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Utilization of blood and blood components in the department of clinical hematology of a tertiary care hospital: A prospective hospital-based study

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ABSTRACT

Background: To have proper utilization of blood and its components adherence to established guidelines is essential. Hence, periodic review of blood components is necessary to improve transfusion practices and decrease the inappropriateness of blood components. **Aims and Objectives:** Our study aims to assess the utilization and appropriateness of blood and blood components in the Department of Clinical Hematology SKIMS, Soura, Srinagar. **Materials and Methods:** This prospective observational study was conducted in the Department of Blood Transfusion and Immunohematology, SKIMS, Soura, Srinagar, over a period of 1 year from August 2020 to July 2021 on patients admitted in Clinical Hematology requiring transfusion therapy. The number of all blood and blood component units supplied over a period of 1 year was assessed. The usage of different types of blood component was recorded and correlated with the patient's diagnosis and indications for transfusion. **Results:** A total of 250 patients were transfused with 2099 blood and blood components, among them 64.32% (1350) units were used appropriately and 35.68% (749) units were used inappropriately. Transfusions of packed red blood cells were found to be inappropriate in patients with asymptomatic chronic anemia with Hemoglobin >7 g/dL. Fresh frozen plasma was given inappropriately in cases of bleeding without derangement of coagulation tests. Inappropriate use of platelets was seen in patients who had received platelets prophylactically with platelet count above 10,000/µL. **Conclusion:** Proper implementation of guidelines for the use of various blood components would help reduce their inappropriateness.

Key words: Packed red blood cell; Platelet concentrates; Fresh frozen plasma; Appropriate

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INTRODUCTION

Blood is essential for human survival.[1] There is currently no effective substitute that has all the properties of human blood.[2] As blood is a scarce resource, physicians should weigh the risks of transfusion against the risks of not transfusion. Studies have shown that high rates of inappropriate blood transfusions are common in both developed and developing countries.[3,4] Therefore, it is essential to use this precious resource carefully and appropriately. The appropriate use of blood and blood products means the transfusion of safe blood products solely for the treatment of a condition that results in significant morbidity or mortality and cannot be prevented or effectively treated by other means.[5]

Imprudent blood orders can strain a healthcare facility's physical and human resources and increase the cost

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of medical care.[6] Proper utilization of blood and its components means that the appropriate blood product is given in the correct quantity only when it is truly needed. This approach seeks to reduce the occurrence of unnecessary blood transfusions, thereby lowering the risk of exposure with blood and its components, which carry both immune and non-immune complications, especially infections that can be transmitted through blood transfusions. The practice of overuse without utilization has been reported in previous studies.[7-9] To ensure the appropriate use of this valuable resource, proactive and good audit management is required to assess the demand and consumption pattern of blood and blood components. Many countries have developed guidelines and policies for the clinical use of blood. However, despite available guidelines, high rates of inappropriate transfusions have been reported worldwide.[10]

Blood component requirement guidelines should be reviewed periodically to keep pace with changing methods and practices. A structured blood transfusion policy should be formulated at both national and international levels. Regular blood consumption checks, standard transfusion guidelines, clinical programs with regular feedback, and bedside visits by transfusion specialists should be implemented to pave the way for better blood inventory, efficient blood utilization, and resource management.

Aims and objectives

The objectives of the study are as follows:

1. To assess the utilization and appropriateness of blood and blood components in the Department of Clinical Hematology
2. To reduce inappropriate use of blood and blood components in mutitransfused patients.

MATERIALS AND METHODS

This prospective observational study was conducted at the Department of Blood Transfusion and Immunohematology, SKIMS, Soura, Srinagar for a period of 1 year from August 2020 to July 2021 on patients admitted to Clinical Hematology requiring transfusion therapy after obtaining proper approval from the Institutional Ethics Committee (IEC) SKIMS (No.: 1131/IEC-SKIMS/2021–53, dated February 27, 2021).

The number of all blood and blood component units delivered over a period of 1 year was assessed. All details of the transfusion recipients in these representative data were recorded, including gender, age, ABO and Rh blood groups, clinical diagnosis, and indications for blood transfusion. Reports of important investigations such as hemoglobin (Hb), platelet count, and coagulation profile were recorded. The use of different types of blood components were recorded and correlated with the patient's diagnosis and indications for transfusion. Appropriate use of blood components was assessed using the World Health Organization/NACO guidelines.[11,12]

Inclusion criteria

Blood components were issued from SKIMS Blood Center to the Department of Clinical Hematology during the study period.

Exclusion criteria

Blood components issued by the Blood Center to Departments other than Clinical Hematology were excluded from the study.

Statistical analysis

Data from blood component requisition forms of blood transfusion and immunohematology were collected and categorical data were shown in the form of frequency and percentage. The statistical analysis was done using Statistical Package for the Social Sciences Software V24.

RESULTS

A total of 250 patients were transfused with blood and blood components. Out of these patients, 149 (59.6%) were males and 101 (40.4%) were females. Majority 49 (19.6%) of the patients belonged to 21–30 years age group followed by 46 (18.4%) to the age group of 41–50 years. Least number of patients, that is, 8 (3.2%) aged >70 years (Table 1). Of total 250 patients transfused 52 (20.8%) were A+ve, 66 (26.4%) were B+ve, 74 (29.6%) were O+ve, 19 (7.6%) were AB+ve, 14 (5.6%) were A-ve, 9 (3.6%) were B-ve, 14 (5.6%) were O-ve, and 2 (0.8%) were AB-ve. Blood components utilized were packed red blood cells (PRBC) in 73.6% (184/250) patients, platelet concentrate (PC) in 62.8% (157/250) patients, single donor apheresis platelets (SDAP) in 44.4 % (111/250) patients, fresh frozen plasma (FFP) in 41.6% (104/250) patients, cryoprecipitate in 2.4% (8/250) patients, and whole blood (WB) in 0.8% (2/250) patients. As per diagnosis most of the patients 23.2% (58) were having acute myeloid leukemia (AML), 20.8% (52) were having acute lymphocytic leukemia followed by chronic myeloid leukemia 7.2% (18) (Table 2).

A total of 2099 units of blood and blood components were issued for 250 patients, out of which 28.06% (589) were PRBC, 51.92% (1090) units were PC, 5.28% (111) were SDAP units and 14.24% (299) units were FFP, 0.38%

(08) units were cryoprecipitate, and only 0.09% (02) units were of WB. Of all 2099 units issued, 64.32% (1350) units were appropriately used and the rest 35.68% (749) units were inappropriately used. Most appropriately used blood components were cryoprecipitate 100% (08) and SDAP 97.29% (108) followed by PRBC 70.28% (414). The most inappropriately used blood component was WB 100% (02) and FFP 53.17% (159), followed by platelets concentrates 37.61% (410) (Table 3).

Table 1: Age distribution of patients transfused with blood components

Age (Years)	Number (n)	Percentage
≤10	24	9.6
11–20	34	13.6
21–30	49	19.6
31–40	26	10.4
41–50	46	18.4
51–60	36	14.4
61–70	27	10.8
>70	8	3.2
Total	250	100

Table 2: Distribution as per clinical diagnosis of patients transfused with blood components

Diagnosis	Number (n)	Percentage
AML	58	23.2
ALL	52	20.8
CML	18	7.2
Aplastic anemia	16	6.4
Anemias (excluding Aplastic)	14	5.6
ITP	13	5.2
AIHA	12	4.8
APML	12	4.8
MDS	11	4.4
Multiple myeloma	10	4
Pancytopenia	9	3.6
CLL	8	3.2
Acute leukemia	6	2.4
Bicytopenia	2	0.8
Behchets disease	1	0.4
DVT with bleeding	1	0.4
Evans syndrome	1	0.4
Factor VIII deficiency	1	0.4
Methemoglobinemia	1	0.4
Myelofibrosis	1	0.4
Plasma cell dyscarasis	1	0.4
Thalassemia	1	0.4
Vitamin B-12 deficiency	1	0.4
Total	250	100

AML: Acute myeloid leukemia, ALL: Acute lymphocytic leukemia, CML: Chronic myeloid leukemia, ITP: Idiopathic thrombocytopenic purpura, AIHA: Autoimmune hemolytic anemia, APML: Acute promylocytic leukemia, MDS: Mylodysplastic syndrome, CLL: Chronic lymphocytic leukemia, DVT: Deep vein thrombosis

DISCUSSION

Blood component therapy allows multiple patients to benefit from a single unit of donated WB. Blood and blood products are considered drugs by the Food and Drug Administration. Like any other treatment strategy with advantages and disadvantages, blood transfusions should only be administered if the benefits outweigh the risks.[13] This inappropriate use of blood and its components has a significant impact on patients and hospital staff in the form of health-care costs, wastage of resources, loss of more vulnerable patients, and transmission of infections with unnecessary allergic reactions, resulting in high mortality and morbidity among patients.[14]

In our study, blood components utilized were PRBC in 73.6% of patients, PC in 62.8% of patients, SDAP in 44.4% of patients, FFP in 41.6% of patients, cryoprecipitate in 2.4% of patients and WB used in 0.8% of patients. Giridharan and Sarada[15] studied the usage pattern of various transfused blood components and found that most patients required PRBC followed by FFP, PCs, and cryoprecipitate. Similar results were also reported by Chandarya et al.,[16] with most patients requiring PRBC.

A total of 2099 units of blood and blood components were dispensed to 250 patients, of which 64.32% were used appropriately and 35.68% were used inappropriately. The rates of inappropriate use of blood components reported in most studies vary widely, and it is difficult to compare rates because the criteria for defining appropriate and inappropriate use are different. Marti-Carvajal et al.,[17] reported in their study that the use of blood products was appropriate in 51% of cases. Richa and Chetna[18] and Katara et al.,[19] documented the overall prevalence of appropriate use of blood as 62.63% and 81%, respectively. Gomathi and Varghese[20] reported in their study that the appropriate

Table 3: Utilization of blood components with regard to appropriate and inappropriate

Components	Appropriate use n (%)	Inappropriate use n (%)	Total no. of units issued n (%)
Packed red cells	414 (70.28)	175 (29.71)	589 (28.06)
Platelet concentrate	680 (62.38)	410 (37.61)	1090 (51.92)
Single donor Apheresis platelet	108 (97.29)	03 (2.70)	111 (5.28)
Fresh frozen plasma	140 (46.82)	159 (53.17)	299 (14.24)
Cryoprecipitate	08 (100)	00	08 (0.38)
Whole blood	00	02 (100)	02 (0.09)
Total	1350 (64.32)	749 (35.68)	2099 (100)

use of blood and blood components is about 90%. Wade et al.,[21] considered 10% of transfusions to be inappropriate in their study, whereas a similar study by Bahadur et al.,[22] found 39% transfusions inappropriate.

In our study, cryoprecipitate (100%) and SDAP (97.29%) were the most appropriately used blood components. The most frequently inappropriately used blood component was WB (100%), although only two units were dispensed. In studies conducted by Gaur et al.,[23] and Giriyan et al.,[24] they showed that the majority of the blood transfused to patients was WB which was contrary to our study.

FFP and PC were inappropriately used in 53.17% and 37.61% of patients, respectively. This is consistent with the studies showing that FFP and PC are the most inappropriately used blood components.[18,20,25] Wade et al.,[21] also reported that FFP was the most inappropriately used blood component, followed by PRBC and platelets. WB is the source material for blood component preparation; it is rarely used nowadays for transfusion where a component separation facility is not available. Although fresh WB may be used to resuscitate severe traumatic hemorrhage when platelets are not available in a military setting.[26] Transfusions of PRBC were found to be inappropriate in patients with asymptomatic chronic anemia with Hb >7 g/dL. In many cases, a low Hb or hematocrit level is used to determine whether a transfusion of PRBC is necessary. However, the correct approach is to combine the laboratory criteria and the patient's symptoms. Recently, new evidence-based transfusion guidelines have been promoted to streamline blood use and reduce complications of transfusion.[27]

FFP was incorrectly administered in cases of bleeding without affecting coagulation tests. A drastic reduction in the use of WB has been reported to be the cause of the inappropriate use of FFP.[28] To establish the appropriate use of FFP, all requests must suffice with the indications for FFP as well as the patient's partial thromboplastin time/activated partial thromboplastin time and international normalized ratio.

Inappropriate use of platelets was observed in patients receiving platelets prophylactically, although there were no risk factors for bleeding with a platelet count above 10,000/μL. The use of prophylactic platelet transfusions to maintain platelet counts above 10×10^9/L is thought to be as effective in reducing the risk of bleeding as maintaining a level above any higher value.[29] However, in the presence of factors such as fever or infections, ongoing chemotherapy, concurrent coagulopathy, rapid decline in platelet count, or potential bleeding sites as a result of surgery, the use of platelet transfusions to maintain platelet counts above 20×10^9/L is clinically justified.[30]

Performing audits on how blood and its components are utilized is merely the first step towards improving and encouraging proper transfusion practices, as well as preventing the unnecessary use and waste of blood products. The impact and success of these audits will increase if physicians are made familiar with the outcome of these audits through continuing medical education, meetings of hospital transfusion committee, and grand rounds. The most significant anticipated advantages include a notable decrease in the use of blood components and the number of patients receiving transfusions for reasons not medically justified, among other benefits, which will also lead to a reduction in health-care costs.[31-33] By performing such audits on utilizations of blood components, the ultimate goal of promoting future safe and effective blood transfusion practice will be achieved.

Limitations of the study

This study has limitations because data were collected from blood components utilized in a single superspecialty, which represents only a subset of patients admitted to our tertiary care hospital. Nevertheless, the current study highlights the importance of the appropriate use of blood components in mutitransfed patients.

CONCLUSION

Blood and its components should be used most judiciously and only when definitely indicated. Regular review of the usage of blood components is very important to assess the blood utilization pattern. Proper implementation of guidelines for the use of various blood components would help reduce their inappropriateness. Not only does this ensure that the right blood components are available to patients in need, but it also reduces transfusion-related reactions, particularly in patients receiving multiple transfusions.

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Authors' Contributions:
RR- Prepared first draft of manuscript, literature survey, review manuscript; **MZQ-** Manuscript preparation and submission of article; literature survey, review manuscript, editing, and manuscript revision; **FAB-** Design of study, clinical protocol, data collection, data analysis; **RHM-** Definition of intellectual content, concept and design; **RR-** Literature survey, coordination and manuscript revision; **AAK-** Coordination and manuscript revision; **SAR-** Statistical analysis and interpretation; **KF-** Preparation of tables/figures.

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