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Research Article

A PROSPECTIVE STUDY OF ANALYSIS OF REASONS FOR DISCARDING BLOOD AND IT'S COMPONENTS IN (M.B.G.H. BLOOD BANK), DEPARTMENT OF TRANSFUSION MEDICINE AND IMMUNOHEMATOLOGY, R. N. T. MEDICAL COLLEGE UDAIPUR (RAJASTHAN)

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A B S T R A C T

Background: Blood Transfusion Services (BTS) is the vital part of modern health care system without which efficient medical care is impossible. Blood transfusion is an important constituent of health-care delivery system. Blood is essential for human life and has no substitutes. So every unit of blood is very precious it should not be wasted. This mandates the proper analysis of the discard of this scarcer source. **Objectives:** The present study was done to analyse causes of discarding blood and it's components, To analyse the discarding rate of blood and it's components and To make strategies that minimise discard of blood as low as possible. **Material and Methods:** This prospective record based study was carried out in Blood Bank (Department of Transfusion Medicine & Immunohaematology) of Maharana Bhupal Government Hospital (RNT Medical College), Udaipur from July 2014 to December 2016. The data were collected from donor screening record, component preparation record, Transfusion transmitted infection testing record (serology register), NAT Testing record (since July 2015) and discard record. **Result:** Of the total collected 39696 blood units 15156 units were whole blood, 24507 were PRBC & FFP, 6240 & 33 units were RDP and SDP respectively. Discard rate of whole blood(316) and components (333) in the present study out of 39696 units was 1.63%. The discard rate of whole blood was 2.08% and Major cause of discarding whole blood due to seropositivity was HBsAg(85.14%) followed by 8.11%, 4.95%, 1.35% and 0.45% due to HIV, VDRL, malarial parasite and HCV respectively. The commonest component were discarded Platelets 1138(18.24%), followed by CRYO 4(5.97%), FFP 518(2.11%) and PRBC 333(1.36%). TTI was the main cause for PRBC and FFP 87.39% and 56.18% respectively whereas expiry was the main reason of discarding platelets 83.57%. **Conclusion:** It is concluded that total units discarded were 1.63%, which is quite low looking to no screening methodology available for seropositivity before blood collection, which is one of the main cause of discarding. Expiry of platelets was main reason for discard due to short shelf life and no prediction of demand.

INTRODUCTION

Blood Transfusion Services (BTS) is the vital part of modern health care system without which efficient medical care is impossible[1]. Blood is liquid connective tissue of the body and in the Layman's language "Blood is river of life." Millions of lives were saved every year in regular and urgent situations for medical and surgical indications by the accessibility of safe blood transfusion services. Human blood has no complete substitute till date[2]. So every unit of blood is very precious it should not be wasted. Transfusion requests are always more than the supply due to advances in health care delivery. Injudicious use of whole blood and blood components strains the transfusion services.

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This mandates the proper analysis of the discard of this scarcer source. Increase in life expectancy and advances in medical technology demand more and more provision of safe blood for efficient health care delivery. To tackle with the demand and supply of blood and blood components more stringent criteria should be available and followed for proper utilization of this limited resource (Sharma N, 2014)[5]. Along with this protocol for minimizing discard of blood should be formed to save energy, human and financial resources in developing countries. Similarly with proper coordination between clinicians and blood bank staff wastage due to expiry of blood can be minimized. The availability of safe and adequate blood save lives.

If not properly screened, however, blood becomes a conduit for transmitting life threatening viral, bacterial and protozoal infections, e.g. hepatitis B, hepatitis C, HIV/AIDS, syphilis

and malaria. If there is any contamination or hemolysis or clots present in issued blood unit may leads to mild to severe transfusion reaction in the recipient (NACO, 2007)[3]. It also intended to suggest various possible strategies for reduction of wastage. A major challenge facing the BTS is to supply sufficient amount of safe blood whenever it is required. It needs to double its efforts to collect sufficient amount of safe blood from voluntary, nonremunerated, healthy, and low-risk donors. To overcome the lack of blood supply, 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. (Morish M, *et al*, 2012)[10].

Another approach is to reduce the amount of blood discarded as a result of inappropriate blood collection and components processing.The efficiency of processing and preparation of the blood components can be monitored by establishing quality indicators that reflect the activities to be evaluated. The rate of discarded blood components is one of those indicators. It is defined as the proportion of a total number of blood components discarded from the total number of blood collections. When the rate of discarded blood is high, the level of efficiency of collection and components preparation process is low. By analyzing the data and the reason for the discards, the BTS can develop plans to improve performance through education and training of staff and introducing new measures in order to minimize the number of discarded blood to a reasonable rate.

Aims and Objectives

To analyse causes of discarding blood and it's components in our blood bank and to analyse the discarding rate of blood and it's components. To make strategies that minimise discard of blood as low as possible.

MATERIAL AND METHODS

This prospective study was conducted in Blood Bank (Department of Transfusion Medicine & Immunohaematology) of Maharana Bhupal Government Hospital (Rabindra Nath Tagore Medical College), Udaipur (Rajasthan) from July 2014 to December 2016.

METHOD

The data were collected from donor screening record, component preparation record, Transfusion transmitted infection testing record (serology register), NAT Testing record (since July 2015) and discard record.

Blood donations were taken from voluntary and replacement donors according to the selection criteria defined by WHO. Blood components packed RBC (PRC), Fresh Frozen Plasma (FFP), Platelet concentrate were prepared from the 350 / 450ml blood bags under all aseptic precautions. As there is manpower scarcity in our setup sometime preparation of blood components was not possible on voluntary blood donation camp days. The seropositivity records were taken from TTI LAB record.

The blood bags were checked for proper labelling including donor units blood group, date of collection, date of expiry etc. The out dated or expiry units of blood and its component were recorded and discarded.

The all units were inspected for volume, appearance, clots, icteric and hemolysis. Leakaging of blood bags also noted. The volume for the 350 ml blood bags considered normal if was 350± 10% ml. Volume beyond this range were discarded.

The appearance of blood bags were checked for color, turbidity and lipemia. The blood bags were also checked for presence of any clot. All bags were visually inspected for hemolysis at the time of crossmatch and before the issue of bag. Some degree of hemolysis is acceptable and expected. The supernatant of centrifuged sample were evaluated microscopically and macroscopically. The blood bags were discarded which shows leakage during procedure after blood collection.

All bags of therapeutic phlebotomy were discarded.

Blood samples were sent to microbiology department for quality control. According to culture report positive contaminated bags were discarded.

The blood bags were discarded according to standard operating procedures laid down by the local authority and according to the NACO guidelines.

Rate of discard - 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[4]. Data collected was studied and analysed prospectively.

OBSERVATIONS & RESULTS

During this study period total 39696 blood units were collected in which 15156 units were whole blood, 24507 were PRBC & FFP, 6240 & 33 units were RDP and SDP respectively.

Table No 1 Total Number of Unit Collection & Component Prepared

Year wise	Whole Blood	Components				
		PRBC	FFP	Platelets	CRYO	SDP
2014	3415	4824	4824	1256	10	5
2015	6476	8970	8970	2138	26	6
2016	5265	10713	10713	2846	31	22
TOTAL	15156	24507	24507	6240	67	33
%	38.18%	61.74%	61.74%	25.46%	0.27%	0.08%

Out of total blood units received 38.18% of units were used as whole blood and 61.74% was used as components. Total platelets prepared were 25.49%, CRYO 0.27% and SDP 0.08%.

Table No. 2 Analysis of Discarded Whole Blood Bags due to Various Reasons

Reason	No.	%
Seropositivity	222	70.25%
Less amount	44	13.92%
Therapeutic phlebotomy	25	7.91%
Clotted	19	6.01%
Hemolysis	2	0.63%
Bag leakage	2	0.63%
Bact. Contamination	1	0.32%
NAT reactive bags	1	0.32%
TOTAL	316	100%

Above table shows that out of total whole blood bags discarded 316, maximum were due to seropositivity 222 (70.25%), followed by less amount 44 (13.92%), therapeutic phlebotomy 25 (7.91%), clotted 19 (6.01%), hemolysis 2

(0.63%), bacterial contamination 1 (0.32%) and NAT reactive bags 1 (0.32%).

Table No 3 Analysis of Discarded Whole Blood Bags due to Seropositivity (N=15156)

	HIV	HB_SA_g	HCV	VDRL	MP	Total
No.	18	189	1	11	3	222
%	8.11%	85.14%	0.45%	4.95%	1.35%	

Above table shows that among total 222 bags discarded due to seropositivity highest were due to HB_SA_g seropositivity 189(85.14%) followed by HIV 18 (8.11%), VDRL 11 (0.45%), malarial parasite 3(1.39%)and only 1 (0.45%) due to HCV.

Table No. 4 Analysis of Reasons for Discarding Blood Components

Blood Component	PRBC		FFP		PLATELETS		CRYO
	No.	%	No.	%	No.	%	
Seropositivity	291	87.39%	291	56.18%	100	8.79%	0
Expiry	0	0.00%	0	0.00%	951	83.57%	0
Clotted	25	7.51%	1	0.19	4	0.35%	0
NAT reactive bags	6	1.80%	6	1.16%	1	0.09%	
Heamolysis	4	1.20%	0	0.00%	0	0.00%	0
Less amount	3	0.90%	0	0.00%	0	0.00%	0
Bact.Contamination	3	0.90%	0	0.00%	0	0.00%	0
Bag leakage	1	0.03%	95	18.34%	0	0.00%	4
Send for culture	0	0.00%	62	11.97%	82	7.21%	0
Thaw not issue	0	0.00%	63	12.16%	0	0.00	0
TOTAL	333		518		1138		4

Note: Units sent for culture examination are sent as whole unit in casesof FFP and Platelets, hence it is discarded as whole.

Above table shows TTI was the most common cause for PRBC and FFP 87.39% and 56.18% respectively whereas expiry was the most common cause of discarding blood components (platelets) 83.57%. In PRBC 1.80%, in FPP 1.16% and in platelets 0.09% units were discarded due to NAT reactive. 1.20% units were discarded due to hemolysis in PRBC only. Due to clotting 7.51% PRBC, 0.19% FFP and 0.35% platelets were discarded.

The only reason to discard cryoprecipitate was leakage. Not a single unit of SDP was discarded in our study.

Table No. 5 Analysis of Discarding due to Blood Components and Seropositivity

		HIV	HBsAg	HCV	VDRL	MP	Total
PRBC	No.	36	231	7	8	9	291
	%	12.37	79.38%	2.41%	2.75%	3.09%	
FFP	No.	36	231	7	8	9	291
	%	12.37%	79.38%	2.41%	2.75%	3.09%	
PLATELETS	NO.	8	79	2	7	4	100
	%	8.00%	79.00%	2.00%	7.00%	4.00%	
CRYO	NO.	0	0	0	0	0	0
	%	0%	0%	0%	0%	0%	

Above table shows that on analysis of discarding blood components PRBC and FFP, maximum discard 231 (79.38%) was due to HBsAg followed by HIV 36 (12.37%), malarial parasite 9 (3.09%), VDRL 8 (2.75%) and HCV 7 (2.41%).

In platelets, maximum discard 79 (79.00%) was due HBsAg followed by HIV 8 (8.00%), VDRL 7 (7.00%), malarial parasite 4(4.00%) and HCV 2 (2.00%).
None was discarded for CRYO.

Percentage of discarded whole blood and components in the present study (316 + 333) out of 39696 units is 1.63%.

DISCUSSION

Total number of units collected were 39696 & component prepared were 24507 from voluntary and replacement donors. Out of total blood units received 38.18% of units were used as whole blood and 61.74% were used as components. Total platelets prepared were 25.49%, CRYO 0.27% and SDP 0.08%.

Comparision of present study whole blood discard rate, PRBC discard rate, FFP discard rate and platelets discard rate with other studies shows:

Studies	Whole blood	PRBC	FFP	Platelets
Sharma N *et al*(2014)[5]	4.46%	3.2%	6.2%	43.6%
Suresh *et al*(2015)[6]	5.7%	3.8%	5.5%	16.3%
Kaur H *et al*(2015)[7]	10.11%	6.86%	7.96%	56.31%
Roy D *et al* (2015)[8]	2.18%	4.49%	1.5%	32.35%
Duarah *et al*(2016)[9]	2.41%	1.79%	2.68%	6.17%
Present Study	2.08%	1.36%	2.11%	18.24%

In the present study number of blood units(Whole blood+PRBC) discarded due to seropositivity were 513. Major causes were HBsAg 420 (81.87%), followed by HIV 54 (10.53%), 3.70%, 2.34% and 1.56% due to VDRL, malarial parasite and HCV respectively. Our findings were similar to studies of Duarah *et al* (2016).

Study conducted by Thakare *et al* (2011)[12] Main reasons for discarding was positivity for TTI constituting 68.86%. Most common TTI was hepatitis B (49.82%). Total discard due to TTI in our study was 513 out of 649 i.e. 79.04%, which was similar to findings that of Thakre M (2011) 68.86%. Kaur P *et al* (2016)[14] reported 74.2% blood discard due to TTI which is quite similar to our study. Gauravi *et al* (2012)[11], founded that 226 (2.86%) blood bags were discarded because of seropositivity for TTI against 7882 blood begs collected in year 2008.

In the present study major cause of discarding whole blood due to seropositivity was HBsAg (85.14%) followed by 8.11%, 4.95%, 1.35% and 0.45% due to HIV, VDRL, malarial parasite and HCV respectively. Suresh P (2015) showed among 146 whole blood units which were discarded due to TTI, HBsAg seroreactivity (64.4%). Duarah *et al* (2016) [9]reported 763(2.41%) out of 31655 whole blood bags were discarded.

Discard rate of FFP was 2.11% with TTI being the main reason of its wastage (56.18%) followed by leakage 18.34% as compared to 91.3% due to TTI and 7.2% for leakage by Kaur *et al*.

In the present study total 24507 PRBC and FFP, 6240 platelets and 67 CRYO components were prepared. Blood platelets 1138 (18.24%), followed by CRYO 4 (5.97%), FFP 518 (2.11%) and PRBC 333 (1.36%) were the commonest component discarded. Duarah *et al* (2016) had similar finding. They reported commonest component discarded was platelet 154 (6.17%) followed by FFP 140 (2.68%)

Other reasons for whole blood discarding were less amount 44 (13.92%), therapeutic phlebotomy 25 (7.91%), clotted 19 (6.01%), both for hemolysis & leakage 2 (0.63%), bacterial contamination 1 (0.32%) and NAT reactive bags 1 (0.32%). Therapeutic phlebotomy is a therapeutic procedure for polycythemia, rubra vera and these bags couldn't be used for transfusion, so discard due to this cannot be prevented.

Morish M *et al* (2012) stated reason for whole blood discard due to underweight was 52% which is quite high from our study i.e. 13.92%. Hemolysis in our study was 0.63% which

was similar 0.7% to that of study by Suresh *et al* (2015) and 1.32% by that of Bobde V (2015).

TTI being the main reason for FFP discard (56.18%) followed by leakage (18.34%), thaw not issue (12.16%) and sent for culture (11.97%). Comparable to study by Kaur *et al* (91.3%) for FFP and 6.25% for thaw not issued. In studies by Kumar A (2014) in FFP discard due to seropositivity was 17.02%, leakage 28.72%; Patil P (2016) seropositivity 35.58%; Kaur P (2015) seropositivity 91.3% and due to leakage 7.2%.

The main reason of discard of platelets in our study was expiry (83.57%) due to short shelf life (5days) followed by TTI in 8.79% as compared to 17.2% for TTI by Suresh *et al* (2015). Discard due to expiry 87.71%, 97.3%, 92.64% and 70.8% were reported in studies by Kaur H, Kumar A, Patil P[13] and Suresh *et al*. None was discarded for CRYO.

In our study bacterial contamination was found in FFP contamination by staphylococcus and bacillus species. In RDP coagulase negative staphylococcus, bacillus species, Klebsiella, and coagulase positive staphylococcus. There was none in cases of CRYO.

In our study there was no discard due to expiry in whole blood and PRBC. This was achieved due to the policy of FIFO (first in first out).

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

- Increased use of instrumentation such as apheresis technique to prevent wastage of components like platelets whose demand cannot be predicted.
- Platelet additive solution (PAS) could replace plasma as a storage media for platelet concentrates to increase the life span of platelets.
- Wastage due to TTI. Strict adherence to donor selection criteria's, proper pre-donation history taking and counselling. Biometric identification of TTI positive donors and suspected professional donors. Pre-donation screening of voluntary donors using rapid and cost effective kits.
- Blood group wise voluntary donor registry, proper scheduling of blood donation camps. Blood donation camp organizers should be informed about the need of blood bank as per stock available in blood bank.
- Proper handling of blood bags and stringent storage conditions to prevent hemolysis, clotting, bacterial contamination.
- Leucoreduction of blood and its components.
- Precautions during thawing of FFP to prevent leakage such as use of polystyrene protective containers.
- Technical expertise in component preparation to prevent RBC contamination.
- Sharing of data between the blood banks in vicinity.
- Use of advance software in blood bank and hospital wards for proper coordination between clinicians and blood bank staff.
- Attention to skin cleaning techniques, including evaluation of both the disinfectant solution and the technique of cleaning by monitoring of effectiveness through pre- and post-cleaning swabbing of the skin, training and regular retraining of staff

CONCLUSION

It is concluded from our study that total units discarded were 1.63%, which is quite low looking to no screening methodology available for seropositivity before blood collection, which is one of the main cause of discarding. Expiry of platelets were next main reason for discard due to short shelf life and no prediction of demand, whereas there was no discard due to expiry in whole blood and PRBC. This was achieved due to the policy of FIFO (first in first out). Self audit of blood and blood components discarded over a period of time provides us insight into avoidable and non-avoidable reasons of discard. It guides us to plan various alterations and corrections to reduce the wastage.

Abbreviation: CRYO-Cryoprecipitate, FFP-Fresh frozen plasma, NAT- Nucleic acid amplification testing, PLT-Platelets, PRBC –Packed Red Blood Cells, SDP –single Donor Platelets, TTI – Tranfusion Transmitted Infection.

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