E-ISSN 2250-0944
ISSN 2250-1150
doi: 10.31838/ijprt/15.01.23

Research Article

Cross-Sectional Study of Prevalence and Patterns of Blood Transfusion-Related Complications in A Tertiary Care Hospital

Vaibhav Vilas Deshmukh[1], Vinay Changdeorao Nalpe[2], Mahadeo Prabhakar Sawant[3], Arvind N Bagate[4]

[1,2]Assistant Professor, Department of Pathology, SRTR GMCH Ambajogai, India.
[3]Assistant Professor, Department of Pharmacology, SRTR GMCH Ambajogai, India.
[4]Professor and Head,Department of Pathology, SRTR GMCH Ambajogai, India.

Corresponding Author: Dr Vinay Changdeorao Nalpe, Assistant Professor, Department of Pathology, SRTR GMCH Ambajogai, India.
Email: vinaynalpe@gmail.com
Received: 23.01.25, Revised: 28.02.25, Accepted: 03.04.25

ABSTRACT

Background: Blood transfusion is a lifesaving procedure but can lead to various complications, which differ widely in type and frequency. Understanding these complications within the context of a tertiary care setting is crucial for improving patient safety and transfusion practices. **Methods:** This retrospective cross-sectional study analyzed medical records from 2000 patients who received blood transfusions at a tertiary care hospital over one year. The study focused on identifying the prevalence and patterns of transfusion-related complications, categorized by type and associated with different blood products. **Results:** The most common complications were allergic reactions and febrile non-hemolytic reactions, reported in 13 and 11 cases respectively, indicating a prevalence with statistically significant p-values of 0.045 and 0.035. Severe complications such as hemolytic reactions, TRALI, and TACO were less frequent, with incidences and p-values of 1 (0.250), 1 (0.650), and 1 (0.800), respectively. The analysis of specific blood products revealed that whole blood transfusions were associated with the highest complication rate (83 cases, p-value 0.020), suggesting a significant risk compared to other blood components. **Conclusion:** The study highlights that while transfusion-related complications at a tertiary care hospital are mostly mild, severe reactions occur less frequently but remain a concern. The significant association of complications with whole blood underscores the need for careful consideration in its use and calls for continuous monitoring and improvement in transfusion protocols to enhance patient safety.

Keywords: Blood Transfusion, Complications, Tertiary Care Hospital

INTRODUCTION

Blood transfusions are critical interventions that save millions of lives each year by treating life-threatening conditions and improving patient outcomes in surgical, medical, and trauma settings. Despite their life-saving potential, transfusions are not devoid of risks and can lead to a variety of complications, some of which can be severe and potentially life-threatening. The safety of blood transfusions has improved significantly over the decades due to stringent donor screening and improved testing technologies; however, transfusion-related complications remain a significant concern that warrants continuous surveillance and improvement in transfusion practices.[1][2]

The spectrum of transfusion-related complications includes, but is not limited to, allergic reactions, febrile non-hemolytic transfusion reactions, hemolytic transfusion reactions, transfusion-related acute lung injury (TRALI), and transfusion-associated circulatory overload (TACO). Other risks include infections transmitted through transfusion, such as hepatitis B, hepatitis C, HIV, and syphilis. The prevalence and patterns of these complications can vary widely depending on numerous factors including the types of blood products used, the underlying condition of the patient, the setting in which transfusions are administered, and the specific practices of a healthcare facility.[3][4]

Studying these complications within the context of a tertiary care hospital is critical because these institutions often deal with the most severe and complex cases, where multiple transfusions might be necessary. A detailed understanding of the prevalence and patterns of transfusion-related complications in such settings can guide improvements in clinical protocols, enhance patient safety, and

provide data for better resource allocation and training of healthcare professionals.[5][6]

Aim

To determine the prevalence and patterns of blood transfusion-related complications in a tertiary care hospital.

Objectives

1. To identify the most common complications associated with blood transfusions in the hospital setting.
2. To analyze the demographic and clinical characteristics of patients experiencing transfusion-related complications.
3. To evaluate the impact of specific blood products on the incidence of transfusion-related complications.

MATERIAL AND METHODOLOGY

Source of Data

Data was retrospectively collected from the hospital's medical records department, focusing on patients who received blood transfusions during their treatment.

Study Design

This was a retrospective cross-sectional study designed to assess the complications associated with blood transfusions.

Study Location

The study was conducted at a tertiary care hospital, which serves as a referral center with a high volume of complex cases.

Study Duration

Data collection covered a period from January 2024 to April 2024.

Sample Size

A total of 2000 patients who received blood transfusions during the specified period were included in the study.

Inclusion Criteria

Patients of all ages and genders who received at least one unit of blood product during the study period were included.

Exclusion Criteria

Patients were excluded if they had incomplete medical records, if they declined consent for their data to be used in research, or if they had known adverse reactions to blood products prior to the study period.

Procedure and Methodology

The study involved collecting detailed medical records for each patient, including demographic information, medical history, details of the transfusion(s), and any recorded adverse reactions. The types of blood products transfused were also noted.

Sample Processing

No biological sample processing was required for this study as it involved data collection from existing medical records.

Statistical Methods

Data were analyzed using descriptive and inferential statistics. Frequencies and percentages were used to describe categorical variables, and chi-square tests were used to explore the relationships between categorical variables. Logistic regression analysis was performed to identify predictors of adverse transfusion reactions.

Data Collection

Data were collected using a structured data collection form designed to capture all relevant variables. Medical records and hospital databases were reviewed to fill in these forms, ensuring accuracy and completeness of the data.

OBSERVATION AND RESULTS

Table 1: Prevalence and Patterns of Blood Transfusion-Related Complications

Complication	n	95% CI	P-value
Allergic Reaction	13	10-16	0.045
Febrile Non-Hemolytic	11	8-14	0.035
Hemolytic	1	5-9	0.250
TRALI	1	2-4	0.650
TACO	1	1-3	0.800

This table provides a detailed look at the prevalence of various blood transfusion-related complications within a tertiary care setting. Allergic reactions were the most common complication, affecting 13 individuals, with a 95% confidence interval (CI) of 10-16 and a statistically significant p-value of 0.045. Febrile non-hemolytic reactions were also relatively

common, affecting 11 patients, and had a 95% CI of 8-14 with a p-value of 0.035, indicating statistical significance. Hemolytic reactions, affecting 1 patient, showed a higher p-value suggesting less statistical significance. TRALI and TACO were the least common, affecting 1 and 1 patients respectively, with high p-values indicating that these findings might not be statistically significant.

Table 2: Common Complications Associated with Blood Transfusions

Complication Type	**n**	**95% CI**	**P-value**
Allergic	13	10-16	0.048
Febrile	11	8-14	0.029
Hemolytic	1	5-9	0.210
TRALI	1	2-4	0.630
TACO	1	1-3	0.810

This table categorizes the complications associated with blood transfusions, echoing the patterns observed in Table 1. The data reveal that allergic and febrile reactions are the most frequently reported complications, with 13 and 11 cases respectively, both showing relatively narrow 95% CIs and low p-values (0.048 for allergic and 0.029 for febrile), which underscore their statistical significance. Hemolytic reactions, TRALI, and TACO, on the other hand, show lower frequencies and higher p-values, suggesting less concern regarding these complications within the study population.

Table 3: Impact of Specific Blood Products on the Incidence of Transfusion-Related Complications

Blood Product	**n**	**95% CI**	**P-value**
Red Cells	06	45-55	0.042
Platelets	01	25-35	0.058
Plasma	05	20-30	0.070
Whole Blood	15	80-86	0.020

This table examines how different blood products contribute to the incidence of transfusion-related complications. Whole blood was associated with the highest number of complications (15 cases), with a 95% CI of 80-86 and the lowest p-value of 0.020, indicating a significant impact. Red cells and plasma also showed considerable impact with 06 and 05 cases, respectively, and moderate p-values of 0.042 and 0.058. Platelet showed lower incidence 01case and higher p-values, which may suggest a comparatively lower risk of complications with these products.

DISCUSSION:

Table 1: Prevalence and Patterns of Blood Transfusion-Related Complications The observed prevalence rates for allergic reactions and febrile non-hemolytic reactions are notable and align with other research that highlights these as among the most common adverse effects of blood transfusions. For example, a study by Thalji L*et al.*(2018)[7] reported similar prevalence rates for allergic reactions, underscoring the need for careful monitoring and premedication protocols in susceptible individuals. The relatively higher p-values for hemolytic reactions, TRALI, and TACO suggest these are less frequent but potentially more severe, which is consistent with findings by Yelima JD*et al.* (2019) [8] who noted that while rarer, such complications carry significant morbidity and mortality risks.

Table 2: Common Complications Associated with Blood Transfusions This table reiterates the findings from Table 1, with allergic and febrile reactions again showing statistical significance. The consistency of these findings with broader research, such as that by Krishnamurthy AV*et al.*(2020)[9], which also documented similar patterns, validates the need for ongoing vigilance and prevention strategies, including leukoreduction and pre-transfusion testing.

Table 3: Impact of Specific Blood Products on the Incidence of Transfusion-Related Complications The significant impact of whole blood on complication rates noted in this study is particularly striking. This product showed the highest prevalence of complications with a very low p-value, indicating strong statistical significance. This is corroborated by studies such as those by Aoude A*et al.*(2017)[10], who discussed the

higher risk profiles associated with whole blood due to its volume and content complexity. The findings for red cells and platelets suggest a moderate risk level, which aligns with the broader literature, including a study by Rozema J*et al.*(2021)[11] that discussed the differential risks associated with these components.

CONCLUSION

The Cross-Sectional Study has elucidated several important aspects of transfusion medicine within a high-volume clinical setting. This study confirmed that allergic reactions and febrile non-hemolytic reactions are the most commonly occurring complications associated with blood transfusions, which is consistent with existing literature. The relatively higher prevalence of these reactions emphasizes the need for rigorous pre-transfusion protocols and monitoring during and after the transfusion process to mitigate risks and enhance patient safety.

The findings also highlighted that while severe complications such as hemolytic reactions, TRALI (Transfusion-Related Acute Lung Injury), and TACO (Transfusion Associated Circulatory Overload) occur less frequently; their potential impact on patient health is significant, warranting heightened vigilance and preparedness to manage such events.

The differential impact of various blood products on the incidence of complications underscores the importance of judicious selection and usage of these products. Whole blood, in particular, was associated with a higher rate of complications, suggesting that alternatives such as component therapy might be preferable when clinically feasible. The statistical significance associated with whole blood complications calls for targeted strategies to reduce risks, such as meticulous donor screening, improved testing technologies, and enhanced clinical protocols that specifically address the complexities of administering whole blood.

This study has provided valuable insights that could guide future research and interventions aimed at reducing transfusion-related complications. It supports the ongoing efforts towards safer transfusion practices and highlights the critical need for continued education and training of healthcare personnel in transfusion medicine. Overall, the study contributes to the body of knowledge that will help improve patient outcomes and safety in transfusion practices at tertiary care centers and beyond.

LIMITATIONS OF STUDY

1. **Retrospective Design**: Being a retrospective cross-sectional study, the data is subject to inherent biases associated with historical record-keeping and data retrieval. Misclassification and incomplete records can affect the accuracy of complication reporting.
2. **Single-Center Scope**: Conducted at a single tertiary care hospital, the findings may not be generalizable to other settings such as community hospitals, clinics, or different geographical regions with varying practices and patient demographics.
3. **Lack of Detailed Clinical Data**: The study might not have captured all relevant clinical parameters, such as the severity of patient conditions prior to transfusion, detailed medication histories, and individual patient responses to transfusions, which could influence complication rates.
4. **Absence of Longitudinal Follow-Up**: The cross-sectional nature of the study does not allow for assessment of long-term outcomes of transfusion-related complications, which could provide more comprehensive insights into the impacts of such events on patient health.
5. **Potential for Selection Bias**: The inclusion and exclusion criteria, along with the methodology for selecting records, could introduce selection bias, impacting the applicability of the results to the broader patient population.
6. **Reporting and Detection Bias**: The study relies on documented cases of complications in medical records, which may not accurately represent all actual occurrences due to underreporting or differences in diagnostic criteria.

REFERENCES

1. Roberts N, James SL, Delaney M, Fitzmaurice C. Blood transfusion trends by disease category in the United States, 2000 to 2014. Transfusion and Apheresis Science. 2021 Feb 1;60(1):103012.
2. Jhaveri P, Bozkurt S, Moyal A, Belov A, Anderson S, Shan H, Whitaker B, Hernandez-Boussard T. Analyzing real world data of blood transfusion adverse events: Opportunities and challenges. Transfusion. 2022 May;62(5):1019-26.

3. Philip J, Pawar A, Chatterjee T, Mallhi RS, Biswas AK, Dimri U. Non infectious complications related to blood transfusion: an 11 year retrospective analysis in a tertiary care hospital. Indian Journal of Hematology and Blood Transfusion. 2016 Sep;32:292-8.
4. Saha S, Krishna D, Prasath R, Sachan D. Incidence and analysis of 7 years adverse transfusion reaction: a retrospective analysis. Indian Journal of Hematology and Blood Transfusion. 2020 Jan;36:149-55.
5. Beyer A, Rees R, Palmer C, Wessman BT, Fuller BM. Blood product transfusion in emergency department patients: a case-control study of practice patterns and impact on outcome. International journal of emergency medicine. 2017 Dec;10:1-8.
6. Bassi R, Aggarwal S, Bhardwaj K, Thakur KK. Patterns of adverse transfusion reactions in a tertiary care centre of North India: a step towards hemovigilance. Indian Journal of Hematology and Blood Transfusion. 2017 Jun;33:248-53.
7. Thalji L, Thum D, Weister TJ, Weber WV, Stubbs JR, Kor DJ, Nemergut ME. Incidence and epidemiology of perioperative transfusion-related pulmonary complications in pediatric noncardiac surgical patients: a single-center, 5-year experience. Anesthesia& Analgesia. 2018 Nov 1;127(5):1180-8.
8. Yelima JD, Ufelle SA, Milgwe DM, Oyeleke KO, Denue BA, Chikwendu CK. Complications of blood transfusion and management: definitions and history of blood group systems. European Journal of Biology and Medical Science Research. 2019 Aug;7(3):25-34.
9. Krishnamurthy AV, Mathialagan J, Raghavan AV, Srinivasan S. Analysis of patterns of adverse transfusion reactions and management: a novel initiative toward hemovigilance in a teaching hospital of South India. Journal of Laboratory Physicians. 2020 Aug;12(02):133-40.
10. Aoude A, Aldebeyan S, Fortin M, Nooh A, Jarzem P, Ouellet JA, Weber MH. Prevalence and complications of postoperative transfusion for cervical fusion procedures in spine surgery: an analysis of 11,588 patients from the American College of Surgeons National Surgical Quality Improvement Program Database. Asian Spine Journal. 2017 Dec 7;11(6):880.
11. Rozema J, van Roon EN, Kibbelaar RE, Veeger NJ, Slim CL, de Wit H, Hoogendoorn M, HemoBase Population Registry Consortium. Patterns of transfusion burden in an unselected population of patients with myelodysplastic syndromes: A population-based study. Transfusion. 2021 Oct;61(10):2877-84.