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Original Article

Acute Transfusion Reactions—A Multi-Center Study

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Abstract

Background: Blood transfusion is a life-saving yet risk-laden procedure. Although advances in technology and treatment have reduced reaction rates, a variety of adverse reactions still occur. **Objective:** To determine the prevalence of adverse transfusion reactions and to compare these findings with data from both domestic and international studies.

Methodology: This descriptive cross-sectional study included all adverse transfusion reactions reported to the blood banks of Islam Central Hospital and Islam Teaching Hospital, Sialkot. Data were recorded and analyzed according to the guidelines set by the Punjab Blood Transfusion Authority and the Health Care Commission over a three-year period, from January 2022 to December 2024.

Results: Out of 4,185 blood transfusions, 30 (0.71%) were associated with adverse transfusion reactions. The most commonly observed complication was febrile non-hemolytic transfusion reaction, with packed red cells identified as the most frequently implicated blood component.

Conclusion: The spectrum of adverse transfusion reactions remains evident despite rigorous prophylactic efforts.

Keywords: Adverse transfusion reaction, Packed red blood cells, Febrile non-hemolytic transfusion reaction.

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Introduction

Critical care needs increase with the aging of the population, and transfusion practices are among the most commonly performed procedures in critically ill patients.¹ Any adverse event occurring during or after the transfusion of blood and its components, unrelated to other causes, is classified as a transfusion reaction. The spectrum of these reactions varies widely, ranging from benign to life-threatening events.²

Despite advancements in blood donor screening and antibody detection methods aimed at making transfusions risk-free, transfusion reactions still frequently occur. Most of these reactions are non-infectious and are categorized as either acute or delayed. Acute non-infectious transfusion reactions differ from common allergic reactions in that their severity can range from mild to moderate, severe, or even life-threatening.³

Adverse reactions are broadly classified into two categories: acute reactions, which occur within 24 hours of transfusion, and delayed reactions, which manifest

after 24 hours. These include immune and non-immune-mediated hemolytic transfusion reactions, transfusion-related acute lung injury (TRALI), allergic transfusion reactions, post-transfusion sepsis, transfusion-associated circulatory overload (TACO), febrile non-hemolytic transfusion reactions (FNHTRs), and nonspecific transfusion reactions.

Most adverse transfusion reactions (ATRs) occur within 24 hours of transfusion, with the majority happening during or within four hours after the transfusion.⁴ ATRs can be either immunologic or non-immunologic. Acute immunologic reactions result from immune responses to antigens present on red blood cells, white blood cells, platelets, or plasma proteins.^{5,6} Non-immunologic reactions include transfusion-associated sepsis, circulatory overload, non-immunologic hemolysis, hypocalcemia, and hypothermia.

Recent reports estimate that approximately 0.2% to 10% of transfusion recipients experience acute transfusion reactions, with an estimated mortality rate of approximately one death per 250,000 units transfused.⁷

Methodology

This descriptive cross-sectional study was conducted to analyze adverse reactions reported to the blood bank

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from January 2022 to December 2024 at Islam center Hospital, Sialkot, and Islam Teaching hospital Sialkot. Ethical approval was obtained from the ethics committee. All the transfusion reactions occurred during this period were recorded and analyzed as per Punjab Blood Transfusion Authority and Health Care Commission guidelines within the three-year timeframe. ATRs were observed in the hospital's emergency room, intensive care unit, surgery room, medicine department, and gynecological and obstetric ward. Severe symptoms included hemoglobinuria, respiratory distress, hypotension, and consciousness disturbance. The reported transfusion-related symptoms and indicators meet the AABB and CDC standards.

Results

A total of 4185 blood components were issued in the study period. The patients were between the ages of 18 to 76. Adverse Transfusion responses were recorded in 30 patients (0.71%). Majority (83%) were male. Itching and palpitation were the commonest symptom (Table I).

Table I: Various types of symptoms in patients experiencing adverse transfusion reactions.

Symptoms	Numbers
Itching	9 (30.0%)
Chills	7 (23.33%)
Nausea	5 (16.66%)
Fever	4 (13.33%)
Hypertension	3 (30.0%)
Palpitations	2 (6.66%)

Febrile non-hemolytic reaction was the commonest reaction (Table II). Majority of reactions were in Gynae/Obs wards (Figure 1). Majority of reactions took

Table II: Number of different types of reactions.

TYPE OF REACTION	NO OF REACTIONS
Febrile non-hemolytic reaction	14 (46.66%)
Allergic reaction	10 (33.33%)
Anaphylactic reaction	4 (13.3%)
Transfusion associated circulatory overload (TACO)	1 (3.3%)
Transfusion related acute lung injury (TRALI)	1 (3.3%)

Table IV: Comparison between the local and international studies.

Author	Place of study	ATR (%)	Commonest reaction type	Component type	years
Akhtar et al	Multan, Pakistan	0.38	FNHTR	Whole blood	2019
Rahimetal	Kerala, India	1	FNHTR	PRBC	2021
N.Islam et al	Dhaka, Bangladesh	11.5	FNHTR	Whole blood	2021
Suryatapasaha et al	Calcutta India	0.14	Allergic reaction	PRBC	2019
Theresa et al	Switzerland		Alloimmunization	Whole blood	2022
Izhar.Sidra et al	Sialkot Pakistan		AFNHTR	Whole blood	2025

place while administering whole blood (Table III)

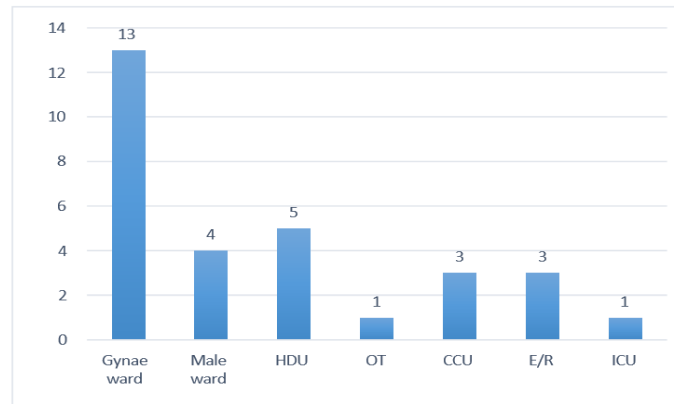


Figure1. Number of reactions in different wards.

Table III: Blood components which caused most reaction.

Blood group	Number	Percentage
B Positive	11	36.66%
O Positive	9	30%
A Positive	4	13.33%
AB Positive	5	16.66%
B Negative	1	3.33%

Discussion

Blood transfusions carry an inherent risk of adverse reactions. Clinical examination and laboratory workup were integral parts of the evaluation process at Islam Central Hospital. Over a period of three years, a total of 4,185 transfusions were performed, with 30 cases of adverse transfusion reactions recorded, accounting for an incidence of 0.71%.

According to research by Islam et al 11.5% of patients experienced various transfusion reactions. In their study, eight patients (8.33%) had febrile non-hemolytic reactions, followed by two patients (2.08%) who experienced allergic reactions. One patient (1.04%) developed an acute hemolytic transfusion reaction. Of these reactions, seven (63.6%) were associated with whole blood, two (18.2%) with red cell concentrate, and one each (9.1%) with apheresis platelets and fresh frozen plasma—findings consistent with our study.⁹

Another study by Rahim R. et al. found that 1% of patients experienced an acute transfusion reaction, with packed PRBC transfusions accounting for the majority of reactions. In that study, 54.64% of reactions were due to febrile non-hemolytic transfusion reactions and 36.36% to allergic reactions.¹⁰

The table above compares various studies on transfusion reactions, showing that our findings align with those of Islam et al. (2021) and Akhter et al. (2019), where the most common reaction was febrile non-hemolytic reaction, typically associated with whole blood.

However, our findings contrast with a study by Theresa et al. (2022), where the most common reaction was alloimmunization, also involving whole blood. Similarly, a study by Surypta et al. (2021) from India reported that allergic reactions were the most common, primarily associated with packed red blood cells.

Kopseel et al. (2021) found that febrile non-hemolytic transfusion reactions accounted for 0.1% to 2% of all reactions. In a 2021 study,¹¹ Ryu Yanagisawa also reported that febrile non-hemolytic reactions were the most frequent type, supporting our findings.^{12,13}

A study by Perrin Jhaveri from the USA (2022) observed that allergic reactions were the most common in their cohort and emphasized that hemovigilance improves patient safety.¹⁴

Receiving a blood transfusion can be life-saving, but it is crucial to minimize the risks of complications. To ensure safe transfusions, medical teams take several precautions: carefully matching blood types, screening for unexpected antibodies, and removing white blood cells from donated blood products. For patients with severe allergies, red blood cells may be washed to remove plasma proteins.¹⁵⁻¹⁷

By continuously monitoring and analyzing transfusion-related adverse events, healthcare providers can identify areas for improvement and help prevent future errors.

Conclusion

This multi-center study highlights that despite stringent safety measures, acute transfusion reactions (ATRs) continue to occur, with an incidence of 0.71%. Febrile

non-hemolytic transfusion reactions were the most common, followed by allergic and anaphylactic reactions. Whole blood was the primary component implicated. These findings align with local and international studies, emphasizing the ongoing need for vigilant hemovigilance systems, staff training, and strict adherence to transfusion protocols to minimize transfusion-related risks and enhance patient safety.

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