

Analysis of Reasons for Discarding of Whole Blood and Blood Components- A Retrospective Study

Brilsee Simeon¹, Satish Laxman Belagatti²

¹Assistant Professor, Department of Pathology, ESIC Medical College and PGIMSR, Bangalore, Karnataka.

²Associate Professor, Department of Pathology, ESIC Medical College and PGIMSR, Bangalore, Karnataka.

ABSTRACT

BACKGROUND

Human blood till date has no substitute. Every unit of blood has to be used judiciously with minimal discard. The aim of this study is to evaluate the causes for discarding of blood and blood components.

METHODS

A total of 10597 units of blood collected from donors in ESIC MH Blood period from January, 2016 to December 2018, was studied.

RESULTS

Among the total of 10597 units of blood collected, 164 were not separated into any components. Of these 164 blood bags containing whole blood, a total of 66 (40.2%) was discarded. Of these, 93.9% were discarded due to expiry of date and 3.03% were discarded because these units were seropositive for Transfusion Transmitted Infections (TTI). 3498 (13.5%) units of blood components were discarded from a total of 25789 blood components prepared. The most common component discarded was platelets (21.7%) followed by FFP (17.3%). Causes for discarding components was leakage in 1774 component units (42.4%), component expiry due to non-utilization in 1287 (30.7%) and seropositivity for TTI in 438 (10.4%).

CONCLUSIONS

Training of staff as well as implementation of blood transfusion policies help to improve process and output of BTS. This would reduce the discarding of blood components and wastage due to non-conformance. Reducing the amount of discarded blood can contribute towards decreasing the total cost of blood and its components.

KEYWORDS

Discard Blood, Leakage, Non-Utilization, Seropositive, Insufficient Quantity

Corresponding Author:

*Dr. Satish Laxman Belagatti,
Associate Professor,
Department of Pathology,
ESIC Medical College and PGIMSR,
Bangalore, Karnataka.
E-mail: drslb1977@gmail.com*

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BACKGROUND

Blood donation is one of the most noble gestures a human can make to save life. It has been estimated that every two seconds someone needs blood.¹ Much of the medical and surgical emergency procedures depend on the steady supply of blood from healthy individuals. Till date there is no substitute to human blood. Even today, many modern surgical procedures cannot be carried out without the use of blood and there is no substitute for human blood.^{2,3} Hence blood should be used judiciously. Each blood component is used for different indication; thus, the component separation has increased the utility of one Whole Blood unit. Advancement in medical technology demands more and more provision of safe blood for the effective management of patients.⁴

By analysing the data and the reason for the discards, the blood transfusion services (BTS) can develop plans to improve performance through education and training of staff and introduce new measures in order to minimize the number of discarded blood to a reasonable rate.⁵ To overcome demand and supply gap, the performance of BTS can be increased either by increasing the level of resources used in the collection and production of blood components or by utilizing existing resources more efficiently. Rational use of blood and components, and review of the blood management system will further help in reducing the discard rate.⁶ The present study is designed to analyse the various reasons for the discard of Whole Blood and Blood Components in ESIC Model Hospital Blood Bank. It is also intended to suggest various possible strategies for optimum utilization of blood and reduction in its wastage.

METHODS

A retrospective study of analysis of discarded blood and blood components is carried out in the blood bank of ESIC Model Hospital Blood Bank from January 2016 to December 2018. All Voluntary and Replacement donors, fulfilling World Health Organization criteria for donor selection, were included in this study.

Data Collection

Details of donors and blood unit collected was retrieved from the Blood Bank registers. The daily amount of blood collected, number of blood components prepared from each unit, the number of units of various components discarded and reason for the discard was analysed. A total of 10597 units of blood was collected.

Data Analysis

All Blood bags were screened for transfusion transmissible infections (TTIs). The blood bags, which were seroreactive were discarded. Those blood bags, which were expired due to non-utilization, were also discarded as per the protocol. Less amount of blood collected from the donors because of any reasons, including donor's reactions was discarded.

Evidence of haemolysis turbidity or leakage if seen in collected units were also discarded.

RESULTS

Among total donors in the blood bank, 98.6% were male and 1.3% were female. Voluntary donors were 85.6% of whom 98.47% were male and 1.56% as shown in Table 1. Replacement donors constituted 14.3%

Types of Donors	Male (%)	Female (%)	Total Donors (%)
Voluntary Donors	9060 (98.47)	140 (1.5)	9200 (85.6)
Replacement Donors	1537 (14.5)	07 (4.7)	1544 (14.3)
Total	10597 (98.6)	147 (1.3)	10744 (100)

Table 1. Source of Blood Bags as per Sex and Type of Donors

Out of total 10597 blood bags which were collected from donors during the study period, 66 (40.2%) units of whole blood bags were discarded. Out of these 66 units, 62 (93.9%) were discarded because of expiry of date due to non-utilization followed by seropositivity for transfusion transmitted diseases, which constituted 3.03% as shown in Table 2.

Reasons for Discarding	Number
Expiry	62 (93.9%)
Seropositive of TTI	2 (3.03%)
Units for Sterility	1 (1.5%)
Others	1 (1.5%)

Table 2. Reasons for Discarding Whole Blood

Expiry of date due to nonutilization (93.9%) is the most common cause for discard of whole blood, next common cause is seropositivity for TTIs (3.03%). Other causes include signs of haemolysis which was noticed in blood units. A total of (13.5%) blood components were discarded against 25789 blood components prepared during the study period. The most common blood components discarded were Platelets (21.7%) followed by FFP (17.3%), as mentioned in Table 3.

Blood Components	No. of Blood Components Prepared	No. of Units Discarded	Discarded Rate (%)
Platelet concentrate	4647	1012	21.7
Fresh Frozen Plasma	10422	1805	17.3
Cryoprecipitate	298	39	13.0
Packed Red Blood Cells	10422	849	8.1
Total	25789	3498	13.5

Table 3. Analysis of Discarded Units of Blood Components against Total Prepared Components

This rate of discard is derived when the number of Packed Red Blood Cells, Platelets Concentrate, Fresh Frozen Plasma, or Cryoprecipitate discarded is divided by the number of whole blood, Packed Red Blood Cells, Platelets Concentrate, Fresh Frozen Plasma, or Cryoprecipitate prepared, respectively multiplied by 100. Overall rate of discarded blood and blood components in ESIC blood bank is 13.5% (Table 3). The rate of discard for Platelet concentrate was highest being 21.7%. The rate of discard for whole blood, Packed Red Blood Cells and Fresh Frozen Plasma is 40.2%, 8.1% and 17.3%.

A total of 3706 blood components were discarded. The most common cause of discarding components was leakage 1774 (42.4%), expiry of component due to non-utilization which constituted of 1287 (30.7%), seropositivity for Transfusion Transmitted Infections which constituted 10.4%, and Insufficient quantity 4.9%, as shown in Table 4 which summarizes the reasons for discard of blood and blood components.

Blood Component	Seroreactive for Transfusion Transmitted Infections (Including Grey zone)	Leakage	Insufficient Quantity	Expiry	Total
PRBC	181	91	207	370	849
FFP	181	1624	-	0	1805
Platelet concentrate	75	20	-	917	1012
cryo	1	39	-	-	40
Total	438	1774	207	1287	3706

Table 4. Reasons for Discard of Blood Components

The blood bags were discarded according to standard operating procedures according to the NACO guidelines. The rate of discard is derived when the number of whole blood, packed RBC (PRBC), platelets, Fresh Frozen Plasma (FFP) is divided by the number of whole blood, PRBC, Platelet, FFP prepared respectively multiplied by 100. Data collected was studied and analysed retrospectively.

DISCUSSION

A total of 10597 units of blood was collected of which, 164 units of whole blood was prepared and from the remaining 10433 units, 25789 components were prepared during study period in ESIC Model Hospital Blood bank. Of these, 3772 (14.5%) units were discarded. There were many reasons for the discard, i.e. expiry due to non-utilization, seropositivity to TTI, of which leakage of blood components was the most common cause.

The study by Chavan SK reported discard of 4641 (14%) of total of 33070 whole blood (3355) and blood components units (29715) prepared.⁷ In another study by Deb et al⁸ the common component to be discarded was platelet concentrate and the reason being non utilization and this is in concordance with our study in their study an average 292 (14.61%) bags from the total collection were discarded. The reason for expiry of shelf-life of whole blood and PRBC was due to failure in proper implementation of first-in-first out (FIFO) policy. This could be prevented by continuous monitoring and proper implementation of FIFO policy. Shelf-life expiry of platelet concentrate were due to short expiry dates. However, platelet concentrate can be prepared according to the need taking emergency requirements also into consideration, so that wastage can be reduced.

In a study carried by Chitnis et al⁹ the monthly discard rate of blood components was 10%. Seropositive for TTI or contamination or reactions to recipients and non-utilisation leading to expiry were the reasons for discard in their study. In our study discard rate of blood components was 10.4% for, seropositivity similar to Chitnis et al study. According to Kumar et al¹⁰ 3.25% of whole blood were discarded and the reason was positivity for TTI. Major cause for discarding whole blood bags was a result of expiry or outdated units 62 (93.9%) followed by seropositivity for Transfusion Transmitted Infections 2 (3.03%), which was similar to our study. In present study of the total 1774 units discarded due to leakage, 91.5% of the fresh frozen plasma accounts for discard was due to leakage.

While in study by Morish et al recorded that leakage was the second cause of discarded blood units and its components, which represented 26% of discarded blood. Mishandling of blood bags during collection, processing, and storage or manufacturing errors may be the major causes of defects and leakages of blood bags.¹¹ The bag may be damaged during the centrifugation. This happens when the bag is forced to a sharp interior bottom/wall junction or corner, resulting in the bag material being stretched too far, causing a tear.¹² The integrity of plastic bags is essential and precautions should be taken to prevent leakages.¹³ The FFP should be stored in cardboard or polystyrene protective containers that minimize the risk of breakage of brittle frozen product during storage, handling, and transportation.¹⁴ Another approach to decrease the leakage and contamination immediately before immersion of the frozen blood bags in the water bath is that the whole container should be placed in a sterile plastic bag.¹³

Blood Component	Collections	Discard (Number %)
Whole Blood	164	66 (40.2%)
PRBC	10422	849(8.1%)
FFP	10422	1805 (17.3%)
Platelet concentrate	4647	1012 (21.7%)
Cryoprecipitate	298	40 (13.0%)
	25953	3772 (14.5%)

Table 5. Units of Whole Blood and Blood Components Collected and Discarded

CONCLUSIONS

Blood and its components are very important and hence should be used judiciously. Proper blood bank management will reduce the rate of discard of blood and its components and improves the efficiency of Blood Transfusion Services. Discarding of blood units was mostly because of leakage of FFP. The other causes of discarding the blood components was expiry date of units and positivity for Transmission Transmitted Infections. A proper inventory management system is necessary to minimize wastage. Proper visual inspection, storage and also precaution during thawing of FFP decrease the breakage/leakage of the FFP. Reducing the amount of discarded blood can contribute towards decreasing the total cost of blood and its components.

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