B et al., (2014) [10]	Tendulkar A et al., (2009) [11]	Present study (2021)
Total leucocyte count	Increased	Decreased	Decreased	Increased
Haemoglobin	Increased	Decreased	Decreased	Decreased
Haematocrit	Increased	Decreased	Decreased	Decreased
Platelet count	Decreased	Decreased	Decreased	Decreased

[Table/Fig-5]: Complete recovery of all haematological parameters according to various studies [9-11].

It has been documented that the first or earlier generation of apheresis devices cause more loss of red blood cells during plateletpheresis compared to recent models. The blood loss was attributed to several factors. The first factor is concerned with blood loss in the volume that remains in the apheresis kit at the end of procedure. The second factor is concerned with mechanical haemolysis that may occur due to squeezing of the blood tubes by device's pumps. The third factor includes anaemia that may because by haemodilution due to infusion of saline and citrate solutions during the apheresis procedure [26].

In a study carried out by Hans R et al., 50 plateletpheresis donors were recruited in the study over one year, out of which only 29 donors were evaluated as they completed the follow-up [27]. Their study established that the platelet counts didn't reach the baseline even on the third or fifth day postdonation. Another study by Tendulkar

A et al., which studied 2148 donors on three different continuous flow cell separators stated a statistically significant decrease in the TLC, Hb, Hct and platelet count on all the three continuous flow separators [11].

In the present study, immediate postdonation, it was observed a statistically significant rise in TLC, PDW and P-LCR, while a statistically significant decrease was observed in Hb, Hct and platelet count. Also, there are no studies that have compared the postdonation haematological parameters till the 14th postdonation day.

In the present study, TLC, increased statistically significantly immediately post plateletpheresis, and reached to the base line by the second day of donation. Love E et al., and Mahmud WHW et al., also found a rise in WBC count post plateletpheresis donation [9,24]; while Suresh B et al., Tendulkar A et al., and Das SS et al., in their studies found a reduction in the WBC count after plateletpheresis [10,11,23]. The cause for the rise in TLC in the present study could be due to the reactive increase due to Anticoagulant (ACD) infusion or due to the long duration of phlebotomy and venipuncture site inflammation. Further study is warranted to explain the causes behind rise or fall in the total leukocyte count immediate postdonation. In view of the PDW, the present study showed a significant increase, immediate postdonation which was similar to the findings of Suresh B et al., while Nomani L et al., and Hans R et al., didn't show a statistical significance increase after immediate postdonation [10,25,27]. The reason for rise in PDW is expected due to regeneration of platelets following loss from the body, younger, reticulated platelets, which are larger in size are released into the system [28,29]. This will lead to platelets anisocytosis and increased PDW. The duration of procedure is a critical aspect of plateletpheresis, as lengthy procedure might fail in between the procedure due to vein collapse or haematoma formation, it is important to select a donor with higher platelet count and good body built to reduce the procedure duration as well as chances of procedural failure. In the present study, the procedure duration was least in the pre-obese group for single unit procedures and obese group for double unit procedures. This was contradictory to the study by Sadri S and Bilgen H concluded that obesity does not have a relationship with platelet apheresis donation [30].

As the present study showed that, platelet count of all the plateletpheresis donors doesn't reach their baseline value on the second day, so if the plateletpheresis donors are subjected to frequent repeat donations, they must be thoroughly evaluated to avoid potential adverse consequences. Further studies with larger sample size from different regions of world, is warranted to conclude about causes and trends in variations of different haematological parameters in plateletpheresis donors.

Limitation(s)

Small sample size is the main limitation for this study future research can be conducted focusing on larger sample size including more donors from other hospitals.

CONCLUSION(S)

Though there was a statistically significant decrease in the platelet count, Hb level and Hct, immediately postdonation; Hb and Hct levels return back to normal two days after donation. Platelet counts, on the other hand, take 7-14 days to reach back to predonation baseline. TLC, PDW and P-LCR showed a significant rise postdonation and reach the baseline within two days and 14 days, respectively. The time taken for these parameters to reach their baseline mandate the need for evaluation of these parameters especially in the frequent apheresis donors keeping in mind the health of donors as the top most priority. A donor who has shown significant decrements has to be reviewed and screened for future donations keeping in mind the baseline haematological parameters to avoid any iatrogenic anaemia and thrombocytopenia.

Acknowledgement

I would like to acknowledge the contribution of all the donors who gave their valuable time and the blood centres for giving me a platform for performing the study. Also, the technical staff and my juniors for their immense help in collecting the samples.

REFERENCES

[1] Blood Donor Selection. Guidelines on Assessing Donor Suitability for Blood Donation; World Health Organization, Luxembourg. 2012; 22-24.
[2] Arya RC, Wander GS, Gupta P. Blood component therapy: Which, when and how much. Anaesthesiol Clin Pharmacol. 2011;27(2):278-84.
[3] The Clinical use of Blood. In Medicine, Obstetrics, Paediatrics, Surgery & Anesthesia, Trauma & Burns; World Health Organization; Blood Transfusion Safety, Geneva. 1999.
[4] American Association of Blood Banks (AABB), Primer of Blood Administration. (Revised September 2010). Available from: www.bloodcenter.org/.../AABB%20Primer%20of%20Blood%20Administration.
[5] Slicher SJ, Sherrill J. Platelet refractoriness and alloimmunisation. Leukemia. 1998;12:S51-53.
[6] Kakaiya R, Aaronson C, Julleis J. Technical Manual AABB. 16th edition. Bethesda: AABB; 2008. Whole blood collection and component processing; Pp. 189-228.
[7] Gite V, Dhakane M. Analysis of pre and postdonation haematological values in plateletpheresis donors. Apollo Med. 2015;12:123-25.
[8] Rock G, Sutton DM. Apheresis: Man versus machine. Transfusion. 1997;37:993-95.
[9] Love E, Pendry K, Hunt L. Analysis of pre- and postdonation haematological values in plateletpheresis donors. Vox Sang. 1993;65:209-11.
[10] Suresh B, Arun R, Yashovardhan A, Deepthi K, Sreedhar Babu KV, Jothibai DS. Changes in pre- and postdonation haematological parameters in plateletpheresis donors. J Clin Sci Res. 2014;3:85-89.
[11] Tendulkar A, Rajadhyaksha SB. Comparison of plateletpheresis on three continuous flow cell separators. Asian J Transfus Sci. 2009;3(2):73-77.
[12] Dai YD, Sun QJ, Meng B, Xu SL. Influence of repeated platelet donation on megakaryopoiesis in donors. Zhongguo Shi Yan Xue Ye Xue Za Zhi. 2005;13(2):320-22. (Pubmed: Original article in Chinese).
[13] Gyongyossy-Issa MIC, Miranda J, Devine DV. Generation of reticulated platelets in response to whole blood donation or plateletpheresis. Transfusion. 2001;41(10):1234-40.
[14] Silva MA, Gregory KR, Carr-Greer MA, Holmberg JA, Kuehnert MJ, Brecher ME, et al. Summary of the AABB Interorganizational task force on bacterial contamination of platelets: Fall 2004 impact survey. Transfusion. 2006;46(4):636-41.
[15] Lazarus EF, Browning J, Norman J, Oblitas J, Leitman SF. Sustained decreases in platelet count associated with multiple, regular plateletpheresis donations. Transfusion. 200;41(6):756-61.
[16] Page EA, Coppock JE, Harrison JF. Study of iron stores in regular plateletpheresis donors. Transfus Med. 2010;20(1):22-29.
[17] Simon TL, Dzik WH, Snyder EL. Rossi's Principles of Transfusion Medicine. Philadelphia: Lippincott Williams and Wilkins. 2002.
[18] Dettke M, Hlousek M, Kurz M, Leitner G, Rosskopf K, Stiegler G, et al. Increase in endogenous thrombopoietin in healthy donors after automated plateletpheresis. Transfusion. 1998;38:449-53.
[19] Dogra K, Fulzele P, Rout D, Chaurasia R, Coshic P, Chatterjee K. Adverse events during apheresis procedures: Audit at a tertiary hospital. Indian J Hematol Blood Transfus. 2017;33:106-08.
[20] Guidelines for Blood Donor Selection and Blood Donor Referral- National Blood Transfusion Council, National AIDS Organization, Ministry of Health and Family Welfare, Government of India, New Delhi, October 2017; 3-11.
[21] Barbosa MH, Nunes da Silva KF, Coelho DQ, Tavares JL, da Cruz LF, Kanda MH. Risk factors associated with the occurrence of adverse events in plateletpheresis donation. Rev Bras Hematol Hemoter. 2014;36:191-95.
[22] WHO Expert Consultation Appropriate body-mass index for Asian populations and its implications for policy and intervention strategies. Lancet. 2004;363(9403):157-63.
[23] Das SS, Chaudhary R, Verma SK, Ojha S, Khetan D. Pre- and post- donation hematological values in healthy donors undergoing plateletpheresis with five different systems. Blood Transfus. 2009;7(3):188-92.
[24] Mahmud WHW, Rifin NSM, Ibrahim S, Mastazamin LT, Mustafa R. Significant reduction in hematological values after plateletpharesis: Clinical implication to the donor. Asian Biomedicine. 2011;5(3):393-39.
[25] Nomani L, Raina TR, Sidhu M. Feasibility of applying the 2-day deferral for repeat plateletpheresis: Indian perspective. Transfus Apher Sci. 2013;48(3):341-43.
[26] Mendez A, Wagli F, Schmid I, Frey BM. Frequent platelet apharesis donations in volunteer donors with haemoglobin <125 g/l are safe efficient. Transfus Apher Sci. 2007;36:47-53.
[27] Hans R, Sharma RR, Marwaha N. Effect of plateletpheresis on postdonation serum thrombopoietin levels and its correlation with platelet counts in healthy voluntary donors. Asian J Transfus Sci. 2019;13:10-16.
[28] Ault KA, Rinder HM, Mitchell J, Carmody MB, Vary CP, Hillman RS. The significance of platelets with increased RNA content (reticulated platelets). A measure of the rate of thrombopoiesis. Am J Clin Pathol. 1992;98:637-46.

[29] Koike Y, Yoneyama A, Shirai J, Ishida T, Shoda E, Miyazaki K, et al. Evaluation of thrombopoiesis in thrombocytopenic disorders by simultaneous measurement of reticulated platelets of whole blood and serum thrombopoietin concentrations. Thromb Haemost. 1998;79:1106-10.

[30] Sadri S, Bilgen H. The relationship of body mass index with platelet counts and donation frequency of platelet apheresis donors. Duzce Medical Journal. 2022;24(1):90-94.

PARTICULARS OF CONTRIBUTORS:
1. Professor, Department of Pathology, Pramukh Swami Medical College, Anand, Gujarat, India.
2. Associate Professor, Department of Pathology, Pramukh Swami Medical College, Anand, Gujarat, India.
3. Third Year Resident, Department of Pathology, Pramukh Swami Medical College, Anand, Gujarat, India.

NAME, ADDRESS, E-MAIL ID OF THE CORRESPONDING AUTHOR:
Kailash Inaniya,
Associate Professor, Department of Pathology, Pramukh Swami Medical College, Gokal Nagar, Karamsad, Anand-388325, Gujarat, India.
E-mail: drkkinaniya@gmail.com

PLAGIARISM CHECKING METHODS: [Jain H et al.]
- Plagiarism X-checker: Apr 24, 2022
- Manual Googling: Dec 08, 2022
- iThenticate Software: Jan 13, 2023 (12%)

ETYMOLOGY: Author Origin

AUTHOR DECLARATION:
- Financial or Other Competing Interests: None
- Was Ethics Committee Approval obtained for this study? Yes
- Was informed consent obtained from the subjects involved in the study? Yes
- For any images presented appropriate consent has been obtained from the subjects. Yes

Date of Submission: **Apr 22, 2022**
Date of Peer Review: **Jun 03, 2022**
Date of Acceptance: **Jan 14, 2023**
Date of Publishing: **Apr 01, 2023**