Original Research Article

Conditions associated with discarding of blood and its components in a blood bank of tertiary care hospital of Western Uttar Pradesh: a retrospective study

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ABSTRACT

Background: Blood transfusion services in India rely on different factors for a smooth workout. Thus proper utilization of blood is necessary with minimal wasting. The aim was to evaluate the causes of discarding of blood and its components and to implement possible intervention for minimizing wastage.
Methods: A retrospective study was carried out in the blood bank of Sardar Vallabh Bhai Patel Hospital, Lala Lajpat Rai Medical College, Meerut, Uttar Pradesh over a time period of 24 months from April 2019 to March 2021.
Results: A total of 21627 units were collected from donors. A total of 11534 whole blood (WB), 10093 packed red blood cells (PRBC), 3245 platelets (PC), and 9669 fresh frozen plasma (FFP) were prepared. A total of 4046 units of blood and its components were discarded. The discard rate for WB, PRBC, PC and FFP was 6.25%, 7.46%, 38.39%, and 13.71% respectively.
Conclusions: An average of 18.70% of blood units were discarded during this study period. The overall most common reason for discard was the date of expiry followed by transfusion transmitted infections (TTI). To minimize wastage of blood units, blood banks should be fully committed to organizing and coordinating the blood transfusion services,implementing all possible strategies as discussed in order to lower the discarding of blood and its units and to make them widely available.

Keywords: Blood, Discard, TTI

INTRODUCTION

Blood is a vital healthcare resource. Blood transfusion is an essential element of the healthcare system. Millions of lives are saved each year through blood transfusions. Inadequacies in blood safety and supply contribute significantly to the burden of disease and loss of life.[1] Safe and adequate supplies of blood are dependent on the implementation of an integrated strategy for blood safety.[2] The easiest way to ensure the timely availability of blood is to have an appropriate inventory on the shelf at all times. Therefore to deal with ever ever-increasing demand and supply of blood and its components in resource-constraints settings such as ours, more stringent criteria should be applied for blood donations and proper utilisation of blood. The rate of discarded blood components or wastage rate is one of those indicators and has been listed third among the ten quality indicators recommended by National Accreditation Board for Hospitals and Healthcare Providers.[3] To minimize the wastage of blood and its components, this study is being conducted in order to efficiently deliver this life source to those who are in need with wastage being as low as possible.

Aims and objectives

The study was done with the objective of evaluating the causes of the discarding of blood and its components and to implement possible methods of preventing discarding.

METHODS

Study design

The study was carried out in the blood bank of Sardar Vallabh Bhai Patel Hospital, Lala Lajpat Rai Medical College, Meerut, Uttar Pradesh over a time period of 24 months from April 2019 to March 2021. All blood 350/450 ml whole blood and blood components of age group 18 to 60 years were included in the study. Rare blood groups and blood issued in emergency cases were excluded from the study.

Type of study

It was a retrospective study.

Data analysis

To analyze the reason for discarding whole blood and its components data of two years was collected from the blood bank of SVBP Hospital, LLRM MC from the period of April 2019 to March 2021, after informed consent to the personnel and authority. The present study included blood units (whole blood, packed RBCs, platelets and FFPs) that were discarded due to various reasons which included date of expiry, leakage, lipaemic contamination, TTI-HCV, HBV, VDRL, HIV and MP, return from ward, hemolysis and clotting, blood contamination, suboptimal volume.

The statistical software namely SPSS22.0 and R environment ver. 3.2.2 were used for the analysis of the data and Microsoft Word and Excel were used to generate graphs, tables. The units were discarded according to the norms mentioned in standard operating procedures made by the blood bank under NACO guidelines.

The data were calculated as follows,

$$\text{Discard rate} = \frac{\text{total number of blood or components discarded}}{\text{total number of blood or components prepared}} \times 100.$$

$$\text{Prevalence rate} = \frac{\text{total number of cases of specific disease in a given time period}}{\text{total population during same time period}} \times 100.$$

Ethical committee of LLRM Medical College has reviewed and approved the study.

RESULTS

The observations when interpreted showed that a total of 21627 units were collected from donors. These units were composed of 15702 voluntary donors, collected in blood bank setups and camps and 5925 were replacements.
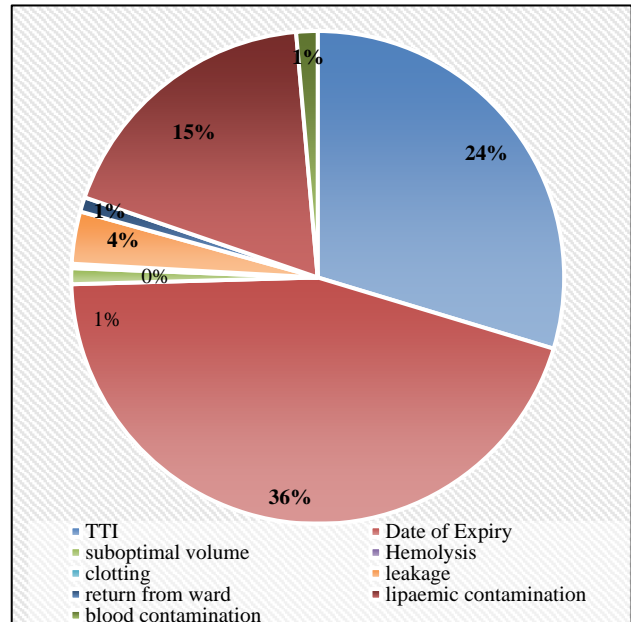
Figure 1: Various reasons for discarding of blood and its units.

During the two-year study period, the total units of whole blood (WB) were 11534 and the rest were components such as 10093 PRBC, 3245 PC, and 9669 FFP. A total of 4046 units of blood and its components were discarded. It was observed that the discard rate for WB, PRBC, PC, and FFP were 6.25% (721/11534), 7.46% (753/10093), 38.39% (1246/3245), and 13.71% (1326/9669) respectively. Total units of WB and its components discarded due to TTI positivity were 4.47% (968/21627), date of expiry 6.77% (1465/21627), suboptimal volume 0.84% (183/21627), hemolysis 0.12% (28/21627), clotting 0.11% (24/21627), leakage 2.76% (598/21627), return from ward 0.77% (167/21627), lipaemic contamination 1.70% (368/21627) and blood contamination 1.13% (245/21627). Various reasons for discarding are shown in Figure 1. Out of these 4046 discarded units the top three most common reasons were date of expiry 36.20% (1465/4046), TTI positivity 23.92% (968/4046), and leakage 14.78% (598/4046).

Discard rate for WB and its components are shown in Table 2. The prevalence of TTI for WB was also calculated and the results were HBV 1.06%, HCV 0.95%, HIV 0.09%, Syphilis 0.01%, and malaria 0.004% depicting that Hepatitis B surface antigen positivity was the most prevalent TTI among other seroreactive units.

The comparison of discard rates and their reasons is shown in Figure 1.

Table 1: Total blood collection.

Years	No. of voluntary donors	No. of replacement donors	No. of male donors	No. of female donors	Total no. of donors
April 2019 to March 2020	9335	3276	12130	481	12611
April 2020 to March 2021	6367	2649	8804	212	9016
Total	15702	5925	20934	693	21627

Table 2: Discard rate for WB and its components.

Year/total donation	Component status	WB	PRBC	PC	FFP
April 2019 to March 2020	Collected	6657	5872	2403	5486
	Discarded	366	295	944	772
	Discard rate (%)	5.49	5.02	39.2	14.0
April 2020 to March 2021	Collected	4877	4221	842	4183
	Discarded	355	458	302	554
	Discard rate (%)	7.27	10.85	35.8	13.24
Total	Collected	11534	10093	3245	9669
	Discarded	721	753	1246	1326
	Discard rate (%)	6.25	7.46	38.39	13.71

Table 3: Comparison of the reason for discarding whole blood units and components in different published studies with the present study.

Study (place)	Study period	No. of units collected	No. of units discarded (%)	TTI Positive (%)	Expired (%)	Less quantity (%)	Leakage (%)	Others (%)
Kanani et al[6] (Jamnagar, Gujarat)	January 2014 to December 2016	66,255	4604 (7.0)	520 (11.3)	1997 (43.4)	1169 (25.4)	631 (13.7)	163 (3.5)
Morish et al[10] (Kuala Lumpur)	January to December 2007	390,634	8968 (2.3)	-	-	353 (3.9)	2306 (25.7)	6309 (70.4)
Kora et al[11] (Bagalkot, Karnataka)	January 2009 to December 2010	6129	263 (4.3)	220 (83.6)	38 (14.4)	5 (2.0)	-	-
Kumar et al[12] (Sevagram. Wardha, Maharashtra)	November 2009 to May 2011	10,582	888 (8.4)	300 (33.8)	513 (57.8)	18 (2.0)	27 (3.0)	20 (3.4)
Thakare et al[7] (Aurangabad, Maharashtra)	2005 - 2007	24,547	879 (3.6)	604 (68.86)	275 (31.3)	-	-	-
Suresh et al[13] (Tirupati, Andhra Pradesh)	January 2013 to June 2014	24,847	1747 (7.0)	663 (37.9)	131 (7.5)	536 (30.7)	28 (1.6)	78 (4.5)
Patil et al[9] (Sawangi, Wardha, Maharashtra)	January 2013 to June 2015	14,026	2888 (20.6)	953 (33.0)	1531 (53.0)	48 (1.7)	97 (3.4)	186 (6.4)
Present study (Meerut, Uttar Pradesh)	April 2019 to March 2021	21,627	4046 (18.7)	968 (23.9)	1465 (36.2)	183 (4.5)	598 (14.8)	832 (20.5)

DISCUSSION

Blood banking is a medical logistic activity. It attempts to bring the potentially lifesaving benefits of transfusion to the patients who need them by making blood components available, safe, effective, and cheap. Blood banks try to maximize delivering getting blood from the right donors to the right patients in a timely manner. The easiest way to assure the timely availability of blood is to have an appropriate inventory on the shelf at all times.[4] Blood components such as red cells, platelets, and plasma are prepared from a single whole blood donation. Components have tightly regulated preparation and storage requirements. Each component carries the same risk of hepatitis, and human immunodeficiency virus (HIV) transmission as the original volume of whole blood.[5] Therefore proper blood management at the blood bank should be done reducing unnecessary wastage of blood and blood components and providing safe blood.

In our study, the average discard rate was 18.70% (4046/21627). In a study done by Kananiet al it was observed that the average discard rate was 6.95%.[6] The most common reasons of discarding these blood bags were outdated units, suboptimal volume and leakage. In a study done by Thakre et al the average discarding rate was 3.58%, the main reason being TTI positivity.[7] In a study by Deb et al average was 14.61% and the main cause was non utilization of units.[8] In another study by Patil et al the average discard rate was 22.45%, the most common reason for discarding was TTI positivity.[9] The average discard rate in other studies by Morish et al, Kora et al, Kumar et al, Suresh et al, Bobde et al, Sharma et al and Ghaflez et al was 2.3%, 4.3%, 8.4%, 7.0%, 6.63%, 8.69% and 12.0% respectively.[10-16]

Whole blood

The discard rate of WB in the present study was 6.25% which was slightly higher than quoted by Kanani et al (3.15%), Suresh et al (5.7%), Sharma et al (4.46%) and slightly lower than Bobde et al (6.63%) and Patil et al (7.70%). The most common reason for the discard of whole blood was TTI positivity which comprised 11.4% of total wastage, followed by suboptimal volume comprising of 4.5% and the rest of the reasons holds a percentage of 1.8% (expiry, leakage, return from ward, clotting and hemolysis). The main reasons for less quantity of blood were phlebotomy failures due to collapse of the vein, hematoma formation, donor uncooperation because of uneasiness, fainting, and vomiting.

PRBC

The discard rate for PRBC in the present study was 7.46% which was higher than quoted by Kanani et al (2.26%), Suresh et al (3.3%), Sharma et al (3.2%), Bobde et al (2.0%) and Patil et al (6.74%). The most common reason for discard of PRBC was again TTI positivity comprising 11.0% of total discarded units and other causes as discussed above comprised 7.5% of total discarded units. Proper donor screening by history taking may decrease the rate of discard due to TTI positivity.

Platelets

The average discard rate for platelets in the present study was 38.39% which makes it the most common component discarded during the study period. The most common reason for the discard of PC was date of expiry (28.6%) and the other causes like TTI, return from ward, leakage and red cell contamination comprised of 2.12 % only. The reason for the high discard of PC was short shelf life (5 days). This can be decreased by preparing platelets on demand and using modern techniques like apheresis.

FFP

The average discard rate for FFP in the present study was 13.71% which was higher than Kanani et al (5.36%), Bobde et al (7.6%), Sharma et al (6.2%), and slightly lower than Patil et al (14.24%). The main reason for discard of FFP was leakage (12.70%) followed by lipaemic contamination (9.09%), red cell contamination (4.96%), date of expiry (3.48%) and return from ward (1.63%). Leakage can be minimized by putting FFP bags in a cardboard or polystyrene protective container that minimizes the risk of breakage of product during storage, handling and transportation. The lipemic discards can be minimized by proper donor questioning regarding the interval between donation and time of last meal. Avoidance of fatty meal prior to the donation may prevent the lipaemic collection of blood units.[17]

Strategies to maintain discard of blood as minimum as possible

Blood donation camps to be organized as per the need of blood bank stock. Blood group wise record of voluntary donors to be maintained as to contact when required. Use of advanced software in blood banks and hospital wards for proper coordination between clinicians and blood bank staff.

Encouragement of scheduled blood donations for elective operative procedures. Increased use of techniques like apheresis machine to prevent wastage of components like platelets whose demand cannot be predicted. Strict adherence to the alignment of blood bags in blood bank refrigerators according to their blood groups and date of expiry.

Proper donor screening and detailed history taking of previous infections, family history, personal history, medical history, and history of multiple sexual partners, to avoid discarding blood units due to TTI positivity. Proper handling of blood bags and stringent storage conditions to prevent hemolysis, clotting, bacterial

contamination. Technical expertise in component preparation to prevent RBC contamination Precautions during thawing of FFP to prevent leakage such as use of polystyrene protective containers. Education and training to technical staff for 350/450 volume collection with the use of calibrated blood collection monitor even in camps.

Continued medical education for technical staff to maintain self audit and ensuring a safe, ethical, appropriate and rational supply of blood and its components.

Limitations

Small sample size and reduced duration were the limitation of our study. An increase in duration and sample size would have helped us accordingly.

CONCLUSION

The present study revealed that an average of 18.70% of blood units were discarded during this study period. The most common unit to be discarded was Platelets, mainly due to a short shelf life of 5 days. The most common reason for discard was the date of expiry followed by TTI positivity. To minimize the wastage of blood units, blood banks should be fully committed to organizing and coordinating blood transfusion services, implementing all possible strategies as discussed to lower the discarding of blood and its units and to make them widely available.

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