

Original article

Analysis of Whole Blood and Blood Components Discard in a Rural Teaching Hospital Blood Bank: a Retrospective Study

¹Dr. Apurva Vasant Kale*, ²Dr. Bharati P. Baviskar, ³Dr. Suryakant D. Dongre,
⁴Dr. Ravindra R. Karle

1. M. D. Pathology, Asst. Professor, Dept. of Pathology, Rural Medical College, Loni

2., M. D. Pathology, Professor, Dept. of Pathology, Rural Medical College, Loni

3., M. D. Pathology, Professor, Dept. of Pathology, Rural Medical College, Loni.

4., M. D. Pathology, Professor and Head, Dept. of Pathology, Rural Medical College, Loni.

*Corresponding Author: Dr. Apurva Vasant Kale, E-mail address: apurvasaanviira@gmail.com



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Abstract:

Background: It has been estimated that one-third of all patients admitted to intensive care units in the developed world receive a blood transfusion. So each unit of blood is precious and utilized judiciously with minimal wasting. The aim of our study is to find out the various causes for discarding blood and blood components, to find out Comparative utilization of components and to find WAPI (Wastage as per issue) a teaching hospital blood bank in Western Maharashtra.

Materials and methods: A retrospective study of discard of blood & blood components was done from January 2015 to December 2019 using records available in blood bank in a tertiary care hospital.

Results: Packed red cells was the most common blood component utilized, closely followed by FFP. Whole blood was the least utilized. A total of 18316 units were collected and 1636 units were discarded because of various reasons. Expiry was the single most important cause for discard. Overall wastage rate i. e. wastage as per issue (WAPI) was 6.79 from January 2015 to December 2019.

Conclusion: This data can be used to optimize their use by training and education. Proper scheduling of blood donation camps, training of the staff for proper handling and storage of blood, use of apheresis technique can reduce the wastage of whole blood and blood components. Donor's history is important to reduce transfusion transmitted Infections and avoid professional donors.

Key-words: Discard, analysis, blood components, whole blood, transfusion transmitted infections

Introduction:

Today, many modern surgical procedures cannot be carried out without the use of blood and there is no substitute for human blood. It has been estimated that one-third of all patients admitted to intensive care units in the developed world receive a blood transfusion. So each unit of blood is precious and

should be utilized judiciously with minimal wasting. ^[1]Wastage of red cell concentrate/whole blood unit has important impact on blood supply and financial stability of the blood centre. It has been calculated that discarding of red cell units in hospitals ranges from 0 to 6.7%. ^[2]

By analysing the data and the reason for the discards, the blood transfusion services 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.^[1]

Several studies are available from western countries on red cell/whole blood wastage in different blood banks, but there is paucity of data on the degree and nature of wastage of red cell/whole blood units in blood banks in India.^[2] The present study describes discard rate of blood components /whole blood units in a regional transfusion centre from western Maharashtra and discusses means to reduce the discard rate.^[2]

Aims:

To analyze the reasons for the discard of whole blood and blood components [packed RBC (PRC), Fresh Frozen Plasma (FFP), Platelet concentrate] in a rural teaching hospital blood bank.

Material and Methods:

A retrospective study of discard of blood & blood components was done from January 2015 to December 2019 using records available in blood bank of a tertiary care hospital. The data analysis

from donor record, TTI (transfusion transmitted infections) testing record, component preparation record and discard record was taken into consideration. Blood donations were taken from voluntary donors according to the selection criteria defined by WHO.^[3] Blood units already in stock on January 1st 2015 were also included in the study. Blood units issued for Quality control purpose during January 2015 to December 2019 were excluded. Detailed record of all discarded units regarding reasons and date of discard was obtained. Statistical analysis used: Data obtained was analysed by percentage .

Results:

A total of 18316 blood units were collected from January 2015 to December 2019; out of which 2568 were Whole blood units. Remaining 15,748 units were used to make components like Packed red cell, random donor platelets and fresh frozen plasma. Total 2385 Whole blood units were issued in 5 years, the components issued were 29,007. Average whole blood issued were 477 per year and components issued were 5801 per year. Whole blood and components issued per year are as follows (Table 1):

Table 1: Year wise utilization of whole blood and blood components

Year	Whole blood	PRBC	FFP	Platelets	Total
2015 (Table 1	437 (8.66%)	2107 (41.75%)	2010 (39.83%)	492 (9.75%)	5046
2016	512 (9.33%)	2457 (44.77%)	2351 (42.84%)	167 (3.04%)	5487
2017	444 (8.52%)	2592 (49.76%)	2036 (39.1%)	137 (2.63%)	5209
2018	417 (5.88%)	3756 (53.02%)	2444 (34.50%)	466 (6.57%)	7083
2019	575 (6.71%)	4586 (53.53%)	2185 (25.50%)	1221 (14.25%)	8567
Total	2385 (7.59%)	15498 (49.36%)	11026 (35.12%)	2483 (7.90%)	31392

Packed red cells was the most common blood component utilized(49.36%), closely followed by FFP (35.12%). Whole blood was the least utilized (7.6%).

Total number of discarded units from January 2015 to December 2019 was 1636(8.93% of collected units). Most common reason for discard

of blood units was expiry (41.9%), followed by leak (31.7%). Discard due to TTI was 28.2%, out of which discard due to HBsAg reactivity was highest (45.96%) followed by HCV (36.21%) and HIV (17.82%). Less than optimal quantity units were 4.1% and 0.6% were hemolysed. There were no clotted units found (Table 2).

Table 2:Year wise Distribution of Donors, Discard and its Causes

Year	Total Discard	Expiry	T. T. I.	QNS	Leak	Hemolysis	Clotted
2015	306	169	57	14	61	5	0
2016	285	140	63	16	66	0	0
2017	243	97	52	7	87	0	0
2018	432	139	76	15	197	5	0
2019	370	138	111	15	106	0	0
Total	1636	683	359	67	517	10	0

Out of the units discarded, FFP was at the top (40.75%), followed by RDP (25.4%) and packed red cells(21.86%). Lowest number of discard was

shown by whole blood(8.64%). The discard rate of whole blood was the lowest because of lowest utilization.

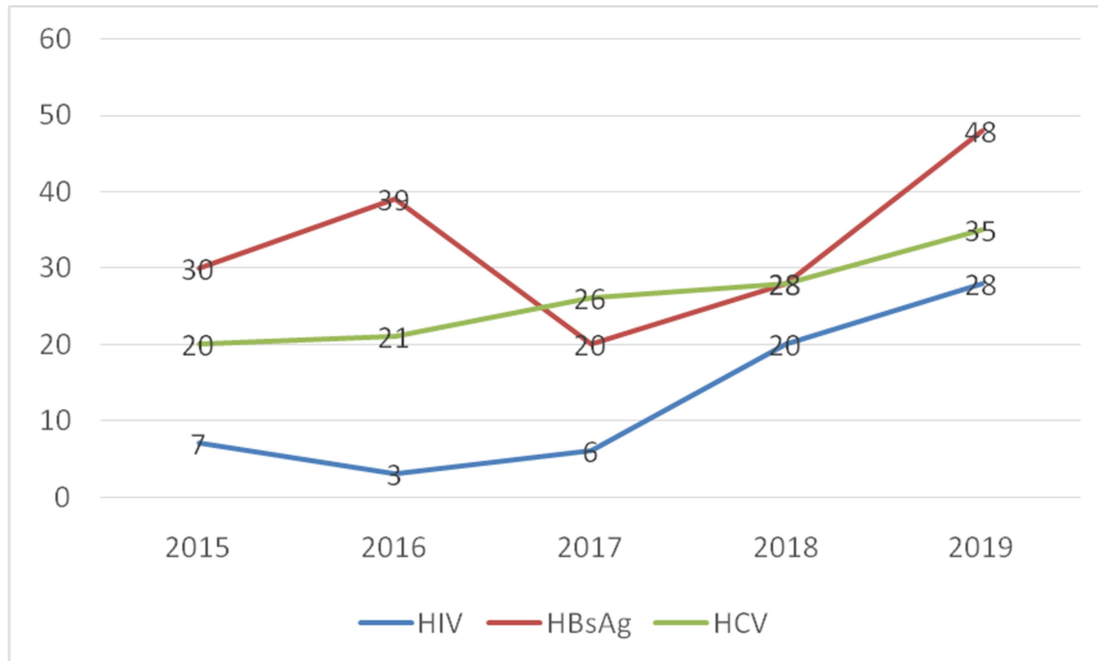
Table 3: Component wise Discard

	Expiry	TTI	QNS	Leak	Hemolysis	Clotted	Total
Whole blood	123	27	06	03	05	00	164
PRBC	94	147	28	24	05	00	298
FFP	42	147	26	471	00	00	686
RDP	424	38	07	19	00	00	488
Total	683	359	67	517	10	00	1636

Expired shelf life was the commonest cause of discard of whole blood, followed by transfusion transmitted infections(TTI). Seroreactivity was the leading cause of discard in (50.16%) packed red cell units, expiry was the second most common cause of discard (31.02%) inPRBC units, whereas leakage and hemolysis was seen in 7.9% and 1.65% respectively (Table 3).

Highest number of donors were HBsAg reactive (48.85%), followed by HCV (33.44%) and HIV (17.7%). Incidence of HIV has increased from2017-2019 and HCV is increasing in 2019. HBsAg is more in 2016 and again in 2019. There is no linear trend in the set of ordered proportions so chi square test cannot be applied. (Figure 1)

Figure 1: Year wise Distribution of TTIs detected in blood Sample



Leakage was the commonest cause of discard for FFP (68.65%), followed by TTI (21.42%).

Expired shelf life was the major cause for RDP discard (86.88%), while TTI (7.78%) was the second most common cause.

Overall wastage rate i. e. wastage as per issue (WAPI) was 6.79 from January 2015 to December 2019. Year wise WAPI is given in the following table (Table 4).

Table 4: year wise WAPI(wastage as per issue)

Year	W.A. P. I.	Total Discard	Total issue
2015	7.53	306	2304
2016	6.52	285	1858
2017	5.85	243	1422
2018	7.68	432	3318
2019	6.37	370	2357

The commonest cause of overall discard of whole blood and blood components was expired shelf life apparently contributed primarily by RDP and

PRBC. Following figures (Figure 2,3) show the month wise distribution of donors and discard.

Figure 2: Boxplot Showing Month wise distribution of Donor

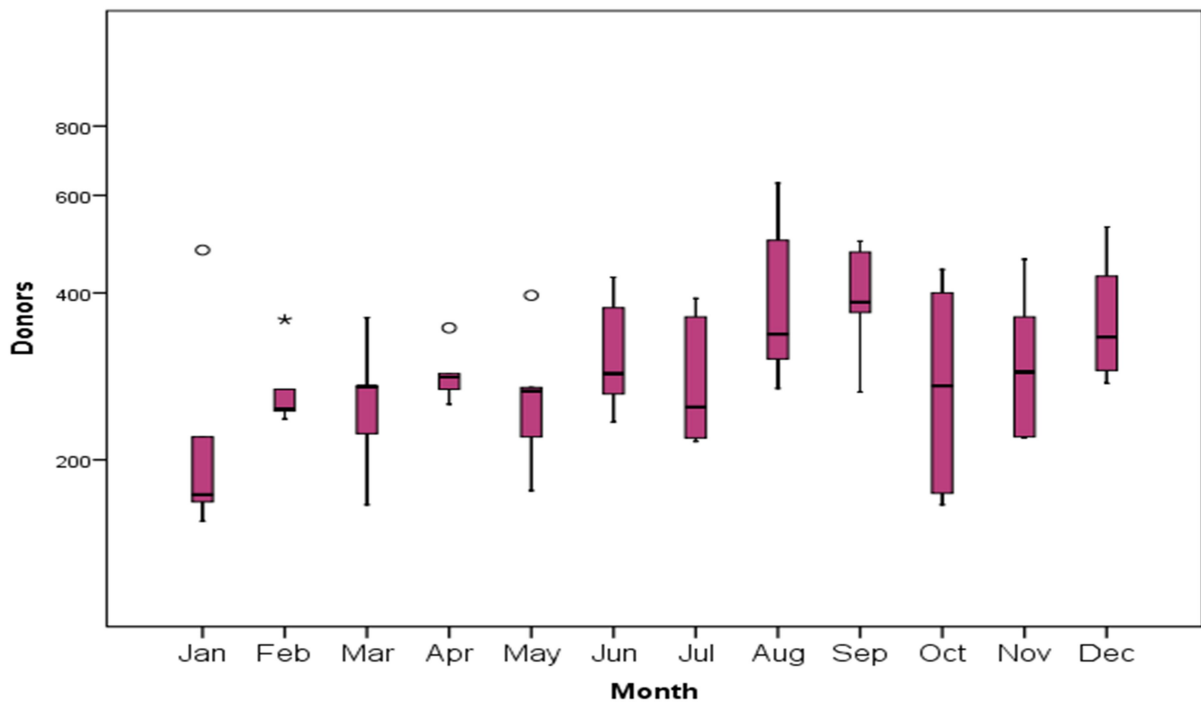
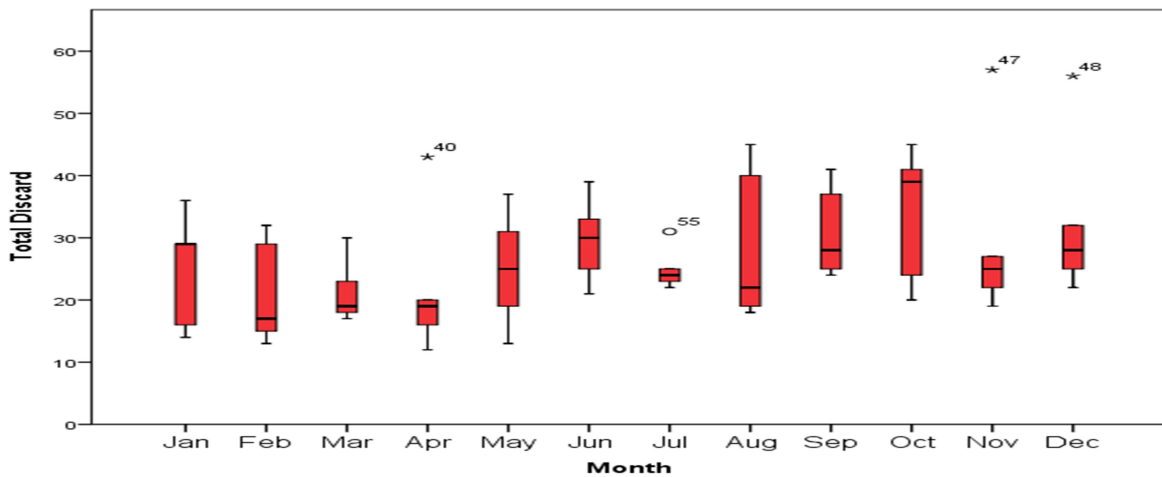


Figure 3: Boxplot Showing Month wise distribution of Discard



There are increased donors in July-September and increased discard in August-October. There are large number of blood donors in July to September because of religious reasons and donor availability and donor discards are more in August to October because of infectious diseases which is more in this time.

The commonest cause of the discard was the product expiry in present study which is in concordance with the studies done by Kumar et al^[1], Jariwala et al^[5] and Kanani et al.^[6] The reason for expiry of whole blood, packed red cells and FFP was due to failure to follow “first in and first out policy” (FIFO)..^[7]

The second most common cause of discard in present study was leakage; which is significantly more than the studies conducted by Kumar et al, Suresh et al, Jariwala et al and Kanani et al. The reason could be manufacturing defects in the blood bags, mishandling. Replacement of manufacturer may reduce the incidence of leakage significantly.^[6]

The incidence of transfusion transmitted diseases was comparable with Kumar et al⁽¹⁾ and Suresh et al⁽⁴⁾, but was greater than that found in the studies done by Jariwala et al⁽⁵⁾ and Kanani et al⁽⁶⁾. The incidence of HbsAg is highest among the TTI. The incidence of HIV and HCV show increasing trend which is attributable to increasing donors. Increased incidence is seen during the months of September and October each year; which is after the average highest donors in July August. This can be prevented by proper history taking and strict adherence to WHO donor selection criteria.

Insufficient quantity was a minor reason for discard according to our study (4.1%) and is comparable with Kumar et al^[1] and Jariwala et al.^[5] Hemolysis was the least common cause of discard. They are because of good phlebotomy quality. Following proper storage and preparation guidelines by the staff was the reason.

WAPI shows decreasing trend from 2015 to 2017 (table 4). There is raise in the year 2018 owing to the increased collection of blood units, and slight fall due to increased utilization in the year 2019.^[4,8] Judicious use of blood can minimize the number of discarded blood to a reasonable rate. Blood and blood components play an essential role in patients' management. Blood components are frequently ordered and utilized without proper analysis of the real needs, thus wasting a very important resource. A well-structured blood transfusion services contribute towards better healthcare.^[9]

Expiry was the leading cause of discard of whole blood and packed RBCs. Decreased utilization of Whole blood, demand of recently collected (fresh) whole blood by clinicians contributed to failure to implement first in first out policy.

FFP was the most commonly discarded component. The major reason being leakage, which was the major reason of discard in studies done by Kumar et al,^[1] Bobde et al^[10] and Patil et al.^[11] whereas, study done by Suresh et al^[4] showed the major cause of discard was transfusion transmitted infections This was due to substandard collection bags. Replacement of those bags by changing the purchase policy has reduced the discard due to leakage.

Platelets again had expiry as a major reason, which was comparable with the results of Bobde et al^[10] and Patil et al.^[11] This was due to short shelf life of platelets, preparation on demand by clinicians followed by non-utilization of platelets. Co-ordination between clinicians and blood bank staff, proper evaluation of the need of the platelets can reduce the discard rate. Second most common reason was transfusion transmitted infections followed by other reasons of discard.

Thus, present study provides a basis for the implementation of corrective measures and continuous quality improvement by means of QI's like Discard rate and WAPI. The proper standard operating procedure should be followed for manufacturing, storage and transfer of blood component. Hospital transfusion committee should be involved in formulating the guideline for minimizing blood wastage. Strict checks on need-based demand specific products, following first in first out (FIFO) will be helpful to reduce the wastage.^[9] To minimize wastage of blood, there should be proper implementation of blood transfusion policies and coordination between hospital and blood bank staff. Strict adherence to

donor selection criteria,taking proper donation history and counseling, software to identify transfusion transmitted infection positive donors and deferring suspected professional donors.Process improvements such as phlebotomy,prevent red cell contamination during platelet and FFP preparation,precaution during thawing of FFP to prevent leakage and increased use of apheresis technique to prevent wastage of blood components.Continued medical education for technical staff to maintain self-audit, tracking quality indicators of processing and preparation of

the blood components,rational use of blood and components and review the management system will help in reducing the discard rate.^[6]

Conclusion:

Co-ordination between blood bank staff and treating physician can minimize the wastage of blood units. Pre-donation history taking with strict adherence to donor selection criteria by WHO can avoid TTI positivity. Change in the purchase policy of the blood bags can reduce the wastage due to leakage.

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