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Original Article

Frequencies of Various Transfusion Reactions in a Tertiary Care Hospital in Karachi

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ABSTRACT

Objective: To determine frequency of various transfusion reactions among transfusion recipients in a tertiary care hospital in Karachi.

Study Design: Cross sectional study.

Place and Duration of Study: Dr. Ziauddin Hospital, North Nazimabad, Karachi Pakistan, from Jan 2019 to Jun 2021.

Methodology: All transfusion reactions reported to the blood bank of Dr. Ziauddin Hospital were noted on the work-up form. Age, gender, type of products transfused, pre and post-transfusion reaction vitals including Blood pressure, Temperature, Pulse, Respiratory rate, time of the start of transfusion, and appearance of symptoms were recorded on proforma. Issue proforma, post-transfusion sample were sought.

Results: 8785 patients were admitted and received blood transfusions. The median age was 30 years. 4628(52.68%) were female and 4157(47.32%) were male. Out of these, 22 patients (0.25%) developed a transfusion reaction, while 8763 patients (99.75%) did not experience any reaction. The most commonly reported sign and symptoms were chills 13(59.09%) and fever 10(45.45%). FNHTR was the most common type of reaction, 9(40.91%), 8(36.36%) were identified as ATRs.

Conclusion: The frequency of transfusion reactions varies significantly in different geographical regions due to differences in hemovigilance systems. This variation may be due to underreporting of transfusion reactions by clinical staff, who may lack knowledge on reporting them properly. To determine the variations in transfusion reaction patterns more accurately, further studies on a larger scale are required.

Keywords: Blood Transfusion/Adverse Effects, Blood Donors Hemovigilance, Patient Safety, Recipients.

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INTRODUCTION

Regardless of undergoing blood transfusions, there is still a chance of contracting infectious and non-infectious ailments. A response in a recipient which is directly related to the infusion of blood or blood components is referred to as an adverse transfusion reaction.[1] Infectious adverse effects are caused by infectious agents such as bacteria, viruses, or parasites, which can be transmitted through blood transfusion. The hazards of transfusion transmitted infections have been greatly reduced through rigorous donor screening, testing of blood products, and implementation of safety protocols. Non-infectious blood transfusion reactions can be caused by factors such as incompatible blood types, immune responses to transfused components, allergic reactions, and volume overload. Acute and delayed transfusion reactions are additional categories for these adverse effects. Acute transfusion reactions (ATR) are those with signs and symptoms occurring within 24 hours and include Acute Hemolytic transfusion reaction (AHTR), Febrile nonhemolytic transfusion reaction (FHNTR), Allergic transfusion reaction (ALTR), Transfusion-associated circulatory overload (TACO), Transfusion-related acute lung injury (TRALI). Delayed reactions appear after 24 hours and include Delayed Serologic Transfusion Reactions, Post Transfusion Purpura, Transfusion-associated Graft versus host disease and Iron overload in transfusion dependent patients. The worldwide collection of blood donations has reached 118.5 million.[3] However; adverse events are still a concern. A study from Nigeria reported 0.54% transfusion reactions among 5550 units issued.[4] Another study from Turkey reported 0.09% of transfusion reactions out of which the most common was allergic transfusion reaction accounting for about 47.3% of reactions.[5]

Quality assurance in the blood banking system is of utmost importance. One crucial aspect of quality assurance is the prompt reporting of adverse events that occur during or after transfusion by clinicians. Today, the term "hemovigilance" is accepted as a quality indicator and is used as a crucial part of quality control in transfusion medicine throughout the world.[6] Hemovigilance reports serve as a vital source

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for documenting and monitoring ATRs and can provide insights into the safety and efficacy of the transfusion process. Effective ATR recording and reporting can aid in locating the reaction's underlying cause and in the implementation of countermeasures to avoid repeat events. Timely reporting of ATRs can also aid in ensuring that proper medical interventions are provided to affected patients, potentially reducing morbidity and mortality. Healthcare professionals must have good knowledge of transfusion reactions and practices to minimize adverse reactions in the future. In our study, we intended to ascertain the prevalence of various transfusion responses among transfusion recipients in a tertiary care hospital.

METHODOLOGY

It was a cross sectional study conducted at Blood Bank of Dr. Ziauddin Hospital, Main Campus, Karachi, Pakistan between March 2020 through June 2021 by. Approval from the ethical review committee (ERC no: 1671219MAHEM dated 20th March2020) was pursued before data collection. Sample size was analyzed by using WHO sample size calculator, taking prevalence of transfusion reactions as 15%,[6] margin of error 5% and 95% Confidence interval, the calculated sample size was found to be 205; however it was increased to improve representativeness.

Inclusion Criteria: Data was collected from patients who received blood transfusions at Ziauddin Hospital, of both genders, aged between 1 day to 90 years.

Exclusion Criteria: Recipients with preexisting clinical symptoms like dyspnea and blood products arranged from outside were excluded from study.

All recipient's information was kept confidential and anonymous. Blood bags, infusion sets, post-transfusion samples, IV fluids (if applicable), first void urine after symptom onset, and records of pre- and intra-transfusion vital signs were collected.Standard questionnaire was used to record recipient symptoms. A detailed clerical check was performed by verifying patient identifiers on the cross-match form, issue proforma, and blood unit. ABO and Rh grouping, along with antibody screening of the recipient, were repeated, while donor blood group details were reconfirmed with existing records. Compatibility testing was reassessed using retained donor segments. Pre- and post-transfusion samples were examined for hemolysis, and direct antiglobulin testing (DAT) was performed.

In febrile cases, malarial parasite was screened and blood culture of transfused product was conducted. Findings were analyzed to determine the type of transfusion reaction. Based on criteria from the Association for the Advancement of Blood & Biotherapies, reactions were classified using clinical features such as fever, hematuria, hypoxemia, tachycardia, hypotension, and urticaria. Reactions were classified into FNHTR, allergic reactions, TACO, TRALI, AHTR, and nonspecific reactions. Analysis was performed using Statistical Package for Social Sciences (SPSS) version, 20. Data were expressed as frequencies and percentages. Statistical significance was assessed using the chi-square test, with a p-value ≤ 0.05 considered significant.

RESULTS

In our study, a total of 8785 patients received blood products. The median age was 30 years (Interquartile rangeIQR 56.92, range 1 day- 90 years) Of these patients, 4628(52.68%) were female and 4157(47.32%) were male. Distribution of various blood products are given in Table-I. Out of total, 22 patients (0.25%) developed a transfusion reaction, while the remaining 8763 patients (99.75%) did not experience any reaction. The most commonly reported sign and symptoms were chills 13(59.09%) and fever 10(45.45%) as presented in Table-I.

Table-I: Frequency of Blood Products issued, signs and Symptoms of Transfusion Reactions (n=8785)

Blood Products	Frequency (%)
Packed Cells	4570(52.02%)
Fresh Frozen Plasma	1439(16.38%)
Platelets	1122(12.76%)
Pedi Fresh Frozen Plasma	844(9.61%)
Pedi Packed Cell	801(9.12%)
Whole blood	9(0.10%)
Symptom (n=22)	
Chills	13(59.09%)
Fever	10(45.45%)
Dyspnea	5(22.73%)
Hypotension	7(31.82%)
Itching	4(18.18%)
Rash	4(18.18%)
Chest Pain	1(4.55%)
Oliguria	1(4.55%)
Back pain	1(4.55%)
Flushing	1(4.55%)

Overall, packed cells have the highest incidence of transfusion reactions in this dataset, followed by FFP as shown in Figure-1. Our study analyzed the types and frequency of transfusion reactions in our patient population. Of the 22 adverse outcomes, among 9(40.91%),cases, FNHTR represented the most prevalent type of reaction, 8 cases (36.36%) were

identified ALTR, while TRALI was not reported in any case. As indicated in Table-II, there was no statistically significant correlation between transfusion reaction types and age groups, gender, blood groups, or blood product types (*p*-value >0.05).

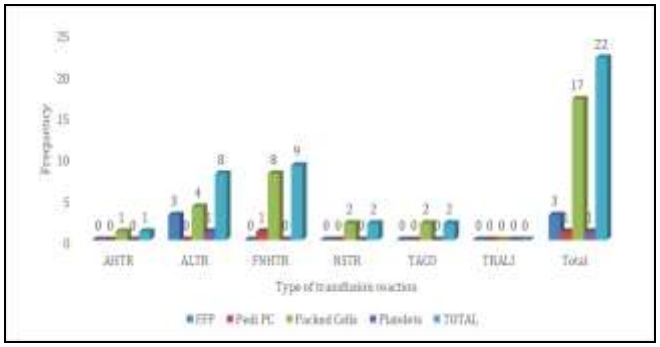

Figure: Frequency of Transfusion Reaction in Different Blood Products (n=8785)

**FNHTR: Febrile non-hemolytic TR, ALTR: Allergic transfusion reactions, NSTR: Non-specific transfusion reactions, TACO: Transfusion-associated circulatory overload, AHTR: Acute hemolytic transfusion reactions, TRALI: Transfusion-related acute lung injury*

Table-II: Types of transfusion reaction with Age Groups, Gender, Blood Products, and Blood Groups (n=22)

	TYPE OF TRANSFUSION REACTION							
	AHTR n(%)	ALTR n(%)	FNHTR n(%)	NSTR n(%)	TACO n(%)	TRALI n(%)	Total n(%)	*p*-value
Age Groups(yrs.)								
<18	0	0	1(4.5)	0	0	0	1(4.5)	0.634
19-45	0	5(22.7)	7(31.8)	1(4.5)	0	0	13(59.0)	
46-65	0	2(9.0)	1(4.5)	0	1(4.5)	0	4(18.0)	
>65	1(4.5)	1(4.5)	0	1(4.5)	1(4.5)	0	4(18.0)	
Gender								
Female	1(4.5)	6(27.3)	7(31.8)	1(4.5)	1(4.5)	0	16(72.7)	0.811
Male	0	2(9.0)	2(9.0)	1(4.5)	1(4.5)	0	6(27.3)	
Blood Product								
FFP	0	3(13.63)	0	0	0	0	3(13.6)	0.226
Pedi PC	0	0	1(4.5%)	0	0	0	1(4.5)	
Packed Cells	1(4.5)	4(18)	8(40.90)	2(9.0)	2(9.0)	0	17(77.3)	
Platelets	0	1(4.5)	0	0	0	0	1(4.5)	
Blood Group								
A Positive	1(4.5)	3(13.63)	2(9.0)	0	0	0	6(27.3)	0.071
B Positive	0	3(13.63)	4(18)	2(9.0)	0	0	9(40.6)	
B Negative	0	1(4.5)	1(4.5)	0	1(4.5)	0	3(13.6)	
O Positive	0	1(4.5)	2(9.0)	0	1(4.5)	0	4(18.0)	

** FNHTR: Febrile non-hemolytic TR, ALTR: Allergic transfusion reactions, NSTR: Non-specific transfusion reactions, TACO: Transfusion-associated circulatory overload, AHTR: Acute hemolytic transfusion reactions, TRALI: Transfusion-related acute lung injury, FFP: Fresh Frozen Plasma*

Furthermore, undergoing malarial parasite screening and blood cultures, we determined the incidence of transfusion-related infections in 15 instances. We did not find any positive results for either MP or blood culture in any case. Hemolysis in post transfusion sample was observed visually after centrifugation in one case of AHTR. While checking for the correctness of documentation, we found only one discrepancy in clerical checks while there were no discrepancies in patient identification, including name and MR number, all workstation and unit verifications were found to be acceptable. Lastly, we observed that all blood bags and post-transfusion samples were received, but none of the patients had their first void urine sent for testing.

DISCUSSION

In our study, 8785 recipients of blood transfusions at a tertiary care hospital were evaluated for the types and frequency of transfusion outcomes. The results of our study showed that 22 patients (0.25%) experienced a transfusion reaction, while the majority of patients (99.75%) did not experience any reaction. A higher reaction rate of 0.38% was stated by Akhter *et al.,* from Southern Punjab.[7] A study from Multan also reported a transfusion reaction rate of 2.7% which was higher than our results.[8] However, the frequency was higher than in some studies from India and European nations.[9-11] A higher rate of transfusion reactions may be a result of an array of variables, including altered immune system, medications, the preservation conditions of blood units, the procedure of transfusion, higher recording and monitoring, and repeated transfusions.[12] The most commonly administered blood product in our study was packed cells (52.02%), followed by FFP (16.38%). Whole blood was administered to only 0.10% of patients. This distribution of blood products is consistent with the standard transfusion protocols followed in our hospital. Similar findings have been reported by Vaithy *et al*.[13] These findings demonstrate the importance of appropriate blood product inventory management to ensure that appropriate products are available for transfusion in a timely manner.

Packed cells had the highest number of reactions with 17(77.27%), FFP had 3(13.63%)while both Pedi PC and whole blood had 1(4.5%) transfusion reaction each. The increased issuance and high immunogenicity of PCs when compared to other blood components like platelets and FFP could be one of reasons of more pronounced reactions with Packed Red Cells. Burhany *et al.,* have reported similarly.[14] Overall, the results provide valuable insights into the usage and safety of different blood products and can help healthcare providers make informed decisions when choosing the most appropriate blood product for their patients.

The most commonly reported signs and symptoms of transfusion reactions in our study were chills and fever, reported in 59.09% and 45.45% of cases, respectively. Cyanosis, jaundice, seizures, and

hematuria were not reported in any case. These findings demonstrate the importance of appropriate blood product inventory management to ensure that appropriate products are available for transfusion in a timely manner. Such findings are also reported by Sidhu *et al.*,[15] and Owusu-Ofori *et al*.[16]

In our analysis, FNHTR accounted for 40.91% of all transfusion reactions, making it the most prevalent form. Allergic transfusion reactions were identified in 36.36% of cases, while TRALI was not reported in any case. These findings are different from another Pakistani study that reported minor allergic reactions (46.8%) and NHTRs 28%.[14] Our study did not find any statistically significant association between types of transfusion reaction and age groups, gender, blood groups, and type of blood products. These findings suggest that these demographic factors do not influence the incidence of transfusion reactions.

Only 1(4.5%) case of AHTR was reported in our study due to mis labelled sample resulting discrepancy (ABO incompatibility). Higher incidence of AHTR has been reported in India and Brazil.[17-18] It's important to note that AHTR is a preventable adverse event, and proper patient identification and blood typing protocols are crucial to reducing the risk of this type of reaction. Transfusion medicine experts recommend a "two-person verification" process, where two healthcare professionals independently confirm the patient's identity and blood type before administering any blood products. Our study also investigated the incidence of infection after transfusion by performing both MP and blood culture in 15 cases. We did not find any positive results for either MP or blood culture in any of the cases, suggesting that the risk of infection after transfusion is low in our hospital.

During our investigation, we found only one discrepancy in clerical checks, indicating that the documentation process for transfusion is reliable in our hospital. However, we also observed that first void urine was not sent for testing, indicating lack of knowledge regarding importance of urine testing in transfusion reaction workup.[20]

We also reported FNHTR in a female child which was the only reaction observed in pediatric age group. Identification of ATR in paediatric age group is difficult to recognize as sign and symptoms may differ as from adult population leading to underreporting of these reactions. Moreover, scarcely any hemovigilance systems has defined definite guidelines for paediatric transfusions. Therefore, it is a dire need to establish specific guidelines for paediatric transfusion reactions.[19]

LIMITATIONS OF STUDY

Our analysis has several limitations. First of foremost, only individuals who were hospitalized to this single tertiary care hospital were enrolled in the study. The results of this study may not therefore be projected to other populations with various demographics, medical issues, and health care settings. Additionally, the sample size was relatively small, with only 22 cases of transfusion reactions reported. This may limit the statistical power and precision of the findings, and may not be able to capture the full spectrum of transfusion reactions in a more extensive and more diverse population.

CONCLUSION

Our study provides valuable insights into the types and frequency of transfusion reactions in our recipient population. Our findings suggest that the incidence of transfusion reactions is low in our hospital and that our transfusion protocol is reliable. However, we also identified areas for improvement in our current protocol, including the inclusion of urine testing in transfusion reaction protocol.

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Authors' Contribution

Following authors have made substantial contributions to the manuscript as under:

MA & MZI: Data acquisition, data analysis, critical review, approval of the final version to be published.

NS & AQ: Study design, data interpretation, drafting the manuscript, critical review, approval of the final version to be published.

HT: Conception, data acquisition, drafting the manuscript, approval of the final version to be published.

Authors agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

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