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ANALYSIS AND REASON FOR DISCARD OF BLOOD PRODUCTS: A RETROSPECTIVE STUDY IN A TERTIARY CARE HOSPITAL BLOOD BANK FROM PARUL SEVASHRAM HOSPITAL, VADODARA

Shifa Ghanchi (M.Sc M.L.T)[1], Dhruvi Patel (Assistant professor)[2]

[1,2]Parul Institute of Paramedical Health and Sciences

ABSTRACT

Background: A life-saving procedure is a blood transfusion, but there is often a shortage in blood supply due to various factors. Despite the enormous advancements in medical research, there is still no substitute for blood, making blood transfusions a crucial component of contemporary healthcare. The study aimed to evaluate the discard reasons for blood components, particularly Fresh Frozen Plasma, Platelet Concentration, and Red Cell Concentration and to suggest possible strategies to reduce wastage. **Methods:** The Retrospective analysis of discarded blood components was carried out from July, 1st 2023 to December 31st 2023 in the blood bank of Parul Sevashram. Data was collected using a discard register and computer data of discard available in blood bank and was analysed in SPSS software version 26.0 and Microsoft Excel. The wastage rate was calculated with a percentage of total number of unit's wastage against the total number of collections. **Results:** A total of 4990 blood component were prepared out of which 706 blood components was discarded. The total discard ratio of the study was 14.14%. Total replacement donors were 83.91% and 16.31% were voluntary donations. The discard rate for PC, RCC, and FFP was 86.30%, 6.82%, and 2.01%. HbsAg was the most common reason for the discard due to seropositivity of TTIs. **Conclusion:** The Most common component discarded was platelet and the reason for discard was the date of expiry due to non-utilization. Seropositivity was the reason for discarding red cell concentration and leakage was the most common reason for fresh frozen plasma. The wastage can be reduced by implementing proper strategies such as FIFO policy, avoiding Mega camps, proper staff training and wastage reduced protocol.

Keywords: Blood wastage, Discard component, PC, FFP, RCC, seropositivity.

INTRODUCTION

Blood is an essential component required during many modern surgical procedures and for treating patients in intensive care units. Human blood cannot be replaced, making each donation valuable and in high demand. (1) As per World Health Organisation (WHO) data, 87.5% of developing nations fail to collect enough blood to meet their population's transfusion needs. (2) An average of 6.5 lakh units of

blood and its products are discarded in India each year before being provided to patients in need. It's concerning that a total of 50% of the discarded units were plasma, which has an extended shelf life than other components. India requires 12 million blood units annually on average but only manages to collect 9.9 million. (3) Blood product waste can be caused by several purposes, including damaged bags, broken seals, expired units, returned after 30 minutes, lipemic patients, those with high bilirubin levels, clots in the blood, and other things, but inappropriate handling is the main cause. Proper criteria for donor screening, component processing, and storage should be established in order to reduce waste. Each blood bank should establish protocols to reduce the loss of blood and its components in order to conserve both human and financial resources. (4) The goal of the present study is to investigate the different factors contributing to the disposal of blood components. It also aimed to explore potential strategies to optimize proper blood product utilization, thereby minimizing the wastage of blood constituents.

METHODS

TYPE OF STUDY:

This study is a retrospective study.

STUDY PERIOD:

The study was conducted from July 2022 to December 2022, covering a period of 6 months.

SOURCE OF DATA:

The retrospective study utilized data retrieved from multiple registers maintained at the Blood Bank of Parul Sevashram Hospital, Waghodia, Vadodara.

STUDY DESIGN

The retrospective study analyses discarded data from a specified period, involving RCC, FFP, and PC units. The reasons for discard were categorized into subgroups, including seropositivity for TTIs, microbial contamination, RPR positivity, expiry date, low volume, clotting, leakage, RBC contamination, and hemolysis. Donor information, including type (voluntary or replacement) and gender, was also considered. The discard ratio was calculated by dividing the total number of discarded units by the total number of units collected. Further research and targeted interventions are recommended to optimize blood component utilization and minimize discard rates, ensuring an efficient and sustainable transfusion service at the hospital.

INCLUSION CRITERIA:

The components including RCC, PC, and FFP discarded or wasted due to TTI Positivity, expired shelf life, hemolysis, broken/leakage units, broken segments, expired bag, lipemia, or wasted due to leakage were included in the study.

EXCLUSION CRITERIA:

Register without incomplete information of components' name or their discard reason was not included in the study.

Single Donor platelet (SDP) is not included in the study because it is prepared on demand and it is prepared after screening the donor for transfusion-transmitted infection so the rate of wastage is minimal.

ETHICAL CONSIDERATIONS:

To collect discarded data for a retrospective study from blood bank registers was permitted by Parul University – Institutional Ethics Committee on Human Research (PU-IECHR). (Approval number: PUIECHR/PIMSR/00/081734/5207-A).

THE METHOD USED FOR STATISTICAL ANALYSIS

The collected data was entered into a suitable spreadsheet in MS Excel and analyzed using SPSS software version 26.

Descriptive statistics, such as frequencies and percentages, are used to summarize the data. Crosstabulation and graphical representations are used to present the relationship between different discard reasons and component types.

The discard ratio was calculated for each component manually:

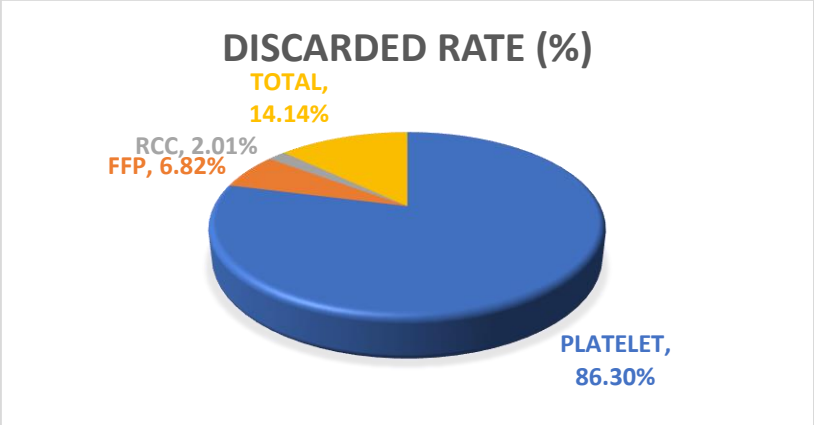
1. Discard rate = a total number of blood or components discarded / a total number of blood or components prepared × 100

RESULT

Out of the total of 4990 bags prepared during the study period,706 (14.14%) total bags were discarded. Total of 613 units of platelets were prepared out of which 529(86.30%) bags were discarded, out of 1845 (36.97%) bags of fresh frozen plasma prepared total of 126 units (6.82%) were discarded, and out of 2532 (50.74%) bags of RCC prepared 51units (2.01%) were discarded during the study period. (table 1)

Table 1 *(Analysis of Discarded Unit Per Total Prepared Components)*

BLOOD COMPONENTS	NO. OF UNIT PREPARED	NO. OF UNIT DISCARDED	DISCARDED RATE (%)
PLATELET	613(12.28%)	529	86.30%
FFP	1845(36.97%)	126	6.82%
RCC	2532(50.74%)	51	2.01%
TOTAL	4990(100%)	706	**14.14%**



Graph 1 *(Total Discard percentage.)*

The most common cause for discard of blood component was the expiry of date, accounting for 72.52% (512) of total discarded bags. Seropositivity for transfusion-transmitted infections (TTIs) was the second most common cause of discarding blood components, accounting for 14.87% (105) of all discarded bags. Leakage was the third reason, accounting for 7.64% (54) of total discarded bags, followed by other reasons like lipemic, hemolysis, or discoloration of plasma, which accounted for 4.96% (35) of all discarded bags. (table 2)

Table 2 *(Total Percentage of Discarded Components Bags Due to Other Reasons)*

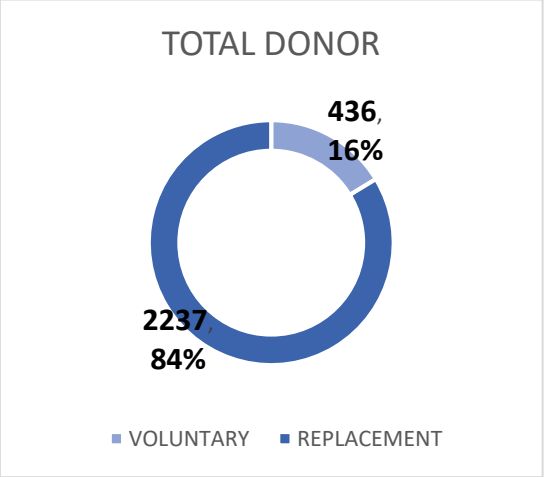
COMPONENT	EXPIRY	LEAKAGE	OTHER	SEROPOSITIVITY	TOTAL
FFP	0	53	28	45	126
PLATELET	511	1	3	14	529
RCC	1	0	4	46	51
TOTAL	512	54	35	105	706
PERCENTAGE	72.52%	7.64%	4.96%	14.87%	100%

Throughout the study period, a total of 2673 donations were received. Out of which the majority of donors are male, comprising 97.39% (2603) of all donors, while female donors comprise only 2.61% (70) of all donors. Out of all donors, total voluntary donors were 16.31% (436), while 83.69% (2237) were replacement donors. Among replacement donors, the overwhelming majority are male, accounting for 99.25% (2220) of all replacement donors, while female replacement donors accounted for only 0.75% (17) of all replacement donors. (table 3)

Table 3 *(The ratio of gender in accordance with the type of donor.)*

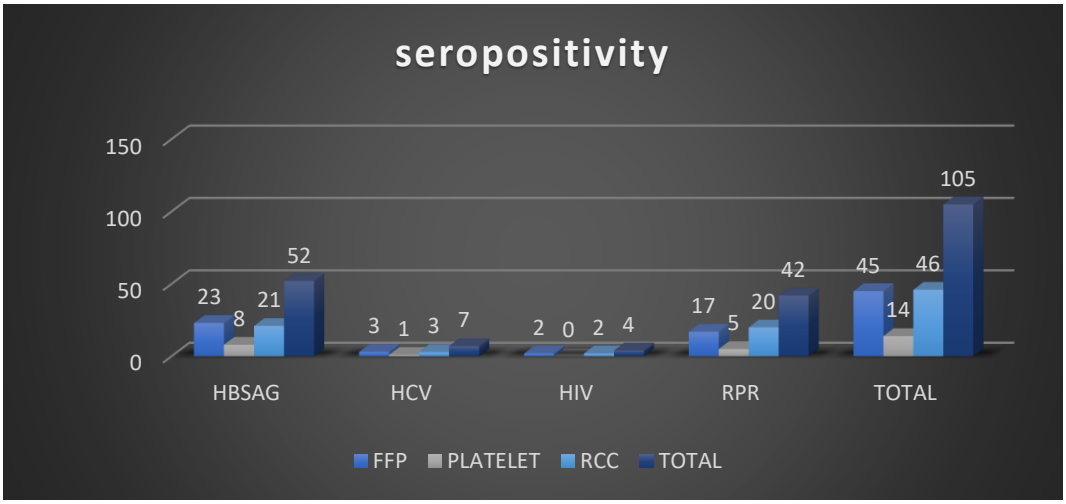
TYPE OF DONORS	MALE	FEMALE	TOTAL DONOR
VOLUNTARY	383(87.85%)	53(12.15%)	436(16.31%)
REPLACEMENT	2220(99.25%)	17(0.75%)	2237(83.69)

TOTAL	2603(97.39%)	70(2.61%)	2673 (100%)



Graph 2 *(Type of donor.)*

The study indicates a total of 105 units were discarded due to seropositivity for transfusion-transmitted diseases. Out of these, 52 bags (49.52%) were discarded due to HbsAg, which is the most common reason for the discard of blood bags due to seropositivity,42(40%) due to RPR,7(6.66%) due to HCV, 4(3.8%) due to HIV which was the least reason for discard. (graph 2)

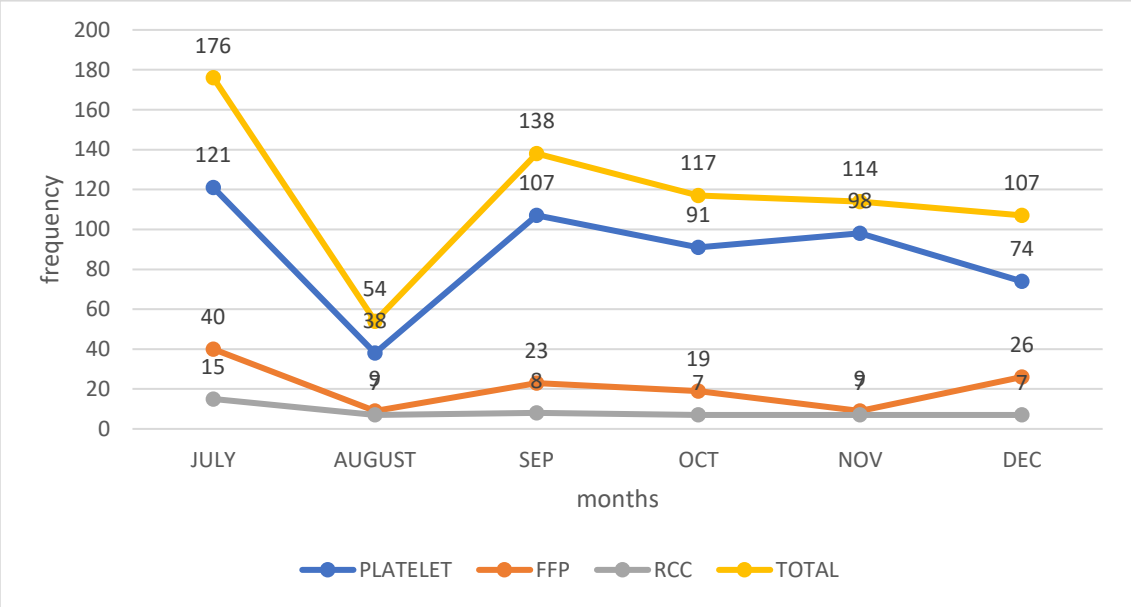


Graph 3 *(Discard rate of seropositivity.)*

The blood components are categorized into Fresh Frozen Plasma (FFP), Platelets, and Red Cell Concentrate (RCC), and the blood types are categorized into A-, A+, AB-, AB+, B-, B+, O-, and O+. According to the different blood groups, out of the total B+ was the most discarded blood group among others, and A- is the least discarded.

In July total of 176 units were discarded due to different reasons. 54 units were discarded in August, 138 units in September, 117 units in October, 114 units in November, and 107 units in December were

discarded. The highest discard ratio was reported in July and the least in August. A total of 706 units were discarded in the study period. (graph 3)



Graph 4 *(Month-wise discards of components.)*

DISCUSSION

The present study revealed a significant gender imbalance in blood donors. out of the total 2673 donation carried out in the study period, males comprise 2603 (97.39%) of all donors while Female donors account for only 70 (2.61%) of total donors. Similar gender imbalances were observed in the study done by Patil p et al. [5] reported that out of 14026 blood donations, 96.66% were male donors and 3.34% were female donors. In a study conducted by Kumar et al. [1], it was observed that out of a total of 10,582 blood donations, approximately 97.05% were contributed by males, while females accounted for approximately 2.95% of the donations. These findings were quite similar to the results obtained in our own study. In contrast, other studies conducted by lakum et al. [6], Smita et al. [7], and kanani et al. [4] reported a higher proportion of female donors compared to the findings of our present study. Dispelling misconceptions and providing reassurance about the safety and health benefits of donation can help alleviate fears and encourage more women for voluntary donations.

In the present study, replacement donors account for 83.69% and voluntary donors 16.31% as compared to the study done by Anjum W et al. [8], which was 85.19% replacement donors and 14.81% voluntary donors which has lower voluntary donors compared to our study, whereas Kanani et al [4]. observed higher voluntary donation (54.85%) than both the studies.

In the present study, a total of 4990 components were prepared from 2673 whole blood donations, which reported an average discard rate of 14.14%. this study was compared with the study conducted by Suresh et al. [9], (7%), lakum et al. (6), (4.09%), Smita et al. [7], (1.60%), and kanani et al. [4], (6.95%) reported lower discard rate than the present study.

The present study identified platelets as the most discarded component, which is consistent with the findings of Simon et al. [10], Kumar et al. (1), Suresh et al. [9], and Kanani et al. [4], and contradictory to the result of Ibrahimu SM et al., which states that packed red cell was most discarded component in their study period.

The most common reason for the discard of platelets was expiry (511 units), followed by seropositivity (14 units), other reasons like lipemic or high bilirubin (3 units), and at least leakage (1 unit) similar to the study of Patil p et al. [5]

red cells concentrate discard rate in the present study was observed at 2.01%, which aligns with the finding of Kumar et al. [1] (2.78%). When comparing this study to others, it was noted that Patil P et al [5]. reported the highest discard ratio at 6.74%, while the lowest was found in Simon et al

(10) was 1.8%. In our study, the rate of discarding fresh frozen plasma (FFP) was found to be 6.82% and the most common reason found was leakage A similar reason where the cause of discard in Simon et al. [10]

In our study, the major blood group discarded was B+ and at least AB-. similarly, the study of Joshi Hetal. [11] reported maximum blood group wastage was B+ and the minimum was AB-. According to a standard textbook, the majority of individuals have the blood group "B Positive," which consequently results in a higher wastage rate for this particular blood group.

The total of 706 units discarded, 105 (14.87%) components were wasted due to positivity for TTIs and the most common reason was HbsAg 49.52%, followed by RPR 40%, HCV 6.66% and HIV 3.8% compared with Simon et al. [10] it was 7.8% which was lower than the present study. Anjum W et al. [8] reported seroprevalence of HBsAg, HIV, HCV, and Syphilis of 3.68%, 0.94%, 0.64%, and 0.05%.

Table 4 *(Comparison of the present study data with other published studies.)*

AUTHORS	RATE	FFP	RCC	PLTS	COMPONENT	REASON
Kumar et al	14.64%	7.25%	2.78%	37.11%	platelets	expired
Kanani et al	6.95%	5.36%	2.26%	28.39%	platelets	expired
Simon et al	19.3%	1.8%	1.23%	16.3%	platelets	expired
Suresh et al	7%	5.5%	3.8%	16.3%	platelets	expired
Smita et al	1.60%	1.49%	1.35%	1.76%	platelets	seropositivity
Patil p et al	22.45%	14.24%	6.74%	61.11%	Platelets	Short-life
Deepika et al	5.95%	57.51%	1.25%	4.16%	platelets	expiry
Mamtha et al	8.69%	6.69%	3.21%	40.7%	platelets	expiry
Present study	14.14%	6.82%	2.01%	86.3%	Platelets	expired

CONCLUSION

The present study revealed an average of 14.14% of blood bags were discarded with a compromise discard rate of PC-86.30%, FFP-6.82%, and RCC-2.01% due to various reasons. The study data also provides us with valuable insights into the blood donation patterns in the blood bank. The study also suggests various stratergies to reduce wastage.

- **Suggested strategies that would maintain the discard of blood as low as possible are as follows:**

1. Prioritize FIFO to use blood products with shorter shelf life first.
2. Avoid mega donation camps and maintain a list of regular donors.
3. Provide ongoing education and training for staff.
4. Implement Patient Blood Management (PBM) programs.
5. Enhance collaboration and communication among blood banks.
6. Develop waste reduction protocols within healthcare facilities.
7. Increase the use of apheresis techniques for high-demand components.
8. Ensure timely notification and care for reactive donors.
9. Focus on retaining blood donors by improving their experience.
10. Establish a comprehensive donor registry for rare blood groups.

These strategies collectively optimize blood utilization, reduce waste, and improve the overall efficiency of blood management systems.

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