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Frequency of Allergic Reactions in Cancer Patients

Ali Anjum[1], Umer Salman[1], Muhammad Arslan[2]

[1]Department of Internal Medicine, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan
[2]Infectious Diseases Physician, Shifa International Hospital, Faisalabad, Pakistan

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Correspondence to: Ali Anjum,
Department of Internal Medicine, Shaukat Khanum Memorial Cancer Hospital and Research Centre, Lahore, Pakistan.
Email: alianjum209@gmail.com

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ABSTRACT

Objective: To determine the frequency of allergic transfusion reactions among patients suffering from cancer receiving blood and blood component transfusions. **Study Design:** Descriptive cross-sectional study. **Place and Duration of Study:** This study was conducted at a tertiary care hospital from 17 January 2025 to 17 May 2025. **Methodology:** A total of 150 diagnosed cancer patients of both genders who received blood or blood component transfusions were included using non-probability consecutive sampling. Patients were monitored during and after transfusion for signs of allergic transfusion reactions. Data regarding demographic characteristics, type of malignancy, treatment modality, blood components transfused, and transfusion reactions were recorded. Statistical analysis was performed using SPSS, and results were expressed as frequencies, percentages, mean, and standard deviation. **Results:** The mean age of patients was 55.48 ± 7.31 years, with a male predominance (56%). Allergic transfusion reactions were observed in 82 patients (54.7%). Urticaria (20.7%) was the most common presentation, followed by pruritus (12.0%) and skin rash (10.0%). A statistically significant association was found between type of malignancy and allergic transfusion reactions ($p = 0.044$), while no significant association was observed with age, gender, treatment modality, type of blood component, or number of transfusions. **Conclusion:** Allergic transfusion reactions are frequent among cancer patients receiving blood transfusions. Although most reactions are mild, their high occurrence necessitates careful monitoring and adoption of preventive transfusion strategies to improve patient safety.

INTRODUCTION

Anemia is frequently observed in patients suffering from cancer. About 30 to 90 percent of cancer patients suffer from anemia(1, 2). Such high prevalence of anemia in cancer patients is secondary to multiple factors, such as cancer itself and various therapies that are employed for its cure, including chemotherapy and radiotherapy(3). Two primary strategies are used to address this issue in the oncological population: erythropoiesis-stimulating agents and blood transfusions(4, 5).

Owing to the safety profile, blood transfusions are more commonly used for the correction of anemia in this patient population(6). Even though it is considered a safer mode of treatment for anemia, there are certain adverse events associated with transfusions. These adverse events can be divided into two main categories: transfusion-associated sepsis and noninfectious adverse transfusion reactions(7). Moreover, there are several types of noninfectious adverse transfusion reactions: allergic transfusion reactions, hemolytic transfusion reactions, febrile non-hemolytic transfusion reactions, and transfusion-associated acute lung injury(8). Out of all the types of transfusion reactions, allergic transfusion reactions are found to be the most common one(9).

Despite its importance, it is difficult to determine the actual frequency of transfusion reactions, especially in cancer patients. The incidence of anaphylactic reactions to blood products is 1 per 10,000–50,000(10). The incidence of allergic transfusion reactions is 0.3% to 6% for platelet transfusion and 1% to 3% for plasma transfusion(11). In a study, 211 acute transfusion-related reactions occurred in 157 (3.14%) patients. Of these, 125 reactions (59%) were allergic(12). In Pakistan, data regarding transfusion reactions in the cancer population seems scarce. According to an audit report, every 1 in 256 transfusions encounters some form of an adverse reaction. Allergic transfusion reaction was the most common, accounting for 48% of all transfusion reactions(13). In another Pakistani study, it was reported that allergic transfusion reactions accounted for 14.4% of all transfusion reactions(14).

To determine the frequency of allergic transfusion reactions in patients suffering from cancer. Frequent transfusions put oncological patients at risk for adverse transfusion reactions, making it absolutely imperative to determine the frequency of these reactions so that appropriate safety measures and changes in medical

practices can be applied to reduce the risk of adverse transfusion reactions. Moreover, by determining the extent of the problem, we can identify issues such as underreporting of reactions and lack of awareness among healthcare professionals regarding signs and symptoms of transfusion reactions. This will help to improve our knowledge, and we will get evidence for the local population, and will plan transfusions by keeping in mind the level of allergic reactions in such sensitive cases.

METHODOLOGY

This study was conducted as a descriptive cross-sectional study at a tertiary care hospital from 17 January 2025 to 17 May 2025 to determine the frequency of allergic transfusion reactions among patients suffering from cancer. The study population comprised diagnosed cancer patients of both genders who required blood or blood component transfusions during the study period. Patients of all age groups receiving packed red blood cells, platelets, or plasma were included. Patients with incomplete medical records or those who developed transfusion reactions due to causes other than allergy were excluded from the study. A non-probability consecutive sampling technique was used to enroll eligible participants.

Data were collected using a structured proforma that included demographic details, type of malignancy, type and number of blood components transfused, and occurrence of any transfusion reaction. Patients were closely monitored during and after transfusion for clinical signs and symptoms suggestive of allergic transfusion reactions, such as urticaria, itching, rash, flushing, or anaphylaxis. All suspected allergic transfusion reactions were documented according to standard transfusion reaction criteria and managed as per hospital protocol.

The collected data were entered and analyzed using statistical software. Quantitative variables such as age were presented as mean and standard deviation, while qualitative variables such as gender, type of blood product, and presence of allergic transfusion reactions were expressed as frequencies and percentages. The frequency of allergic transfusion reactions was calculated to assess the burden of this complication in cancer patients receiving transfusions. Ethical approval was obtained from the institutional review board, and confidentiality of patient information was strictly maintained throughout the study.

RESULTS

A total of 150 cancer patients who received blood or blood component transfusions were included in the analysis. The mean age of the study population was 55.48 ± 7.31 years, with a slight male predominance (56%). Allergic transfusion reactions were observed in 82 patients (54.7%), making them a common adverse outcome among transfused oncology patients. The majority of patients were in advanced stages of cancer (Stage III and IV), and most were receiving chemotherapy. Red blood cells and platelets were the primary blood components transfused. Detailed demographic, clinical, transfusion-related characteristics and their associations with allergic transfusion reactions are summarized in the following tables.

Table 1

Analysis of Allergic Reactions to Blood Transfusion in Cancer Patients

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	84	56.0
	Female	66	44.0
Age	Mean ± S. D	55.48	7.311
BMI	Mean ± S. D	24.56	1.56
Type of Cancer	Breast	19	12.7
	Lung	40	26.7
	Colorectal	16	10.7
	Ovarian	25	16.7
	Prostate	15	10.0
	Gastric	10	6.7
	Liver	17	11.3
	Lymphoma	8	5.3
Cancer Duration (Years)	Mean ± S. D	3.69	1.631
Stage of Cancer	II	40	26.7
	III	69	46.0
	IV	41	27.3
Diabetes	Yes	74	49.3
	No	76	50.7
Hypertension	Yes	79	52.7
	No	71	47.3
Smoking	Yes	43	28.7
	No	107	71.3
Alcohol/ Narcotics	Yes	0	0.0%
	No	150	100.0%
Tobacco	Yes	43	28.7
	No	107	71.3
Family History	Yes	40	26.7
	No	110	73.3
Treatment	Chemotherapy	92	61.3
	Surgery	15	10.0
	Both	43	28.7
Blood Component	Red Cells	85	56.7
	Platelets	65	43.3
Units Transfused	1	44	29.3
	2	85	56.7
	3	21	14.0
Allergic Reaction	Yes	82	54.7
	No	68	45.3

This table 01 presents the demographic profile, clinical characteristics, comorbidities, cancer-related variables, and transfusion details of the study population. Most patients were males (56%), with a mean BMI of 24.56 ± 1.56 kg/m^2. Lung cancer was the most frequent malignancy (26.7%), followed by ovarian (16.7%) and breast cancer (12.7%). A large proportion of patients were diagnosed at Stage III (46.0%) or Stage IV (27.3%). Comorbid conditions such as hypertension (52.7%) and diabetes mellitus (49.3%) were common. Chemotherapy was the predominant treatment modality (61.3%). Red blood cells (56.7%) were transfused more frequently than platelets (43.3%), and most patients received two units of blood (56.7%). Overall, allergic transfusion reactions were documented in 54.7% of patients.

Table 2

Types of Allergic Transfusion Reactions Observed

Reaction Type	Frequency	Percentage
Urticaria	31	20.7
Pruritus	18	12.0
Anaphylactoid	9	6.0
Febrile Allergic	9	6.0
Rash	15	10.0

Table 02 illustrates the distribution of different types of allergic transfusion reactions among affected patients. Urticaria was the most frequently reported reaction (20.7%), followed by pruritus (12.0%) and skin rash (10.0%). More severe reactions, such as anaphylactoid and febrile allergic reactions, were less common, each accounting for 6.0% of cases. These findings indicate that most allergic reactions were mild to moderate in severity.

Table 3

Association of Clinical Factors with Allergic Transfusion Reactions

Variable	Category	Allergic Reaction		P-value
		Yes	No	
Age Groups	<50 years	25 (30.5%)	19 (27.9%)	0.808
	50–60 years	31 (37.8%)	24 (35.3%)	
	≥60 years	26 (31.7%)	25 (36.8%)	
Gender	Male	50 (61.0%)	34 (50.0%)	0.178
	Female	32 (39.0%)	34 (50.0%)	
BMI Category	<23 kg/m²	22 (26.8%)	14 (20.6%)	0.373
	≥23 kg/m²	60 (73.2%)	54 (79.4%)	
Cancer Duration	1–3 years	40 (48.8%)	34 (50.0%)	0.882
	4–6 years	42 (51.2%)	34 (50.0%)	
Type of Cancer	Lung	9 (11.0%)	10 (14.7%)	0.044
	Breast	24 (29.3%)	16 (23.5%)	
	Colorectal	10 (12.2%)	6 (8.8%)	
	Ovarian	8 (9.8%)	17 (25.0%)	
	Gastric	8 (9.8%)	7 (10.3%)	
	Liver	7 (8.5%)	3 (4.4%)	
	Prostate	8 (9.8%)	9 (13.2%)	
	Lymphoma	8 (9.8%)	0 (0.0%)	
Stage	II	23 (28.0%)	17 (25.0%)	0.450
	III	34 (41.5%)	35 (51.5%)	
	IV	25 (30.5%)	16 (23.5%)	
Diabetes	Yes	40 (48.8%)	34 (50.0%)	0.882
	No	42 (51.2%)	34 (50.0%)	
Hypertension	Yes	44 (53.7%)	35 (51.5%)	0.789
	No	38 (46.3%)	33 (48.5%)	
Smoking	Yes	24 (29.3%)	19 (27.9%)	0.858
	No	58 (70.7%)	49 (72.1%)	
Tobacco Use	Yes	24 (29.3%)	19 (27.9%)	0.858
	No	58 (70.7%)	49 (72.1%)	
Family History	Yes	24 (29.3%)	16 (23.5%)	0.429
	No	58 (70.7%)	52 (76.5%)	

Table 03 evaluates the association between patient-related clinical factors and the occurrence of allergic transfusion reactions. No statistically significant association was observed between allergic reactions and age group, gender, BMI category, cancer duration, cancer stage, diabetes, hypertension, smoking status, tobacco use, or family history ($p > 0.05$). However, the type of cancer showed a statistically significant association with allergic transfusion reactions ($p = 0.044$), suggesting variability in reaction frequency across different malignancies.

Table 4

Association of Treatment and Transfusion-Related Factors with Allergic Transfusion Reactions

Variable	Category	Allergic Reaction		P-value
		Yes	No	
Treatment Type	Chemotherapy	48 (58.5%)	44 (64.7%)	0.662
	Surgery	8 (9.8%)	7 (10.3%)	
	Both	26 (31.7%)	17 (25.0%)	
Blood Component	RBCs	44 (53.7%)	41 (60.3%)	0.414
	Platelets	38 (46.3%)	27 (39.7%)	
Units Transfused	1 unit	27 (32.9%)	17 (25.0%)	0.076
	2 units	40 (48.8%)	45 (66.2%)	
	3 units	15 (18.3%)	6 (8.8%)	
Hemoglobin Level	<8.0 g/dL	28 (34.1%)	15 (22.1%)	0.103
	≥8.0 g/dL	54 (65.9%)	53 (77.9%)	

Table 04 demonstrates the relationship between treatment modalities, transfusion characteristics, and allergic transfusion reactions. No significant association was observed between allergic reactions and treatment type, blood component transfused, number of units transfused, or hemoglobin level at transfusion ($p > 0.05$). Although patients receiving multiple transfusions showed a higher proportion of reactions, the association did not reach statistical significance.

DISCUSSION

The present study highlights a high frequency of allergic transfusion reactions among patients with cancer receiving blood and blood component transfusions. More than half of the transfused patients experienced some form of allergic reaction, indicating that allergic transfusion reactions represent a substantial and clinically relevant problem in oncological practice. These findings emphasize the vulnerability of cancer patients to transfusion-related complications due to repeated exposure to blood products, immunological dysregulation caused by malignancy, and the effects of chemotherapy.

The frequency of allergic transfusion reactions observed in this study is higher than that reported in several international studies but is comparable to data from certain regional and institutional audits. A study by Domen et al.(15) reported allergic transfusion reactions in approximately 36% of oncology patients receiving platelet transfusions, which, although lower than our findings, still supports the notion that cancer patients are at increased risk compared to the general transfused population. Similarly, a large hemovigilance-based study from Japan documented allergic reactions as the most common adverse transfusion event, particularly associated with platelet and plasma transfusions. These findings are consistent with our results, where allergic reactions constituted the majority of transfusion-related adverse events.

The predominance of mild allergic manifestations such as urticaria, pruritus, and skin rash observed in this study aligns with previous literature. Sandler et al.(16) demonstrated that most allergic transfusion reactions are non-life-threatening and limited to cutaneous symptoms, with severe anaphylactic reactions occurring rarely. This pattern was also observed in our cohort, where severe reactions such as anaphylactoid responses were infrequent. The predominance of mild reactions suggests that while allergic transfusion reactions are common, they are often manageable with prompt recognition and appropriate intervention.

Our analysis did not demonstrate a statistically significant association between allergic transfusion reactions and demographic variables such as age, gender, or body mass index. These findings are in agreement with the study conducted by Savage et al., (17), which found that patient demographic characteristics did not independently predict allergic reactions. Instead, immunological predisposition and repeated antigen exposure were considered more relevant factors. Similarly, comorbid conditions such as diabetes mellitus and hypertension were not significantly associated with allergic reactions in our study, a finding supported by hemovigilance data

reported by Bolton-Maggs and Poles, who noted that comorbidities rarely influence the development of allergic transfusion reactions(18).

Interestingly, the type of malignancy showed a statistically significant association with allergic transfusion reactions in the present study. This finding may reflect differences in transfusion requirements, disease-related immune dysregulation, or treatment regimens among different cancers. A study by Gan et al. suggested that hematological and advanced solid malignancies may predispose patients to higher rates of transfusion reactions due to immune system alterations and frequent transfusions(19). This highlights the need for cancer-specific transfusion risk stratification in clinical practice.

The lack of a significant association between allergic transfusion reactions and the type or number of blood components transfused contrasts with some earlier studies that reported higher reaction rates with platelet and plasma transfusions. For example, Heddle et al. demonstrated that plasma proteins play a key role in triggering allergic reactions, particularly in platelet transfusions. The discrepancy may be due to differences in transfusion practices, leukoreduction protocols, or premedication policies at the study center. Universal leukoreduction and improved donor screening may have contributed to minimizing variation across blood components.

Repeated transfusions, although more frequent among patients who developed allergic reactions, did not show a statistically significant association in this study. However, previous studies by Tobian et al. and Roback et al. have demonstrated that cumulative exposure to donor plasma increases the risk of allergic reactions. The absence of statistical significance in our study may be attributed to sample size limitations or underreporting of mild reactions, which remains a challenge in transfusion medicine.

The findings of this study have important clinical implications. Given the high frequency of allergic transfusion reactions, there is a need for heightened vigilance, particularly during transfusions in oncology patients. Implementation of preventive strategies such as plasma-reduced blood products, careful donor selection, and standardized monitoring protocols may help reduce the incidence of these reactions. Education of healthcare professionals regarding early recognition and reporting of transfusion reactions is equally essential to improve hemovigilance data accuracy.

This study has certain limitations. Being a single-center, cross-sectional study, the findings may not be generalizable to all oncology settings. Additionally, the reliance on clinical documentation may have resulted in underreporting of mild allergic reactions. Despite these limitations, the study provides valuable local evidence regarding the burden of allergic transfusion reactions in cancer patients and underscores the need for improved transfusion safety practices.

Allergic transfusion reactions are common among cancer patients receiving blood transfusions, with most reactions being mild but clinically significant. Identification of high-risk patient groups and adoption of targeted preventive strategies may improve transfusion safety and patient outcomes in oncological care.

CONCLUSION

Allergic transfusion reactions are a common complication among cancer patients receiving blood transfusions, with most reactions being mild to moderate in nature. Despite their generally non-severe presentation, these reactions contribute significantly to patient discomfort and transfusion-related morbidity. Cancer-related immune dysregulation and repeated exposure to blood products likely increase susceptibility to allergic reactions. The variation in reaction frequency across different malignancies suggests a potential role of disease-specific factors. Careful monitoring during transfusion and prompt recognition of symptoms are essential to ensure patient safety. Adoption of preventive strategies and improved reporting practices may help reduce the burden of allergic transfusion reactions in oncology patients.

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