

Analysis of Discard Blood and Its Components in Five Years at a Tertiary Care Hospital of Central Gujarat

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ABSTRACT

Blood is a precious resource that should be used efficiently. Blood centers worldwide provide safe and ample blood components, which are vital in modern medicine. Blood transfusion services (BTS) play a crucial role in ensuring a safe blood supply, with blood components now being more commonly used than whole blood. One whole blood donation can be separated into three components, saving three lives. To optimize blood use, BTS can evaluate reasons for discarding blood and develop training programs based on data analysis. This retrospective study aimed to analyze reasons for the discard of blood & its components for five years in tertiary care hospital, in Karamsad, Gujarat, India for the duration of 5 years from January 2015 to December 2019. The data was collected from the hospital information system of the Blood Bank. The study found discard rates for various blood components: 2.91% for Fresh Frozen Plasma, 0.80% for Red Blood Cells, 13.6% for Platelet Concentrates, and 4.96% for Cryoprecipitate. To reduce blood waste, the study suggests implementing effective transfusion policies, fostering collaboration between hospital and blood bank staff, adhering to donor selection criteria, improving technical skills, preventing contamination, and promoting apheresis technology use. Additionally, continuous medical education and quality monitoring are recommended for rational blood usage.

KEYWORDS: Blood, blood transfusion, blood components.

1. INTRODUCTION

Blood is a precious resource gifted by donors to patients. World Health Organization (WHO) has included blood in its list of essential medicines¹ to highlight the life-saving role of blood. Blood is a precious resource gifted by donors to patients. World Health Organization (WHO) has included blood in its list of essential medicines¹ to highlight the life-saving role of blood. The demand for blood is still very high and the supply is below the demand levels.

According to the latest annual report published by the Ministry of Health and Family Welfare, India, the annual requirement for blood in India is estimated at 13 million units based on the WHO norm of 1% of the population, and our collection was 12.5 million units.² Therefore, each unit of blood should be optimally and judiciously utilized.

The AABB defines quality indicators as the specific performance measurements designed to monitor one or more processes during a defined time and is useful for evaluating service demands, production, adequacy of personnel, inventory control, and process stability of the blood transfusion services (BTS).³ One such quality indicator for assessing the performance of BTS is the discard rate of blood and blood components. The demand for blood is still very high and the supply is below the demand levels.

The discard rate of blood and blood components is

quantified as wastage as a percentage of the issue (WAPI). In an ideal situation, the discarding and wastage of previously donated blood and blood components should never occur. The discard rates of blood and blood components reflect upon the overall planning and technical efficiency of the department and its coordination with other clinical departments utilizing the transfusion services.

By analyzing the data and the reason for the discards, the blood transfusion service can develop plans to improve performance through education and training of staff and introduce new measures to minimize the number of discarded blood units to the minimum possible.

2 AIM AND OBJECTIVES

1. To make an informative analysis of the wastage of blood and its components.
2. To make possible preventive measures to reduce blood wastage.

3 MATERIALS AND METHOD

The retrospective study was carried out in the A D Gorwala blood bank at Shree Krishna Hospital, Karamsad, from a laboratory information system for 5 years from January 2015 to December 2019. Data were retrieved from integrated blood bank management system software. (The data were obtained from the Laboratory information system - component preparation register and component discard register.)

Inclusion criteria: The blood units were discarded for different reasons which include blood units which are expired, with sub-optimal volume, leakage, clotted, haemolysed, contaminated collected blood bags, and even not utilized after tissue, lipemic and icteric blood units discarded during the study period over 36 months in an institution. Blood components such as packed RBC (PRBC), platelet concentrate (PC), and fresh frozen plasma (FFP) were prepared regularly from 350/450 ml blood bags under all aseptic conditions according to Food and Drug Administration (FDA) guidelines as per demand and workforce available in the blood bank.

Exclusion criteria: Transfusion transmitted infection (TTI) positive units.

STATISTICAL ANALYSIS

Descriptive statistics [Mean (SD), Frequency (%)] is used to determine the reasons and discard rate. Logistic regression was employed to determine associated factors with the most common reasons for the discard of blood.

4 RESULTS

This study was conducted at the blood bank, tertiary care hospital located in the central region of Gujarat. The major source of blood in the blood bank was voluntary blood donation through regularly organized blood donation camps and by mobile blood donation van. The 100 % collected blood is separated into different blood components according to requirements with proper cold chain maintenance within six hours of collection. The blood bank is accredited by a national accreditation board for hospitals and healthcare providers.

The wastage of blood components is calculated incidence of discarding blood components due to various reasons (Volume out of range, Haemolysis, Leakage, Expired). Blood bags discarded due to seropositivity are NOT calculated into these as this reason is unavoidable.

The formula for the calculation of % of discard rate is as follows;

$$\text{Formula} = \frac{\text{Number of components wasted}}{100} \times$$

Total number of components separated

2015 discard rate;

In the present study, a total of 16425 components were prepared in the year 2015. Out of that 6046 were red cell concentrate, 3909 were platelet concentrate, 6265 were fresh frozen plasma and 205 were cryoprecipitate. The rate in the year 2015 was 4.08%

The various reasons for discard in 2015 were leakage 73, expiry 521, haemolysed 7, and other 70.

2016 discard rate;

In the present study, a total of 16343 components were prepared in the year 2016. Out of that 6453 were red cell concentrate, 2699 were platelet concentrate, 6453 were fresh frozen plasma and 738 were cryoprecipitate. The rate in the year 2016 was 2.98%. The various reasons for discard in 2016 were Red cell contamination 10, leakage 109, expiry 295, haemolysed 2, and another 72.

2017 discard rate;

In the present study, a total of 16970 components were prepared in the year 2017. Out of that 6844 were red cell concentrate, 2595 were platelet concentrate, 6844 were fresh frozen plasma and 687 were cryoprecipitate. The rate in the year 2017 was 4.77%

The various reasons for discard in 2017 were Red cell contamination 10, lipemic 2, expiry 570, haemolyzed 4, leakage 179, and other 45.

2018 discard rate;

In the present study, a total of 16731 components were prepared in the year 2018. Out of that 6743 were red cell concentrate, 2762 were platelet concentrate, 6743 were fresh frozen plasma and 483 were cryoprecipitate. The rate in the year 2018 was 4.77%

The various reasons for discard in 2018 were Red cell contamination 12, leakage 215, expiry 527, haemolysed 21 and other 24.

2019 discard rate;

In the present study, a total of 19216 components were prepared in the year 2019. Out of that 7374 were red cell concentrate, 3821 were platelet concentrate, 7376 were fresh frozen plasma and 645 were cryoprecipitate. The rate in the year 2019 was 4.00%

The various reasons for discard in 2019 were Red cell contamination 64, leakage 265, lipemic 4, expiry 309, haemolysed 9, and other 119.

Figure: 1 Discard blood rate and blood components

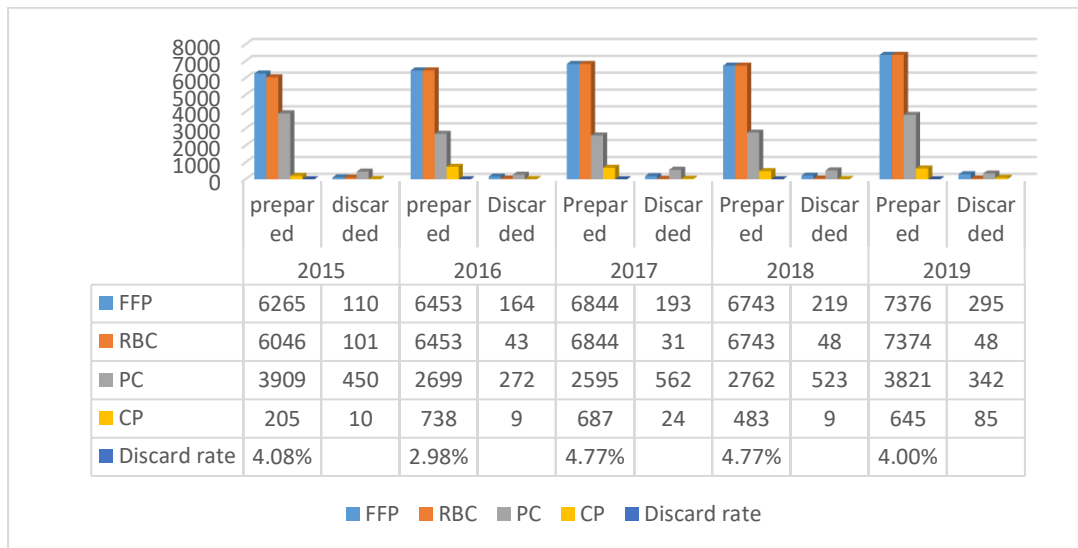


Table: 1 Reason for discarding blood and blood components

Year	No. of prepared units	No. of discarded units	Leakage	RCC contamination	Lipemic	Expiry	Haemolysed	Other
2015	16425	671	73	0	0	521	7	70
2016	16343	488	109	10	0	295	2	72
2017	16970	810	179	10	2	570	4	45
2018	16731	799	215	12	0	527	21	24
2019	19216	770	265	64	4	309	9	119

Table: 2 Total number of units discarded due to date of expiry

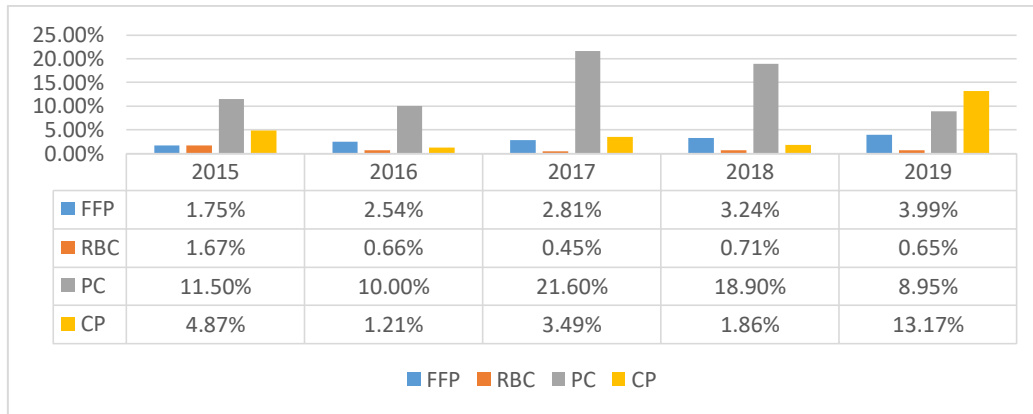
Components	2015	2016	2017	2018	2019
RC	83	30	12	18	22
FFP	0	1	1	0	0
PC	438	264	557	509	28
CP	0	0	0	0	0

Table: 3 Total blood components and discard rate

Years	Components	Total No. of units prepared	No. Of units discarded	Discard rate of components
2015 to 2019	FFP	33681	981	2.91%

2015 to 2019	RBC	33460	271	0.8%
2015 to 2019	PC	15786	2149	13.6%
2015 to 2019	CP	2758	137	4.96%

Figure: 2 Year wise discard rate of Blood Components



5 DISCUSSION

Table 4: Comparison of reasons for discarding blood units and components: In various published studies with the present study.

Study	Study period	Number of units collected	Number of units discarded	Reasons for discarding blood and Components			
				Expiry	Less quantity	Leakage	Others
Reason for discard							
Morish et al. (Kuala Lumpur)	January to December 2007	390,634	8968 (2.29%)	-	353 (0.09%)	2306 (0.59%)	6309 (1.61%)
Kora et la. (agalkot, karanataka)	January 2009 to December 2010	6129	263 (4.29%)	38 (0.62%)	5 (0.08%)	-	-
Kumar et al. (Sevagram, Wardhan, Maharastra)	November 2009 to May 2011	10582	888 (8.39%)	513 (4.84%)	18 (0.17%)	27 (0.25%)	20 (0.18%)
Thakkare et al. (Aurangabad, Maharastra)	2005 to 2007	24547	879 (3.58%)	275 (1.12%)	-	-	-
Suresh et al. (Tripati, Andhra Pradesh)	January 2013 to June 2014	24847	1747 (7.03%)	131 (0.52%)	536 (2.15%)	28 (0.11%)	78 (0.31%)
Patil et al. (Sawangi, Wardha, Maharashtra)	January 2013 to June 2015	14026	2888 (20.59%)	1531 (10.91%)	48 (0.34%)	97 (0.69%)	186 (1.32%)
Current Study	January, 2015 to December 2019	85685	3538 (4.12%)	2222 (2.59%)	-	841 (0.98%)	330 (0.38%)

6 CONCLUSION

In our study, out of 3538 (4.12%) discarded blood product 2222 (2.59%) was due to expiry. The highest discard rate (70.95%) amongst components was of Platelet concentrate and expiry was the main reason. Blood is an irreplaceable resource, so there should be proper utilization of blood and its components, and ideally, there should be minimal wastage. Proper donor implementation of blood transfusion policies, proper donor screening, and counseling, and strict adherence to Standard operating procedures can help to reduce the wastage of blood. Regular Internal Audits are a must in all blood centers, to monitor the rate and reason for discarding blood and blood components.

Conflict of interest

None of the authors of this study is having any kind of conflict of interest in present study.

7 REFERENCES

- [1] Ghosh1, K Jariwala1, K Mishra1, G Patell, R Seliya1, R Shukla1 and Kanjaksha. "Reasons for Discarding of Whole Blood/Red Cell Units in a Regional Blood Transfusion Centre in Western India." *Indian J Hematol Blood Transfus* 2018; 34(3): 501-505.
- [2] nbtc.naco.gov.in [Internet]. National Blood Transfusion Council. Available from: <http://www.nbtc.naco.gov.in/>.
- [3] Blood Transfusion, National Heart, Lung, and Blood Institute (NHLBI)". www.nhlbi.nih.gov. Retrieved 2019.
- [4] who. int [Internet]. The Clinical Use of Blood. Blood Transfusion Safety.;2002. Available from: <http://www.who.int/>
- [5] A Kumar, S M Sharma, N S Ingole and N Gangane. "Analysis of reasons for discarding blood and blood components in a blood bank of tertiary care hospital in central India: A prospective study." *Int J Med Public Health* 2014; 4(1):72-74.
- [6] B Suresh, K S Babu, R Arun, P Chandramouli and D Jothibai."Reasons for discarding whole blood and its components in a tertiary care teaching hospital blood bank in South India." *J Clin Sci Res*2015; 4:213-219.
- [7] Louis M. Katz, Paul D. Cumming, and Edward L. Wallace. Computer-Based Blood Donor Screening: A Status Report. *Transfusion Medicine Reviews*, 2007; 21: 13-25.
- [8] Wiltbank TB, Giordano GF, Kamel H, Tomasulo P, Custer."Faint and pre-faint reactions in whole-blood donors: an analysis of pre-donation measurements and their predictive value". *Transfusion*. B May 2008; 9: 1799–808.
- [9] Richard R. Gammon, MD Theresa Boyd, MD. Collection and production of components. In: *Standards for blood banks and transfusion services*, 32 ed. United States of America: 2020. p. 16-21.
- [10] cdscoonline.gov.in [Internet]. Central Drugs Standard Control Organisation. Available from: <http://www.cdscoonline.gov.in/>.
- [11] Gay Wehrli and Kathleen Sazama. Universal donor education and consent: what we know and where we should go. *Transfusion*, 2010; 50: 2499-2502.
- [12] Dr. Neelam Dhingra. Screening Transfusion-transmissible infections. In: Dr Neelam Dhingra. *Screening Donated Blood for Transfusion Transmissible Infections*, United States of America:2009; p. 23-36.
- [13] A Kumar, S M Sharma, N S Ingole and N Gangane. "Analysis of reasons for discarding blood and blood components in a blood bank of tertiary care hospital in central India: A prospective study." *Int J Med Public Health* 2014; 4(1): 72-74.
- [14] R K Bedi, K Mittal, T Sood, P Kaur, and G Kaur. "Segregation of blood inventory: A key driver for optimum bloodstock management in a resource-poor setting." *Int J Appl Basic Med Res* 2016; 6:119-22.
- [15] Accreditation Standards on Blood Banks, 3 ed. India: National Accreditation Board for Hospitals and Healthcare Providers;2016.
- [16] B. Newman; S. Graves. "A study of 178 consecutive vasovagal syncopal reactions from the perspective of safety". *Transfusion*. 2001;12: 1475–79.
- [17] K D Blaney, P R Howard. Blood collection and testing. In: Maggie Reid. *Blood banking and transfusion practice*, 3 ed. United States: Andrew Allen; 2000. P.275-78.
- [18] J D Roback, B J Grossman, T Harris, and C D Hillyer. Blood collection, component preparation, and storage. In: John D. Roback, MD Ph.D. *Technical Manual*, Bethesda, Maryland: AABB, 17th ed. United States: J D Roback; 2011. p.944-56.
- [19] D M Harmening. Transfusion practices. In: Christa Fratantoro. *Modern blood banking & transfusion practices*, 6th ed. United States: Harmening Denise;

- 2012.p.290-91.
- [20] Wiltbank TB, Giordano GF, Kamel H, Tomasulo P, Custer B "Faint and pre-faint reactions in whole-blood donors: an analysis of pre-donation measurements and their predictive value". *Transfusion*. May 2008; 9: 1799–808.
- [21] Guidelines for Blood Donor Selection and Blood Donor Referral, National Blood Transfusion Council, Government of India. New dehli:2017. p.5-19.
- [22] Dr. Neelam Dhingra. Criteria for blood donor selection. In: Dr Neelam Dhingra. Guidelines on Assessing Donor Suitability for Blood Donation, United States:2012. p.39-68.
- [23] [gujhealth.gujrat.gov.in](http://www.gujhealth.gujrat.gov.in) [Internet]. Food and Drug Control Administration. Available from: <http://www.gujhealth.gujrat.gov.in/>.
- [24] A Kumar, S M Sharma, N S Ingole and N Gangane. "Analysis of reasons for discarding blood and blood components in a blood bank of tertiary care hospital in central India: A prospective study." *Int J Med Public Health* 2014; 4(1): 72-74
- [25] R K Bedi, K Mittal, T Sood, P Kaur, and G Kaur. "Segregation of blood inventory: A key driver for optimum bloodstock management in a resource-poor setting." *Int J Appl Basic Med Res* 2016; 6:119-22.
- [26] Accreditation Standards on Blood Banks, 3 ed. India: National Accreditation Board for Hospitals and Healthcare Providers;2016.
- [27] B. Newman; S. Graves. "A study of 178 consecutive vasovagal syncopal reactions from the perspective of safety". *Transfusion*. 2001;12: 1475–79.
- [28] K D Blaney, P R Howard. Blood collection and testing. In: Maggie Reid. Blood banking and transfusion practice, 3 ed. United States: Andrew Allen; 2000. P.275-78.
- [29] J D Roback, B J Grossman, T Harris, and C D Hillyer. Blood collection, component preparation, and storage. In: John D. Roback, MD Ph.D. Technical Manual, Bethesda, Maryland: AABB, 17th ed. United States: J D Roback; 2011. p.944-56.
- [30] D M Harmening. Transfusion practices. In: Christa Fratantoro. Modern blood banking & transfusion practices, 6th ed. United States: Harmening Denise; 2012. p.290-91.
- [31] Wiltbank TB, Giordano GF, Kamel H, Tomasulo P, Custer B "Faint and pre-faint reactions in whole-blood donors: an analysis of pre-donation measurements and their predictive value". *Transfusion*. May 2008; 9: 1799–808.
- [32] Guidelines for Blood Donor Selection and Blood Donor Referral, National Blood Transfusion Council, Government of India. New dehli:2017. p.5-19.
- [33] Dr. Neelam Dhingra. Criteria for blood donor selection. In: Dr Neelam Dhingra. Guidelines on Assessing Donor Suitability for Blood Donation, United States:2012. p.39-68.
- [34] [gujhealth.gujrat.gov.in](http://www.gujhealth.gujrat.gov.in) [Internet]. Food and Drug Control Administration. Available from: <http://www.gujhealth.gujrat.gov.in/>.
- [35] Carson, Jeffrey L, Stanworth, Simon J, Roubinian, Nareg, Fergusson, Dean A, Triulzi, Darrell, Doree, Carolyn Hebert, Paul C. "Transfusion thresholds and other strategies for guiding allogeneic red blood cell transfusion". 20