

FREQUENCY OF THE APPROPRIATE USE OF PLATELET CONCENTRATES IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Objective: The objective of the study was to determine frequency of the appropriate use of platelet concentrates in a tertiary care hospital.

Material and Methods: It was a descriptive cross-sectional study that was conducted in Department of Pathology, Pakistan Atomic Energy Commission (PAEC) General Hospital, Islamabad for a period of six months from 1st January to 30th June 2021. Patients of both genders, above five years of age receiving platelets transfusions during the study period were included in this study. An informed consent was obtained from the patients. The data was collected on a predesigned form that included patient demographic and clinical details. All patients were categorized whether the platelet transfusion was appropriate or inappropriate according to the mentioned definitions. To control confounding effects of various factors and to avoid bias in the study, the exclusion criteria were strictly followed. t test was applied to find statistical difference between appropriate and inappropriate transfusions.

Results: Out of total 331 patients, 169 (51%) were females while 162 (49%) were males, male:female ratio being 1: 1.04. Mean age was 41.75 ± 23.1 years with a range of 6-92 years. Maximum patients were in 31-40 years age group. Single donor platelet units were transfused to 55(16.6%) patients while rest 276 (83.4%) patients received random donor platelets. 301 (90.9%) had appropriate transfusion while 30 (9.1%) patients received blood transfusion due to inappropriate indications. ($p < 0.0001$).

Conclusion: From this study it was concluded that a significant number of patients in hospital setting receive inappropriate platelet transfusions.

Key Words: Appropriate, Platelet concentrates, Transfusion.

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INTRODUCTION

Blood transfusion is a life-saving procedure. Whole blood is separated into its components in order to obtain individual therapeutic benefits by administering only that component which is needed. Platelet concentrates have been used both prophylactically and therapeutically for treating different clinical disorders including haem-oncological diseases, bone marrow transplant recipients, and bone marrow failure being the common indications. The therapeutic approach is used to manage acute hemorrhage whereas the prophylactic approach is used to prevent bleeding in patients with treatment-induced thrombocytopenia and before invasive procedures. Various guidelines have been published regarding platelet transfusion practices globally [1-3].

According to the clinical practice guidelines of the American Association of Blood Banking

(AABB) for platelet transfusion, prophylactic transfusion is recommended for hospitalized adult patients with a platelet count of 10×10^9 cells/L or less and less than 20×10^9 cells/L for those undergoing elective central venous catheter placement. For diagnostic lumbar puncture and major elective non-neuro axial surgery with a platelet count less than 50×10^9 cells/L, platelet transfusion should be done. (1) On the other hand in pregnant women, according to an international consensus report, a platelet count of $>50 \times 10^9/L$ is considered safe for vaginal delivery and C-section while the count of $>80 \times 10^9/L$ is considered to be safe for neuraxial analgesia and anesthesia [4,5]. American Society of Clinical Oncology recommends prophylactic platelet transfusion at count $<10 \times 10^9/L$ in patients with hematological and solid organ malignancies and hemopoietic stem cell transplant recipients except for adult autologous transplant recipients where platelet transfusion is recommended only at the first sign of bleeding. Likewise, prophylactic platelet transfusion is not recommended in chronic, stable thrombo-

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cytopenia where it is only advisable on the first sign of bleeding [2].

Various studies showed a discrepancy between established guidelines and clinical practices, highlighting the importance of prospective blood audits by a transfusion specialist to implement patient blood management program [6,7]. Studies show that most of the time, despite sophisticated blood banking services, platelet concentrates are used inappropriately and without any clinical indication [8]. A prospective analysis of platelet transfusion data from 57 hospitals showed 41.5% inappropriate platelet orders for adults while 63.3% in pediatrics [6]. There is a considerable variation in the appropriateness of usage of blood components among different departments of a hospital and even among different hospitals of a country and the proportion of inappropriate platelet transfusion has been observed to be relatively higher in surgical patients [8]. Some studies have suggested inappropriate platelet transfusion rates of up to 31% [9].

The above studies show that there are wide variations among institutes about their adherence to clinical guidelines for transfusion of platelet concentrates. The rationale of this study was to determine the rate of inappropriate usage of platelet concentrates. This may help to explore the common indications and their appropriateness according to established guidelines to provide an evidence base so that this valuable product may be reserved for only those who are in critical need of it.

MATERIAL AND METHODS

It was a descriptive cross-sectional study conducted in Department of Pathology, PAEC General Hospital, Islamabad for a period of six months from 1st January 2021 to 30th June 2021. Sample size was calculated to be taking 31% inappropriate platelet transfusion rate with 95% confidence level and 5% confidence interval using WHO sample size calculator. An informed consent was obtained from the patients. Sampling technique used was consecutive non-probability sampling. All patients of both genders and above five years of age receiving platelets transfusion during the study period were included in the study. However, all patients who received transfusions for platelet function abnormalities, patients <5years of age who received platelet transfusions due to any indication, patients undergoing neuroaxial surgery and patients receiving blood on massive transfusion protocol were excluded. The data was collected on a predesigned form which included patient demographic details as

well as clinical details such as diagnosis, platelet count at the time of platelet transfusion, indication for platelet transfusion, number of units of platelet concentrates which were transfused. All patients were categorized whether the platelet transfusion was appropriate or inappropriate according to the International guidelines as mentioned above. [1,2,4,5]. To control confounding effects of various factors and to avoid bias in the study, the exclusion criteria were strictly followed. Hematologist was directly involved in clinical decision making by giving consultations and advice regarding the need for platelet transfusions as well as indirectly by setting up standard operating procedures (SOP's) on platelet transfusion thresholds according to established guidelines in collaboration with specialists from various clinical fields. The data was entered and analyzed in Statistical Package for Social Sciences (SPSS version 22.0). Descriptive statistics were applied to analyze data. Quantitative variables were presented in the form of mean and standard deviations while categorical variables were presented in frequencies and percentages. Data was stratified according to age, gender and clinical groups. t-test was applied to investigate the statistical difference between appropriate and inappropriate transfusions.

RESULTS

A total of 331 patients receiving platelet transfusion for any reason were included in the study after fulfilling inclusion criteria. This included individuals of both genders. However, patients fulfilling exclusion criteria were excluded. As this study did not include any follow up visits; therefore, none of the subjects dropped out or were lost at any point in the study. Out of total 331 patients, 169 (51%) were females while 162 (49%) were males. Mean age was 41.75 ± 23.1 years (range=6-92 years). Single donor platelet units were transfused to 55 (16.6%) patients while rest 276 (83.4%) patients received random donor platelets. Of total 331 patients' proportion of patients receiving platelets transfusion due to therapeutic indications and as prophylaxis is shown in Figure-I. Distribution of patients receiving single donor platelets and random platelet units on therapeutic and prophylactic basis is shown in Table-I. Patients were stratified into different clinical groups; the results obtained are mentioned in Table-II. Of 331 patients, 301 (90.9%) had appropriate transfusion while 30 (9.1%) patients received blood transfusion due to inappropriate indications (Figure-II). Appropriateness according to platelet concentrate type is shown in Table-III. ($p=0.00004$)

Table-I: Frequency of single and random donor platelets used therapeutically and prophylactically.

	Therapeutic (% of total)	Prophylactic (% of total)	Total
Random donor platelets	246 (74.3%)	30 (9.06%)	276
Single donor platelets	0 (0%)	55 (16.62%)	55
Total	246 (74%)	85 (26%)	331

Table-II: Characteristics of platelet transfusions in various clinical groups.

Clinical Groups	Total transfusion events	Random Donor Platelets	Single Donor Platelets	Appropriate	Inappropriate
Medicine	101(30.5%)	84(83.2%)	17(16.8%)	87(86.1%)	14(13.9%)
Haematology	94(28.3%)	90(95.7%)	4(4.3%)	85(90.4%)	9(9.6%)
Oncology	49(14.8%)	20(40.8%)	29(59.2%)	45(91.8%)	4(8.2%)
Surgery	48(14.5%)	45(93.7%)	3(6.3%)	45(93.7%)	3(6.3%)
Gynaecology/ Obstetrics	35(10.5%)	33(94.3%)	2(5.7%)	35(100%)	0(0%)
Intensive Care Unit (ICU)	4(1.2%)	4(100%)	0(0%)	4(100%)	0(0%)

Table-III: Frequency of appropriateness according to platelet concentrates type.

	Appropriate	Inappropriate	
Random donor platelets	246	30	P=0.00004*
Single donor platelets	55	0	

*t-test was applied to investigate statistical difference between appropriate and inappropriate transfusions

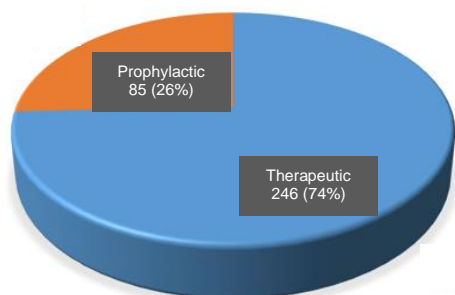


Figure-I: Frequency of platelets transfusion due to therapeutic indications and prophylaxis

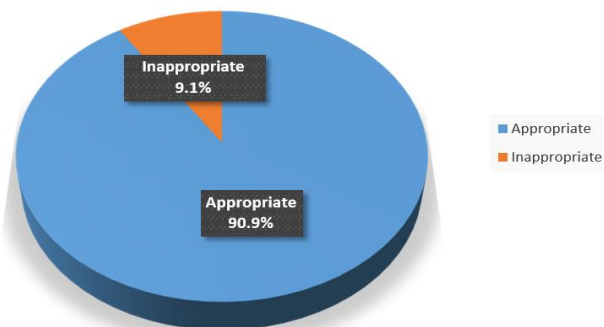


Figure-II: Frequency of appropriate and inappropriate platelets transfusion.

DISCUSSION

The availability of platelet concentrates depends on the goodwill of voluntary donors. Unlike drugs that are manufactured in industries and are widely available, blood products are human-derived and their accessibility depends upon voluntary blood donation and other factors, including strict adherence to donor deferral criteria and lack of component preparation facility at every center. Blood products

including platelet components are; therefore, a valuable and limited resource. Also, among blood products, platelets have a limited shelf life of five to seven days, which makes inventories of platelets very difficult to maintain and resource-intensive [10,11]. Hence, the rational use of platelets not only preserves this valuable resource but also minimizes the chance of transfusion hazards. Apart from infectious and non-infectious complications of platelet transfusion, platelet alloimmunization and refractoriness have emerged as a serious concern emphasizing the critical need for rational use of platelet transfusions [12].

Platelet concentrates are used for treating a variety of clinical disorders for certain definite indications [12,13] but it has been observed that most of the time this blood product is used inappropriately and without any rationale. Current guidelines published by multiple organizations consider platelet transfusion appropriate only under specific circumstances [12,14].

In the present study, out of 331 patients, 301 (90.9%) had appropriate transfusion while 30 (9.1%) patients received platelet transfusion due to inappropriate indications. These results are comparable to an Australian study regarding the appropriateness of platelets and Fresh Frozen Plasma utilization at a tertiary care teaching hospital where 88% of platelet transfusions were found to be appropriate [15]. Moreover, a chart review of 200 patients receiving platelet transfusions was performed to evaluate 50 consecutive transfusion episodes per site. Overall, 78% (95% CI: 72-84%) of platelet transfusions were considered as appropriate, with results varying significantly by hospital site

(range 62-94%), while in 22% of patient's platelet transfusion was considered inappropriate [8]. A retrospective review of platelet orders received at the blood bank showed that 34% of orders were without any appropriate indication [16]. In a study from Pakistan, in an audit of blood component transfusions in pediatric intensive care unit (ICU), it was found out that the most inappropriate transfusions were of platelets (57%). [17]. In a study from India, the rate of appropriate platelet transfusions was 93.6%, with the specialties of Medicine and medical oncology having the highest number of appropriate transfusions [18]. In another study, 93% of platelets were transfused appropriately, and constituted mainly prophylactic indications [19].

In our study, the proportion of males was 49% in comparison to 60% in a study from the US [20]. A Canadian study reported that 55 % of platelet transfusions were given to males [6]. The difference in the male preponderance across the studies could be by chance.

In our study, the age of the patients ranged from 6 to 92 years. The mean age was 41.75 ± 23.1 years. The age of the patients ranged from 12 to 70 years and the mean age was 40.10 ± 29.1 years in another study of 200 patients [8]. Maximum transfusions were received by patients in the age group (31-40yr) in our study while an Indian study reported age group 21-30yr receiving maximum transfusions.

In our study, out of 331 patients receiving a transfusion, 55(16.6%) patients were transfused single donor platelets (SDP) and 276 (83.4%) patients received random donor platelets (RDP). This increased utilization of RDP over SDP in the South Asian region is probably due to limited resources, higher cost of apheresis procedure, and lack of technical expertise in every tertiary care hospital. In contrast, the majority of platelet transfusions in developed countries are SDP [21, 22].

Platelet transfusions due to therapeutic indications constituted 74% of all transfusions in our study as compared to 26% prophylactic transfusions which are near to the results of Etchells *et al* who showed a proportion of prophylactic transfusions of up to 35% [8].

In a landmark study, the platelet count threshold of $10 \times 10^9/L$ was found to be safe in reversible bone marrow failure states and reduced platelet usage by 21.5%. There was no evidence to support that a higher threshold may lead to a decreased risk of bleeding. Various organizations have established well-defined thresholds for platelet transfusions based on similar rationale [12]. The

distribution of patients receiving random platelet units on a therapeutic basis was 74% however on a prophylactic basis, RDP transfusion was 9% of the total in my study. In contrast, all single donor platelets in our study were transfused prophylactically and appropriately but none therapeutically, because it takes time to prepare single donor platelets. This also involves a multidisciplinary approach for preparation including hematologists thus minimizing chances of inappropriateness. Our study showed that most of the inappropriate platelet transfusions were done in the medicine department. In contrast, the rate of inappropriate transfusions is found to be higher in operation rooms in other studies [6,8]. The departments consuming more blood components need to be addressed particularly while designing any patient blood management program to ensure rational use of blood products.

The results from our study cannot be generalized as it is a single institution-based study which is the main limitation of our study. Furthermore, our blood bank is governed by hematologists performing meticulous scrutiny of blood component orders which may have resulted in underestimation of inappropriate usage as compared to blood banks not being supervised by hematologist which was not an uncommon practice in the recent past. Multi-center studies including both the private and public sector regarding the utilization of other components, in addition to platelets, are recommended in the future. Such studies may give a broader view of platelet transfusion practices across the country to identify non-compliance to current guidelines.

Prospective concurrent assessment of platelet request forms is recommended to evaluate adherence to national and institutional guidelines. Successful implementation of such protocols leading to a significant reduction in inappropriate platelet utilization has been documented [23]. Reinforcement and continuing education and training of the physicians will lead to improvement in platelet transfusion practice [24].

CONCLUSION

From the above discussion, we have concluded that inappropriate platelet transfusion is a common practice in hospitals. This necessitates the use of periodic audits of platelet transfusion practices, which may serve as an educational tool for the physicians.

AUTHOR CONTRIBUTION

Naheed Khattak: Study design and concept, data collection, drafting

Sara Jamal: Data collection, data interpretation

Sundas Ali: Data analysis, data interpretation

Huma Abdul Shakoor: Data collection, data interpretation

Sana Syed: Drafting, data analysis

Samina Tufail Amanat: Data analysis

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