Original Article

Analysis of Reasons for Discard of Blood and Blood Components in a Tertiary Care Hospital in South India

Deepika. M.[1]*, Megala. C.[2] and ThamilSelvi. R.[2]

[1]Dept. of Immunohematology and Transfusion Medicine, Vinayaka Missions KirupanandhaVariyar Medical College and Hospital
[2]Dept. of Pathology, Vinayaka Missions KirupanandhaVariyar Medical College and Hospital

ABSTRACT

Background: Blood transfusion is an important and essential constituent of presenthealth-care delivery system. Millions of lives are saved every year in regular and emergency situations by the accessibility of safe blood transfusion services. This emphasizes the need for proper utilization of blood and its components with preferably "NO" or minimal wastage. The aim of this study was to find out causes for discarding blood and blood components.

Methods: Retrospective analysis was carried out at Vinayaka Missions Medical College and Hospital Blood Bank from October 1st, 2018 to October 31st, 2019.

Results: The total number of donors from whom blood was collected during this study period was 2522. Out of which 2507 units of components were prepared. The overall discard rate of blood and its components was 5.95%. Among those 5 (33.33%) whole blood, 28 (1.25%)packed red blood cell concentrate, 93 (4.16%) fresh frozen plasma, 157 (57.51%) platelet concentrate were discarded. The common causes of discarding blood components were due to expiry date 211 (74.56%), 30 (10.60%) were due to sero-reactivity for transfusion transmitted infections, 23 (8.13%) due to leakage of components, 13 (4.59%) due to low volume and other causes were 6 (2.12%).

Conclusion: Blood being irreplaceable source, discard rate can be reduced by proper counselling of blood donors, conducting donor screening, adhering to strict donor deferral criteria, notification and counselling of permanently deferred donors. Properly implementing blood transfusion policies will help to utilize the blood components in a proper way, thus resulting in discarding a smaller number of blood bags due to expiry.Continued medical education for technicians with regards to maintenance of proper stock, quality indicators, review of blood management system will further help in reducing discard rate.

Keywords: Discard Rate, Packed Red Cells (PRC), Fresh Frozen Plasma (FFP), Platelet Concentrate(PC), Transfusion Transmitted Infections (TTI), Self Audit.

Introduction

Blood transfusion service is the vital part of present health care system without which efficient medical care is possible [1]. The aim of blood transfusion service should be to provide effective blood and blood products which are safe as possible and adequate to meet the patients need [2]. One third of all patients admitted to ICUs in developed world receives blood transfusion [3]. Demand of blood and its components always outpace its supply. Advances in medical technology demand more and more provision of safe blood for effective management of patients [3].

This emphasizes the need for proper utilization of blood and its components with preferably "NO" or minimal wastage [4]. Protocols for minimizing the wastage of blood and its components should be formed in each blood bank to save human and financial resources.

Aims

1. To analyze the causes for discarding of whole blood and its components

2. Interventions to minimize the number of discarded blood and its components

Objectives

To implement possible strategies for reducing unnecessary wastage of blood and its components.

Materials and Methods

Retrospective analysis was carried out at our Blood bank from October 1st, 2018 to October 31st, 2019.

Blood donors fulfilling donor selection criteria defined by NACO [5] were included in the study after taking proper medical history and brief clinical examination. The donors were either voluntary or replacement. Replacement donors were patients' acquaintance.

Data collected from the blood bank discard register was used for analyzing the results and for calculation of the percentage of discarded blood and its components. Blood bags were discarded according to standard operating procedures laid down by National AIDS control organization (NACO)[6].

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

Results

Among 2522 total donors in present study 78.51% were voluntary donors and 21.49% were replacement donors. Out of which 2507 units of components were prepared. Of these, packed cell concentrates and fresh frozen plasma prepared were 2234 (88.58%), platelet concentrate was 273 (10.82%) and whole blood were 15 (0.60%). A total of 283 (5.95%) components were discarded from them as depicted in Table 1. The common causes of discarding blood components as shown in Table 2 were due to expiry date 211 (74.56%), 30 (10.60%) were due to sero-reactivity for transfusion transmitted infections, 23 (8.13%) due to leakage of components, 13 (4.59%) due to low volume and other causes were 6 (2.12%) which included components sent for quality control, hyperlipemia, red cell contamination, return components and clotted components.

Discussion

There is an increasing demand for blood and its components with the advent of precise diagnosis of complicated diseases that require transfusion. With the emergence of newer treatment modalities, requirement of blood units is increasing. Hence, if blood is used efficiently and judiciously, it can save lives of many patients. Proper management at blood bank will reduce unnecessary wastage of blood and blood components.

Whole blood: In the present study, discard rate for whole blood was (33.33%) which is higher compared to *Sharma et al* [8] (4.46%), *Bobde V et al* [9] (6.63%), *Suresh et al* [10] 5.7% . Most common reason for discard of whole blood in present study was date of expiry accounting for 40% followed by TTI positive status of donors in 20%, low volume in 20% and other causes in about 20%. Out of 30 (10.60%) tested positive for TTIs, HBsAg was positive in 63.33% units followed by HIV 16.67%, HCV 10%, Syphilis 3.33 % and malaria 6.67%. This data was

Table 1: Analysis of discarded units of blood components against total prepared components.

COMPONENTS	NO. OF COMPONENTS PREPARED	NO. OF UNITS DISCARDED	DISCARD RATE (%)
Whole blood	15	5	33.33
Packed red cells	2234	28	1.25
Fresh frozen plasma	2234	93	4.16
Platelets	273	157	57.51
Total	**4756**		**5.95**

Table 2 : Analysis of reasons for discarding blood components

BLOOD COMPONENT	DATE OF EXPIRY	TTI	LEAKAGE	LOW VOLUME	OTHER CAUSES	DISCARD RATE (%)
Whole blood	2	1	-	1	1	33.33
Packed cells	20	5	-	2	1	1.25
Fresh frozen plasma	54	17	15	6	1	4.16
Platelet concentrate	135	7	8	4	3	57.51
Total (283)	**211**	**30**	**23**	**13**	**6**	**5.95**

Table 3 : Comparison of reasons for discarding blood components in various published studies with the present study.

Study	Study period	No. of units collected	No. of units discarded (%)	Date of expiry (%)	TTI positive (%)	Leakage (%)	Low volume (%)	Others (%)
Suresh et al	January 2013 to June 2014	24,847	1747 (7.0)	131 (7.5)	663 (37.9)	28 (1.6)	536 (30.7)	78 (4.5)
Kumar et al	November 2009 to May 2011	10,582	888 (8.4)	513 (57.8)	300 (33.8)	27 (3.0)	18 (2.0)	20 (3.4)
Thakare et al	2005-2007	24,547	879 (3.6)	275 (31.3)	604 (68.86)	-	-	-
Patil P et al	January 2013 to June 2015	14,026	2888 (20.6)	1531 (53.0)	953 (33.0)	97 (3.4)	48 (1.7)	186 (6.4)
Present study	October 2018 to October 2019	2522	283 (5.95)	211 (74.56)	30 (10.60)	23 (8.13)	13 (4.59)	6 (2.12)

* *Present study compared with other studies showed statistical significance (x^2 = 305.966, p < 0.0001)*

Table 4 : Strategies to minimize discard rate of whole blood and its components

BLOOD COMPONENT	STRATEGY
Whole blood	1. FIFO policy 2. Proper donor screening 3. Proper donor selection (NACO guidelines) 4. Proper training of blood bank technicians 5. Proper calibration of blood collection monitor 6. Maintain stock inventory on regular basis
Packed cells	1. Sensitization regarding indication and use of PRBC 2. Return of non-utilized unit within 30 mins
Fresh frozen plasma	1. Place in polystyrene container during storage 2. Place in sterile plastic bag during thawing
Platelet concentrate	1. Prepare on request 2. Apheresis technique

comparable to a study done by *Suresh et al* in which 64.4% units were discarded due to Hepatitis B infection [10].

Measures by blood bank like FIFO (First in First Out) will reduce blood component discard due to date of expiry. Reason for low volume collected was due to phlebotomy failure like vein collapse and acute donor reaction such as uneasiness, vomiting, fainting, perspiration, hematoma formation during blood donation. This can be resolved by selecting suitable healthy donors and technical expertise of blood bank technicians in phlebotomy. Another reason for clotted and low volume was due to use of uncalibrated blood collection monitor and spring balance, thereby making it difficult to measure accurately the volume of blood in the bag.

Blood components: In present study, 283 (5.95%) blood components were discarded against 2507 components prepared. In a study done by *Deb et al* [11], it was observed that an average 292 (14.61%) bags from total collection were discarded. Of the 292 units discarded, 242 units were due to non-utilization. In another study done at Choithram Hospital and Research Center, Indore, India by *Chitnis et al* [12], it was observed that approximately (8.9-10%) of blood bags were discarded.

In a study by *Suresh et al,* 24,847 blood components were prepared, out of which 7% of units were discarded. Discard rate was slightly higher compared to present study [10]. Reasons for discard of blood components in the present study were date expired (74.56%), testing positive for TTIs (10.60%), leakage of blood bags damaged during component separation (8.13%), less volume collected (4.59%) and other causes (2.12%) .

Similarly, in a study conducted by *Thakare M M et al* [13], Hepatitis B (49.82%) was the most common TTI followed

by HIV (10%) and HCV (8.97%). Proper donor screening and strict adherence to donor selection criteria (by NACO) would minimize wastage of blood components due to collection from such sero-positive donors.

The most common blood components discarded were platelets (57.51%) followed by whole blood (33.33%), fresh frozen plasma (4.16%) and packed red cell concentrate (1.25%). Discard rate for platelets in present study was lower (57.51%) as compared to studies by *Ghaflez M Bet al* [14] where discard rate for platelets was high (61.11%). Most common reason for discard of platelets was date of expiry due to non utilization. Similar findings were observed in studies conducted by *Kumar et al* [15] and *Deb et al* [11] where high discard rate of platelets was due to short shelf life of 5 days. To minimize high discard rate, platelets should be prepared on request and using modern techniques like apheresis [15].

Discard rate for fresh frozen plasma (FFP) was 4.16% in present study. In a study by *Sharma et al* [8] discard rate of FFP was 6.2% and slightly higher discard rate of (7.6%) was reported by *Bobde V et al* [9]. Most common reason for discard of FFP was date of expiry followed by TTI, leakage, low volume and other causes included components sent for quality control, hyperlipemia, red cell contamination, return of components, clotted components.

Reason for non-utilization was excess of FFP units requested against requirement. However, leakage of FFP bags can be minimized by putting FFP bags in a cardboard polystyrene protective container that minimizes risk of breakage of product during storage, handling and transportation. [2] Also, taking precautions during thawing of FFP by placing the whole container in a sterile plastic bag.

Reasons for return of components were due to death of patients, transfer of patients to higher centre, wrong blood component demanded and excess number of units ordered. This can be minimized by sensitization of doctors and residents regarding indication and use of blood and its components, clear instructions to send back units not utilized after issue within 15-30 minutes to the blood bank maintaining cold chain and sterile conditions. FFP taken back to inventory, if returned within 15-30 minutes of issue and stored at 1-4°C, could be used within 24 hours of return. The sub-optimal volume and RBC contamination can be decreased by technical expertise in component preparation. The lipemic discards can be minimized by proper donor questionnaire about the interval between blood donation and time of last meal.

In present study, discard rate for packed red cells concentrate (PRC) was 1.25% which was lower as compared to studies by *Sharma et al* [8] (3.2%), *Suresh B et al* [10] (3.3%), *Patil P et al* [16] (6.76%). Most common reason for discard of PRC was date of expiry followed by TTI positive status of donors, leakage, low volume and other causes like clotted or hemolyzed sample. Main reason for sub-optimal volume of PRBC was aliquots (pediatric transfer bags) issued to thalassemia and pediatric patients. Proper stock inventory and preparation of aliquots as per demand with aseptic precautions would prevent discard rate of PRBC due to sub-optimal volume. Proper donor screening and strict adherence to donor selection guidelines would decrease the collection of low volume units from donors, thereby avoiding discard of such units [15].

Table 3 compares the reasons for discarding blood components in various published studies with the present study and showed that it was statistically significant (p<0.0001). Using MedCalc, "N-1" Chi-square test as recommended by Campbell (2007) and Richardson (2011) was 305.966. The 95% Confidence Interval was calculated according to the recommended method given by Altman et al which was 13.4579% to 15.7431%. The various strategies to reduce the discard of blood and its components are tabulated in Table 4.

Conclusion

Blood being an irreplaceable resource needs to be properly utilized. To minimize wastage of blood, there should be proper implementation of blood transfusion policies and co-ordination between hospital and blood bank staff. In the present study, platelet concentrate was the most common blood component discarded. These bags were discarded as they were not utilized. Hence, this affects the blood bank financially and is also socially harmful.

Conflict of Interests:

There are no conflicts of interest.

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*Corresponding author:
Dr. Deepika.M., No.218, Sankagiri main road, line medu, Salem- 636006
Phone: +91 9566593509
Email: mani.deepik07@gmail.com