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# An Analytical Study of Discarded Units of Whole Blood and its Components in a Blood Bank at a Tertiary Care Hospital in Vadodara

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*Abstract-* *Background*: Blood is precious and there is no alternative for human blood. Proper utilization as well as rationale use of blood is necessary with minimal discarding of blood units and implementing various interventions that can be used to optimize blood and its components use by training and education.

*Aim:* An analytical study of discarded units of whole blood and its components in a blood bank at a Tertiary care hospital in vadodara.

*Study designs and methods:* Data on the number of discarded whole blood units and its components, reasons for discard, number of blood components processed as well as the number of collected blood units were obtained from blood bank records and registers. The data obtained was analyzed.

*Results:* The total number of blood units collected from Jan 2016 to Dec 2018 was 13249 from which 36447 units of components were prepared. The total number of discarded whole blood units and its components was 5097.

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# An Analytical Study of Discarded Units of Whole Blood and its Components in a Blood Bank at a Tertiary Care Hospital in Vadodara

Ashu Dogra [α] & Devanshi Gosai [σ]

*Abstract-* *Background:* Blood is precious and there is no alternative for human blood. Proper utilization as well as rationale use of blood is necessary with minimal discarding of blood units and implementing various interventions that can be used to optimize blood and its components use by training and education.

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*Results:* The total number of blood units collected from Jan 2016 to Dec 2018 was 13249 from which 36447 units of components were prepared. The total number of discarded whole blood units and its components was 5097. Platelets recorded the highest discard rate of 35.11% (3629/5097 units). Non utilization was the major cause of discard at 69.06% (3520/5097 units). Other causes of discard included TTI positivity 13.06% (666/5097 units), leakage 11.69% (596/5097 units), lipemic 2.29% (117/5097 units), underweight 0.58% (30/5097 units), clotted 0.54% (28/5097 units) and haemolysis 0.51% (26/5097 units).

*Conclusion:* Properly implemented blood transfusion policies, training of staff notification of permanently deferred donors will help in discarding less number of blood bags from collected units. These discarded bags, because they are unutilized are both financially as well as socially harmful to blood bank.

## I. Introduction

Blood Transfusion services play a significant role in Patient management. Therefore a well organized and efficient Blood transfusion services is a prerequisite for better patient care, which could contribute towards the development of health care in the country.(1)

In resource constraint settings like ours, there is a requirement of blood after every 2 second, and therefore policies should be made about more judicious use of blood. Both medical and surgical specialists require a steady supply of blood from healthy voluntary blood donors. Rational use of blood and its components is the need of hour, since each unit is precious. Discard rate of Blood is also one of ten quality indicators defined by National Accreditation board of standards and Health care and reflects quality assurance of system (2), (3).

The blood bank needs to put enormous efforts to collect a sufficient amount of safe blood from voluntary non remunerated, healthy, and low- risk donors. Since blood can't be manufactured artificially therefore, efficient use of resources is required to collect human blood and preparation of its components. (4)The aims of present study is to analyze the discard rate of blood and its components and thereafter educate, train the staff, and introduce new measures to minimize the discard rate of blood to a reasonable value.

## II. Material and Methods

*Study design:* A Retrospective study was carried out in the blood bank of Tertiary care hospital involving analysis of discard rate of whole blood and its prepared components for a period of three years, i.e., from Jan 2016 to Dec. 2018.

*Inclusion criteria:* After complete Medical history and brief clinical examination by medical officer, Blood donors fulfilling WHO criteria for donor selection are included in present study. The donors included in the study are replacement and voluntary donors.

*Data collection:* Data required for study retrieved from Blood Bank Registers. Information collected for the study involved mainly

Daily total number of blood collections.

Daily total number of blood components prepared.

A Number of units of various components discarded and the reason for discard.

## III. Data Analysis

Screening of Blood bags are done for TTI Infections. Seroreactive blood bags are discarded. Expired blood bags due to non utilization, failed tap or quantity not sufficient collected from donors, because of any reasons, including donor reactions are discarded. Other reasons included, signs of hemolysis, leakage or tear during centrifugation, clotted blood, lipemia and greenish colored plasma.

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*Statistical Analysis:* Descriptive statistical methods were used to analyze the data.

## IV. Results

The total numbers of blood units collected from Jan 2016 to Dec 2018 were 13,249. (Table no. 1) All the collected blood units are screened and processed for the preparation of blood components. The percentage of blood kept as whole blood was 0.77%.The total number of blood components prepared was 36,477.

*Rates of discarded blood*

In present study the overall discard rate observed was 13.87%. Amongst it the highest discard is observed for platelets 35.11%, for whole blood is 26.5%, PCV 2.57%, FFP and Frozen plasma 8.18%. The lowest rate of discard observed for cryoprecipitate and SDPs (Table no.1)

*Table 1:* Distribution numbers of prepared and discarded blood and its components.

| Blood and blood components | Number of Blood & its components prepared | Number of blood discarded | Discard Rate (%) |
|---|---|---|---|
| Whole Blood | 279 | 74 | 26.5 |
| PCV | 12,970 | 333 | 2.57 |
| FFP and Frozen plasma | 12,970 | 1061 | 8.18 |
| Platelets | 10,335 | 3629 | 35.11 |
| Cryoprecipitate | 198 | Nil | 0 |
| SDP | 4 | Nil | 0 |

*Definition of Discard rate:*

$$\frac{\text{Number of (whole Blood, RBC, Platelet, FFP, cryoprecipitate) discarded}}{\text{Number of (whole blood, RBC, Platelet, FFP, cryoprecipitate) Prepared}} \times 100$$

*Reasons for discarded blood components:*

The Blood Bank followed WHO guidelines as standards for discard of blood and its components as shown in *Table 2*. (1)

*Table 2:* Explanations of the reasons for discarding

| Reasons of discard blood and blood components | Explanation |
|---|---|
| Red cell contamination | Occurs during production and results from ineffective separation of red cells and platelets or plasma |
| Leakage in bag | That is already opened or broken |
| Underweight bag | Less than 10% of blood bag standard volume respectively |
| Lipemia | Excessive amount of fatty substances (lipids) in the blood including cholesterol and triglycerides. |
| Haemolysis | Break down of red cell membranes and the subsequent release of free haemoglobin |
| Icterus | Yellow discoloration due to high bilirubin content in blood. |
| Clots | Clots are formed in blood due to activation of clotting processes and can be a mixture of clotting proteins and platelets. |

Distribution of discarded blood with reasons is as shown in *Table no.3.*

*Table 3:* Summarizes the Reasons of discarded blood and blood components

| Blood and its component | RBC Contami-nation (%) | Leakage (%) | Lipemic (%) | Under weight (%) | Clotted (%) | Haemolysis (%) | TTI (%) | Expired (%) | Total |
|---|---|---|---|---|---|---|---|---|---|
| Whole Blood | - | 12 | 8 | 30 | 10 | 14 | - | - | 74 |
| PCV | - | 06 | - | - | 18 | 12 | 285 | 12 | 333 |
| FFP | 56 | 329 | 69 | - | - | - | 285 | - | 1061 |
| Frozen plasma | 33 | 249 | 40 | - | - | - | | - | |
| Platelets | 25 | - | - | - | - | - | 96 | 3508 | 3629 |
| Cryoprecipitae | - | - | - | - | - | - | - | - | - |
| Total | 114 (2.23%) | 596 (11.69%) | 117 (2.29%) | 30 (0.58%) | 28 (0.54%) | 26 (0.51%) | 666(13. 06%) | 3520 (69.06%) | 5097 |



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No blood unit discarded because of overweight, Greenish appearance or Icterus

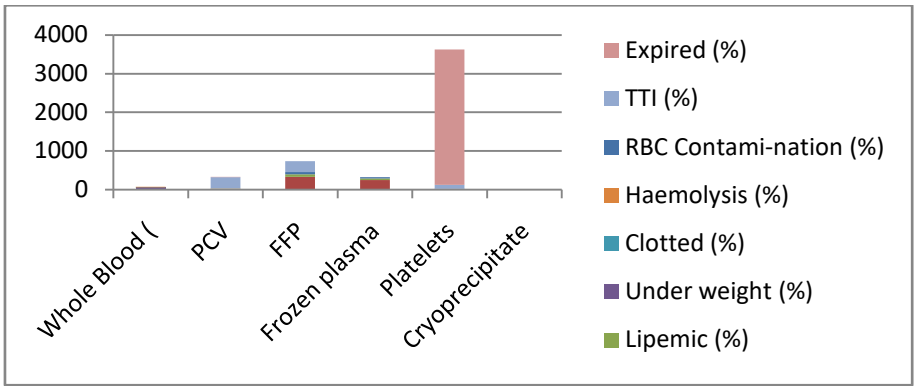


*Figure 1:* Summarizes the reasons for discard of whole blood and its components

The main reason for discard of blood and Blood component at our centre was expired units, which accounted for 69.1%, TTI reactive units accounted for 13.1% and the third reason is leakage at 11.7%. Other reasons for discard are less than 5%.

The significant reason for discarding whole blood is underweight which accounted for 0.59%. The major reason for discarding packed cells is TTI positivity which accounts for 5.6%.

Most of platelets discarded at our centre due to expiry. FFP are discarded due to leakage and TTI.

## V. Discussion

From January 2016 to December 2018, a total of 279 whole blood and 36,447 blood components prepared. Of these, 5097 (13.86%)(%) units were discarded. There are many reasons for discard like expiry due to non utilization, seropositivity to TTIs, leakage observed as the most common causes of blood and components. *Table 4* shows a comparison of reasons for discarding whole blood and components in various published studies with the present study.

*Table 4:* Shows comparison of reasons for discarding whole blood and components in various published studies with present study

| Study | Number of units collected | Number of units discarded% | TTI Positive % | Expired % | Less quantity % | Leakage % | Others % |
|---|---|---|---|---|---|---|---|
| Deb et.al | | | | 242 (14.61%) | | | |
| Morish et.al | 390634 | 8968(2.3%) | | | 353 (3.9%) | 2306 (25.7%) | 6309 (70.4%) |
| Kumar et.al | 10582 | 888(8.4%) | 300 (33.8%) | 513 (57.8%) | 18 (2.0%) | 27 (3.0) | 20 (3.4%) |
| Patil et.al | 14,026 | 2888(20.6%) | 953 (33.0%) | 1531 (53%) | 48 (1.7%) | 97 (3.4%) | 186 (6.4%) |
| Present study | 13249 | 5097 | 666 (13.06%) | 3520 (69.06%) | 30 (0.58%) | 596 (11.69%) | 285 (5.59%) |

In a study done by Deb etal., (5) an average of 292(14.61%) bags from the total collection were discarded, and out of this 292 units, non utilization contributed to 242 units. Various protocols that can reduce the rate of expiry of blood units are:-1) Proper management of Rh-negative units since there requirement is less ,2) To arrange blood units of near expiry, and maintenance of proper inventory management in blood bank.(6) The Second most common cause of discard, was seropositivity to TTI, which accounted for 13.06%. complete screening of donor is key factor to avoid wastage.

Platelets concentrate scored the highest at 3629/ 5097 (71.1%) when compared with other blood components. The reason behind discard being short shelf life of 5 days and red cell contamination.(7) In the present study 25/114 (21.9%) platelets and 89/114 (78%) of plasma was wasted due to red cell contamination. In similar study, by Morish et al., RBC Contamination of platelet concentrate was the main reason behind discard. (8)

Another main cause of discarded blood and blood components was leakage 596 (11.69%) seen in mainly FFP and Plasma units. In a similar study by Kumar et al. discard due to leakage was 26%. (9).The main reasons for leakage noticed were due to the mishandling of blood bags during storage or manufacturing errors. Another reason for leakage was



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seen during the centrifugation process, as it happens because the blood bag is forced to sharp interior bottom/wall junction or corner, resulting in bag material being stretched too far, causing a tear. Always visually check the blood bags for any defect/leakage during processing, before freezing, and after thawing. It is recommended to store plasma and FFP in polystyrene protective bags to minimize the risk of breakage of FFP during storage, handling and transportation.

Another next reason for discard of blood and its components observed was gross lipemia 117 (2.29 %). Lipemic blood units interfere with the ability to perform viral marker tests, and hence the units are discarded. (10) Doctors and nurses during predonation should interview carefully, the history of donors for intake of fatty meal before coming to donate blood.

0.58% (30 Bags) were discarded due to underweight. Various reasons responsible for low volume collected can be due to discontinuation of blood donation as donors suffered adverse donor reactions, small vein selected for phlebotomy, and duration exceeded by 15 minutes. The discard rate due to underweight bags can be reduced by careful selection of donor, training and monitoring, the staff involved in donation procedures.

## VI. Conclusion

*TTI and expired* blood units are mostly responsible for high discard rate. Platelets are the highest amongst discarded components. Discard due to nonutilization of blood components can be financially as well as socially harmful to blood bank.

We conclude our study with the following recommendations:

1. Donor history questionnaire should be conducted properly
2. TTI Positive donors should be notified for there permanent deferral
3. Hospital transfusion committee meetings and transfusion policies should be made from time to time to promote rational use of Blood and components.
4. Whole blood collected should be kept to minimum to prevent expiry and non utilization.
5. Networking and interlinking with other blood banks to outsource excess blood n components can prevent wastage.

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