ORIGINAL ARTICLE

Monitoring Blood Utilization for Transfusion Services in a Tertiary Care Teaching Hospital: Evidence-Based Analysis

RE Ugandar[1], R Suresh[2], D Lakshmi[1], K Nandin[1], P Phaneendra[1], P Preethi[1]

[1]Department of Pharmacy Practice, Santhiram College of Pharmacy, Nandyal-518501. Andhra Pradesh, India.

[2]BloodCenter, Santhiram Medical College and General Hospital.Nandyal-518502.Andhra Pradesh, India.

CORRESPONDING AUTHOR

Dr RE Ugandar, Department of Pharmacy Practice, Santhiram College of Pharmacy, Nandyal-518112. Andhra Pradesh, India

Email: reugandar@gmail.com

CITATION

Ugandar RE, Suresh R, Lakshmi D, Nandini K, Phaneendra P, Preethi P. Monitoring Blood Utilization for Transfusion Services in a Tertiary Care Teaching Hospital: Evidence-Based Analysis. Journal of the Epidemiology Foundation of India. 2025;3(2):167-179.

DOI: https://doi.org/10.56450/JEFI.2025.v3i02.010

ARTICLE CYCLE

Received: 19/01/2025; Accepted: 14/06/2025; Published: 30/06/2025

ABSTRACT

Background: Blood transfusion services have to provide adequate, timely, safe blood and its components. With the aim of maximizing the use of this vital medical resource, there has been a significant evolution in the processes of clinical transference of blood and its components. **Objective**: To analyze the utility of whole blood and specific components, appropriateness and health outcomes related to use of these products. **Methods**: Pooled data from various inpatient departments in a tertiary care hospital during the period 2021–2024, which included six separate phases in all, five retrospective phases (Phase-1 to Phase-5) and one prospective phase (Phase-6), each phase with a duration of six months. **Results**: Revealed that female patients utilized 51.79% and male patients utilized about 48.21% of the total of 1504 blood transfused samples which included whole blood and separated components. Among all VI phases, the most utilised component was PRBC 67.75%, the moderately used component was FFP 10.70%, the low-used components were Whole blood and Platelets 5.38%, and the least utilized components were RDP 3.92%. **Conclusion**: All findings revealed that the utilization of the Whole Blood and Components was appropriate based on the diagnosis with indications and resulted in positive health outcomes among the patients.

KEYWORDS

Blood; PRBC; FFP; Platelets; RDP; SDP; Whole Blood

INTRODUCTION

Transfusion medicine has evolved significantly since the early 20th century, shifting from whole blood transfusions to the use of individual blood components. Centrifugation enables separation of red blood cells, plasma, and platelets based on their densities, allowing targeted therapy for conditions such as trauma, obstetric hemorrhage, and hematological disorders (1,2). Safety, sufficient supply and protection of the donor are the main priorities of modern transfusion, and the use of component therapy instead of whole blood is recommended in specific clinical cases (3). Components may be derived by centrifugation or apheresis where direct

harvesting of platelets or stem cells is an advantage and advanced therapy is feasible in haematologic tumors (4-7). To maintain biological activity and minimize bacterial growth, storage and processing is needed, and the proper use of red blood cells is required based on the condition of a patient, platelets for bleeding control, red blood cells to treat anemia, and plasma to treat coagulation disorders (8). Present usage emphasizes the physiological advantages of the component therapy, but the variability in the storage and hemolysis are the problems (9,10). Fresh Frozen Plasma (FFP) and cryoprecipitate are used in certain instances when factor concentrate is not available such as disseminated intravascular coagulation and hepatic failure (11). In this way, the rational use of components provides the best patient outcome and cost-effective use of donated blood.

Material & Methods

Study Type/Study Design: This was a mixed-methods study involving a retrospective and a prospective observational study design to examine transfusion practice in different phases. Previous transfusion history was reviewed on the retrospective arm and the incidents of the recent transfusion were noted on the prospective arm.

Study context: The research was carried out in a teaching tertiary care hospital, and data were collected at the Medical Records Department (MRD) and blood bank request forms.

Population of the study: The entire population encompassed all patients who received transfusion of whole blood, blood components, packed red blood cells (PRBC), fresh frozen plasma (FFP), platelets, random donor platelets (RDP), or single donor platelets (SDP), either as therapeutic or diagnostic.

Duration of the study: The retrospective analysis was done between January 2021 and June 2023 (Phase 1-5; six months each), and the prospective analysis was done between September 2023 and February 2024 (Phase 6). The total period of the research was six months.

Calculation of Sample Size: A total of 1,504 transfusion episodes were examined consisting of 1,126 retrospective records and 378 prospective cases.

Inclusion Criteria: Patients of all age groups (pediatrics to geriatrics).
Patients who received transfusions of whole blood or any separated component (PRBC, FFP, platelets, RDP, SDP).

Exclusion Criteria: Patients with incomplete transfusion records. Patients who did not consent for prospective data collection.

Strategy for Data Collection: Data were systematically extracted from MRD files and transfusion request forms. The information captured included: Patient demographics (age, gender, inpatient number).Department of admission and clinical diagnosis. Chief complaints, date of admission, and date of transfusion. Type and number of blood units transfused. Indications for transfusion.
Transfusion-related issues (TRIs).

Working Definition: For this study, a transfusion episode was defined as the administration of whole blood or any blood component (PRBC, FFP, platelets, RDP, or SDP) prescribed and recorded for a single patient encounter.

Ethical Issues & Informed Consent: Approval was obtained from the Institutional Ethics Committee (IEC) prior to initiation. Retrospective data were collected from hospital records without direct patient involvement. Written informed consent was obtained from participants in the prospective phase.

Data Analysis – Software: Data were entered into a structured database and analyzed using SPSS (Statistical Package for the Social Sciences), version 25. Descriptive statistics summarized patient demographics and transfusion patterns, while inferential tests compared retrospective and prospective trends.

RESULTS & DISCUSSION

Table 1 Total number of Transfusion events and Number of Transfused Units (Retrospective and Prospective Data)

Phase	Duration	No.of Transfusions	No.of Units
Phase-1	Jan 2021 To Jun 2021	112	235
Phase-2	Jul 2021 To Dec 2021	417	686
Phase-3	Jan 2022 To Jun 2022	177	281
Phase-4	Jul 2022 To Dec 2022	250	356
Phase-5	Jan 2023 To Jun 2023	170	321
Phase-6	Sep 2023 To Feb 2023	380	741
Total		1506	2620

Figure 1 Total number of Transfusion events and Number of Transfused Units (Phase-1 to Phase-6 of Retrospective and Prospective Data)

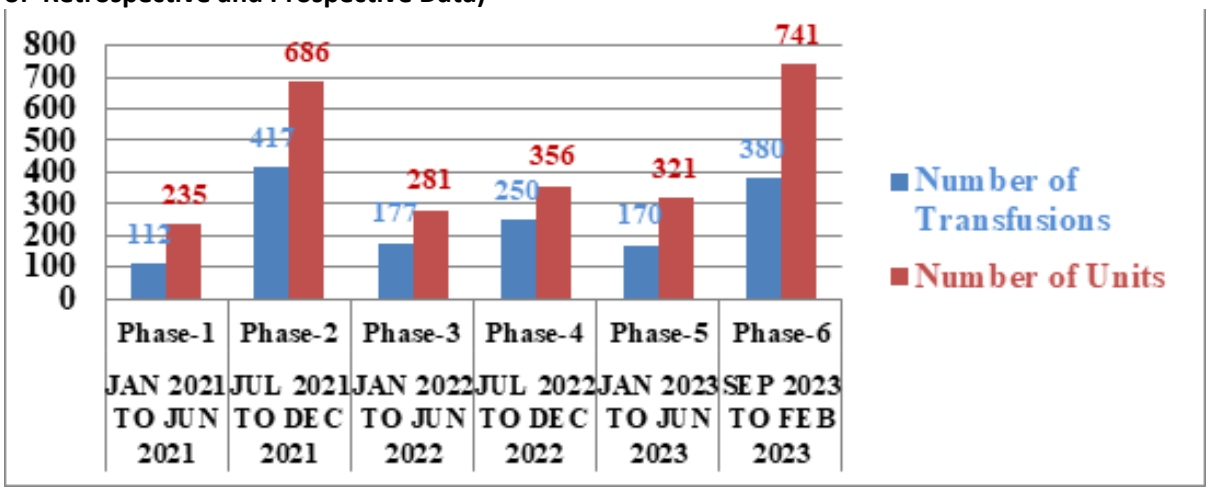


Table 2 Comparison of Gender and Age specific utilization of Whole Blood and Components of Phase-1 Retrospective Data with Phase-6 Prospective Data

Age group	Gender		Phase-1. Type & No.of Whole Blood and Component Units Transfused (Retrospective)						
	M	**F**	**WB**	**PRBC**	**FFP**	**Platelets**	**RDP**	**SDP**	**TRIs**
Paediatrics (0-14Y)	1	2	0	0	0	2	0	1	0
Youth (15-47Y)	27	26	12	44	26	17	0	2	0
Middle age (48-63Y)	18	6	13	12	16	10	10	1	0
Elderly (≥ 64 Y)	16	16	16	18	20	11	4	0	0
TOTAL (235)	62	50	41	74	62	40	14	4	0
Age group	**Gender**		**Phase-6. Type & Number of Whole Blood and Components Transfused (Prospective)**						
	M	**F**	**WB**	**PRBC**	**FFP**	**Platelets**	**RDP**	**SDP**	**TRIs**
Paediatrics (0-14Y)	5	4	0	5	10	1	0	0	0
Youth (15-47Y)	69	115	12	188	106	6	13	0	0
Middle age (48-63Y)	60	49	40	105	80	25	17	0	0
Elderly (>64Y)	53	25	12	76	36	8	1	0	0
TOTAL (741)	187	193	64	374	232	40	31	0	0

Figure 2 Comparison of Gender and Age specific usage of Whole Blood and Components of Phase-1 Retrospective Data with Phase-6 Prospective Data

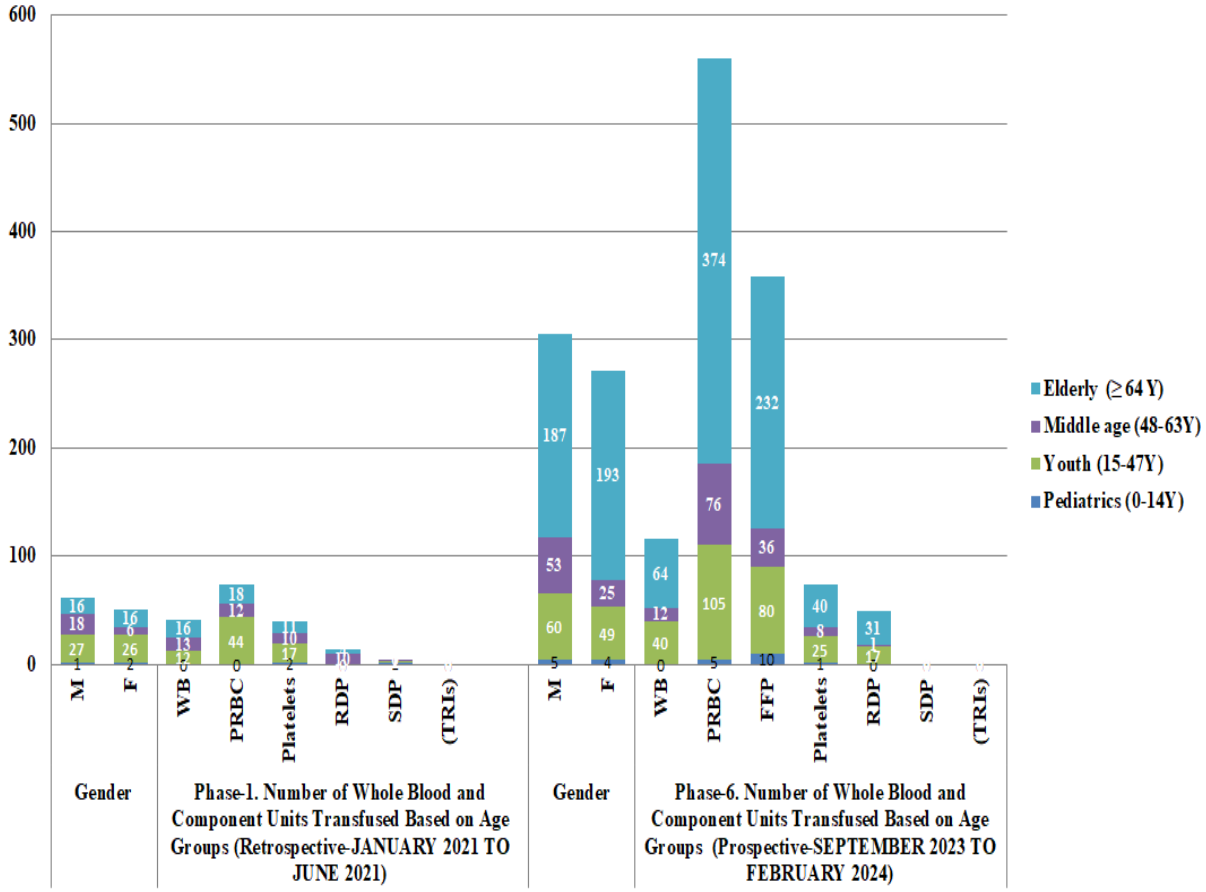


Table 3 Comparison of Gender and Age specific utilization of Whole Blood and Components of Phase-2 Retrospective Data with Phase-6 Prospective Data

Age group	Gender		Phase-2. Type & No.of Whole Blood and Component Units Transfused (Retrospective)						
	M	F	WB	PRBC	FFP	Platelets	RDP	SDP	TRIs
Paediatrics (0-14Y)	17	15	1	7	2	1	8	18	0
Youth (15-47Y)	80	140	34	171	29	56	15	15	0
Middle age (48-63Y)	59	36	53	82	34	20	4	1	0
Elderly (≥ 64 Y)	47	23	16	59	30	6	14	2	0
TOTAL (235)	203	214	104	319	95	91	41	36	0
Age group	**Gender**		**Phase-6. Type & Number of Whole Blood and Components Transfused (Prospective)**						
	M	F	WB	PRBC	FFP	Platelets	RDP	SDP	TRIs
Paediatrics (0-14Y)	5	4	0	5	10	1	0	0	0
Youth (15-47Y)	69	115	12	188	106	6	13	0	0
Middle age (48-63Y)	60	49	40	105	80	25	17	0	0
Elderly (>64Y)	53	25	12	76	36	8	1	0	0
TOTAL (741)	187	193	64	374	232	40	31	0	0

Figure 3 Comparison of Gender and Age specific utilization of Whole Blood and Components of Phase-2 Retrospective Data with Phase-6 Prospective Data

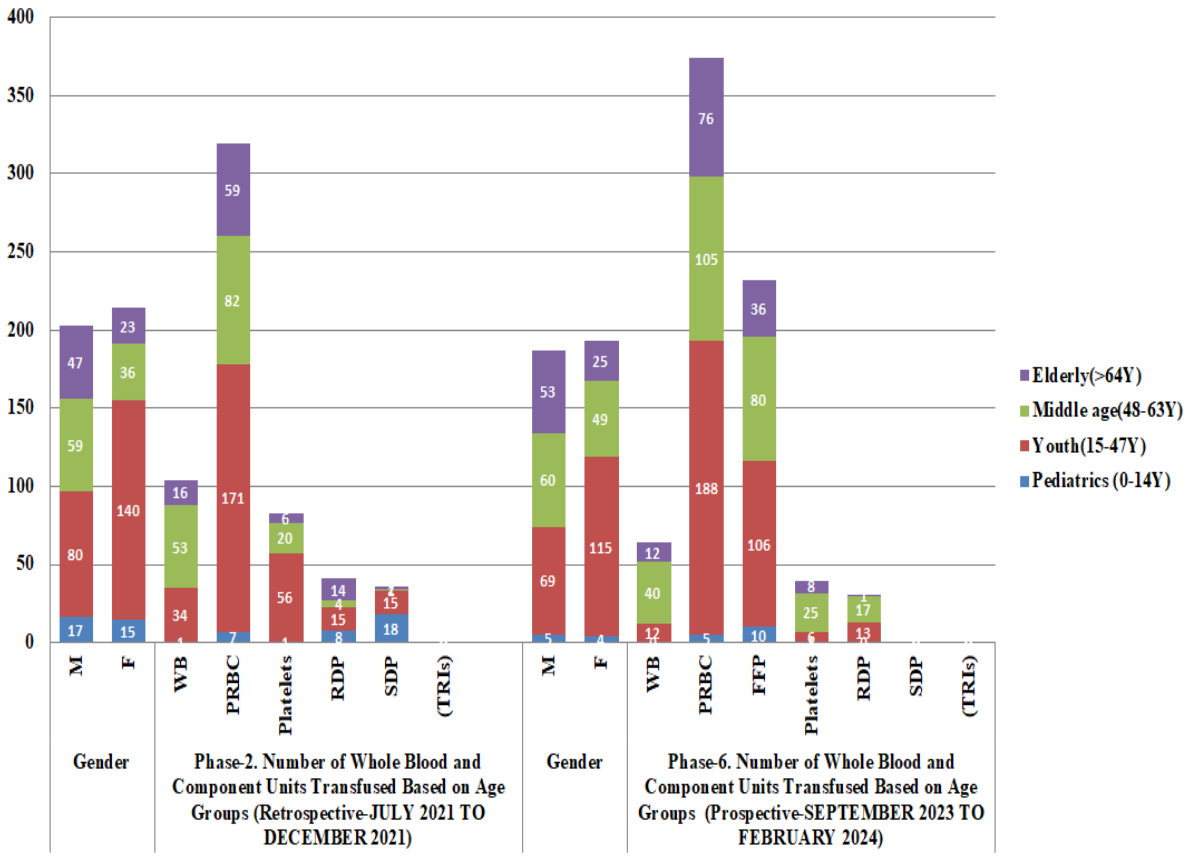


Table 4 Comparison of Gender and Age specific utilization of Whole Blood and Components of Phase-3 Retrospective Data with Phase-6 Prospective Data

Age group	Gender		Phase-3. Type & No.of Whole Blood and Component Units Transfused (Retrospective)						
	M	F	WB	PRBC	FFP	Platelets	RDP	SDP	TRIs
Paediatrics (0-14Y)	3	2	0	6	0	1	0	0	0
Youth (15-47Y)	42	56	16	95	15	7	20	0	0
Middle age (48-63Y)	30	17	12	35	19	4	4	3	0
Elderly (≥ 64 Y)	13	14	3	24	12	2	2	1	0
TOTAL (235)	88	89	31	160	46	14	26	4	0
Age group	**Gender**		**Phase-6. Type & Number of Whole Blood and Components Transfused (Prospective)**						
	M	F	WB	PRBC	FFP	Platelets	RDP	SDP	TRIs
Paediatrics (0-14Y)	5	4	0	5	10	1	0	0	0
Youth (15-47Y)	69	115	12	188	106	6	13	0	0
Middle age (48-63Y)	60	49	40	105	80	25	17	0	0
Elderly (>64Y)	53	25	12	76	36	8	1	0	0
TOTAL (741)	187	193	64	374	232	40	31	0	0

Figure 4 Comparison of Gender and Age specific utilization of Whole Blood and Components of Phase-3 Retrospective Data with Phase-6 Prospective Data

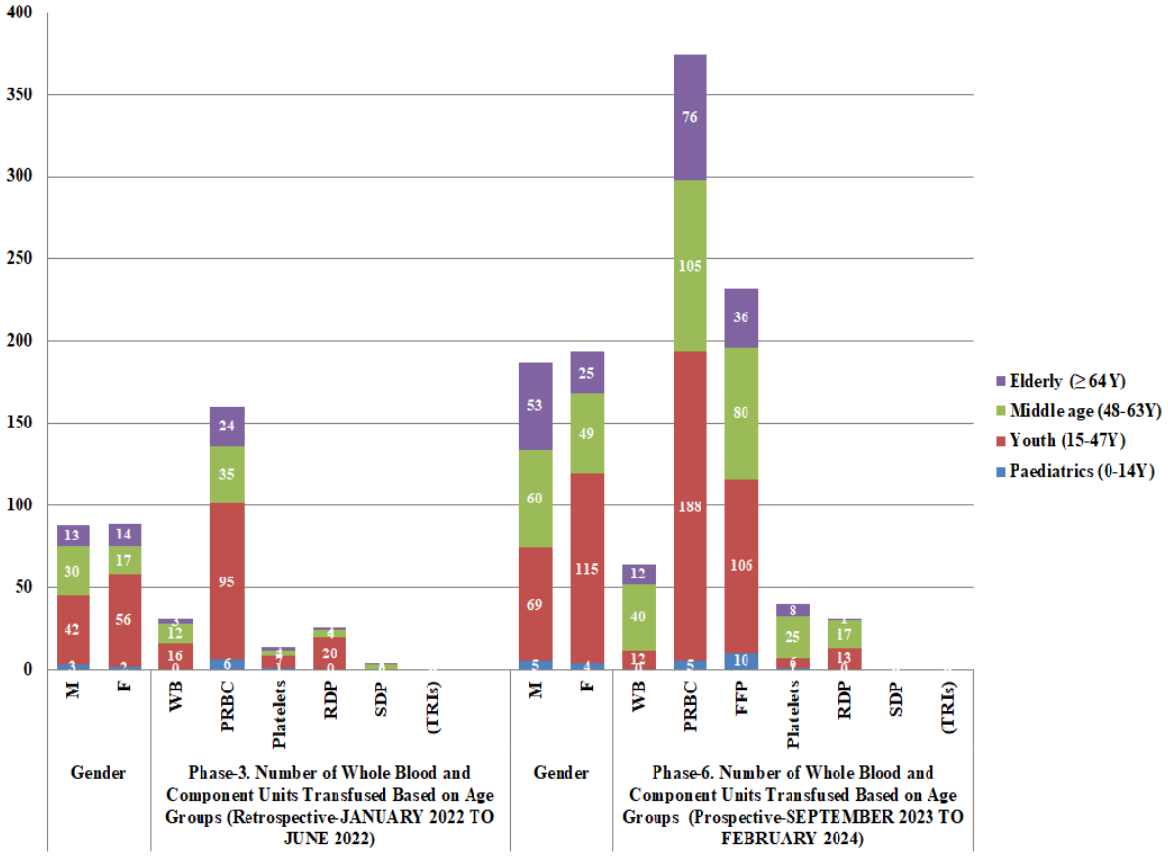


Table 5 Comparison of Gender and Age specific utilization of Whole Blood and Components of Phase-4 Retrospective Data with Phase-6 Prospective Data

Age group	Gender		Phase-4. Type & Number of Whole Blood and Component Units Transfused (Retrospective)						
	M	F	WB	PRBC	FFP	Platelets	RDP	SDP	TRIs
Paediatrics (0-14Y)	1	3	0	2	0	1	0	1	0
Youth (15-47Y)	47	115	7	171	20	6	13	0	0
Middle age (48-63Y)	30	19	13	54	12	0	7	4	0
Elderly (≥ 64 Y)	15	20	2	41	1	1	0	0	0
TOTAL (235)									

Age group	Gender		Phase-6. Type & Number of Whole Blood and Components Transfused (Prospective)						
	M	F	WB	PRBC	FFP	Platelets	RDP	SDP	TRIs
Paediatrics (0-14Y)	5	4	0	5	10	1	0	0	0
Youth (15-47Y)	69	115	12	188	106	6	13	0	0
Middle age (48-63Y)	60	49	40	105	80	25	17	0	0
Elderly (>64Y)	53	25	12	76	36	8	1	0	0
TOTAL (741)	187	193	64	374	232	40	31	0	0

Figure 5 Compares the usage of whole blood and blood components between different age groups and genders in retrospective and prospective data collection of Phase-4 and Phase-6.

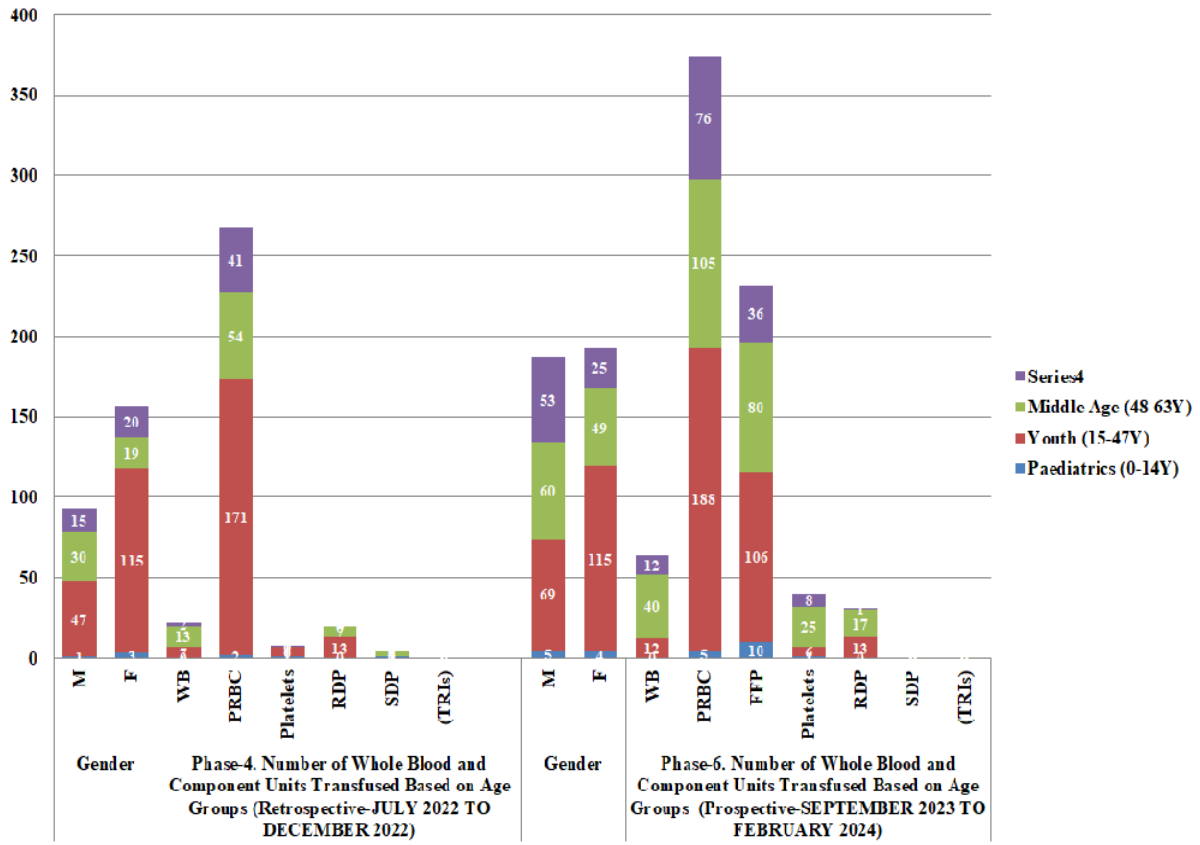


Table 6 Comparison of Gender and Age specific utilization of Whole Blood and Components of Phase-5 Retrospective Data with Phase-6 Prospective Data

Age group	Gender		Phase-5. Type & N0.of Whole Blood and Component Units Transfused (Retrospective)						
	M	F	WB	PRBC	FFP	Platelets	RDP	SDP	TRIs
Paediatrics (0-14Y)	4	3	2	4	0	1	0	0	0
Youth (15-47Y)	27	46	3	77	19	2	10	1	0
Middle age (48-63Y)	31	20	21	44	26	13	0	0	0
Elderly (≥ 64 Y)	32	7	13	35	35	14	1	0	0
TOTAL (235)	94	76	39	160	80	30	11	1	0
Age group	**Gender**		**Phase-6. Type & Number of Whole Blood and Components Transfused (Prospective)**						
	M	F	WB	PRBC	FFP	Platelets	RDP	SDP	TRIs
Paediatrics (0-14Y)	5	4	0	5	10	1	0	0	0
Youth (15-47Y)	69	115	12	188	106	6	13	0	0
Middle age (48-63Y)	60	49	40	105	80	25	17	0	0
Elderly (>64Y)	53	25	12	76	36	8	1	0	0
TOTAL (741)	187	193	64	374	232	40	31	0	0

Figure 6 Presents a comparison of the blood component transfusions across different age groups and genders in a hospital for the duration of Phase-5 and Phase-6.

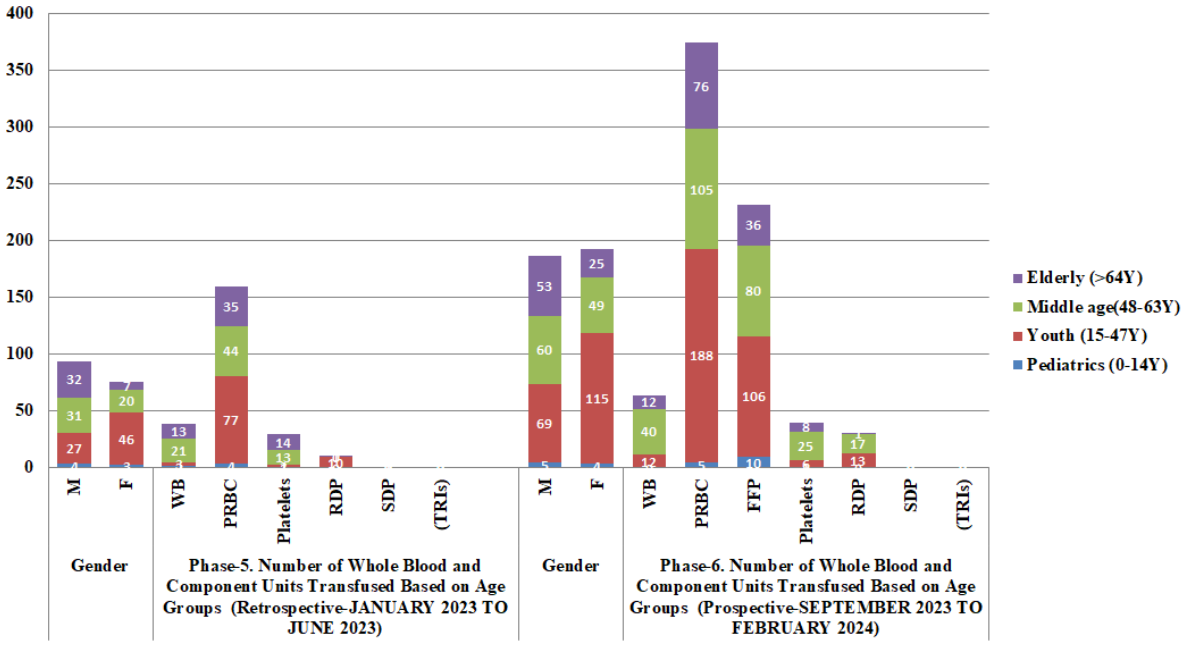


Table 7 Comparison of the Percentage of Transmissions and Components at various Super Specialty Departments of the Hospital

Department	Retrospective		Prospective	
	Transfusions	Percentage	Transfusions	Percentage
General Medicine	210	18.60%	64	16.93%
Orthopedics	161	14.30%	42	11.11%
OBG	143	12.70%	46	12.16%
General surgery	101	8.96%	0	0
C3 ward	83	7.37%	33	8.73%
Gynecology	70	6.21%	7	1.85%
SS ward	50	4.44%	34	8.99%
CTVS	47	4.17%	8	2.11%
CCM	44	3.90%	40	10.58%
PICU	37	3.28%	0	0
SICU	33	2.70%	20	5.29%
Emergency	24	2.13%	11	2.91%
Pulmonology	24	2.13%	6	1.58%
Nephrology	17	1.50%	19	5.02%
ICU	15	1.33%	4	1.05%
Nephrology-ICU	13	1.15%	5	1.32%
Gastroenterology	11	0.97%	9	2.38%
NICU	10	0.88%	8	2.11%
CICU	8	0.70%	2	0.53%
Dialysis ICU	8	0.71%	0	0
POW	6	0.53%	2	0.53%
Pediatrics	3	0.26%	1	0.26%
Neurology	2	0.17%	5	1.32%
Dialysis	1	0.08%	0	0
ENT	1	0.08%	0	0
ICCU	1	0.08%	0	0
Neurosurgery	1	0.08%	1	0.26%
Ophthalmology	1	0.08%	0	0
Cardiology	1	0.08%	3	0.79%

Figure 7 Comparison of the Percentage of Transmissions and Components at various Super specialty Departments of the Hospital

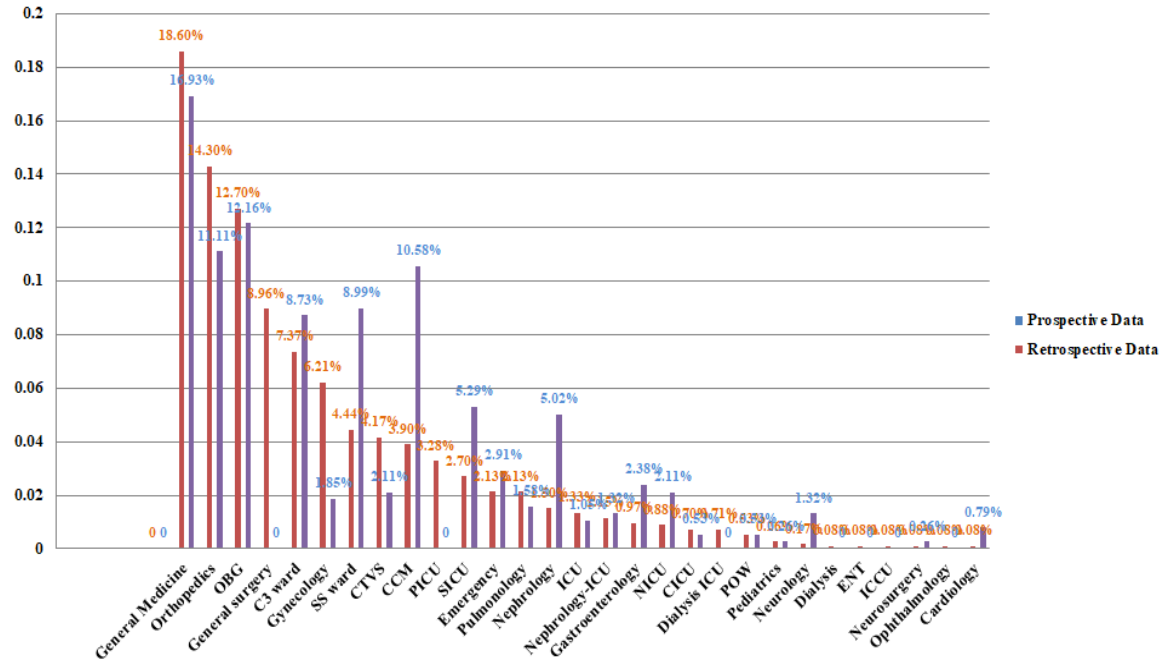


Table 8 Comparison of Transfusion episodes and Units Transfused among Retrospective with Prospective Data

Phase	Duration	No.of Transfusions	No.of Units
Phase-1	**Jan 2021 To Jun 2021**	112	235
Phase-2	**Jul 2021 To Dec 2021**	417	686
Phase-3	**Jan 2022 To Jun 2022**	177	281
Phase-4	**Jul 2022 To Dec 2022**	250	356
Phase-5	**Jan 2023 To Jun 2023**	170	321
Phase-6	**Sep 2023 To Feb 2023**	380	741
Total		1506	2620

Figure 8 Comparison of Total Number of Transfusions and Units Transfused between Retrospective versus Prospective Data

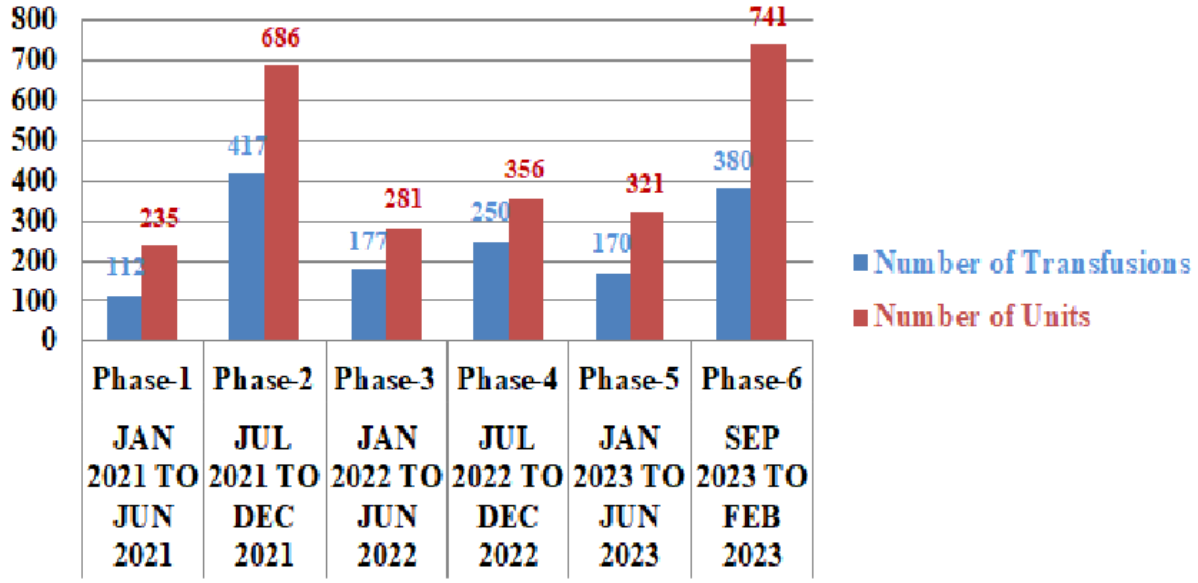
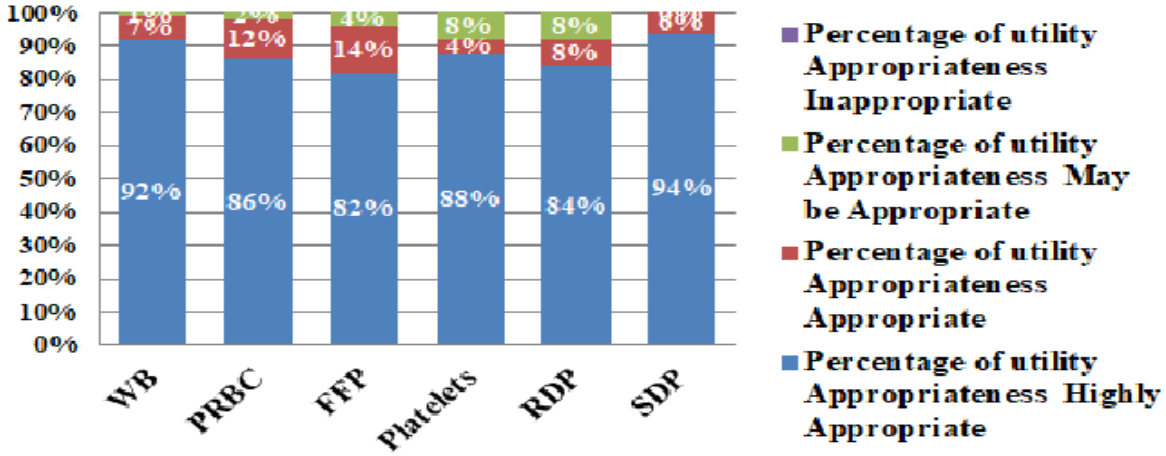


Table 9 Percentage of utility Appropriateness of Whole blood and Components

Components	Highly Appropriate	Appropriate	May be Appropriate	Inappropriate	Highly Inappropriate
WB	92%	7%	1%	0%	0%
PRBC	86%	12%	2%	0%	0%
FFP	82%	14%	4%	0%	0%
Platelets	88%	4%	8%	0%	0%
RDP	84%	8%	8%	0%	0%
SDP	94%	6%	0%	0%	0%

Figure 9 Percentage utility Appropriateness of Whole blood and Components



Overall volume (Phases 1–6): Across six phases, transfusion activity rose to a peak in Phase 6 (Tables 1 & 8; Figure 1/8). Phase 6 contributed roughly one-quarter of all episodes and over one-quarter of all units, indicating higher intensity of support per patient encounter. Mean units per episode varied by phase (approx. 1.4–2.1), dipping in mid-phases and increasing again in Phase 6, consistent with a sicker case-mix or protocolized resuscitation.

Component mix across time: There was a significant change in component utilization with PRBCs as the study progressed. The PRBC proportion of all units grew by about 19 percentage points in Phase 1 through Phase 6, whereas whole blood and platelet (pooled) proportions fell; FFP grew by a small margin. In more recent times, the use of single-donor platelets was very limited (Table 2-6). These changes are consistent with more recent use of component therapy instead of whole blood and specific therapy of anemia/coagulopathy.

Age–Gender distribution: The 15–47year group consistently accounted for the largest component use across phases (Tables 2–6; Figure 2–6). Gender distribution varied by period: Phase 1 showed a mild male predominance, whereas several subsequent phases, including Phase 6, showed a female predominance in total transfused patients. This pattern is compatible with service mix (e.g., obstetric/gynaecologic and surgical indications) and evolving referral streams.

Departmental contribution: General Medicine remained the leading contributor in both retrospective and prospective periods, with Orthopaedics and OBG also prominent (Table 7; Figure 7). Prospectively, critical care areas (e.g., CCM, SICU) increased their proportional share, suggesting greater reliance on protocol-driven transfusion in higher-acuity settings. Some departments recorded little to no prospective activity (e.g., General Surgery, PICU, Dialysis ICU), likely reflecting temporal service changes rather than true absence of need.

Transfusion-related issues (TRIs): Recorded TRIs were uncommon overall and absent in the prospective phase; only isolated events appeared in one retrospective phase (Table 2–6).

This low signal supports effective haemovigilance and screening processes but

should be interpreted with caution given possible under-reporting.

Appropriateness of use: Appropriateness assessments showed the vast majority of transfusions classified as highly appropriate or appropriate across all components (Table 9; Figure 9).

Whole blood and SDP exhibited the highest "highly appropriate" proportions, with no categories rated as inappropriate in this dataset. Together with low TRI rates, these findings indicate generally judicious, guideline-concordant use.

Interpretation and implications: Rising PRBC intensity likely reflects higher anemia/hemorrhage burden, greater surgical/trauma throughput, or adoption of restrictive thresholds with targeted correction when given. Declining whole blood/pooled platelet proportions are consistent with maturation of component therapy and inventory stewardship. Departmental shift toward critical care underscores the need for sustained stock resilience (PRBC and FFP) and rapid cross-match pathways. Demographic patterns (youth predominance; shifting sex balance) suggest service-level drivers (e.g., OBG, ortho/trauma) and warrant periodic re-alignment of component forecasts.

Strengths and limitations: Single-centre design and reliance on record completeness may introduce classification or capture bias. Minor discrepancies between departmental sums and period totals likely reflect timing or documentation gaps. The percentages of adjudicated indications summarize the data of the whole dataset and do not necessarily reflect the composition of a single phase. The study period, practice of transfusion in this centre changed to greater PRBC intensity, slight increase in FFP transfusion, and decreased whole blood and pooled platelet dependent services, with the activity becoming concentrated in General Medicine and critical care services. Maximisation of low TRI and high appropriateness with safe and directed use can be further enhanced with stock planning and prevention of non-adherence to guidelines by continuing to audit the high-use units and youth-age indications.

CONCLUSION

This research achieved its aims by measuring the activity of phase-wise transfusion, identifying a comparison between a retrospective and prospective practice, describing age-gender and departmental trends, and evaluating the correct and safe signals. Use changed to red-cell components that were used steadily and congruently across services; the highest proportion of component support was in the 15-47-year group, and the highest demand was in the General Medicine and critical-care areas. The overwhelming pattern of appropriateness adjudication was highly appropriate/appropriate, with very low transfusion-related issues recorded, which is consistent with current restrictive transfusion practices and patient blood management guidelines. The paper contributes for the first time to the body of literature with granular, phase-resolved data of a tertiary-care environment indicating a mature transition to component therapy, rising red-cell intensity, and escalating critical-care demand. These empirics encourage inventory prediction (PRBC and FFP in particular), focused haemovigilance, and reinforcement of protocols on a case-by-case basis. These coincide with the current directions that promote limited volumes of RBC transfusion (usual 7-8 g/dL) and scheduled audit to reconcile the transfusion practice. Recent AABB guidelines and randomised-evidence syntheses support restrictive RBC triggers without any undue short-term mortality, whereas specialty guidelines support sensible platelet and plasma utilisation within patient blood management systems; WHO reporting has highlighted the system-level importance of auditing utilisation and safety. Our results reflect these trends in practice.

RECOMMENDATION

The study recommendations are based on the development of a safer, leaner, and more equitable transfusion system. The most important measures are to put in place a hospital-wide Patient Blood Management program with quarterly audits; to standardize indication-based order sets and single unit- then reassess policy; and to reinforce high-

acuity pathways through massive transfusion protocols, rapid crossmatch, and bedside checklists. Pre-operative and antenatal anaemia clinics should screen and correct iron deficiency before elective procedures. Inventory resilience is prioritized through data-driven forecasting (especially PRBC/FFP), O-negative stewardship, platelet outdate reduction, and strict cold-chain monitoring. Haemovigilance is enhanced by universal, simple reaction reporting, rapid case reviews, and routine safety drills. Digital decision support embedded in the EMR and real-time dashboards guide appropriate use. Department-specific reviews (General Medicine, critical care, OBG, trauma/orthopedics) align practice with thresholds. Donor stewardship, community engagement, and rare-donor lists protect supply. Ongoing clinician education and patient information materials sustain culture change, while hub-and-spoke networking improves regional equity. Measurable KPIs (appropriateness ≥90%, falling TRI rate, better C/T ratios, lower wastage, ≥80% reassessment after single-unit PRBC, rising anaemia-optimization coverage) ensure accountability and continuous improvement.

LIMITATION OF THE STUDY

Limitations. Single-centre scope and partial retrospective capture may introduce documentation bias; case-mix, haemoglobin triggers, bleeding severity, and coagulopathy indices were not uniformly available for risk adjustment; appropriateness criteria were locally operationalized and may not generalize; and the prospective window was relatively short. Future work should incorporate standardized trigger documentation, outcome tracking (e.g., 30-day morbidity/mortality), and multi-centre benchmarking against national comparative audits. Transfusion practice at this centre is largely appropriate, increasingly component-focused, and concentrated in high-acuity departments; periodic audit against contemporary thresholds and service demand should continue to guide safe, efficient blood-stock management.

RELEVANCE OF THE STUDY

This study provides phase-resolved, time-series evidence, spanning retrospective and prospective periods, that distinguishes true shifts in transfusion practice from short-term variability. It reports a mature shift to component therapy, increased PRBC and reduced FFP utilization and reduced dependence on whole blood and pooled platelets, which directly feed into inventory planning and thresholds. Demographic indicators (preponderance of 15-47 years and phase-specific sex distributions) are transformed into preoperative and antenatal anaemia optimization and trauma/orthopedic preparedness actionable priorities. The General Medicine and critical-care service sustained demand are demonstrated in department-level mapping and inform targeted stock allocation and point-of-care support. Low recorded transfusion-related issues alongside high appropriateness rates establish a local benchmark and a practical suite of stewardship KPIs for dashboards and feedback cycles. The dataset also strengthens supply-chain resilience planning (e.g., O-negative stewardship, platelet outdate reduction, hub-and-spoke redistribution) and defines a clear agenda for future multicentre benchmarking with standardized triggers, case-mix adjustment, and outcome linkage.

AUTHORS CONTRIBUTION

REU: Conceptualization and methodology; IEC/ethics coordination; supervision and project administration; formal analysis and interpretation; critical revision of the manuscript; guarantor of data integrity and overall content. RS: Methodology input; provision of resources and data access (MRD and blood bank); oversight of data curation; ethics documentation; critical review and editing. DL: Data curation and case verification; preparation of tables; contribution to the original draft. KN: Data curation; formal analysis; figure preparation/visualization; contribution to the original draft. PP: Database construction and data management; data curation; contribution to the original draft. PP: Investigation and case verification; figure preparation/visualization; manuscript review

and editing. The views expressed are those of the authors and do not necessarily represent the official policies of the affiliated institutions. All authors made substantial contributions, approved the final manuscript, and accept responsibility for the accuracy and integrity of the work.

Financial Support and Sponsorship

Nil

Conflict of Interest

There are no conflicts of interest.

Acknowledgement

The authors gratefully acknowledge the Institutional Ethics Committee and the leadership of Santhiram College of Pharmacy, Nandyal, and Santhiram Medical College & General Hospital, Nandyal, for their guidance and oversight. We thank the teams of the Medical Records Department and the Blood Center for timely access to records, meticulous verification of transfusion requests, and support during data abstraction. We are indebted to the clinicians, nursing staff, and coordinators across participating departments, particularly General Medicine, Orthopedics, Obstetrics & Gynecology, Critical Care Medicine, SICU, and Emergency Services, for their cooperation throughout the study period. Our sincere thanks extend to the pharmacy practice faculty and student volunteers for assistance with data curation, database management, and internal quality checks. We express our deepest gratitude to the patients and their families, whose anonymized clinical data made this audit possible, and to the blood donors whose contributions sustain essential transfusion services.

Declaration Of Generative AI And AI Assisted Technologies In The Writing Process

During the preparation of this work, the authors did not used any AI or AI assisted tools in the writing process. The authors take full responsibility for the content of the publication.

References

1. Babu RS, Reddy PR, Janaki M. Retrospective analysis of fresh frozen plasma component separation and its impact on inventory after implementation at our blood center. Asian J Transfus Sci. 2019;13(Suppl 1):S9–S17.
2. Basu D, Kulkarni R. Overview of blood components and their preparation. Indian J Anaesth. 2014 Sep;58(5):529–37. https://doi.org/10.4103/0019-5049.144647.
3. Begum F, Samalla S, Ali MI, Lavanya M. A study of utilisation of blood and blood components at a tertiary care centre—5 years study. Int J Pharm Clin Res. 2022;14(8):1043–50.
4. Ai J. Take a spin: Apheresis in the care of adult leukaemia patients. Best Pract Res Clin Haematol. 2023;36(1):101467. https://doi.org/10.1016/j.beha.2023.101467.
5. Melville D, Paul F, Roath S. High-gradient magnetic separation of red cells from whole blood. IEEE Trans Magn. 1975 Nov;11(6):1701–4.
6. Ai J. Take a spin: Apheresis in the care of adult leukaemia patients. Best Pract Res Clin Haematol. 2023;36(1):101467. https://doi.org/10.1016/j.beha.2023.101467.
7. Swarup D, Dhot PS, Arora S. Study of single donor platelet (SDP) preparation by Baxter CS 3000 plus and Haemonetics MCS plus. Med J Armed Forces India. 2009 Apr;65(2):137–40. https://doi.org/10.1016/S0377-1237(09)80127-5.
8. Andreu G. Du bon usage des produits sanguins. Presse Med. 2015 Feb;44(2):165–77. Epub 2014 Dec 24. French. https://doi.org/10.1016/j.lpm.2014.10.020. PMID:25542709.
9. Malkin M, Nevo A, Brundage SI, Schreiber M. Effectiveness and safety of whole blood compared to balanced blood components in the resuscitation of hemorrhaging trauma patients: a systematic review. Injury. 2021 Feb;52(2):182–8. https://doi.org/10.1016/j.injury.2020.10.095.
10. Sparrow RL. Red blood cell components: time to revisit the sources of variability. Blood Transfus. 2017 Mar;15(2):116–25. https://doi.org/10.2450/2017.0326-16.
11. Koju S, Karmarcharya RM, Makaju R. Pattern of blood component utilization in tertiary care hospital of central Nepal. Kathmandu Univ Med J (KUMJ). 2019;17(65):20–4. PMID:31734673.
12. Motta M, Del Vecchio A, Radicioni M. Clinical use of fresh-frozen plasma and cryoprecipitate in the neonatal intensive care unit. J Matern Fetal Neonatal Med. 2011 Oct;24 Suppl 1:129–31. https://doi.org/10.3109/14767058.2011.607677.