

Research Article

Distribution and Utilization Pattern of Single Donor Platelet Units Obtained by Platelet Apheresis at Regional Blood Center, Peshawar: a One-Year Retrospective Review

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ABSTRACT

Objective: To determine the distribution and utilization pattern of single donor platelet units collected by platelet apheresis at the Regional Blood Center, Peshawar, during a one-year period.

Study Design: Retrospective descriptive study.

Place and Duration of Study: Regional Blood Center, Peshawar, Pakistan. From January-2025 to December-2025.

Methodology: All the electronic records of single donor platelet units collected through platelet apheresis during the above-mentioned study period was reviewed. Data of 193 records, which fulfilled the inclusion criteria was analyzed and the demographic record of the donors, recipient departments, primary diagnosis of recipients, and monthly distribution of platelet apheresis procedures were extracted. The primary outcome measure was the departmental distribution and utilization pattern of single donor platelet units while the secondary outcomes included the demographic characteristics of the donor and the monthly distribution of the procedures. Descriptive statistics were employed to present the study findings.

Results: The mean age of platelet donors was 29.97 ± 7.63 years. Out of the total of 193 units, the Medicine/Medical ICU department (46.63%) demonstrated the highest utilization of single donor platelet units followed by the oncology department (36.27 %). The monthly distribution of platelet apheresis procedures remained stable throughout the year, with a modest increase during the months of October and March. Acute lymphoblastic leukemia was the most frequent primary diagnosis among recipients (19.17%), followed by chemotherapy-induced thrombocytopenia (15.54%) and dengue-associated thrombocytopenia (14.00%).

Conclusion: The demand for SDP transfusion was greatest among medical and oncology departments, and remained relatively stable throughout the year.

Keywords: Blood Banks, Blood Donors, Platelet Apheresis, Platelet Transfusion.

INTRODUCTION

Platelet transfusion is an indispensable therapeutic modality in modern transfusion medicine and has a crucial role in preventing and treating the bleeding associated with thrombocytopenia and platelet dysfunction.¹ The need for platelet support is often required in patients with hematological malignancies, solid organ cancers undergoing chemotherapy, bone marrow failure syndromes, dengue fever, major trauma, massive hemorrhage, and complex surgical procedures requiring platelet support to reduce the risk of life-threatening bleeding.²

With the ongoing advances in oncology, critical care, organ transplantation and hematopoietic stem cell (HSC) transplantation, the need for

platelet transfusion has significantly increased at global level.³

Platelets can be obtained in two major forms: random donor platelets (RDPs), prepared from whole blood donations, and single donor platelets (SDPs), obtained by platelet apheresis (PA).

PA is an automated blood collection procedure where whole blood is drawn from the donor, platelets are selectively collected, and the remaining blood components are returned to the donor. A single SDP unit has the advantage of providing an equivalent therapeutic platelet dose to that provided by a pool of RDPs while exposing the recipient to only one donor. SDP significantly minimizes donor exposure and is therefore associated with a lower risk of

transmission of infectious diseases and alloimmunization than the RDPs.⁴

With these advantages, SDP has emerged as the preferred choice for the patients who need multiple platelet transfusion such as those with hematological disorders and malignancies.^{5,6} However, SDP is considerably more resource-intensive than conventional platelet concentrates as it requires specialized equipment, trained staff, stringent donor selection, and dedicated scheduling. Additionally, platelets have a limited shelf life, which generally does not exceed five to seven days, posing a constant challenge for transfusion services to maintain efficient inventory.⁷

This creates a situation where overproduction may cause unnecessary waste while underproduction has a risk of compromise in patient care because of delaying urgently required transfusions.⁸ Understanding institutional patterns of platelet utilization has therefore become increasingly important to optimize blood bank operations and ensure equitable allocation of limited resources.⁹ Audits of platelet use not only enable the blood banks to forecast demand, optimize inventory, and target donor recruitment, but also guide the clinicians towards guideline-based transfusion and help administrators to allocate financial and logistical resources accordingly.^{9,10}

While a few international studies are available reporting the assessed use of platelets in various departments such as oncology, medical, surgical, gynecology and obstetrics (Gyn/Obst) and emergency room (ER), data on platelet use in Pakistan are limited, particularly regarding the distribution of SDPs collected by PA.¹¹

The local variation in patient profiles, disease burden, and infrastructure impacts the platelet demand and underscores the need for local evidence, and such audits can guide quality improvement and blood management. The present study was therefore conducted to determine the distribution and utilization pattern of SDP units obtained through PA at the Regional Blood Center, Peshawar, over a one-year period. These findings are expected to provide valuable information regarding departmental platelet requirements and support efficient blood inventory management in our blood centers. Moreover, this will also guide donor recruitment planning, and contribute to optimize the transfusion services within the institution.

METHODOLOGY

This retrospective descriptive study was conducted at the Regional Blood Center, Peshawar, after getting approval from the Institutional Review Committee of the hospital. The records of all SDP units collected through PA between January 1, 2025 and December 31, 2025 were reviewed. The study was based exclusively on blood bank records and involved no direct contact with the patient or the donor. All data were kept confidential and donor identifiers were removed before including into the analysis. Incomplete records regarding platelet collection or the recipient department were excluded from the analysis. A total of 193 SDP units collected through PA and fulfilling the eligibility criteria were included in the final analysis.

PA was performed by using an automated cell separator (in accordance with the manufacturer's recommendations) following the Standard Operating Procedures (SOPs) of our Regional Blood Center.¹² Eligibility of platelet donors was checked as per the donor selection criteria by the National Blood Transfusion Service, Pakistan. All the donors were healthy adults aged between 18 and 45 years with adequate venous access and satisfactory laboratory parameters, including hemoglobin level and platelet count. Donors were also screened for the transfusion-transmissible infections.¹³

In the PA procedure, whole blood was removed from the donor, platelets were selectively separated and collected, and the remaining blood components were continually returned to the donor during the process. One therapeutic dose of SDP was obtained from each successful PA procedure.¹⁴

All the data were retrieved from the electronic blood bank records using a structured proforma. The proforma contained all the information including donor's age and gender, date of platelet collection, and the name of department to which each SDP unit was issued. The departments were categorized into Oncology, Emergency, Medicine/Medical ICU, Surgery/Surgical ICU, and Gynecology and Obstetrics. The utilization of SDP units was counted when the issuance of an SDP unit was made by the Blood Center to any of the hospital departments for transfusion to an eligible patient.

The primary outcome measure was set as the departmental distribution and utilization pattern of SDP units during the one-year study period. Secondary variables included the demographic

characteristics of the donor and the monthly distribution of PA procedures.

Data were analyzed using the SPSS version 26.0. Descriptive statistics were used to express the study variables where continuous variables were summarized as mean $\pm$ standard deviation or median with interquartile range (depending on data distribution) while categorical variables were presented as frequencies and percentages. The monthly

utilization pattern of SDP units was presented as figures.

RESULTS

A total of 193 SDP units collected through PA were included in the final analysis. All platelet donors were healthy males aged between 18 and 45 years, with the majority belonging to the 18–25 years' age group (39.38%). The demographics of donors are shared in Table-I.

Table-I: Demographic details of Platelet Donors (N = 193)

Demographic details		Frequency (%) / Mean $\pm$ SD
Age (Years)		29.97 $\pm$ 7.63
Gender	Male	193 (100)
	Female	0 (0)
Age groups	18-25 years	76 (39.38)
	26-35 years	71 (36.79)
	36-45 years	46 (23.83)

The data extracted from the records showed that the highest utilization of SDP units was observed in the Medicine/Medical ICU department (46.63%), followed closely by the Oncology Department (36.27%). The other

departments utilizing SDP units included Surgery/Surgical ICU (8.29%), Gynecology and Obstetrics (5.7%) and emergency room (3.11%), as shown in Table-II.

Table-II: Distribution and Utilization of SDP Units (N = 193)

Department	Frequency (%)
Medicine/Medical ICU	90 (46.63)
Oncology	70 (36.27)
Surgical/Surgical ICU	16 (8.29)
Gyn/Obst	11 (5.7)
Emergency room	6 (3.11)

The most common primary diagnosis among patients requiring SDP transfusion were acute lymphoblastic leukemia (ALL) (19.17%), chemotherapy-induced thrombocytopenia (15.54%),

dengue-associated thrombocytopenia (14%), aplastic anemia (10.36%) and acute myeloid leukemia (AML) (8.29%). The details of primary diagnosis of these patients are shown in Table-III.

Table-III: Primary Diagnosis of Patients Receiving SDP Units (n = 193)

Primary diagnosis of patients receiving SDP units	Frequency (%)
Acute Lymphoblastic Leukemia (ALL)	37 (19.17)
Chemotherapy-induced thrombocytopenia	30 (15.54)
Dengue-associated thrombocytopenia	27 (14.00)
Aplastic anemia	20 (10.36)
Acute myeloid leukemia (AML)	16 (8.29)
Perioperative thrombocytopenia	13 (6.74)
Obstetric hemorrhage	10 (5.18)
Acute febrile illness (AFI)	10 (5.18)
Isolated thrombocytopenia	8 (4.15)
Chronic liver disease (CLD)	7 (3.63)
Hemophagocytic lymphohistiocytosis (HLH)	5 (2.59)
Pancytopenia	4 (2.07)
Malaria	3 (1.55)
Chronic kidney disease	2 (1.04)

β-thalassemia major	1 (0.52)
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The number of procedures remained relatively stable throughout the study period, with a modest increase during the spring and autumn months. The highest number of procedures was

recorded in October (21 procedures), followed by March (20 procedures), whereas January, July, and December each recorded 12 procedures. The details are shown in Figure-1.

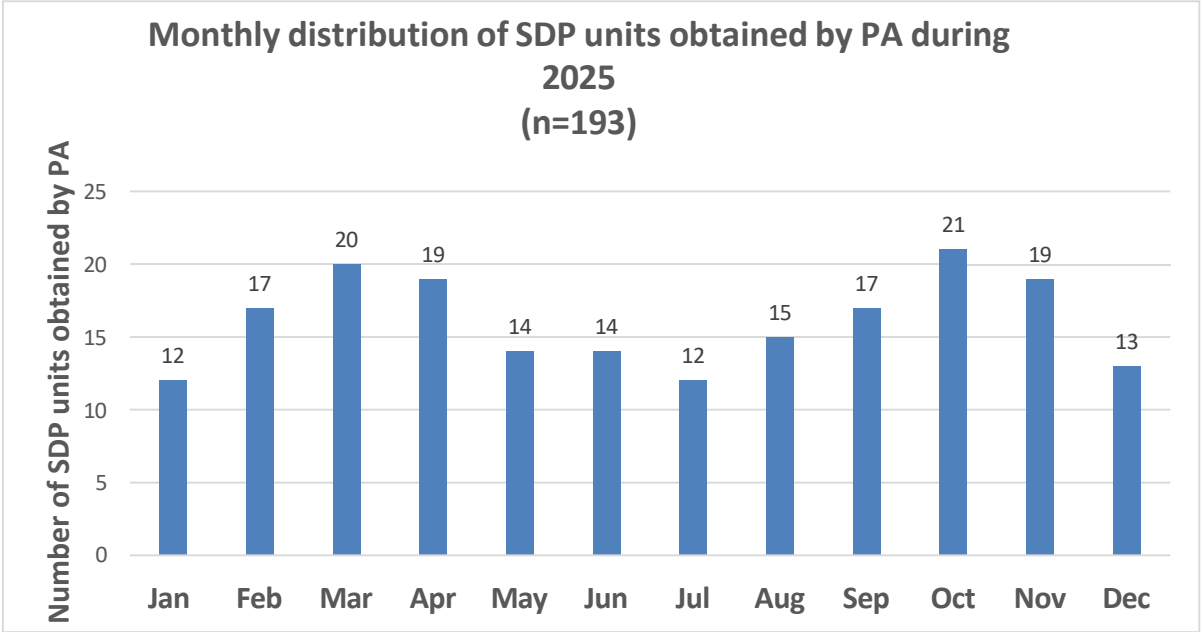


Fig-1: Month wise Distribution of SDP Units Collected Through PA During Year 2025

DISCUSSION

This study evaluated the departmental distribution and utilization pattern of SDP units obtained through PA at our regional blood center over a one-year period. Out of the total of 193 units, the Medicine/Medical ICU department (46.63%) demonstrated the highest utilization of single donor platelet units followed by the oncology department (36.27 %). The monthly distribution of platelet apheresis procedures remained stable throughout the year, with a modest increase during the months of October and March, which may reflect seasonal variations in diseases associated with thrombocytopenia, such as dengue fever spreading in the spring and the autumn seasons. Acute lymphoblastic leukemia was the most frequent primary diagnosis among recipients (19.17%), followed by chemotherapy-induced thrombocytopenia (15.54%),dengue-associated thrombocytopenia (14.00%), aplastic anemia (10.36%), and acute myeloid leukemia (8.29%). These findings of our study are consistent with studies previously done for evaluating the clinical utilization of SDP units. A study conducted in South Asian context by Manjula et al. to retrospectively audit the platelet transfusion practices over six months.

The distribution pattern of SDP units was similar to our study as medical oncology recorded the highest SDP utilization (40.8%), followed by general medicine (29.6%). It was reported that 16.79% of this demand was administered prophylactically in patients with platelet count <10,000 while 15.81% was administered prophylactically in patients with platelet count <20,000 with additional risk factors such as fever, sepsis, splenomegaly, or on chemotherapy.¹⁵ Another study conducted in India by Chenna et al. performed a prospective audit of platelet transfusion practices, and reported that medicine (38.6%), medical oncology (19.8%) and pediatrics and neonatology (17.9%) had the highest demands for platelet transfusion. The study also analyzed the appropriateness of use of these SDP units which was in 93.6% of episodes. The authors also highlighted that these two departments had the highest proportion of appropriate platelet transfusions. Prophylactic transfusions accounted for the majority of use (66.1%), followed by therapeutic (13%) and pre-procedure (11.3%) indications.¹⁶ Similar observations have also been reported in an institutional audit of longer-duration evaluating SDP utilization. Vujhini et al.

conducted an audit over a three-year period including 325 SDP procedures at a tertiary care hospital. Consistent with the departmental distribution pattern observed in our study, this study also reported that medical oncology recorded the highest SDP utilization (75.69%), followed by General Medicine. The demographic records of donors showed that the majority of donors belonged to 26-30 years age group (49.23%), followed by the age group 18-24 (29.23%). It was found that six SDP units were discarded due to expiry, highlighting the importance of effective platelet inventory management in the blood centers.¹⁷

Memon et al. evaluated SDP distribution across departments at a tertiary care hospital at Hyderabad, Pakistan. The record of a four years period showed that oncology had the highest utilization (25.47%), followed by Medicine (24.45%), Surgery (18.23%), and Gynecology/Obstetrics (16.64%).¹⁸

In many low- and middle-income countries, including Pakistan, the dedicated oncology services are often limited in capacity, and a proportion of patients with hematological malignancies and chemotherapy-related complications are managed under the Medicine Department. This may partly explain the higher demand for SDP units observed in the Medicine/Medical ICU department in our study compared to the studies discussed above.

Overall, the results of our study and the studies conducted earlier support the observation that platelet utilization is largely influenced by the burden of hematological malignancies, oncology services, and critical care requirements in the medical department. These findings further emphasize the importance of periodic institutional audits to guide evidence-based platelet inventory management and optimize the transfusion practices in line with the institutional needs.

This was a retrospective study from a single regional blood center; therefore, the findings may not be generalizable to all healthcare institutions.

CONCLUSION

The results of this study demonstrated that the utilization of SDP units obtained through PA was primarily driven by the demands from the medical and oncology departments, with hematological malignancies, chemotherapy-related thrombocytopenia, and dengue-associated thrombocytopenia being the most frequent clinical indications for this transfusion. Utilization patterns observed here highlight the

importance of continuous monitoring of platelet demand to ensure the efficient use of this blood component in our resource constrained healthcare system. These findings provide valuable local evidence to assist the regional blood centers and hospital transfusion services in optimizing resource allocation, strengthening transfusion practices, and thereby enhancing the overall quality of patient care. In conclusion, periodic institutional audits can support evidence-based inventory management, improve donor recruitment planning, minimize unnecessary wastage, and facilitate timely availability of platelet products when needed.

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