

# A Study of the Discard Rate of Blood and Blood Products and their Management at Tertiary Care Centre

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**Abstract:** ***Introduction:** Blood is an essential part of the human system. Transfusion of blood and component is an integral part of health care practices. As blood works as a boon for needy ones on discard and wastage of blood products should be minimized and the data of causes of the same should be analyzed. **Material and methods:** The methodology involves data collection from primary sources and study of secondary sources (Research publication) followed by extensive data analysis. The data from the primary source was assimilated from hospital records and later redefined into usual data. A total of 5364 donations has taken place over 15 months, From April 2018 to June 2019 at our hospital. Data on transfusion and discard rate was assimilated from hospital records and evaluated. **Results:** A total of 3320 units were collected in the first 12 months of the study period [April to march]. The mean discard rate of the first 12 months of the component was 15.5%. Average discard rate of various components were noted as packed red blood cell (PRBC)- 8.3%, fresh frozen plasma (FFP)-8.36%, platelets concentrate (PC)-39.3% and Cryoprecipitate (CPP)-3.2% .We have made multiple interventions in phased manners to reduce the discard rate, and the results of the last 3 months have shown a reduction in mean discard rate to 3%. **Conclusion:** Multiple interventions are necessary to reduce the discard rate. Internal audits should be followed for the assessment of the problem and the best possible management strategies. The judicious use of blood and components practice should be followed.*

**Keywords:** Date expired, Discard blood, Non-utilization, Seropositive, Under-collection.

## 1. Introduction

Blood and blood product have always used in the correction of morbidly by the clinician. We have learned the process of rational use of blood and blood products. **World Health Origination** recommended for the safe and rational use of blood to reduced unnecessary and unsafe transfusion and to improve patient outcome and safety towards patient<sup>1</sup>. Fact sheets of **WHO 2017** showed 11.2 million blood donation collected globally, approximately half of these are collected in high-income countries<sup>1</sup>. blood transfusion services are the lifesaving intervention for patient management and follow a standard transfusion chain donor to recipient. Blood transfusion services make a bridge between clinician and patient. blood and blood products always use by clinicians and surgeons as lifesaving management in trauma emergency as well as elective cases. Each blood unit and component has used for a different indication. Advancement of medical technology studies has shown an increment in the demand for blood products every year. Close views on demand and supply and power full strategies are required to manage our resources which has to utilize. Our aim should be crystal clear every unit of blood is precious and utilized judicious with minimum wasting. An internal audit of demands, utilized and wastage of blood and component provides opportunities to makes the assessment task and solution with their best possibilities to overcome for saving of resources. Accreditation standards on Blood Banks/ Blood Centers and Transfusion Services have enlisted ten quality indicators where the wastage rate of blood and blood component has ranked 3<sup>rd</sup>[2]. It has been assuming that in every two seconds someone needs blood and by the time every year 20% increment in blood demand has been showing, where one-third demands created under in intensive care unit patient<sup>3, 4, 5</sup>. with limit resources of blood

and component for filling the gap of demand and supply could manage only by the strategical manner with specific intervention at specific reasons which lead to discarding of blood and component should be needed. The present study designs to view the reasons for discard and obtain the intervention, and compare it with prior intervention waste rate data. Emerging with a multilevel intervention, which has intended to suggest various strategies for optimum utilization and reduction in wastage rate.

### Objectives of the study

- 1) Find out the reasons that define discard of blood and components
- 2) To obtain the best possible strategies on multi-levels steps to reduce discard rate
- 3) Implementation of strategies

### Study design

The study was conducted at a tertiary care institute in the department of transfusion medicine and blood bank AIIMS Patna Bihar, over 15 months from April 2018 to June 2019.

## 2. Material and Methods

**Inclusion criteria** -Blood donors were selected, who were fulfilling world health organization recruitment donation criteria have participated after the best possible questionnaires'' related to medical history and brief clinical examination by medical officer. The donors were voluntary, replacement or non-remunerated.

### Source of data

Information on data was retrieved by blood bank registers. These informed the daily amount of blood collection, the number of component use, and several components

prepared, the number of components discarded and the reasons for the discard of blood and components.

**Methods**

From the data assimilation, we have found a product [Table A]. Which have been giving a goal to reduce the discard rate and we have reached product [Table B].

**First 12 months study of discards of PRBC and the components**

**Table A**

Months	PRBC discarded	FFP discarded	PC discarded	CPP discarded	Component prepared every month	Discard rate
April	2	6	5		111	16.2%
may	6	4	9		495	3.8%
June	31	21	7		452	13.0%
July	05	8	55		607	11.2%
august	05	5	99	1	879	12.4%
sept	11	18	70		854	11.5%
oct	45	30	63		968	14.2%
nov	74	44	86		889	22.9%
dec	23	42	132		819	24.9%
jan	19	36	130	1	1141	16.3%
feb	28	17	180	4	1066	21.4%
march	28	19	14	1	733	14.4%
total	277	250	850	7	9009	15.4%

**Discard Rate after Multiple Interventions Application**

**Table B**

Months 2019	PRBC Discard	FFP Discard	PC Discard	CPP Discard	Component Prepare	Discard Rate
April	2	2	10		920	1.5%
May	3	2	15	1	820	2.5%
June	4	1	12	1	860	2%

**Statistical analysis**

The obtained records were assimilated and analyzed using descriptive statistics of SPSS version 26.mean of discard rate assimilated, predictive odds ratio obtained. P-value calculated. The chi-square statics is 276.2573. This result is significant at p <.05

Data collected	Component prepared	Component discarded	Marginal row total
1 <sup>st</sup> 12months audit data	9009	2600	11609
Next 3 months of audit data	1384	53	1437
Marginal column totals	10393	2653	13046

**Introduction of strategies**

A total of 5364 donations has taken over 15 months.3320 unit has donated on the first 12 months of collection [April to march][ Table A].9009 units of components prepared. The mean discard rate of component showed 15.5%, which were quite high.[Table A]. Observation of results has followed the best possible intervention to reduce the discard rate [Table B].we have created strategies. Followed in multiple steps; therefore, reduction of the discard rate. Results have shown of last 3 months reduction in mean discard rate to 3%.

**First-line Intervention**

The first-line intervention focuses on donor recruitment; a medical officer asks multiple questions for best donor selection. Some questions directly deal with the discard rate, for example; lipemic plasma discard could be managed by the history of last hour’s fatty meal. That donation should be avoided. History of proper sleep of minimum 6 to 8 hours could not only manage donor reaction but also avoid the under-collection donation. Taking the history of sexual contact is the best possible way to minimization of transfusion-transmitted discard rate of blood units. Offering a proxy questionnaires’ to donor also help in finding of healthy donors.

**Second-line Interventions**

At the point of donor phlebotomy area, some steps were added. These include cleaning of phlebotomy area which reduces the probability of bacterial infection. Three steps cleaning included scrubbing of phlebotomy area with rectified spirit solution- betadine solution- rectified spirit solution. Offering a 400ml glass of water to the donor, before donation reduces the donor reaction. It also helps in the interruption of donation time and management of under-collection units. A calibrated blood collection monitor is also needed.

**Third line Intervention**

Blood unit Equipment which is used for storage should be properly maintained. Temperature, alarms, proper agitation; tachometry results of centrifugation machine should continuously be checked, properly calibrated equipment should be used which reduces the discard rate.

**Fourth line Intervention**

The quality control index is the most important parameter. They have a huge impact on discard. e.g. RBC contamination and WBC contamination of components could only be managed by proper training of staff personals.PH monitoring of platelets unit and other indicators of QC of blood unit and blood component should be minutely improved by the practice of staff personal.

**Fifth line Intervention**

Some important administrative policies should have opted; like First come the first-out system for demands of blood components, Arrangements of donation camp based on inventory requirement, rare units’ donor tracing system which calls out donors in time of need and Motivation for apheresis to the donor. Frequent interval audits should be performed; Training of resident and staff personnel should mandatory. Thawed unit plasma which has not been used by the clinician, should be returned to the blood bank. This could be used and processed for fractionation policies of the plasma.

3. Results

Table C

Months	PRBC Prepared	FFP prepared	PC prepared	CPP prepared	Discard rate of PRBC	Discard rate of FFP	Discard rate of PC	Discard rate of CPP
APRIL	53	51	10	2	3.7%	11.7%	50%	
MAY	236	217	31	11	2.5%	1.8%	29%	
JUNE	188	184	80		16.5%	11.4%	8.6%	
JULY	250	245	107	5	2%	3.2%	51.4%	
AUG	350	338	176	15	1.4%	1.4%	56.5%	
SEPT	346	328	175	5	3.17%	5.4%	40%	
OCT	354	332	269	13	12.7%	9.01%	23.4%	
NOV	313	311	265		23.6%	14.7%	32.4%	
DEC	336	296	200	41	6.8%	14.1%	66%	
JAN	413	331	239	158	4.6%	10.8%	54.4%	
FEB	360	325	373	8	7.7%	5.2%	48.4%	
MAR	241	234	217	41	11.6%	8.11%	6.4%	
total	3320	2990	2162	218	8.3%	8.36%	39.31%	3.2%

Distribution of Discard Rate of Various Components-

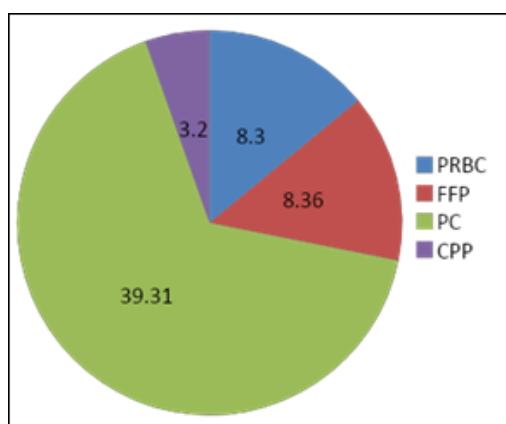


Figure 1

TTI RESULT

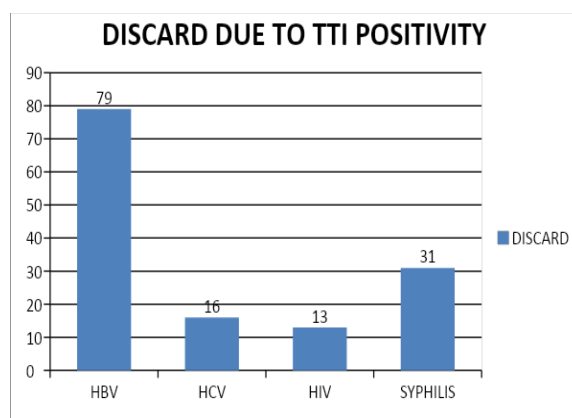


Figure 4

Reasons described discard of FFP

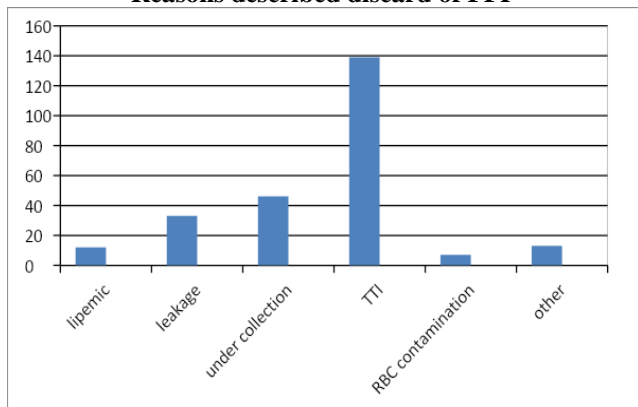


Figure 2

Reason described for discard of PRBC

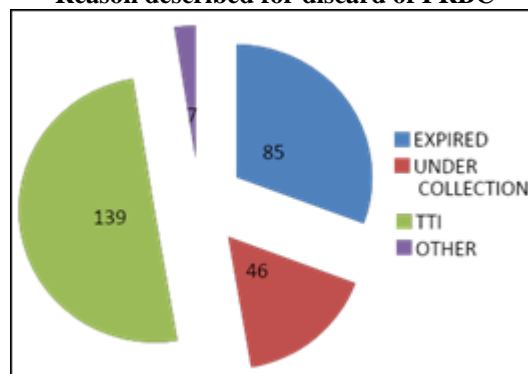


Figure 5

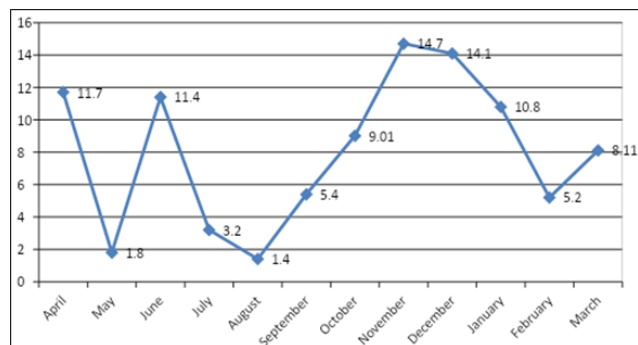


Figure 3

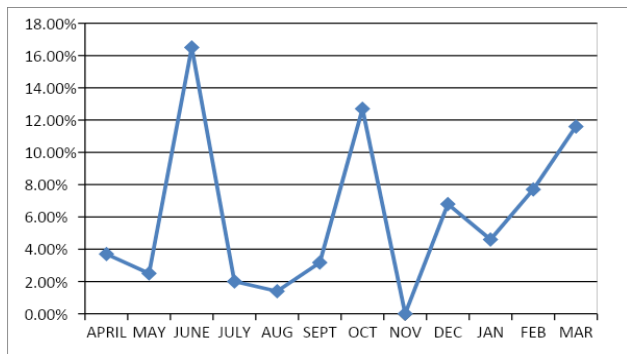


Figure 6

Monthly discard rate of PRBC

Reasons described for discard of PLATELETS

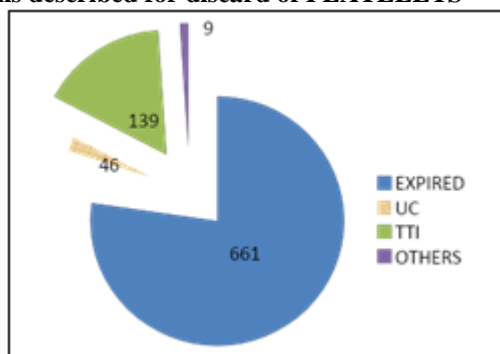


Figure 7

Reason described discard of platelets

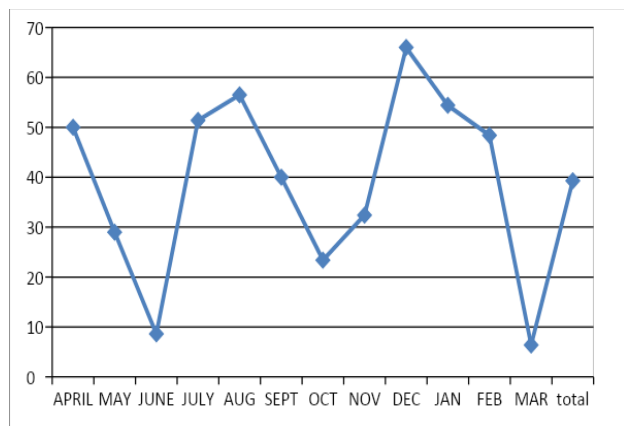


Figure 8

Monthly discard rate of platelets

The total collection unit measured over 15 months has shown 5364 donations [first 12 months +last 3months] (3320+2044). **Table A** shown the first 12 months' study, total component prepared 9009 units which have distributed; as, 3320 units in PRBC, 2990 units of FFP, 2162 units of platelets concentrate, followed by 218 cryo poor plasma in first 12 months of study[**Table A**]. Meanwhile, the mean discard rate of the component in the first 12 months study showed 8.3% of PRBC, 8.36% FFP, 39.31% PC, and 3.2% CPP respectively .which had shown in[**Table C** and **Fig 1**]. The number of discard highest noted in platelets concentrates 850 followed by 277 PRBC, 250 FFP respectively. Meanwhile, the mean/average discard rate was 15.4% of all components noted in the first 12 months study

[**Table A**]. The most common reason for discard in FFP noted due to TTI seropositivity 139 units [**Fig2**]. Peaked discard month was October noted in FFP in 1<sup>st</sup> 12 months study [**Fig3**]. [**Fig 4**] shown HBV was the leading cause of seropositivity. A total of 139 unit recorded seropositive in screening in the first 12 months of study. Primed reasons for discard in PRBC was TTI positivity followed by 85 unit have expired and 45 units were enlisted; as under collection unit PRBC in first 12 months study.[**Fig 5**]. In June which had accounted highest loss of PRBC [**Fig 6**]. Platelets were 1<sup>st</sup> ranked component amongst all of the discards rate list of the component. The most common reason was the expired dates. 661 units have expired in the first 12months of study.[**Fig 7**]. The month of December which had faced the highest loss of platelets.[**Fig 8**].

4. Discussion

The discard rate denotes the total number of units wasted out of the total number of units prepared, expressed as a percentage. Its wastage of resources with financial loss. During our study period, we have received blood donation in 350 ml to 450 ml of single, double, triple and quadruple bags. The price of a single unit blood bag is around 300 to 400 INR. An ancillary consumable for processing costs around 1000 INR. Total cost for a single unit bare [300/400+1000 INR.]. Processing cost assimilated by addition of following cost [ blood bag cost, consumable cost, blood grouping reagent cost, TTI test cost, antibodies screening cost, the salary of technologist, electricity bill, equipment maintains cost, etc.. wastage of finance with wastage of time therefore discard the unit faced financial burden also.

During the study period, we have analyzed the various reasons for discard. In PRBC commonest reasons were TTI positivity followed by the expired date noted. In FFP and CPP reasons were ruptured units, TTI positivity, contamination of RBC and WBC, lipemic plasma and other reasons noted. In platelets expired date was the commonest reason followed by TTI.

We had meticulously followed through multilevel strategies to reduce our mean discard of 1<sup>st</sup> 12 months 15% to 3% which was obtained in the next 3 months of study. studied by Morish et al in National blood center Kulalampur a total of 390634 units collected of these 8968 units were discarded<sup>6</sup>; their, average discard rate was 2.3%. The present study of the first 12 months had shown total collection 3320 and discards was 1384. The total discard rate was 28.8% .which was quite high. Multilevel intervention after the next 3 months' study had shown a collection of 2600 units. Discard of 53 units and average discard was 2.5%.overall total discard rate of the study was 25%. The average discard rate by other authors Patil p, et al<sup>7</sup> Kora et al<sup>8</sup>, Kumar et al<sup>9</sup> Thakre et al<sup>10</sup>, Ghaflez et al<sup>11</sup>, Deb et al<sup>12</sup> and, Ashish et al<sup>13</sup>were 20.6%, 4.3%, 8.4%, 3.6%, 12%, 14.6%, and 7% respectively.

In the Handling of blood units and components, the most important factor is the quality of plastic which should be observed<sup>14</sup>. ISO 3826 standards specification should be followed for a blood bag. The integrity of plastic bags is

essential and preventive measures should be taken to avoid leakages<sup>15</sup>.

#### Comparison of discard rate in various published studies with the present study

Authors	Study period	No of units collected	No of unit discarded	Discard rate
Morish et al <sup>6</sup>	December 2007	390634	8968	2.3%
Patil p et al <sup>7</sup>	Jan 2013 to June 2015	14026	2888	20.6%
Kora et al <sup>8</sup>	January 2009 to Dec 2010	6129	263	4.3%
Kumar et al <sup>9</sup>	Nov2009 to 2011 May	10582	888	8.4%
Thakre et al <sup>10</sup>	2005 to 2007	24547	879	3.6%
Ghaflez et al <sup>11</sup>	2014	30211	3124	12%
Deb et al <sup>12</sup>	June 1995 to 1999 Dec			14.61%
Ashish et al <sup>13</sup>	2014 to 2016	66, 255	4604	7%
Present study	April 2018 to March 2019	9009	1384	28.%
Present study	April 2019 to June 2019	2600	53	2.5%

#### PRBC

In our study, the average discard rate of PRBC first 12 months was 8.3%, which was higher than quoted by Patil p et al<sup>7</sup> 6.7% in PRBC. Ashish et al<sup>13</sup> studied had 2.26%. 1<sup>st</sup> 12 months have shown the total collection of PRBC 3320 units were 227 units discarded. One of the reasons discard of PRBC was direct coombs positive test identified, which were noticed during cross-match compatibility testing. There were 4 units identified; as DCT positive units. At the time of donation, they were screened negative. They have normal hemoglobin >12.5 g per dl. It has also shown that the bag might be getting 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, producing a tear over the bags<sup>16</sup>. This was also accounted for the list of discard rates of PRBC.

#### PC

The discard of platelet concentrate came as highest amongst all components. Patil p et al<sup>7</sup> had found the average discard rate of PC was 61.1%. Ashish et al<sup>13</sup> found a rate of 27.53% while our studies have suggested of first 12 months were 39.31% and the next 3 months were 2.5% of total discard of the components. Reduction in high discards rate could be achieved by on-demand preparation of components. More adoption of modern techniques like apheresis is needed.

#### FFP and CPP

The average discard rate of FFP of first 12 months was 8.36% and CPP was 3.2%; while, Patil p et al<sup>7</sup> had found 14.2%. Ashish et al<sup>13</sup> studies had 5.26%; while, the next 3 months studies have shown the average discard rate was 2.5% of the components. TTI seropositivity was the primary reason. Next were due to breakage that could be avoided by putting the FFP unit in cardboard or polystyrene container. Any other defect and leakage at any part of the plastic blood bags could be detected by visual inspection during the processing, after pressure in a plasma extractor, before freezing, and after thawing<sup>16</sup>. The FFP should be stored in cardboard or polystyrene protective containers that minimize the risk of breakage of brittle frozen products during storage, handling, and transportation<sup>17</sup>.

#### 5. Conclusion

Multiple interventions are necessary to reduce discard rate audits. The frequent interval of internal audit should be

done. Assess the problems. Best possible strategies towards them. Open discussion over problem management. The participation of the blood bank personal to clinicians should be mandatory. The judicious use of blood and components practice should be followed.

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