How to Cite:
Kanya, S. A., Arun, M., Megala, C., Thamilselvi, R., & Vignesh, B. (2021). Analysis of unused blood products and its management during peak COVID period in a rural based teritiary care hospital. *International Journal of Health Sciences*, *6*(S4), 11767–11774. https://doi.org/10.53730/ijhs.v6nS4.11398

Analysis of unused blood products and its management during peak COVID period in a rural based teritiary care hospital

Dr. Kanya S A
Junior Resident, Dept of immunohematology and transfusion medicine, Vinayaka Missions, Kirupanandavariyar medical college and Hospital, Salem

Dr. Arun M
Senior Resident, Dept of Transfusion Medicine,Vinayaka Missions Kirupananda Medical college and Hospital, Salem

Dr. Megala C
Assistant professor, Dept of Pathology, Vinayaka Missions Kirupananda Medical college and Hospital, Salem

Dr. Thamilselvi R
Professor and Hod, Dept of Pathology, Vinayaka Missions Kirupananda Medical college and Hospital, Salem

Dr. Vignesh B
Assistant professor, Dept of immunohematology and transfusion medicine, Vinayaka Missions, Kirupanandavariyar medical college and Hospital, Salem

***Abstract*---**Background: Blood donation is one of the most noble gestures a human can make to save life. Even after so many advances in the field of blood donation till now no alternative of human blood is easily available in all places. The aim of the study is to analyse various unused blood products their causes,during the peak covid period and its management. These are done by formulating guidelines for proper donor screening, component separation, TTI screening,and proper handling of blood products. Methods: A total of 1960 whole blood units from both voluntary and replacement donors were collected from September 2020 to August 2021 in the Department of Transfusion Medicine, Vinayaka Mission Medical college Salem.Out of which 214 units were unused(4.78%) units. Results: The study showed out of 214 units,113units(52.80%) were from platelet components, 30(14.02%) were PRBC,71(33.18%)were FFP. The primary cause of discard wasexpiry of units(45.79%), andsecond major cause was returning of units 24 (27.57%), which can be

Manuscript submitted: 9 Agst 2021, Manuscript revised: 18 Oct 2021, Accepted for publication: 27 Nov 2021

managed by following certain guidelines before issuing. Conclusion: Blood being a valuable resource discard rate must be reduced to 1% by proper counselling of donors, screening, adhering to deferral criteria, proper donor arm disinfectant during phelebotomy, proper management of returned units, implementing the policies in proper way, this atlast leads to decrease in sending bags to expiry. Frequent training classes for technicians, upgradation of new policies to technicians will make them regards to maintenance of proper stock, quality indicators and review of blood management system.

***Keywords*---**PRBC, fresh frozen plasma, discard, unused blood products, returning units.

Introduction

Blood donation is a vital part of worldwide healthcare system.It has been estimated that every two seconds someone needs blood.[1]Even after many advances in the field of science till now no alternative of human blood is easily available.Blood has many roles which include delivering nutrient and oxygen to cells& tissues, helps in gaseous exchange[2].Many chronic medical conditions such as chemotherapy and thalassemia depend on continuous supply of blood from healthy donors. Each unit of blood is precious and has to be utilized properly with minimal wastage.[3-5] There are multiple process that contribute to shortfall in provision of blood which includes donor recruitment, donor selection, blood collection, testing and processing, storage and transportation and finally, transfusion of the blood unit into the patient.

As different blood component has different relative densities and specific gravity they are separated into various blood components when centrifugal force is applied.[6] Indication of whole blood uses limited to acute blood loss, i.e. hypovolemic shock and exchange transfusion only. Transfusion of packed red blood cells is useful in chronic symptomatic anemia and conditions of severe blood loss. Fresh frozen plasma is used in multiple coagulation factor deficiency and liver diseases where coagulation profile is impaired. Platelet components are used in bleeding due to low platelet count or impaired platelet function. Cryoprecipitate is used in fibrinogen deficiency, dysfibrinogenemia, and in cases of disseminated intravascular coagulation.[2] The demand for blood components is increasing day by day, but the supply of the same is not rising in that proportion. It requires proper inventory management and techniques to improve judicious use of blood component so that most of the patient in need can avail blood component as per their transfusion requirement. Further, the inventory of blood components can be supervised in such a way that discard of blood component becomes very low. In quality management system for process improvement and better inventory management, a performance monitoring tool is critical in the blood bank to improve quality and discard rate of blood components is one of the essential elements for this.[3] Wastage of blood can occur for many reasons mainly expiry of blood components, leakage or breakdown, red cell contamination and seropositivity for transfusion-transmitted infections. This study was designed to analyze blood component discard and their reason in a newly developing institute

and blood bank setup. It will provide evidence-based information and acts as a helpful guideline for optimum use of blood and minimizing its wastage after implementation of proper storage.Hence a quality management system should be followed at all stages of collection, processing, storing, and issuing blood products.[6-8]For unused products, we have to formulate protocols,to avoid discarding of units.

Methodology

AProspective study was conducted at the blood bank in a tertiary care center in Salem, Tamil Nadu. In this study, data was collected daily from the discard register of the blood centre and the technicians to know the cause of unused blood products in blood centre.PERIOD OF STUDY: September 2020 to October 2021.SELECTION OF DONOR:Donors were selected after proper screening, medical history, and brief clinical examination.Blood bags were discarded according to standard operating procedures(SOP)followed in our blood centre.[9] The daily amount of blood collected, number of blood components prepared from each unit, the number of units of various components discarded, and reason for the discard was analysed. A total of 1960 units of blood was collected.The present study includes blood units discarded for different reasons that include transfusion-transmitted infection (TTI) seroreactivity, late returning of units to blood bank,expired component, Low volume(LV), leakage/ breakage, clot in the bag, QCfailed units.Blood components such as red blood cells (RBCs), platelet concentrate (PLT), and fresh frozen plasma (FFP) were prepared regularly from 350 ml blood bag under all aseptic condition as advised by Food and Drug Administration guideline and NABH 3rd edition, International Organization for Standardization (ISO) 9001: 2015, National AIDS Control Society (NACO).[10,11]Blood units include packed cells,platelets,and FFP which are transfused,Plasma units that were sent for plasma fractionationwere excluded from the study. Data were compiled and analysed using Microsoft Excel.Descriptive statistics were reported as frequencies (percentage) for categorical variables. Data were statistically evaluated with IBM SPSS Statistics for Windows, Version 25.0., IBM Corp., Chicago, IL.

Results

A total of 4468componentswere collected at the blood bank in a tertiary care center in Salem, TamilNadu, from September 2020 to August 2021. Of the total units obtained, 12 were whole blood, 1948 were RBC, 1948 were fresh frozen plasma (FFP), and 274 platelets (Figure 1). The rate of discard was 13.82% among RBC, 32.97% FFP, and 53.19% platelets (Table 1)

Figure 1:Distribution of blood components collected (N=4468)

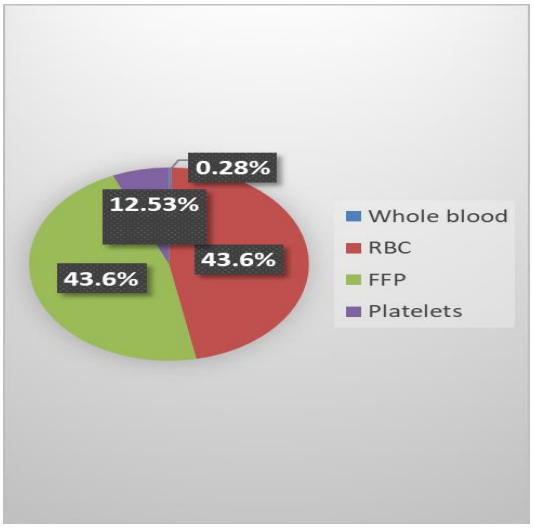

Table 1: Distribution of number of units of blood components discarded (N=4468)

Slno	BLOOD COMPONENT	NO. OF. UNITS OBTAINED	NO. OF UNITS DISCARDED	RATE OF DISCARD
1	Whole blood	12	-	-
2	RBC	1948	30/1948	1.54%
3	FFP	1948	71/1948	3.64%
4	Platelets	560	113/1948	5.8%

Among unused blood products,the commonest cause ofPRBC discardis expiry of units. Total of 12 PRBC expired, 10 units were returned, two had low volume, 1 had clotted bag/hemolysed units, 3 weresero reactive, two had breakage. Among unused FFP, majority were because of returning of units, 15 had breakage,3 weresero reactive, 3 werelow volume, three had lipemic. Among unused platelet products,89 were because of expiry of units, 5due to returning, 2 due to breakage, 12 had more red cell contamination,3were sero reactive,2 were of low volume.(Table 2).

Table 2: Distribution of reason for unused blood products(n=214)

Sl.no	REASON FOR UNUSED BLOOD PRODUCTS	RBC	FFP	PLT	TOTAL
1.	Expiry of units	12	0	89	47.19%
2.	Returning of units	10	47	5	28.97%
3.	Breakage/leakage	2	15	2	8.87%
4.	Red cell contamination	0	0	12	5.6%
5.	Seroreactive	3	3	3	4.20%
6.	low volume	2	3	2	3.27%
7.	Lipemic	0	3	0	1.4%

8	Clotted/hemolysed units	1	0	0	0.04%

Discussion

The most common cause of unused blood products in our blood bank is expiry of unitswhich is 101 units was 47.19%.According to Simon K et al. in his study, he denoted 93.03% of unused blood products were due to expiry of units.[14]It occurs most commonly with platelets(89units) 41.58%.It may be due to improper awareness about blood inventory management among the technicians.To address this platelet expiry, technicians should be guided to keep very minimum units in stock & prepare platelet on request unless an emergency arises.Use apheresis technique to get maximum utilisation from a single unit. For RBC,use FIFO(first in, first out) policy to be followed,and frequent exchange of older units to nearby blood banks that are in need can avoid expiry of units.

The major blood component in returning units wasFFP.Thecausesaredenial of transfusion by the attenders after bringing the units;blood transfusion reactions, patient going against medical advice, delay in returning of blood bag by interns/CRRI/Patient attenders, death of the patient in casualty.In all these cases units were returned after 4 hours of issuewhich should be returned within 30 min of issue.Other reasons for delayed returning in this period is mainly becauseof taking longer time durationfor the units toreturn from covid ward.Basic methods to be followed are proper crossmatching, Proper written consent from the patient/patients attenders before ordering the blood will decrease the returning of units,checking of bag details with the requisition form and crossmatching card in the issue area can avoid returning units instead checking in the ward side.[15]

After all, this if the blood units are returned, we need to ensure Quality Control and reusage of blood products. To follow,Usetemperature indicator stickers on all red cell units.Thawing of plasma requires about 30 min to thaw at 30-37degrees,once thawed plasma must be infused within 5 days.Thawing large volume of units and not transfusing may lead to wastage of units. The discard rate for packed red cells concentrate in the present study was 1.54%.Similar findings were seen in a study by Arora et al. [16] 3.5% and Thakare et al. 3.58%[17] and higher than quoted by Morish et al. 2.3%,[18] Suresh et al. [19] 3.3%, and Sharma et al. 3.2%[20]. The most common reason for discarding red cells concentrate was expiry, followed by returning units. One of the main reasons for expiry is not following FIFO policy.

“Low volume” RBC units is defined as the unit that contains less than 10% of normal PRBC bag volume. It may be due to several reasons including the discontinuation of donation because of donor's reactions; the blood flow from small vein during phlebotomy, and the donation duration exceeding 15 minutes. Another reason may be that the spring balance was not calibrated, and thus was unable to measure the volume of blood in the bag accurately. Selecting a good donor, and training and monitoring the staffs will help to reduce cases of the underweight blood units.Advice of pre-donation drink will reduce the donor reaction.Calibration of the blood collection monitor can reduce the low volume collection from lab side.[21]. To prevent these untoward consequences of hemolysis,

regulatory agencies have set hemolysis standards as a condition for RBC storage system licensure.

The discard rate of FFP in our study was 3.6% (71/1948), which is lower than Bobde et al. [22] (7.6%) and Sharma et al. [23] (6.2%). Similar to Kanani et al. [21] the most common reason for discard of FFP was returning 47/1948,leakage 15/1948, followed by TTI positive units (3/1948), lipemic (3/1948), returning of units,Leakage was the most common cause of wastage of FFP, which can be minimized using,appropriate size freezers, putting FFP units in cardboard, or polystyrene protective container that minimizes the risk of breakage of product during storage, handling, and transportation. Excess FFP can be given to fractionating and this will further minimize the expiry rate of FFP. The lipemic discards can be minimized by proper donor questioning regarding their interval between donation and time of the last meal.

Blood donor selection is the first crucial step in the process of ensuring blood safety as it helps to significantly reduce risk through the deferral, prior to donation, of any individuals or groups of individuals with identified risks that may be associated with infection.Other than this, there is no proper policy to identify TTI before donation because many of theinvestigations need huge samples to proceed.To avoid this, training of technicians with proper guidelines will reduce the contamination of blood bags.

The returning of units was one of the major cause of discarded blood and its components in fresh frozen plasma.The leakage was anothercause of unused FFP's.Frozen plasma's leakage is due to arranging of frozen units forcefully.Mishandlingof blood bags during collection, processing, and storage or manufacturing errors may be the major causes of defects. The integrity of plastic bags is essential and precautions should be taken to prevent leakages.[24] The bag may be damaged during centrifugation. This happens when the bag is forced to a sharp interior bottom/wall junction or corner, resulting in the bag material being stretched too far, causing a tear.The defect and leakage at any part of the plastic blood bags can be detected by visual inspection during the processing, after pressure in a plasma extractor, before freezing.The FFP should be stored in cardboard or polystyrene protective containers that minimize the risk of breakage of brittle frozen product during storage, handling, and transportation.[25] Another approach to decrease the leakage and contamination immediately before immersion of the frozen blood bags in the water bath is that the whole container should be placed in a sterile plastic bag.

A units of yellowish white milky gross lipemic fresh frozen plasma was traced from 3 donor who donated after eating a high-fatty meal. Lipaemia itself does not affect the safety of a product but might interfere with the ability to perform viral marker tests.The doctors and nurses should make an attempt to identify or suspect donors who are at high risk for hyperlipemia prior to donation by asking the donors during the pre-donation interview if they had eaten a fatty meal prior to coming for blood donation. If their blood components were discarded because of the lipemia, the donors should be investigated for lipid profile. These may assist in minimizing blood component discard due to hyperlipemia.

Conclusion

A good communication between the clinician and blood bank personnel will be an effective solution to avoid wastage due to non-utilization of blood products after the requisition was made. The rate of discarding blood products is a quality indicator of functioning of blood bank. Every institution should have a well-functioning Transfusion committee which should ensure meticulous screening of donors before blood donation, sensitization of clinicians on rational use of blood products, and training of blood bank personnel.Practicing standard transfusion protocols made by proper policy-making and its strict implementation will minimize the discard rate of blood and blood products in the blood banks.

References

1. Arora I, Singh S, Singh S. Donor blood wastage: A study from blood bank Chamba (H.P). Int J Community Med Public Health 2018;5:3016-9.
2. Available from: https://www.who.int/bloodsafety/Manual_on_Management,Maintenance_and_Use_of_Blood_Cold_Chain_Equipment.pdf. Last accessed on 14th Feb 2022.
3. Bashir F, Khalid A, Iqbal S, Ghafoor T, Ahmed M. Exploring the Causes of Wastage of Blood and Its Components in a Tertiary Care Hospital Blood Bank. Cureus. 2021 Dec 18;13(12).
4. Bobde V, Parate S, Kumbhalkar D. Analysis of discard of whole blood and blood components in government hospital blood bank in central India. J Evid Based Med Healthc2015;2:1215-9.
5. Bobde V, Parate S, Kumbhalkar D. Analysis of discard of whole blood and blood components in government hospital blood bank in central India. J Evid Based Med Healthcare March 2015;2:1215-20.
6. Clark JA, Ayoub MM. Blood and component wastage report. A quality assurance functions of the hospital transfusion committee. Transfusion.1989;29:139-142.
7. Ghaflez MB, Omeir KH, Far JM, Saki N, Maatoghi TJ, Naderpour M. Study of rate and causes of blood components discard among Ahwaz's hospital. Sci J Iran Blood Transfus Organ 2014;11:197-206.
8. Hardwick J. Blood processing: Introduction to blood transfusion technology. ISBT Sci Ser. 2008; 3:148–76.
9. Intriago, C. Z., & Posligua, T. I. Q. (2020). Telecommunications and virtualization in times of pandemic: impact on the electrical engineering career. *International Journal of Physical Sciences and Engineering*, *4*(3), 38–44. https://doi.org/10.29332/ijpse.v4n3.630
10. Kanani AN, Vachhani JH, Dholakiya SK, Upadhyay SB. Analysis on discard of blood and its products with suggested possible strategies to reduce its occurrence in a blood bank of tertiary care hospital in Western India. Glob J Transfus Med 2017;2:130-6.
11. Luhar RK, Shah RJ. Discard rate in blood transfusion service–A critical tool to support blood inventory management.
12. Morish M, Ayob Y, Naim N, Salman H, Muhamad NA, Yusoff NM, et al. Quality indicators for discarding blood in the national blood center, Kuala Lumpur. Asian J Transfus Sci 2012;6:19-23.

13. Morish M, Ayob Y, Naim N, Salman H, Muhamad NA, Yusoff NM. Quality indicators for discarding blood in the National Blood Center, Kuala Lumpur. Asian J Transfus Sci 2012;6:19-23.
14. Motschman TL, Jett BW, Wilkinson SL. Quality management systems: Theory and practice. In: Fung MK, Grossman BJ, Hillyer CD, editors. Technical Manual. 18th ed. Bethesda, MD: American Association of Blood Banks (AABB); pp. 1–38.
15. Novis DA, Renner S, Friedberg R, Walsh MK, Saladino AJ. Quality indicators of fresh frozen plasma and platelet utilization three college of American pathologists Q-probes studies of 8 981 796 units of fresh frozen plasma and platelets in 1639 hospitals. Arch Pathol Lab Med 2002;126:527-31.
16. Nugraha, I. S., & Udi, W. W. (2022). The corelation of pharmaceutical services with the incidence of side effects of phase III COVID vaccination participants in RS Tingkat II Udayana. *International Journal of Health & Medical Sciences*, *5*(4), 260-266. https://doi.org/10.21744/ijhms.v5n4.1944
17. Patil P, Bhake A, Hiwale K. Analysis of discard of whole blood and its components with suggested possible strategies to reduce it. Int J Res Med Sci 2016;4:477-81.
18. Price TH. Standards for Blood Banks and Transfusion Services. In: Price TH, editor. Bethesda, MD, USA: AABB; 2009.
19. Sharma DN, Kaushik DS, Kumar DR, Azad DS, Acharya DS, Kudesia S. Causes of wastage of blood and blood components: A retrospective analysis, IOSR Journal of Dental and Medical Sciences, December 2014:13:59-61.
20. Sharma DN, Kaushik DS, Kumar DR, Azad DS, Acharya DS, Kudesia S. Causes of wastage of blood and blood components: A retrospective analysis, IOSR Journal of Dental and Medical Sciences, December 2014:13:59-61.
21. Simon K, Ambroise MM, Ramdas A. Analysis of blood and blood components wastage in a tertiary care hospital in South India. Journal of Current Research in Scientific Medicine. 2020 Jan 1;6(1):39.
22. Suresh B, Babu KS, Arun R, Chandramouli P, Jothibai DS. 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.
23. Suryasa, I. W., Rodríguez-Gámez, M., & Koldoris, T. (2021). The COVID-19 pandemic. *International Journal of Health Sciences*, *5*(2), vi-ix. https://doi.org/10.53730/ijhs.v5n2.2937
24. Thakare MM, Dixit JV, Goel NK. Reasons for discarding blood from blood bank of government medical college, Aurangabad. Asian J Transfus Sci 2011;5:59-60.
25. Thakare MM, Dixit JV, Goel NK. Reasons for discarding blood from blood bank of government medical college, Aurangabad. Asian J Transfus Sci 2011;5:59-60.
26. Veihola M. Technical Efficiency of Blood Component Preparation in Blood Centres of 10 European Countries. Academic Dissertation. Finland: Department of Public Health, Faculty of Medicine University of Helsinki;2008. p. 5.
27. World Health Organization. Quality Systems for Blood Safety: Introductory Module Guidelines and Principles for Safe Blood Transfusion Practice. Geneva: World Health Organization; 2002. p. 65-75.
28. World Health organization. Recommendations. Developing a Normal Policy and Guidelines on the clinical use of Blood. Geneva: WHO; 2009.