

Categorization of the Inevitable Causes of Blood and Components Wastage Detected in South Indian Urban Blood Centre

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ABSTRACT

Background: Since there is no artificial substitute for human blood, it plays a vital role in the patient management in this era of modern medicine. Therefore the donated blood from a healthy donor is precious and must not be wasted without proper utilization. Blood wastage is a universal phenomenon which needs a careful approach with strict guidelines. The study aims at categorizing the various inevitable causes of wastage with an attempt to determine ways of preventing the loss due to non-utilization.

Materials and Methods: A retrospective – cross sectional study was conducted in a newly started Stand-alone Blood Centre in South Indian Urban city between June, 2022 and June 2024. All the components including Whole Blood (WB), Packed Red Blood Cell Concentrate (PRBC), Platelet concentrate (PC) and Fresh Frozen Plasma (FFP) were included in the study. The reasons for blood and component wastage was noted down from the various Registers of the Blood Centre and all the data was analyzed using Microsoft Excel Spread Sheet.

Results: A total of 2456 units of blood were collected. 5284 components were prepared from these which includes 42 units of Whole Blood, 2397 Packed Red Blood cells (PRBC), 2393 Fresh frozen Plasma (FFP), 452 Platelet Concentrate (PC). Overall discard rate was found to be 11.90%. PC discard rate was highest (49.34%) followed by WBU (19.04%), PRBC (13.01%) AND FFP (3.59%). The commonest cause for the discarding was expiry of the shelf life of blood bags (74.72%) followed by damaged bags (9.69%) and TTI's (6.76%).

Conclusion: Blood and its components wastage is an inevitable reality which needs to be approached as upmost priority. Zero wastage of blood and components may be targeted by recommendations like appropriate training of the blood bank staff, keeping negative group donors on reserve, strictly following FIFO policy while dispensing blood, whole blood unit collection may be minimized, encouraging Single Donor Platelets (SDP) by apheresis instead of Random Donor Platelets (RDP) preparation, Blood Utilization Committee to be made mandatory and permission for reciprocal sharing of blood components among blood banks.

Keywords: Blood wastage, Discard rate, Blood and Components, Whole Blood, Platelet Concentrate, PRBC, FFP, TTI.

INTRODUCTION

Human blood collected from healthy donor, if not utilized will have to be discarded due to various reasons. This discarded whole blood or blood components is considered as wastage. Whole blood and all

components prepared from human blood are considered as drug under section 3(b) of the drugs and cosmetics Act 1940 in India ^[1]. As of now there is no artificial substitute for human blood. Hence Blood and its prepared components play a vital role in patient management in this era of modern medicine ^[2]. Therefore each unit of donated blood and the components prepared out of it is precious and must be utilized judiciously with minimal wasting ^[3]. The demand for blood requirement is always surpassing the donated units and stock inventory in Blood Centers ^[4]. To balance between the increased requirement and availability of blood and its components, strict criteria should be set and followed for appropriate utilization of this essential yet limited resource ^[5,6,7]. Blood wastage is a universal economic and ethical problem ranging up to 6% ^[8]. The blood component discard rate or wastage rate is one of the quality indicators recommended by National Accreditation Board for Hospitals and Health Care providers ^[9]. Blood and components may be unavoidably wasted within the laboratory (Blood Centre) during component preparation stage ^[10] or during transfusion stage occurring in hospitals and Medical Centers ^[11]. Various factors can lead to the blood wastage which include Expiry, Sero-positivity, broken bags, contamination and hemolysis of blood etc. ^[12, 13, 14]. The Author undertook this retrospective study not just to categorize the various inevitable reasons for wastage of blood and components but to determine the ways to maximize utilization of healthy donor's blood and to minimize the loss of precious blood.

MATERIALS AND METHODS

A retrospective cross-sectional study was conducted in a newly started standalone Blood Centre, in south Indian Urban City. This study involved the analysis of the Blood Centre's data for the period of two years from June 2022 to June 2024. Data was retrieved from various Blood Centre Registers like Donor Register, Component preparation Register, Issue Register, Master Register, Transfusion Transmissible Infection (TTI) Register and Component Discard Register. The blood bags which reached their shelf life expiry date/ expired due to non-utilization, discolored, hemolysis, damaged and all seropositive blood bags were discarded and data noted down in Blood Discard Register mentioning the reason for discarding. All the data was analyzed using Microsoft Excel Spread Sheet (Microsoft Corporation, Redmond, WA, USA). Percentage distribution was calculated for categorized data.

Exclusion Criteria: All the blood bags which were sent for quality check were not included as wastage category. Data which was not properly maintained/missing data in the Blood Centre Register has been excluded in the study.

RESULTS

A total of 2456 blood units were collected during the study period. 5284 components were prepared from these 2456 units which includes 2397 Packed Red Blood cells (PRBC), 2393 Fresh frozen Plasma (FFP), 452 Platelet Concentrate (PC) and 42 units were retained as Whole Blood (WB). Of the total 5284 units of Blood and Components 629 were discarded accounting for 11.90%. The overall causes for discarding blood and its components were Expiry of shelf life – 470 (74.72%), Damaged Blood Bags – 61 (9.69%), TTI – 42 (6.76%), Hemolysis – 26 (4.13%) and Contamination – 22 (3.64%) as shown in Table. 1

Platelet concentrate discarding was relatively highest accounting for 49.34% (223/452) of the prepared Platelets followed by Whole Blood where 8 units were discarded out of 42 accounting to 19.04%. PRBC wastage was 312 out of 2397 prepared amounting to 13.01 % (312/2397). Least wastage rates were observed for FFP's wherein 86 units were discarded out of 2393 prepared units amounting to 3.59 % (86/2393) as shown in Table. 2

Table 1: Overall Causes of wastage of whole Blood and various Components

SL.NO	REASON	NUMBER	PERCENTAGE
1	EXPIRY	470	74.72
2	TTI	42	6.76
3	DAMAGE	61	9.69
4	HEMOLYSE	26	4.13
5	CONTAMINATION	22	3.54
6	OTHERS	8	1.28
		629	100

Table 2: Analysis of Wastage of Different Blood Components

SL NO	COMPONENT	PREPARED	DISCARDED	% OF WASTAGE
1	PRBC	2397	312	13.01
2	FFP	2393	86	3.59
3	PLATELETS CONC.(PC)	452	223	49.34
4	WHOLE BLOOD(WB)	42	8	19.04
	TOTAL COMPONENTS	5284	629	11.90

The most common cause of discarding due to Sero positivity for TTI's was HbSAg reactivity (28 units), followed by 8 units of HCVAb's reactivity, 4 units of RPR reactivity and 2 units were discarded due to HIVAb's reactive status as shown in Diagram 1

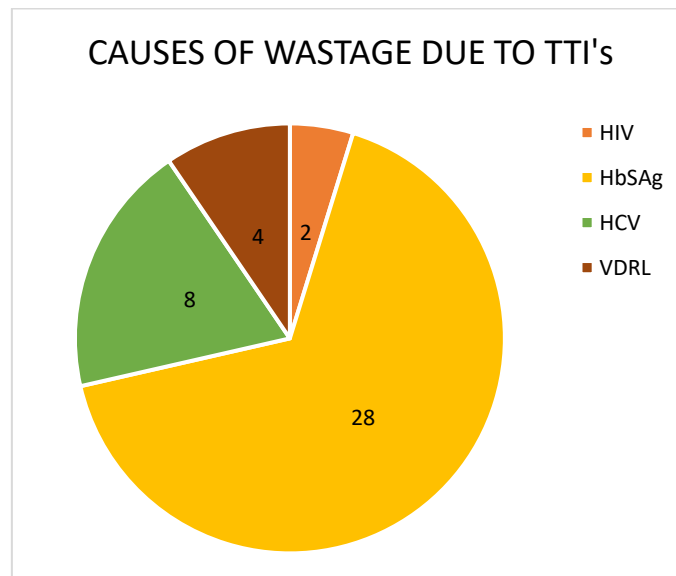


Diagram 1 showing the various causes of Discard due to TTI's

DISCUSSION

Since the demand for requirement is always surpassing the donated blood units and stock inventory in blood centers, it is extremely critical for the blood centers to maintain the stock with minimum inevitable wastages only. In India the blood centers have been paying relatively less attention to these facts [14]. Blood wastage is a scary concern which has to be dealt with strict guidelines. The present study is aimed at categorizing the various inevitable causes of blood and components wastage with an attempt to determine the ways to prevent the loss of blood and components and financial resources.

The overall discard rate of whole blood and components in the present study was 11.90%. A discard rate of 22.45% was observed by Patil et al [16]. A much lower discard rate of 6.7% was observed by Hetal et al [17], 7% by Suresh et al and 8.2% by Bobde et al [13] as shown in Table 3. Various studies on the blood wastage shows varying pattern ranging from 6.7--22.45% of the blood and its components discarded. This varying pattern clearly suggests an urgent need for further exploration of the blood wastage policies.

Table 3: Comparison of overall Wastage of Blood Components.

SL. NO	STUDY NAME	COMPONENTS PREPARED	COMPONENTS DISCARDED	% OF WASTAGE
1	Hetal et al	14955	1007	6.7%
2	Suresh et al	24847	1747	7%
3	Bobde et al	19545	1610	8.2%
4	Present study	5284	629	11.90

The main reasons for discarding the blood and its components in the present study was expiry of the components (74.72%). This is the pattern seen in majority of the studies like Sharma et al [4], Singhal M et al [19] and Bobde et al [13] showing 54.5%, 45.46% and 51.40% respectively as shown in Table 4.

Table 4: Comparison of wastage due to expiry

SL. NO	STUDY GROUP	COMPONENTS DISCARDED DUE TO EXPIRY	% OF WASTAGE
1	Shinghal et al.	596	45.46
2	Sharma et al	930	54.5
3	Bobde et al	829	51.4
4	Hetal et al	522	51.83
5	Present study	470	74.72

The most common blood component that was discarded in our study was platelets concentrate amounting to 49.34%. The reason for platelet concentrate being the predominant discarded component is the shortest half-life equal to five days only. The findings are in line with Patil B et al [16], Monich A G et al [20]. The blood and components wastage due to Transfusion Transmissible Infections (TTI) reactivity were only 6.76%, significantly less when compared to studies of Hetal et al [17], Shingal et al [19] and Sharma et al [4] as shown in Table 5. The reason could be due to the awareness among the donors as this study subject blood donors were mainly from urban city background.

Table 5: Comparison of Wastage of Components due to TTI Positivity

SL. NO	NAME OF STUDY	COMPONENTS DISCARDED	% OF WASTAGE
1	Hetal et al	221	21.94
2	Shinghal et al.	182	13.88
3	Sharma et al	341	20.0
4	Present study	42	6.76

Nearly 10% of the wastage was due to the observed damaged blood bags after the component preparation. The findings correlate with the findings of Hetal et al ^[17], Suresh et al ^[18] and Shinghal et al ^[19] as shown in Table 6. The main reasons encountered with damaged blood bags was rupture during transportation and processing, mishandling the blood bags during collection and sealing the units or manufacturing defects^[21,22,23]

Table 6: Comparison of Wastage of Components due to Leakage or Breakage

SL. NO	NAME OF STUDY	COMPONENTS DISCARDED	% OF WASTAGE
1	Hetal et al	113	11.2
2	Suresh et al	112	8.4
3	Shinghal et al.	181	13.80
4	Present study	61	9.69

All the studies on wastage of blood and components are conducted in Blood banks and Blood Centers and hence the observed blood and components wastage is within the blood banks and centers. The actual blood and components wastage will have to be evaluated after determining the bedside blood and components non utilization also because not all the components dispensed from blood centers are utilized due to numerous reasons like patient death before transfusion, defective transfusion cannula or non-availability of proper storage in hospital wards. Additional contributory research in this matter should be encouraged.

CONCLUSION

Wasting of blood and its components is an inevitable reality which needs to be approached as upmost priority. Some of the common reasons for discarding blood and components from Blood Banks/Blood Centers are expiry of the shelf life of blood/component, damaged bags, Transfusion transmissible infections (TTI's), hemolysis of blood etc. A zero wastage of blood and components may be achieved by the following recommendations:-

1. Appropriate training of the blood bank staff concerned with counselling donors will avoid permanently deferred donors.
2. Negative and rare blood group donors should be on reserve and blood collected only on demand.
3. Blood Bank/Centers should strictly follow FIFO(First in first out) policy in dispensing blood
4. Whole blood units collection can be minimized since it has limited demand
5. Platelet Concentrate/RDP wastage can be avoided by encouraging Single Donor Platelets by Apheresis based on demand only.

6. Blood Utilization Committee consisting of Heads of all the clinical departments in Hospital must be made mandatory to all standalone Blood Banks/Centers also.
7. A Protocol for integrated Blood Banks/Centers inventory where in reciprocal sharing blood components may be adapted with appropriate SOP's.

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