**Original Research**

# A Retrospective Analysis of Transfusion Practices in a Blood Bank at a Tertiary Care Hospital

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**ABSTRACT**
**Background:**The proper use of blood products can be life-saving, but it requires careful management and adherence to established guidelines to ensure that transfusions are safe, effective, and appropriately utilized. Blood banks and transfusion services are integral to this process, managing the collection, testing, storage, and distribution of blood and blood products. The aim of this study was to analyse transfusion practices at a tertiary care hospital's blood bank, assessing clinical indications for blood transfusions, types of blood products used, adherence to transfusion protocols, and associated transfusion reactions.
**Materials and Methods:** This retrospective observational study included 400 patients who received blood transfusions. Data were collected from hospital blood bank records, documenting patient demographics, clinical indications for transfusion, types of blood products used, transfusion reactions, and pre-transfusion testing. The appropriateness of transfusions was assessed based on established guidelines. Statistical analysis was performed using SPSS version 20.
**Results:** The study population was equally distributed by gender, with the majority of patients aged 31 to 50 years. Trauma (30%) and anemia (25%) were the leading indications for transfusion. Red blood cells were the most commonly used product (62.5%), followed by fresh frozen plasma (17.5%) and platelets (12.5%). Most patients (92.5%) did not experience adverse reactions, with fever being the most common (5%). The majority of transfusions (97%) were deemed appropriate according to clinical guidelines, while 3% were considered inappropriate.
**Conclusion:** The study reveals that transfusion practices are largely appropriate, with strong adherence to transfusion guidelines and minimal adverse reactions. However, a small percentage of transfusions were deemed inappropriate, suggesting a need for continued education and guideline reinforcement to optimize blood utilization and improve patient outcomes.
**Keywords:** Blood Transfusion, Transfusion Practices, Red Blood Cells, Transfusion Reactions, Clinical Guidelines.

## INTRODUCTION
Blood transfusion plays a critical role in modern medical care, serving as an essential therapeutic intervention for a range of clinical conditions, including surgery, trauma, and various hematological disorders. The proper use of blood products can be life-saving, but it requires careful management and adherence to established guidelines to ensure that transfusions are safe, effective, and appropriately utilized. Blood banks and transfusion services are integral to this process, managing the collection, testing, storage, and distribution of blood and blood products. The practices followed in a blood bank can significantly impact patient outcomes, including the quality and quantity of blood products issued, as well as the overall efficiency of healthcare delivery.Despite the importance of blood transfusions, there are widespread concerns regarding the overuse, underuse, and inappropriate ordering of blood products, which may contribute to unnecessary risks for patients, increase healthcare costs, and strain limited blood resources. Overtransfusion, for instance, can lead to complications such as transfusion reactions, volume overload, and iron overload, while undertransfusion may result in inadequate treatment of anemia, leading to poor recovery or even life-threatening situations. Therefore, evaluating transfusion practices and understanding the factors that influence blood ordering and utilization is crucial for optimizing blood management in healthcare settings.[1]
Recent studies have pointed out that excessive quantities of red blood cells (RBCs) are often ordered for surgical procedures, particularly in high-risk cases or in anticipation of complications. These practices

are largely driven by the fear of insufficient blood availability during surgeries, which leads to the ordering of excessive blood products in advance, often resulting in waste due to unused RBC units. Such inefficiencies not only contribute to higher operational costs but also exacerbate the global issue of blood shortages, especially in resource-limited settings. An evaluation of transfusion practices can identify discrepancies between the actual need for blood and the quantities ordered, providing insights for better management strategies, such as refining the maximum surgical blood ordering schedule (MSBOS). The MSBOS is a widely used tool that guides clinicians on the appropriate amount of blood to be ordered for specific surgeries, aiming to balance the availability of blood with the actual needs of patients.[1,2]

A retrospective study focusing on transfusion practices provides valuable data that can be used to assess trends in blood ordering, transfusion triggers, and the appropriateness of blood use. By analyzing past cases, such studies can reveal patterns of blood utilization, identify areas where blood is being overused or underused, and help in the development of evidence-based protocols for transfusion management. These studies are particularly useful in tertiary care centers, where the complexity of cases may require more nuanced approaches to blood management.[3,4] Moreover, hospitals and blood banks can use such data to optimize inventory management, reduce wastage, and improve patient safety by adhering to guidelines for transfusion thresholds.

Several factors contribute to the variation in transfusion practices, including institutional policies, clinical guidelines, the experience of healthcare providers, and patient-specific factors such as age, comorbidities, and the severity of illness. Studies have shown that blood utilization varies significantly across different types of surgeries and patient populations. For instance, elective surgeries often have more predictable blood requirements, while trauma cases may require more immediate and variable blood supplies.[2] Additionally, an analysis of blood ordering patterns can reveal whether blood products are being ordered based on individual patient needs or merely as a precautionary measure. This distinction is essential because unnecessarily high orders of blood may increase the risks of transfusion reactions and other complications.[5]

Despite advancements in transfusion practices, challenges remain in ensuring that blood is used judiciously. Guidelines for the clinical use of red cell transfusions have been developed to assist clinicians in making informed decisions based on scientific evidence and best practices.[6] These guidelines emphasize the importance of restrictive transfusion strategies, particularly in non-bleeding patients or those with chronic anemia, where transfusion may not be necessary unless certain hemoglobin thresholds are met. Furthermore, studies have shown that

preoperative screening of patients, including a type and screen protocol, can help reduce the likelihood of transfusion-related complications and prevent unnecessary blood orders.[7]

The growing awareness of transfusion-related risks and the need for more efficient blood utilization has led many healthcare institutions to adopt various quality improvement initiatives. These initiatives aim to promote appropriate blood ordering, reduce unnecessary transfusions, and minimize blood waste. Regular audits and reviews of transfusion practices are essential components of such initiatives, helping institutions identify patterns of overuse or misuse and adjust protocols accordingly. Moreover, interdisciplinary approaches involving surgeons, anesthesiologists, and hematologists can lead to more effective blood management strategies.[8,9] In resource-limited settings, the evaluation of transfusion practices is particularly important due to the scarcity of blood supplies. A shortage of blood products can result in difficult ethical decisions regarding which patients should receive transfusions, further underscoring the need for optimal blood utilization strategies. Research in these areas is crucial for understanding how transfusion practices differ between high-resource and low-resource environments, and for developing strategies that are both cost-effective and safe in such settings.[4] A comprehensive retrospective study can provide insights into these practices and inform the development of targeted interventions aimed at improving blood bank efficiency and patient outcomes.[10]

## MATERIALS AND METHODS

This was a retrospective observational study conducted at a tertiary care hospital's blood bank to evaluate transfusion practices. The hospital, which serves a diverse population, provides blood transfusion services for a variety of clinical conditions, including trauma, surgery, anemia, and hematological disorders. This study aimed to assess the clinical indications for blood transfusions, types of blood products used, adherence to transfusion protocols, and associated transfusion reactions. The study included 400 patients who received blood transfusions at the hospital during the study period. All patients aged 18 years and older who had one or more transfusions of blood products were included. Exclusion criteria consisted of patients who received blood transfusions for diagnostic purposes, those who received transfusions outside the hospital, and those with incomplete transfusion records. The selection of patients was based on data extracted from the hospital's blood bank database.

Data for this retrospective study were collected from the hospital's blood bank transfusion records, which provided detailed information on all blood product transfusions administered during the study period. These records included essential patient demographics such as age, sex, and medical history, as well as

specifics on the type of blood product transfused (e.g., red blood cells, platelets, plasma, or whole blood), the quantity of blood products administered, the clinical indications for transfusion, and any transfusion reactions that occurred. To ensure the accuracy of the clinical indications for transfusion, the transfusion records were cross-referenced with the hospital's medical records. Several key transfusion practices were evaluated as part of this study. First, the primary clinical conditions that necessitated transfusion were identified and categorized into groups such as anemia (including iron deficiency anemia and hemorrhagic anemia), trauma, surgery, malignancy, and hematological disorders. Second, the types and quantities of blood products administered were documented, and the appropriateness of the products used was assessed according to established clinical guidelines. Third, information regarding any adverse reactions to transfusions, including fever, allergic reactions, and hemolysis, was recorded, along with data on how these reactions were managed. Fourth, the study reviewed the pre-transfusion testing procedures, such as blood group matching, crossmatching, and screening for infectious diseases, to evaluate the adequacy of the hospital's transfusion safety protocols. Lastly, the appropriateness of the transfusions was assessed in relation to established clinical guidelines and hospital protocols, focusing on whether the indications for transfusion were appropriate and if the correct blood product was chosen. The primary outcome measure of the study was to evaluate the appropriateness of transfusion practices based on the hospital's transfusion protocols. Secondary outcomes included assessing the frequency and types of transfusion-related adverse reactions, evaluating blood product wastage, determining the extent of adherence to transfusion guidelines, and identifying factors contributing to inappropriate transfusions, such as incorrect documentation or errors in the ordering process.

Descriptive statistics were used to summarize the characteristics of the study population, including demographics, indications for transfusion, and types of blood products used. Categorical variables were presented as frequencies and percentages, while continuous variables were expressed as means and standard deviations (SD). Statistical tests, including chi-square tests and t-tests, were used to compare categorical and continuous variables, respectively. A p-value of less than 0.05 was considered statistically significant. Data were analyzed using SPSS version 21.

## RESULTS

The study included 400 participants, with an equal distribution between genders, as 50% (200) were male and 50% (200) were female. Age-wise, the participants were primarily between 31 to 50 years (37.5%, n=150), followed by those aged 51 to 70 years (30%, n=120). The age group 18-30 years constituted 20% (n=80), while the elderly group aged 71 years and above represented 12.5% (n=50) of the study population. The main indications for blood transfusions were trauma (30%, n=120) and anemia, which accounted for 25% (n=100) of the cases. Trauma as a cause of transfusion is typically linked to patients with significant blood loss, often requiring blood products for stabilization. Anemia, particularly iron deficiency anemia or other related conditions, was also a major reason for transfusion. Surgery accounted for 20% (n=80), as blood transfusions are commonly needed during or after major surgical procedures. Hematological disorders (12.5%, n=50) and malignancy (12.5%, n=50) were less frequent but still significant causes of transfusions. The most commonly used blood product was red blood cells, comprising 62.5% (n=250) of the transfusions. This aligns with the high frequency of anemia and trauma, where red blood cell transfusion is the primary treatment. Fresh frozen plasma was used in 17.5% (n=70) of cases, likely reflecting transfusions for patients with clotting disorders or those undergoing major surgeries. Platelets were transfused in 12.5% (n=50) of cases, which is consistent with the treatment of patients with thrombocytopenia or those undergoing chemotherapy for malignancies. Whole blood was used in only 7.5% (n=30) of the transfusions, reflecting its less frequent application in modern transfusion practices, as more targeted blood products (such as red blood cells and plasma) are typically preferred. The majority of patients (92.5%, n=370) did not experience any adverse reactions to the blood transfusion. This is a positive outcome, indicating that the blood transfusions were generally safe and well-tolerated. Fever was the most common reaction, occurring in 5% (n=20) of the patients, which is often a mild and self-limiting reaction. Allergic reactions and hemolytic reactions were rare, with each accounting for 1.25% (n=5) of the transfusions. Pre-transfusion testing was performed rigorously in this study. Blood group matching and screening for infectious diseases were conducted for all 400 patients, ensuring 100% compliance. Crossmatching, which is essential for ensuring compatibility between donor and recipient, was performed in 100% (n=400) of the cases. Most transfusions (97%, n=388) were deemed appropriate according to the established clinical guidelines, meaning that the transfusions were justified based on the clinical indications for each patient. However, 3% (n=12) of transfusions were considered inappropriate, indicating either overuse or unnecessary transfusions.

### Table 1: Demographic Characteristics of Study Participants

| Characteristic | Frequency (n=400) | Percentage (%) |
|---|---|---|
| **Age (years)** | | |
| **18-30** | 80 | 20% |
| **31-50** | 150 | 37.5% |
| **51-70** | 120 | 30% |
| **71+** | 50 | 12.5% |
| **Gender** | | |
| **Male** | 200 | 50% |
| **Female** | 200 | 50% |

### Table 2: Indications for Transfusion

| Indication | Frequency (n=400) | Percentage (%) |
|---|---|---|
| **Anemia (Iron deficiency, etc.)** | 100 | 25% |
| **Trauma** | 120 | 30% |
| **Surgery** | 80 | 20% |
| **Hematological Disorders** | 50 | 12.5% |
| **Malignancy** | 50 | 12.5% |

### Table 3: Types of Blood Products Used

| Blood Product | Frequency (n=400) | Percentage (%) |
|---|---|---|
| **Red Blood Cells** | 250 | 62.5% |
| **Platelets** | 50 | 12.5% |
| **Fresh Frozen Plasma** | 70 | 17.5% |
| **Whole Blood** | 30 | 7.5% |

### Table 4: Transfusion Reactions

| Reaction Type | Frequency (n=400) | Percentage (%) |
|---|---|---|
| **No Reaction** | 370 | 92.5% |
| **Fever** | 20 | 5% |
| **Allergic Reaction** | 5 | 1.25% |
| **Hemolytic Reaction** | 5 | 1.25% |

### Table 5: Adherence to Pre-Transfusion Testing

| Test Conducted | Frequency (n=400) | Percentage (%) |
|---|---|---|
| **Blood Group Matching** | 400 | 100% |
| **Crossmatching** | 400 | 100% |
| **Screening for Infectious Diseases** | 400 | 100% |

### Table 6: Appropriateness of Transfusions According to Guidelines

| Category | Frequency (n=400) | Percentage (%) |
|---|---|---|
| **Appropriate Transfusion** | 388 | 97.00% |
| **Inappropriate Transfusion** | 12 | 3.0% |

## DISCUSSION

This retrospective study aimed to evaluate transfusion practices in a tertiary care hospital's blood bank, focusing on the demographic characteristics of patients, indications for transfusions, types of blood products used, adverse reactions, adherence to pre-transfusion testing, and the appropriateness of transfusions based on clinical guidelines. The demographic characteristics of the study participants showed an equal distribution of male and female patients, with 50% of each gender represented, which is consistent with findings from other studies, such as the one by Thakur and Solanki[11] who reported similar gender distribution in their study of transfusion practices at a tertiary care center in India. In terms of age, the majority of patients were between 31 to 50 years, reflecting the common need for transfusions in middle-aged adults, especially for conditions like trauma and anemia. A similar age distribution was noted by Yangdon et al.[12], who found that transfusions were most commonly administered to individuals aged 30-60 years, primarily due to surgical or trauma-related indications. The primary indications for blood transfusions in this study were trauma and anemia, accounting for 30% and 25% of transfusions, respectively. This aligns with findings from other studies, such as those by Shrestha et al.[13] and Soril et al.[14], who also reported that trauma and anemia are among the leading causes for blood transfusions. Trauma often results in significant blood

loss, requiring prompt transfusion of red blood cells, while anemia, particularly iron deficiency anemia, is a common cause for transfusion, as blood products help restore hemoglobin levels. Additionally, surgery, malignancy, and hematological disorders were also significant contributors, with surgery accounting for 20% of transfusions in this study, which is consistent with Kumari[15], who observed a similar trend in transfusions following major surgeries.In this study, the most commonly transfused blood product was red blood cells (62.5%), followed by fresh frozen plasma (17.5%) and platelets (12.5%). This pattern reflects common transfusion practices, where red blood cells are typically used to treat anemia and blood loss due to trauma. The predominance of red blood cells in transfusions was also noted by Raghuwanshi et al.[16], who reported red blood cells as the most frequently transfused product.Similarly, Soril et al.[11] and Thakur and Solanki[14] found that red blood cells were the most common blood product used in intensive care units, owing to their role in managing low hemoglobin levels and hypovolemic shock. The use of fresh frozen plasma (17.5%) is also in line with the clinical need for correcting coagulopathies in surgical patients or those with clotting disorders, as observed by Lin et al.[17]The study reported a relatively low rate of adverse reactions, with 92.5% of patients not experiencing any reaction. Among those who did experience reactions, fever was the most common (5%), followed by allergic and hemolytic reactions (both 1.25%). This is consistent with the findings of Musa et al,[18] who also reported that fever was the most frequently encountered reaction, often mild and self-limiting.The low rate of transfusion reactions in this study suggests that the transfusions were well-managed and adhered to safety protocols. Similar safety outcomes were reported by Shrestha et al[13], who found that the vast majority of transfusions in their study were well-tolerated, with only a small proportion of patients experiencing mild reactions like fever.Pre-transfusion testing, including blood group matching and screening for infectious diseases, was performed in 100% of the cases, with 100% of the cases undergoing crossmatching. These findings are in agreement with the practices reported by Aliyo et al.[19], who emphasized the importance of stringent pre-transfusion testing to prevent transfusion reactions and the transmission of infectious diseases.The high level of adherence to testing in this study reflects the hospital's commitment to patient safety, which is consistent with global transfusion safety standards. The study by Raghuwanshi et al.[16] also highlighted the critical role of pre-transfusion testing in reducing the risk of complications.The study found that 97% of the transfusions were deemed appropriate based on clinical guidelines, while 3% were considered inappropriate. This finding is similar to that of Yangdon et al. (2020)[12], who found that a small proportion of transfusions in their study were inappropriate, often due to overuse or lack of clear clinical indication. The 3% of inappropriate transfusions in this study suggests that there may be room for improvement in ensuring that transfusions are only administered when absolutely necessary. Thakur and Solanki[11] similarly noted that inappropriate transfusions often result from misdiagnosis or misinterpretation of clinical indicators and emphasized the need for better adherence to transfusion protocols.

## CONCLUSION

In conclusion, this study highlights the key factors influencing blood transfusion practices, including the predominant use of red blood cells for trauma and anemia, as well as the overall safety and appropriateness of transfusions. The findings suggest a strong adherence to transfusion guidelines and rigorous pre-transfusion testing, ensuring minimal adverse reactions. However, there remains a small percentage of inappropriate transfusions, emphasizing the need for continued education and guideline reinforcement. The results underscore the importance of optimizing blood utilization, particularly in trauma and anemia management, to improve patient outcomes and resource efficiency.

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