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Study of reasons for discarding whole blood and its components in a blood bank in a rural tertiary care teaching hospital in Maharashtra

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ABSTRACT

Introduction: Each unit of blood is valuable; thus, it must be used as efficiently as possible with the least amount of waste. Supply of blood in an emergency requires stringent storage conditions with quality checked and should be available at the time of demand to the needy. So blood banks play a vital role in this demand-supply process. On the other hand, because of the biological nature of blood, it is very vulnerable to contamination by infections, early expiry and hemolysis. The purpose of this study was to determine the reasons for the wastage of blood and blood components.

Materials and Methods: At our tertiary care teaching hospital blood bank we conducted a retrospective analysis of data of all whole blood and blood component samples collected from January 2013 to December 2020.

Results: 391 (9%) of the 4022 entire blood bags collected were discarded 132 (32%) of them were eliminated due to hemolysis and lipolysis and the same 32% expired due to completion of the life span of RBC. Sero-reactivity for TTI or transfusion-transmitted diseases was 22.4% and only 13% were rejected for use because of some leakage or inadequate quantity of blood in the bag.

Conclusion: An adequately conducted donor screening, notification and counseling of permanently deferred donors will help in discarding less number of bags that are positive for different TTI. Properly implemented blood transfusion policies will help to utilize the blood components in a proper way resulting in discarding the number of blood bags due to expiry.

KEYWORDS: Rate of discards, Whole blood, Blood components, Seroreactivity

INTRODUCTION

Since artificial substitutes for blood as a life-saving measure have not yet been created, human blood is a necessary component of life. Blood transfusion services (BTS) should be watchful enough to ensure the quality and safety of blood bags because of their restricted supply. Section 3(b) of the Drugs and Cosmetics Act of 1940 in India classifies human blood as a ”drug”. [1] Since someone needs blood every two seconds worldwide [2–4], it is crucial to have access to safe and timely blood bags. Numerous chronic conditions, such as severe anaemia and beta-thalassemia major, call for ongoing blood transfusions from healthy donors. One of the 10 quality indicators suggested by the National Accreditation Board for Hospitals & Healthcare Providers (NABH), India, is the percentage of wasted blood components, or ”wastage rate”. [5, 6] To prepare blood and its components and use blood as efficiently as possible, this study attempts to identify the numerous reasons why blood is thrown away.

MATERIAL AND METHODS

This retrospective study was done in the blood bank of a tertiary care hospital for a period of 7 years, from January 1, 2014, to December 31, 2020. The blood bank is connected to the Department of Pathology of the Indian Institute of Medical Science, a rural medical college in Maharashtra, India. The World Health Organization’s (WHO) selection standards were followed while choosing the blood donors. Information was gathered from several registries, including the registers for donors, discards, transfusion-transmitted illnesses (TTIs), and components preparation. The justification for eliminating blood and its constituent parts was analyzed. Components were prepared and blood bags were discarded in accordance with our blood bank’s norms and the standard operating procedures established by the National Aids Control Organization (NACO), an organization based in India. In addition, there were no exclusion criteria used in the selection of the samples. MS-Excel for Windows was used to study every bit of data. The frequency and percentages were used to represent all category data.

RESULTS

In the seven years from 2014 to 2020, overall 4022 blood bags were collected. Year-wise 475, 544, 502, 424, 576, 742 and 759 units of blood were collected from the year 2014 to 2020, respectively, in the blood bank. (Table 1) Platelets, fresh frozen plasma, and packed red blood cells (PRBC) were among the components that were manufactured. So, in total 4022 blood bags were collected from which 391 blood units were discarded with a 9.7 overall discard rate in 7 years. Year-wise discard rate was more in the years 2015 and 2016. When component-wise discard rate was considered 13.4% of whole blood was discarded and least discard rate was platelet component which was 6% (Table 2) Out of 391 wasted units, 87 (22.2%) were discarded due to seroreactivity to transfusion-transmitted illnesses (TTI), 126 (32.22% expired, 127 (32.48) hemolysed and 51(13.04%) were discarded due to leakage or less quantity in the bag. (Table 3) Year-wise data of blood collected and reasons for discard shows that from 2014 to 2022 shows HBV infected blood was followed by HCV infection and the most common quality check reason for discard was either the expiry date of blood collected or Hemolysed blood in almost 32% of cases. (Table 4) and Figure 1

Year	Collected	Issued	discarded
2014	475	408	42
2015	544	430	70
2016	502	468	60
2017	424	379	58
2018	576	477	55
2019	742	719	53
2020	759	686	53
Total	4022	3567	391

Table 1: Year-wise discarded, issued and collected blood bags in blood bank

Component	Units	Discarded	%
Whole blood	816	110	13.4
FFP	1232	128	10.3
PCV	1410	114	8.08
Platelet	564	39	6.09
Total	4022	391	9.7

Table 2: Percentage of blood Component units prepared and discarded

Reasons for discard	No.of bags	%
Seropositive bags	87	22.2%
Leakage	51	13.04%
Expired	126	32.22%
Hemolysed / lipemia/other	127	32.48%
Total	391	100%

Table 3: Discard rate of blood bags due to different reasons

DISCUSSION

Furthermore, blood and its components provide unique and lifesaving therapeutic benefits to patients, making BTS an essential component of modern day-to-day clinical practice. The need for blood and its components is growing due to improved treatment and accurate diagnosis of complex diseases requiring repeated transfusion. Still, due to resource limitations, it is not always possible to perform BTS. As a result, ensuring that blood is properly managed at the blood bank and that staff education is maximised would reduce the needless loss of blood and its byproducts. [7] The current study found that from 2013 to 2020, respectively, 42, 70, 60, 58, 55, 53, and 53 units of the 4022 units of blood were wasted. Compared to research by Suresh et al. (5.7%), Bobde et al. (6.63%), Sharma et al. (4.46%), and Kanani et al. (3.5%), the average discard rate for whole blood in the current study was 23.23%. [2,8,9,10,11]. [2, 8–10]The average discard rate in the studies by Morish et al., [9] Kora et al. Kumar et al., Thakare et al., Suresh et al., Patil et al., Bobde et al., Sharma et al., Ghaflez et al., and Deb et al. (Table5) were 2.3%, 4.3%, 8.4%, 3.6%, 7.0%, 22.45%, 6.63%, 8.69%, 12.0%, and 14.61%, respectively

Seropositivity for transfusion-transmissible diseases (TTI) such HIV, HBsAg, HCV, VDRL, quality control, less blood (underweight), expired, hemolyzed sample, and polycythemia are a few of the several reasons blood is discarded. [11–14] Our investigation revealed that seropositivity for TTI, followed by expiry date and hemolyzed sample was the most prevalent cause of wastage of whole blood and its components (HBsAg>HIV>HCV>VDRL). It resembles research carried out by Suresh et al. [2]. However, it can be reduced by taking a thorough medical history, adhering strictly to the donor selection criteria, and setting up a donor database. Sterile check or quality control, which is carried out as a part of the Drugs and Cosmetics Act of 1940, India, was another cause for rejecting whole blood in the current study. [1] it must be adhered to by all blood banks. As a result, this could not be avoided. Our study's limitations included fewer blood bags that were blood or were underweight due to phlebotomy failures such as vein collapse, nausea, vomiting, sweating, hematoma development, and fainting during donation. Due to a mismatch between the volume of blood taken and the anticoagulant employed in

Year	HIV	HBs Ag	HCV	MP	VDRL	Leakage	Expired	Hemolysed/lipemia
2014	2	11	4	0	0	7	13	10
2015	3	13	7	0	1	6	22	23
2016	0	10	4	0	1	8	18	19
2017	1	5	5	0	1	8	20	23
2018	1	4	2	0	1	5	21	21
2019	0	10	0	0	1	6	16	20
2020	2	7	1	0	0	11	16	16
Total	9	50	23	0	5	51	126	127

Table 4: Year-wise distribution of seropositive blood bags by type of infection

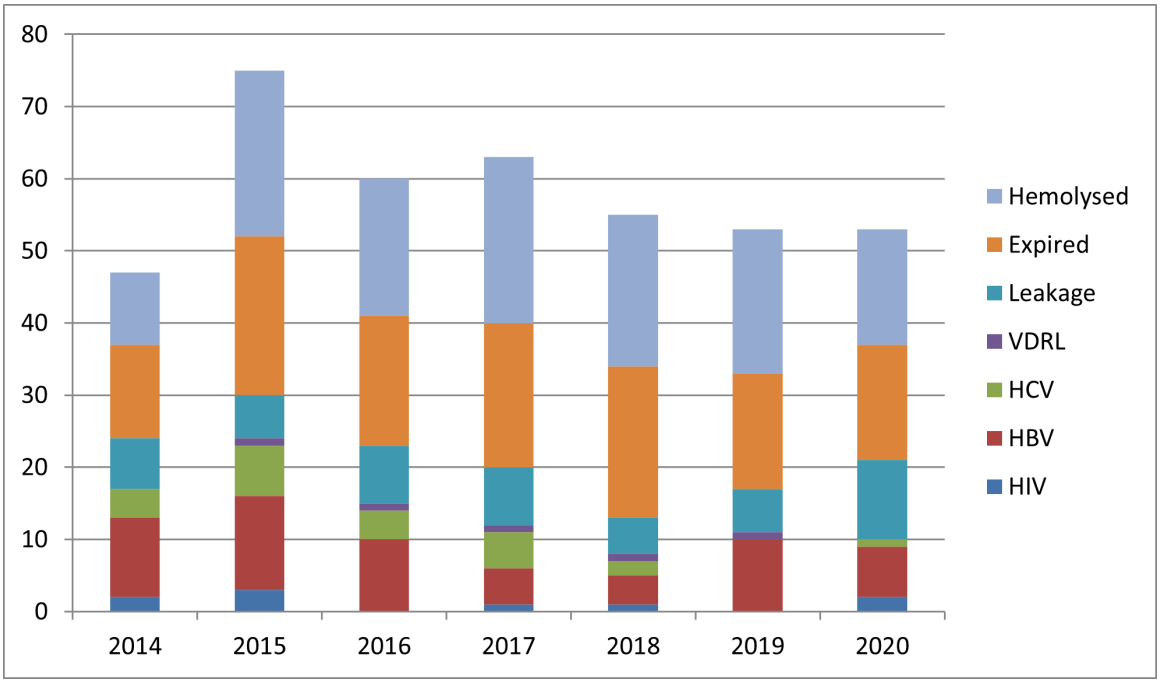

Figure 1: Year-wise distribution of seropositive blood bags by type of infections

the bag, such blood bags are inappropriate for transfusion. Such gathering typically takes place during blood donation camps. It can be avoided by choosing healthy donors wisely, encouraging donors, and providing sufficient phlebotomy staff training. [11] Breakage was the most frequent reason for discarding FFP in the current investigation, followed by seropositivity for TTI, expiration, and other factors. It occurs due to improper processing of these component bags, and breaking of FFP bags was mostly noted while removing bags from the deep freezer prior to thawing. [13] By performing a thorough visual check of the blood bags during centrifugation, leakage of the bags can be avoided. FFP bags can be handled carefully and covered to minimise breakage [8]. According to our study, seropositivity, less quantity of blood, and hemolysis were the next most frequent reasons for discarding platelets after the expiry date. The platelet has a five-day shelf life. Due to the non-use of blood products, their risk of dying was, therefore, highest. [14] Among the produced components in the current investigation, platelets had the greatest discard rate. Optimal preparation in accordance with clinical requirements and increasing usage of the apheresis process can reduce its waste. The loss of blood and its components is unavoidable, but it may be reduced by making the best use of BTS and putting it into practice, as well as by educating and training blood bank workers. Blood and its components can be wasted for several causes, including sterility, storage, decreased bleeding, expiration, hemolyzed samples, and polycythemia.

Conclusion

Authors name	Study Place	No.of units collected	No.of units discarded	Sero - positiveity	Quality	Breakage	Expired	Suboptimal	Other reasons
Morish et al.	Kuala Lumpur	390,634	8968	-	-	2306	-	353	6309
Kora et al	Karnataka, Bagalkot	6,129	263	220	-	-	38	5	-
Kumar et al.	Wardha, Sevagram,	10,582	888	300	-	27	513	18	20
Thakare	Aurangabad, Maharashtra	24,547	879	604	-	-	275	-	-
Present Study	Jalna , Maharashtra	4022	391	87		51	126	-	127

Table 5: Comparison of reasons for discarding whole blood units and components

The loss of blood and its components can be reduced by self-regular audits, cooperation between hospital and blood bank employees, efficient storage and handling of blood units, tight donor selection and deferral criteria, coupled with thorough history taking. Disclosures of Additional Information Human volunteers or tissue were not used in this study, according to all of the authors. Animal subjects: This study did not use any animal subjects or tissue, according to all authors. Competing interests: All authors hereby provide the following disclosures in accordance with the ICMJE uniform disclosure form: Payment and service details: Each author has acknowledged that the work they submitted did not receive any funding from other sources. Financial ties: All authors have indicated that they do not now or over the last three years have any financial ties to any organisations that could be interested in the work that has been submitted.

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