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Original Article

Trends in Whole Blood and Blood Component Utilization: A Multicenter Study from Two Tertiary Care Hospitals in Lahore, Pakistan

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Abstract

Background: Efficient blood components utilization is essential for patient care and safety and resource optimization.

Objective: To analyze trends in blood and blood component practices in adult patients admitted to tertiary care hospitals in Lahore, in order to provide a pooled assessment of transfusion practices.

Methodology: This cross-sectional study was conducted using six-month (May to October, 2025) transfusion records from two major tertiary care hospitals in Lahore. Data of 8,624 transfusion units was taken from Lahore General Hospital (LGH) and 10,445 from Jinnah Hospital (JHL), totaling 19,069 units. It included patient demographics, clinical indication, blood component used, and departments that ordered the transfusions. Data was analyzed using SPSS 26.

Results: Males used 7,136 units, and females used 11,933 units, in ratio of 1:1.6. Around 37.2% units were issued to patients aged 21-30 years. The highest demand was from the Labor room / or Gynecology (24.4%) and Emergency departments (20.6%). Blood group distribution showed a predominance of B RhD+ (31.8%) followed by O RhD+ (30.1%). Most used components in order were Packed Red Blood Cells (PRBCs, 26.8%), Fresh Frozen Plasma (FFP, 12.7%), Platelets (7.9%), and a combination of PRBC + FFP (3.5%). Whole blood utilization was 31.2%. Leading indications for transfusion were Labor/childbirth (16.9%) and anemia (16.3%). Multiple transfusions were more common in females than in males.

Conclusion: This study found that young adults, particularly females, were the primary recipients of transfusion. Obstetrics/Gynecology and Emergency departments requested the most transfusions. Whole blood and PRBCs were the most utilized units, underscoring the need to optimize component therapy and implement patient blood management strategies.

Keywords: Blood utilization, transfusion practices, component therapy, tertiary care, fresh frozen plasma..

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Introduction

Blood transfusion remains a cornerstone of modern healthcare, playing a vital role in the management of trauma, surgical procedures, obstetric emergencies, malignancies, and hematologic disorders. Efficient utilization of blood and blood components is critical not only for improving patient outcomes but also for reducing wastage and ensuring the sustainability of blood bank resources. Recent literature emphasizes the importance of regular audits and evidence-based transfusion practices to optimize blood utilization and patient safety.¹

To minimize transfusion-related hazards and enable tailored restoration of missing blood elements, transfusion medicine has evolved globally toward

component treatment.² In many underdeveloped nations, improper transfusions, an excessive dependence on whole blood, and a lack of standardized transfusion protocols continue despite these developments.^{3,4} Blood is a precious resource, and countries like Pakistan are already suffering to maintain a voluntary blood donation chain. The main reasons include lack of awareness, blood donation related fears and myths, and inadequate access to donation sites.⁵ The necessity for standardized ways of blood usage is highlighted by recent multicenter studies that showed institutional variation in transfusion practices.^{6,7,8}

Although single-center audits yield useful data, they are not generalizable. A more thorough understanding of transfusion trends is provided by multicenter pooled analyses, which can aid in developing regional blood management plans. The purpose of this study was to assess the patterns of consumption of pooled blood and blood components in two major tertiary care hospitals in Lahore, Pakistan.

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Methodology

The present study was a descriptive cross-sectional study conducted at the transfusion medicine divisions of two public sector tertiary care hospitals, Lahore General Hospital (LGH) and Jinnah Hospital, Lahore (JHL). LGH is a 1600 bedded tertiary care hospital and JHL has 1500 patients' beds capacity. Both hospitals cater to a diverse spectrum of patients from Lahore and surrounding districts. The hospitals receive patients across all age groups and clinical categories, including, emergency, outpatient, inpatient, elective and critically ill cases. The hospitals have multiple major specialties and subspecialties, including Medicine and Allied specialties, Surgery and Allied specialties, Pediatrics, Obstetrics and Gynecology, Orthopedics, Plastic Surgery, Dermatology, Neurosciences, and other clinical departments. A total of 19,069 blood and blood component unit records were analyzed, issued over a six-month period from May to October, 2025. Through consecutive sampling, the study included inpatient transfusion records of patients aged 18–60 years who received whole blood or blood components, while records with incomplete data were excluded. Using a structured proforma, data were collected from blood bank issue registers and transfusion requisition forms, including patient demographics (age and sex), blood group, type of blood component issued, clinical indication, and requesting hospital department. The collected data were entered and analyzed using SPSS version 26. Descriptive statistics were summarized as frequencies and percentages.

The protocol of this study was approved by the institutional Ethical Review Committees of both hospitals, [IRB#00-58-A-2025, Lahore General Hospital] dated 25th July 2025 and [ERB173/9/21-10-2024/S1 ERB, Jinnah Hospital Lahore] dated 21st Oct, 2024. According to the hospitals' protocol, informed consent for such data utilization was obtained from patients/guardians at the time of submission of the requisition blood/blood components form in the blood bank.

Results

Females constituted the majority of transfusion recipients (11,933units, 61.9%), reflecting higher transfusion needs related to obstetric, gynecological, and anemia-related conditions. While male recipients used 7,136 units (38.1%). The highest utilization was observed in younger

adults aged 21–30 years (37.2%), followed by the 31–40 years age group (30.3%). Together, these two groups made up over 71% of total blood transfusions. The trend was similar in both hospitals. (Table I)

Table I: Age wise distribution of blood utilization

Age Group (years)	Units (LGH)	Units (JHL)	Total Units	(%)
21–30	4,091	3,006	7,097	37.2
31–40	3,349	2,440	5,789	30.3
41–50	1,120	1,440	2,560	13.4
51–60	1,076	2,547	3,623	19.0
Total	10,445	8,624	19,069	100

Labor Room and Gynecology departments accounted for the highest blood utilization (24.4%), followed by the Emergency Department (20.6%), with more at LGH than JHL. The high burden of head trauma cases being dealt with at LGH might have been a major cause. (Table II)

Table II: Department-wise blood utilization

Department	Units (LGH)	Units (JHL)	Total Units	(%)
Emergency	2004	1927	3,931	20.6
Obstetrics/Labor room	1231	1214	2,445	12.8
Gynecology department	1019	1194	2,213	11.6
CCU	-	864	864	4.53
Surgery	816	829	1,645	8.62
Oncology	-	823	823	4.31
Medicine	580	808	1,388	7.27
Orthopedic surgery	602	806	1,408	7.38
Intensive care units	681	795	1,476	7.74
Urology	501	778	1,279	6.70
ENT	215	407	622	3.26
Neurosurgery units	612	-	612	3.20
Pediatrics units	363	-	363	1.90
Total	8,624	10,445	19,069	100

B RhD positive (B+) and O Rh D positive (O+) blood groups were most frequently issued for transfusion purposes. (Figure 1)

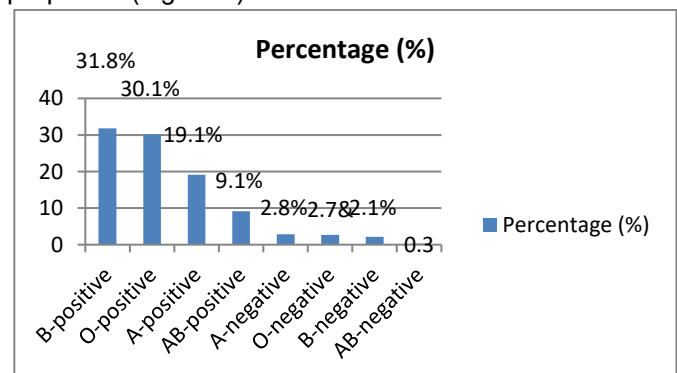


Figure 1. Blood group distribution among the issued blood products

Among the different units issued, Packed red blood cells (PRBCs) and FFP were most frequently used. High whole blood (WB) consumption trend was also observed. This fact highlights the unnecessary consumption of whole blood irrespective of the clinical indication and components availability. Most used components in order were Packed Red Blood Cells (PRBCs, 26.8%), Fresh Frozen Plasma (FFP, 13%), Platelets (8%) and a combination of PRBC + FFP (3.5%). (Figure 2).

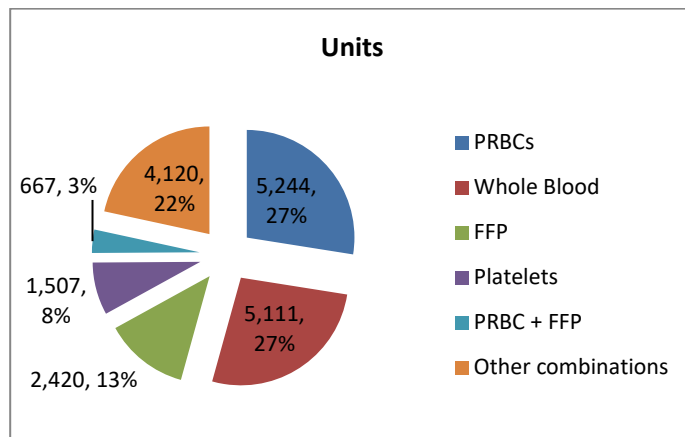


Figure 2. Consumption distribution of whole blood and blood components,

Labor/childbirth (16.9%) and anemia (16.3%) were the leading indications for transfusions with PRBCs and whole blood units being mostly used. Bleeding resulted in 10.7% transfusions with highest consumption of platelet concentrates (39.2%). A huge number (27.4%) of

FFP were transfused during childbirth, but the indications like purpureal bleed or DIC were not mentioned separately. While others included elective surgeries, cardiac, hepatic or hematological disorders and others. (Table III)

Discussion

Efficient blood utilization is essential for ensuring patient safety and sustainable management of limited blood resources. This multicenter study evaluated blood transfusion practices and identified major trends related to demographics, component usage and clinical indications. Females were the major consumers of the blood products consistent with other studies.^{9,10} Haseeb Khan S et al. have reported even higher consumption of 69% among females.¹¹ This drift was mainly attributed to gynecological and obstetrics conditions. In contrast, literature from developed countries report higher transfusion rates among males due to trauma and surgical interventions.¹² The strengthening of anemia prevention and community based reproductive health facilities may reduce transfusion burden among females..

The highest demand was found in the young age group of 21-40 years, reflecting the influence of reproductive health conditions and more surgical interventions in this cohort. Similar age-related blood transfusion trends have been reported by Amadi et al.¹³ Compared to broader age distributions reported in other studies, the younger peak observed in the present study suggests a greater

Table III: Clinical indications for blood transfusions.

Indications	FFP (%)	PLTs (%)	PRBCs/PCV (%)	Whole Blood (%)	Total (%)
Labor/Child birth	960 (27.4)	33 (1.0)	979 (15.2)	1260 (21.2)	3232 (16.9)
Anemia	325 (9.3)	330 (10.4)	1610 (25.0)	840 (14.1)	3105 (16.3)
Bleeding	383 (10.9)	1251 (39.2)	86 (1.3)	316 (5.3)	2036 (10.7)
Elective surgery	396 (11.3)	343 (10.8)	590 (9.2)	338 (5.7)	1667 (8.7)
Trauma	82 (2.3)	95 (3.0)	531 (8.2)	267 (4.5)	975 (5.1)
Massive Haematuria	288 (8.2)	-	150 (2.3)	489 (8.2)	927 (4.8)
Hepatic disorders	491 (14)	20 (0.6)	312 (4.8)	37 (0.6)	860 (4.5)
Cardiac Arrest	-	382 (12.0)	318 (4.9)	102 (1.7)	802 (4.2)
Post-Surgical Bleeding	181 (5.2)	9 (0.3)	566 (8.8)	35 (0.6)	791 (4.1)
Lymphoma	-	-	-	780 (13.1)	780 (4.1)
Myocardial Infarction	31 (0.9)	-	68 (1.0)	677 (11.3)	776 (4.1)
Temporal Bone Fracture	-	-	484 (7.5)	259 (4.3)	743 (3.9)
Leukemia	-	525 (16.5)	190 (2.9)	27 (0.4)	742 (3.9)
Kidney Disease	97 (2.8)	-	201 (3.1)	126 (2.1)	424 (2.2)
Road Traffic Accidents	27 (0.8)	20 (0.6)	345 (5.3)	341 (5.7)	733 (3.8)
DIC	243 (6.9)	152 (4.7)	-	-	395 (2.1)
Postpartum Hemorrhage	-	24 (0.8)	-	57 (0.9)	81 (0.4)
Total	3504 (100)	3184 (100)	6430 (100)	5951 (100)	19069 (100)

burden of transfusions among economically productive groups, effecting community at large. A study from England and North Wales reported median age of 60-years for maximum use of blood products.¹⁴

Red Blood Cell concentrates and Whole blood were the most commonly used blood products, aligning with findings from Altaf et al.⁹ However, the continued reliance on whole blood contrasts with practices in developed countries where component therapy dominates.^{12,14,15} The persistent demand of whole blood issuance was reported more from Gyne/Obs units not because of non-availability of blood components but mainly due to clinicians' preference. This indicates a need to promote judicious use of components through clinical team training and adherence to transfusion guidelines. The issue can be solved through frequent Hospital Transfusion committees' meetings and follow-up of implementation of necessary actions.

Fresh frozen plasma and Platelet concentrates' utilization was prominent in bleeding and hematological disorders. The review of request forms revealed that bleeding or diagnosis was mentioned but not the values of coagulation screening tests including PT and APTT. The relatively higher use of plasma compared to previous studies may depict variations in institutional practices or guideline observance, highlighting the importance of regular transfusion audits to prevent inappropriate use.^{14,15}

Emergency services, labour rooms and gynecology departments accounted for the highest blood and blood products consumption in our study. Similar demographic findings have been described in Pakistani, African and South Asian studies, where maternal health issues and undiagnosed and untreated anemia persist to be main contributors to transfusion demands^{11,16,17} These comparisons reinforce the importance of preventive public health interventions, early anemia screening, and antenatal optimization programs to reduce transfusion burden.

Recent studies increasingly emphasize the application of Patient Blood Management (PBM) programs as a crucial strategy to improve transfusion practices. The structured PBM protocols implementation has significantly reduced unnecessary transfusions, particularly PRBC and FFP use, without compromising patient outcomes.^{18,19} Compared with these reports, the relatively increased

utilization of whole blood units observed in the present study indicates that PBM implementation remains in a developing phase in under-resourced healthcare systems. Clinician education and hospital-based transfusion audit systems can prove beneficial. Similar observations were reported in multicenter audits from different parts of the world, where institutional variations, clinician preferences, and limited guideline enforcement contributed to continued dependence on whole blood transfusion.^{16,20}

Furthermore, recent literature has shown a global shift toward restrictive transfusion strategies supported by evidence from large observational cohorts and randomized trials.^{21,22,23,24} Study by Mehta N. et al have shown reduced transfusion rates following adoption of hemoglobin threshold based transfusion protocols and electronic decision-support systems.²⁵ In comparison, our study demonstrates sustained high demand driven largely by obstetric indications and anemia-related conditions, reflecting differences in disease burden and healthcare access between high-income and developing countries.

Limitations

- Both hospitals are located in the same metropolitan region and are public sector hospitals so, limiting national generalizability.
- Retrospective data analysis depended on record accuracy. The clinical indications of some of the components were not clearly mentioned particularly in cases where different types of components were required.
- The ER cases data could not be segregated into specific department cases.
- Transfusion outcomes were not evaluated.

Conclusion

This multicenter study demonstrates that blood utilization in tertiary care hospitals is predominantly driven by females and younger adults with Labor Room, Gynecology, and Emergency departments accounting for majority of transfusions sites. PRBCs and whole blood remains the most frequently used components. Strengthening patient blood management strategies, promoting component therapy, and conducting regular

multicenter audits are essential to optimize blood utilization and improve patient safety.

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