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Original Article

Analysis of Blood Component Wastage in a Tertiary Care Blood Bank

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ABSTRACT

Background: Blood and blood components are vital therapeutic resources in modern healthcare. Despite stringent donor selection and screening protocols, wastage of blood units continues to pose a challenge to blood banks. Objective of this study is to analyze the magnitude and causes of blood unit wastage in a tertiary care blood bank of Western Assam, India.
Materials and Methods: A retrospective observational study in the blood bank of a tertiary care hospital over a period of six months. Data regarding discarded blood units were collected from blood bank discard registers and records. Parameters analyzed included the total number of discarded units and reasons for discard such as expiry, insufficient quantity, transfusion reactions, and transfusion-transmitted infections (TTIs). Data were entered into Microsoft Excel and analyzed to determine frequencies and percentages
Results: During the study period, total of 223 blood units (6.3%) of 3,516 blood units collected were discarded. Of these, 199 units (89.2%) were discarded due to TTI reactivity. Twelve units (5.4%) were discarded due to expiry, eight units (3.6%) due to transfusion reactions, and four units (1.8%) due to insufficient quantity. TTI reactivity was identified as the leading cause of blood unit discard in the study setting.
Conclusion: A discard rate of 6.3%, largely driven by transfusion-transmitted infections, highlights the need for strengthened donor screening, increased voluntary blood donation, and regular blood bank audits to optimize blood utilization.

Keywords: *Blood bank; Blood unit discard; Transfusion-transmitted infections; Blood wastage; Blood bank audit; Replacement donors.*

INTRODUCTION

Blood transfusion is an essential component of modern healthcare and is critical in the management of trauma, surgical procedures, obstetric emergencies, hematological disorders, and malignancies. Blood and its components are limited and life-saving resources that require efficient collection, processing, storage, and utilization to ensure both safety and availability [1].

Despite advances in transfusion services, wastage of blood and blood components remains a significant concern, especially in developing countries [2]. Discard of blood units leads to loss of valuable resources and increases the financial burden on healthcare systems. Blood units may be discarded due to expiry, transfusion-transmitted infection (TTI) reactivity, inadequate quantity, adverse transfusion reactions, and improper handling or storage.

Among these causes, TTI reactivity continues to be a major contributor to blood wastage in India [3, 4, 6, 9], reflecting the prevalence of infectious diseases and challenges related to donor selection and awareness. While discarding TTI-reactive

units is mandatory for transfusion safety, high discard rates highlight the need for improved donor screening, promotion of voluntary blood donation, and regular audit of blood bank practices.

The National Blood Policy and guidelines by the National AIDS Control Organisation emphasize rational use of blood and periodic evaluation of blood bank performance. However, data on blood unit wastage from Western Assam are limited.

Therefore, this retrospective observational study was conducted in a tertiary care blood bank of Western Assam, India, to assess the magnitude and causes of blood unit discard, with the aim of identifying areas for improvement in blood bank management and transfusion services.

MATERIALS AND METHODS

This retrospective observational study was conducted in the blood bank of a tertiary care hospital in Western Assam, India, over a period of six months. All blood units discarded during the study period were included in the analysis. Data were collected from blood bank discard registers, donor screening records, and transfusion reaction reports.

Discarded blood units were categorized according to the cause of discard, including expiry, insufficient quantity, transfusion reactions, and transfusion-transmitted infection (TTI) reactivity. Screening of donated blood units was performed in accordance with National AIDS Control Organisation guidelines for HIV, hepatitis B virus, hepatitis C virus, syphilis, and malaria using standard serological testing methods routinely employed in the blood bank.

Data were entered into Microsoft Excel and analyzed to determine frequencies and percentages.
Ethical approval was obtained from the Institutional Ethics Committee, and confidentiality of donor and patient information was strictly maintained throughout the study.

RESULTS

During the six-month study period, a total of 3516 units of blood were collected, out of which 699 (19.9%) units were from voluntary donors and 2817 (80.1%) units were from replacement donors. During this period 223 blood units were discarded in the blood bank which comprised 6.3% of total units collected. The reasons for discard are summarized below.

Out of the total discarded units, 199 units (89.2%) were discarded due to transfusion-transmitted infection (TTI) reactivity**,** making it the most common cause of discard. Twelve units (5.4%) were discarded due to expiry**,** eight units (3.6%) due to transfusion reactions**,** and four units (1.8%) due to insufficient quantity **[Table 1].**

Table 1: *Distribution of discarded blood units according to cause of discard (n = 223)*

Cause of discard	Number of units	Percentage (%)
TTI reactivity	199	89.2
Expiry	12	5.4
Transfusion reaction	8	3.6
Insufficient quantity	4	1.8
Total	223	100

Among the 199 TTI-reactive units [Table 2]**,** 71 units were reactive for hepatitis C virus (HCV)**,** 61 for hepatitis B virus (HBV)**,** 49 for syphilis (VDRL)**,** and 34 for human immunodeficiency virus (HIV)**.** Co-infections were also observed, with eight units reactive for both HIV and HCV**,** two units for HIV and HBV**,** one unit for HIV and VDRL, and **one** unit for HBV and HCV**.**

Table 2: *Distribution of TTI-reactive blood units according to infection (n = 199)*

TTI marker	Number of units
HIV	34
HBV	61
HCV	71
VDRL	49
HIV + HCV	8
HIV + HBV	2
HIV + VDRL	1
HBV + HCV	1

Analysis based on the type of blood units discarded revealed that the majority were whole blood units (212 units)**.** Component-wise, six units were packed red blood cells (PRBCs) and five units were fresh frozen plasma (FFP)**.**

Distribution of discarded units according to ABO and Rh blood groups **[Table 3]** showed that B positive blood group constituted the highest number of discarded units (68 units), followed by O positive (64 units)**,** A positive (55 units)**,** and AB positive (20 units)**.** The remaining discarded units belonged to Rh-negative blood groups**.** Notably, all expired blood units were Rh-negative blood groups**.**

Table 3: *ABO and Rh blood group distribution of discarded blood units (n = 223)*

Blood group	Number of units
A positive	55
B positive	68
AB positive	20
O positive	64
Rh negative (all groups)	16
Total	223

DISCUSSION

Blood component wastage is an important indicator of the efficiency and quality of transfusion services. Periodic audit of discarded blood units helps in identifying preventable causes of wastage and in formulating strategies to improve blood utilization [1, 2]. The present retrospective study analyzed the pattern and causes of blood unit discard in a rural tertiary care blood bank of Western Assam, India.

During the six-month study period, a total of 3,516 blood units were collected, of which replacement donors constituted a substantial majority (80.1%), while voluntary donors accounted for only 19.9%. A total of 223 blood units were discarded, representing 6.3% of the total blood collected. The rural tertiary care setting is a crucial factor in interpreting this donor profile. Similar to reports from other rural and semi-urban regions of India, low voluntary blood donation rates in this study may be attributed to limited awareness, socio-cultural barriers, and inadequate community outreach programs. Several Indian studies have consistently shown a higher prevalence of transfusion-transmitted infections among replacement donors compared to voluntary donors, which may have contributed to the high discard rate observed [5, 7, 8].

In the present study, transfusion-transmitted infection (TTI) reactivity was the predominant cause of blood unit discard, accounting for 89.2% of discarded units. This finding is comparable with observations reported by Arora et al., Bobde et al., and other Indian authors, who have identified TTI reactivity as the leading cause of blood wastage in blood banks [3, 4, 6, 9]. Among the TTI-reactive units, hepatitis C virus was the most frequently detected infection, followed by hepatitis B virus, syphilis, and human immunodeficiency virus. The higher prevalence of viral hepatitis observed in this study is in agreement with published Indian data and reflects the ongoing burden of these infections in the donor population, particularly in rural settings where access to preventive healthcare and early screening is limited [7, 8]. The presence of co-infections, though less frequent, further emphasizes the need for careful donor selection and counselling.

Discard due to expiry accounted for a relatively small proportion (5.4%) of the total discarded units, which is comparable to or lower than rates reported in other Indian studies. Notably, all expired units belonged to Rh-negative blood groups, a finding also reported by other authors and likely attributable to lower demand and slower turnover of these relatively rare blood groups [3, 10]. This observation highlights the importance of targeted inventory management strategies, particularly for Rh-negative blood units, in reducing expiry-related wastage.

Discard due to transfusion reactions (3.6%) and insufficient quantity (1.8%) formed a smaller fraction of wastage. These causes are largely preventable and may be minimized through proper donor selection, adherence to standard phlebotomy techniques, and strict compliance with blood collection protocols. Component-wise analysis revealed that the majority of discarded units were whole blood, which aligns with findings from other Indian studies and reflects collection practices in rural tertiary care hospitals catering to emergency and general patient populations [4, 9].

Overall, the findings of this study underscore the need for strengthening voluntary blood donation programs, particularly in rural areas, through sustained awareness campaigns and community engagement. Regular training of blood bank personnel, strict adherence to standard operating procedures, and periodic audit of blood bank activities are essential to minimize avoidable wastage. Improving donor selection practices and optimizing inventory management, especially for Rh-negative blood groups, can further enhance blood safety and ensure judicious utilization of this vital healthcare resource.

CONCLUSION

This retrospective study demonstrates that transfusion-transmitted infection reactivity is the leading cause of blood unit discard in a tertiary care blood bank of Western Assam, with hepatitis C and hepatitis B being the most common infections. Expiry-related wastage was comparatively low and predominantly involved Rh-negative blood units. Strengthening donor selection, promoting voluntary blood donation, and conducting regular audits are essential to minimize blood wastage and ensure optimal utilization of blood resources.

DECLARATION

Conflicts of interests: The authors declare no conflicts of interest.
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