

# Reasons and Recommendations to Reduce Wastage Pattern of the Blood Components in the Newly Started Tertiary Care Hospital Based Blood Center in East India

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## ABSTRACT

**Introduction:** In quality management system for process improvement and better inventory management, a performance monitoring tool is critical in the blood bank to improve quality and discard rate of blood component is one of the essential elements. This study was designed to analyse blood component discard and their reason in a newly developed institute and blood bank setup.

**Material and Methods:** It was a retrospective observational study from May 2018 to March 2019. During the study period data was captured and analysed for component preparation and discarded individually and cumulatively. Major reasons were analysed for blood component discard.

**Results:** Total number of blood component discard observed were 1714 out of which 368 red cell component (21.4%); 1139 Platelet component (66.4%), 210 fresh frozen plasmas (11.7%); 6 cryoprecipitate and cryo poor plasma respectively (0.6%) were discarded. Major reasons for discard of blood component were expiry, TTI reactivity, leakage, and red cell contaminations.

**Conclusion:** The current study reflects very high discard rate compared to other published studies and recommend the following the necessary policies and supervision for reduction of blood component discard are need based change and production of blood components and better inventory management in new hospital based setup and following standard procedure for manufacturing, storage and transfer of blood components.

**Keywords:** Wastage Pattern of the Blood Component, Blood Bank

is used in fibrinogen deficiency, dysfibrinogenemia, and in cases of disseminated intravascular coagulation.<sup>2</sup> The demand for blood components is increasing day by day, but the supply of the same is not rising in that proportion. It requires proper inventory management and techniques to improve judicious use of blood component so that most of the patient in need can avail blood component as per their transfusion requirement. Further, the inventory of blood components can be supervised in such a way that discard of blood component becomes very low. In quality management system for process improvement and better inventory management, a performance monitoring tool is critical in the blood bank to improve quality and discard rate of blood component is one of the essential elements for this.<sup>3</sup> Wastage of blood can occur by many reasons mainly expiry of blood components, leakage or breakdown, red cell contamination and seropositivity for transfusion-transmitted infections. This study was designed to analyse blood component discard and their reason in a newly developed institute and blood bank setup. It will provide experience-based information and acts as a helpful guideline for optimum use of blood and minimizing its wastage, after implementation of proper storage.

## MATERIAL AND METHODS

It was a retrospective observational study conducted at the new hospital-based government blood bank which is a tertiary care center in eastern India. In this study, data was collected for the discarded blood component from May 2018 to March 2019. Blood donor fulfilling drug and cosmetic act criteria for donor selection were included in this study after a proper medical history and brief clinical examination

## INTRODUCTION

Blood is the precious gift one can give to another person. Even after many advances in the field of science till now no alternative of human blood is available. Blood has many roles which include delivering nutrient and oxygen to cells, transporting waste from cells and maintaining hemostasis. As different blood component has different relative densities and specific gravity they are separated into various blood components when centrifugal force is applied.<sup>1</sup> Indication of whole blood uses limited to acute blood loss, i.e. hypovolemic shock and exchange transfusion only. Transfusion of packed red blood cells is useful in chronic symptomatic anemia and conditions of severe blood loss. Fresh frozen plasma is used in multiple coagulation factor deficiency and liver diseases where coagulation profile is impaired. Platelet components are used in bleeding due to low platelet count or impaired platelet function. Cryoprecipitate

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Blood component	Number of component prepared	Number of discard	Discard rate %
PRBC	3605	368	10.20%
Platelet	1640	1139	69.45%
FFP	1885	201	10.66%
Cryo	198	6	3%
CPP	198	6	3%
Total	7526	1720	22.8%

**Table-1:** Analysis of discarded unit of blood component against total prepared components

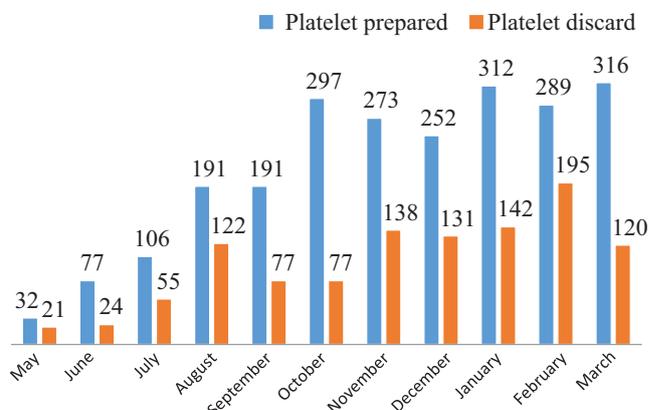
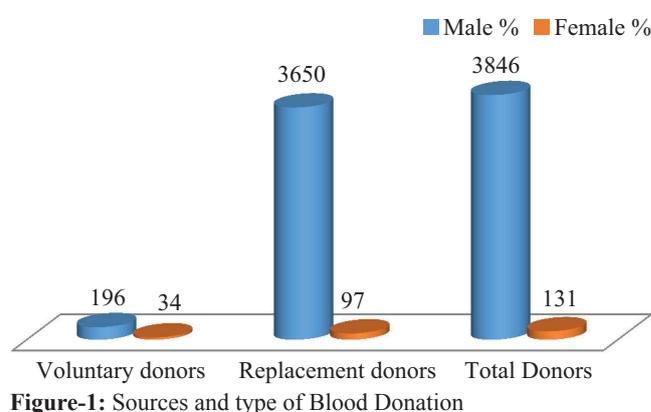
Blood Component	Expired	Leakage	Reactive	Red cell contamination	Others (Issued but not transfused)
PRBC	251	5	112	—	—
Platelets	1059	4	70	6	—
FFP	—	51	104	15	31
CRYO/ CPP	—	5	—	—	1
Total	1324	65	286	7	32

**Table-2:** Analysis of reason for discarding blood component

by the medical officer with the consent for blood donation. Data were collected from donor record register for donor details, component preparation register for component preparation (Packed red blood cells, Platelet concentrate, Fresh frozen plasma, cryoprecipitate, and cryo-poor plasma), transfusion-transmitted infection reactive register for which seropositivity of tested blood units and discard register for collecting components were discarded. During the study period data was captured for component preparation and discarded individually and cumulatively. Major reasons were analysed for blood component discard.

## RESULT

Total 3977 blood donations were made during the study period, out of which 3846 (96.7%) were male donors 131 (3.3%) were female donors, and overall 230 (5.7%) donors donated blood voluntarily as shown in figure 1. The collected whole blood units were tested for blood grouping and screening of transfusion-transmitted infections (TTI) and were converted to different blood components. These 3977 whole units were converted into 3605 (90.6%) Red cell components, 1640 (41.2%) Platelet concentrates, 1885 (47.3%) Fresh Frozen Plasma, 198 (2.6%) cryoprecipitate and cryo poor plasma 198 (2.6%) totaling to 7526 blood component. Out of 7526 blood component prepared, 1714 blood component were discarded which includes 368 (21.4%) Red cell component, 1139 (66.4%) platelet component, 210 (11.7%) fresh frozen plasma, 6 (0.06%) cryoprecipitate and 6 (0.06%) cryo-poor plasma as shown in table 1. The frequently observed reasons for discarding as shown in Table 2 were analysed for each blood component separately. 251 PRBC units were expired due to non-utilization or received back from treating wards. One hundred twelve units were TTI reactive, and five units were ruptured or leakage leading to open system due to manufacturing defects or mishandling. In platelets 1059 units were expired, 70 units were TTI reactive, 4 units were ruptured, and 6 units were showing red cell contamination. In fresh frozen plasma, 104 units were TTI reactive, 51 units were broken during storage, 15 units were contaminated with Red cell, and 31 were wasted import



**Figure-2:** Month wise distribution of platelet preparation and discard

from treating ward. 06 units of cryoprecipitate and Cryo Poor Plasma each were discarded due to leakage during storage and thawing. The fluctuation in discard rate was observed in every month due to disproportionate demand of platelets in respect to preparation, while platelet production showed gradual increase as shown in figure 2.

## DISCUSSION

The need for blood and blood component is presently increasing due to improved and accurate diagnosis of complex diseases and surgeries requiring transfusion, the emergence of newer treatment modalities and due to an

increased life expectancy of the population.<sup>4</sup> Appropriate clinical use of blood component is a critical issue especially in the region that are facing limited resources in the form of blood unit and decreasing blood donation pool. In the present study, we found mean discard of blood component was 22.8% which is the sum of the discard rate of packed red blood cell (10.20%), platelet (69.45%), fresh frozen plasma (10.66%), cryoprecipitate and Cryo poor plasma (3%) each. In other studies, the average rate of discarding is quite variable, which ranges from 2.3% to 22.45%.<sup>5,6,7</sup> Mean Discard rate for PRBC in our study was 10.20% which was higher than quoted by different studies showing the range of discard rate from 2% to 4.5%.<sup>8,9</sup>, although some of them did not include TTI status for calculation of discard rate. Out of total 368 units of PRBC, 251 units were expired due to non-utilization of PRBC units till their expiry, or due to received back from their treating wards. 112 Units of PRBC were discarded due to seropositivity which can be reduced by following stringent donor screening criteria and better testing technique. Total 1139 units of platelets were discarded which comprises 69.45% of total discard of platelet which was a very high rate of discard, and comparable to different studies ranges from 26.2% to 58.1%.<sup>8,10</sup> As platelet get expired after five days due to short shelf life, 1059 units of platelets were discarded due to non-utilization and expiry, which was followed by 70 units reactive for TTI, 06 units contaminated with red blood cells, and 4 units were leaked/ruptured during component preparation. Strict check on platelet production and issue with proper justification is required for reduction of platelet discard. Total 201 Units of FFP were discarded which comprises of total discard of FFP which was comparable to different studies ranges of total discard from 2% to 7.6%.<sup>8,11</sup> FFP, cryoprecipitate and Cryo poor plasma have minimum discard rate due to the long shelf life of 1 year at a storage temperature of -30 degree Celsius or below. Leakage or rupture of FFP bag can be minimized by putting the FFP bag in proper buckets and racks which decreases the risk of breakage of brittle frozen product during storage, handling and transportation. The lipemic discard can be reduced by appropriate donor questioning regarding their interval between donation and time of the last meal and donor lipid profile, if available during the screening. To minimise patient bed-side wastages of blood units treating physician and resident should be educated and trained regarding indication, use and handling of blood components. Clinicians should be educated and made responsible for sending blood units bag to blood bank if not utilised within 30 minutes of issue, maintaining a cold chain and sterile condition. Packed red cell, platelet concentrate can be taken back to inventory if received back within 30 minutes of issue. Plasma component should not be thawed until they are not indicated to be transfused still somehow they remain untransfused after clinical request, store them at 2-6 degree Celsius and issue them within 24 hours on priority. The proper standard operating procedure should be followed for manufacturing, storage and transfer of blood component. Increased use of apheresis technique

to prevent wastage of components such as platelets, whose demand cannot be predicted, should be prepared based on the assessment of platelets demand. Hospital transfusion committee should be involved in formulating the guideline for minimising blood wastage.<sup>12</sup> Strict checks on need-based demand specific products following first in first out (FIFO). Check on production to the reduced chance of repairing red cell contaminated platelet and if red cell contamination is present then use within 24 hours. To handle the wastage in a center which is newly started along with blood transfusion services, it requires much more attention to reduce discard of blood components due to irregular and changing demand pattern of blood components in respect to their preparation.

## CONCLUSION

The current study reflects very high discard rate compared to other published studies and recommend the following the necessary policies and supervision for reduction of blood component discard are-

1. Donor recruitment and retention policies should be made to improve safe donor pool.
2. Need based change and production of blood components and better inventory management in new hospital based setup.
3. Strict donor screening to reduce TTI reactivity.
4. Following standard procedure for manufacturing, storage and transfer of blood components.

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