ORIGINAL ARTICLE

Incidence of blood transfusion reaction–a single center study

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Abstract:

Objectives: The aim of the study is to determine the incidence and types of blood transfusion reactions observed in tertiary care hospital. The collection of data was from blood bank of Taj Medical Complex Hospital of Hamdard University, Karachi.

Material and Methods: In this retrospective study the patients that received blood transfusion due to any medical reason, age between 18 to 80 years, for the duration of two years, at tertiary care hospital in Pakistan were included.

Results: The overall frequency of acute blood transfusion was 0.47%, with 41.6% acute blood transfusion reactions occurring in men and 58.3% in women. The distribution of acute blood transfusion reactions by blood group was 25% in the blood group "A", 36.1% in the blood group "B", 27.7% in the blood group "O" and 11.1% in the blood group "AB". Red cell concentrate was most common component of acute blood transfusion reaction in 86.1% cases. Febrile non haemolytic transfusion reaction was the most common transfusion reaction in 75% cases followed by allergic reactions.

Conclusion: Adverse blood transfusion reactions are unavoidable effects of blood transfusions that can be managed when detected timely. Establishment of a proper hemovigilance system will be vital in providing better care for the patients.

Keywords: Blood transfusion, transfusion reactions, adverse events, hemovigilance system.

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Introduction:

Blood transfusion is one of the most important life saving procedures in different life-threatening conditions either related to some serious illness, surgical adverse incidents or severe injuries related to road traffic accidents, but the transfusion reactions like fever, rashes, allergies, hemolysis, acute or delayed transfusion reactions also go in parallel. These reactions range from the patient being asymptomatic to developing severe symptoms. The transfusions have become safer due to different screening methodologies. However risks of infectious or non-infections transfusion reactions can never be ignored.[1]

Blood transfusion reactions are described as undesired effects following transfusions. Any derangement in vital signs occurring during transfusion orin 24 hours of blood transfusion is considered as an acute transfusion reaction. Blood transfusion reactions occurring days to weeks later after transfusion are called as delayed transfusion reactions. These transfusion reactions can range from trivial events to fatal consequences.[1,2] Any patient suffering from a transfusion reaction should be dealt immediately. Emergency measures include stopping the transfusion, matching the patient ID with the blood product label, using the ABCDE approach of life support for patient's assessment; maintain intravenous line and offering symptomatic treatment.[3]

Many different types of transfusion reactions have been identified ranging from mild to rare fatal reactions. Hemolytic transfusion reactions (HTR) refer to lysis of red blood cells in a patient receiving transfusion. They have been clas-

sified into acute transfusion reactions (AHTR) and delayed transfusion reaction (DHTR) based upon the time of symptom onset. AHTR result from immunologic incompatibility between donor and recipients blood products. In most instances, ABO incompatibility leads to AHTR but the signs and symptoms usually manifests when the recipient receives more than 50 ml of ABO incompatible blood.[4] DHTR occur 3-10 days after transfusion of serologically incompatible blood products. The transfused red blood cells may survive initially but are hemolyzed later.[5] The health care provider offering transfusion should therefore, vigilantly monitor the patient before, during and after transfusion to identify the signs of transfusion reaction and manage them timely. Febrile non-hemolytic transfusion reaction (FNHTR) is characterized by fever, rigors and chills. The patient gets a fever spike of > 38°C or 100.4°F during or within 4 hours of receiving transfusion.[6] Febrile non-hemolytic transfusion reaction is the commonest transfusion reaction with incidence of 1,000-3,000 per 100,000.[3] However Universal Leukoreduction (ULR) could lower the incidence of Febrile non-hemolytic transfusion reaction significantly.[7] Transfusion associated circulatory overload (TACO) presents with signs of volume overload and resulting pulmonary edema. Transfusion associated circulatory overload can manifest as early as 2 hours after transfusion or can be delayed by 12 hours.[8] Transfusion associated circulatory overload is typically seen in patients who have received large volume of blood products over a short time period or those at risk for fluid overload due to a pre-existing medical condition like renal impairment or congestive cardiac failure.[9] Another serious complication of blood transfusion is transfusion related acute lung injury (TRALI) which manifests as respiratory in sufficiency during or after (2- 6 hours) transfusion of a blood product.[10] Transfusion associated graft versus host disease (TA-GvHD) is althoughrare but fatal transfusion reaction when donor's lymphocyte in transfused blood mount an immune response against recipients tissue causing pancytopenia and multiorgan failure.[11] Post transfusion purpura (PTP) is the type of transfusion reaction which is not common with the incidence of 1 in 50,000–100,000 transfusions.[1] PTP occurs due to alloimmunization against platelet antigens leading to thrombocytopenia (<10,000/μl) within 2 weeks of transfusion.[12] Massive transfusion of blood products for the purpose of resuscitation is itself a very common risk factor for developing metabolic changes like electrolyte imbalance, dilutional coagulopathy and hypothermia. Blood products are anticoagulated with citrate. In cases of massive transfusion citrate binds to calcium and magnesium leading to citrate toxicity. Hypocalcemia manifests as tingling sensation and prolonged QT interval on ECG.[13] Transfusion of 10 units of packed red blood cells within 24 hours or transfusion of > 4 packed red blood cells in 1 hour is a commonly define as massive transfusion in literature.[14]

Anaphylactic transfusion reaction (ATR) and minor allergic transfusion reactions are type I hypersensitivity reactions with symptoms manifesting within 4 hours of transfusion. Septic transfusion reactions are transfusion transmitted bacterial infections presenting within 4 hours of transfusion.[15]

Material and Methods:

A retrospective study was carried out to determine the incidence of blood transfusion at Hamdard University Hospital. The research was carried out on 1000-2000 subjects between 16-80 years of age who received blood transfusion for any medical reason. The data collected from Hamdard University Hospital Blood Bank. The number of patients receiving blood transfusion and having acute transfusion reactions and other reactions were recorded. The frequency of blood transfusion at Hamdard University Hospital was also determined.

The study has been approved by the ethical review committee of Hamdard College of Medicine and Dentistry (ERC/MBBS/03/2023).

Results:

Out of 7,513 blood transfusions 4,429 (58.9%) blood bags were transfused in males and 3,084

Table 1: General characteristics of patient with acute transfusion reaction

Variables	n	%
Gender		
Male	15	*41.6*
Female	21	21.0
Blood groups		
A	09	*25.0*
B	13	36.1
O	10	27.7
AB	04	11.1
Blood components		
Packed Red blood cells	31	86.1
Fresh frozen plasma	03	8.3
Platelets	02	5.5
Previous blood transfusion		
Yes	08	22.2
No	29	80.5
Symptoms		
Fever	27	75.0
Urticaria	06	16.6
Hypertension	04	11.1
Restlessness	04	11.1
Tachycardia	02	5.5
Dyspnea	03	8.3
Headache	07	19.4
Backache	01	2.7

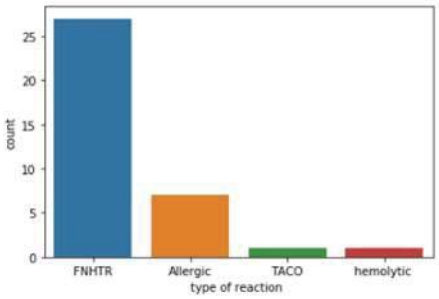

Figure 1: Frequency of type of acute transfusion reaction

Table 2: Frequency of acute transfusion reaction by blood component

Type of acute blood transfusion reaction	Packed r5ed blood cells		Fresh frozen plasma		Platelets	
	n	%	n	%	n	%
Febrile non-hemolytic transfusion reaction	26	72.2	01	2.7	00	00
Allergic reaction	03	8.3	02	5.5	02	5.5
Transfusion associated circulatory overload	01	2.7	00	00	00	00
Hemolytic transfusion reaction	01	2.7	00	00	00	00

(41.0%) females. The age range was 18-80 years. Out of 7,513 blood transfusions, the frequency of acute blood transfusion was 36 (0.47%).

The distribution of 36 acute blood transfusion reaction by gender was; 15 (41.6%) in men and 21 (58.3%) women (Table 1). The distribution of 36 acute blood transfusion reaction by blood group was 9 (25.0%) in the blood group "A", 13 (36.1%) in the blood group "B", 10 (27.7%) in the blood group "O" and in the blood group "AB" was 4 (11.1%). Red cell concentrate was most common component of acute blood transfusion reaction in 31 (86.1%) cases (Table 1). History of previous blood transfusion was present in 8 (22.2%) cases. Fever was the most common clinical presentation of the patient with acute transfusion reaction in 27 (75.0%) cases. Febrile non-haemolytic transfusion reaction was the common most transfusion reaction in 27 (75.0%) cases (figure 1). Febrile non hemolytic transfusion reaction, most commonly occurred by packed red blood cells in 26 (72.2%) cases (Table 2). Febrile non-hemolytic transfusion reaction (FNHTR) was the most commonly recorded in female in 17 (47.2%) cases (Table 3) and most commonly presented in patients with blood group B in 9(25.0%) cases (Table 4).

Discussion:

This study, which retrospectively surveyed 7,513 blood transfusions in patients between 18 to 80 years of age over duration of two years at tertiary care hospital in Pakistan, found acute transfusion reactions to occur in approximately 0.47% of all blood transfusions. This is consistent with the literature of the incidence of acute blood transfusion reactions reported internationally is low as seen in U.S. 0.2% and 0.09% in Turkey.[16,17] Studies conducted in Pakistan have reported the incidence of acute transfusion reactions to be 0.082%, 0.38% and 0.75%.[18-20] However, one study from Multan has quoted the frequency of blood transfusion reactions to be 2.7%.[21] The low incidence of acute blood transfusion reactions internationally and locally can be due to the lack of hemovigilance system.

Amongst the acute transfusion reactions Fe-

Table 3: Frequency of Acute transfusion reaction by gender

	Male		Female	
Type of acute blood transfusion reaction	**n**	**%**	**n**	**%**
Febrile non hemolytic transfusion reaction	10	27.7	17	47.2
Allergic reaction	03	8.3	04	11.1
Transfusion associated circulatory overload	01	2.7	00	00
Hemolytic transfusion reaction	01	2.7	00	00

Table 4: Frequency of acute transfusion reaction by blood group

	A blood group		B blood group		O blood group		AB blood group	
Type of acute blood transfusion reaction	**n**	**%**	**n**	**%**	**n**	**%**	**n**	**%**
Febrile non hemolytic transfusion reaction	08	22.2	09	25.0	07	19.4	3	8.3
Allergic reaction	01	2.7	02	5.5	03	8.3	1	2.7
Transfusion associated circulatory overload	00	00	01	2.7	00	00	00	00
Hemolytic transfusion reaction	00	00	01	2.7	00	00	00	00

brile non-hemolytic transfusion reaction was the most frequently encountered reaction occur in 75% cases in our study. Similar pattern has been seen in other studies conducted in Pakistan.[18,19,21] The second frequently encountered acute transfusion reaction was allergic reactions 19.4%. Allergic reactions have been reported most frequently in Indian population 0.09%.[22] The frequency of Transfusion associated circulatory overload (TACO) and Hemolytic transfusion reactions (HTR) were low, 2.7%, in our study. The frequency of Transfusion associated circulatory overload is between 1-8% cases internationally.[23] Most cases of Transfusion associated circulatory overload are not even identified due to the lack of proper reporting system.

Transfusion reactions are mostly seen in females in our study. This can be due to the fact that females are exposed to transfusions due to multiple factors e.g., blood loss due to menorrhagia and post-partum, increased demand and iron deficiency not responding to injectable iron. Additionally, females are prone to developing transfusion reactions due to antibodies formed during and after pregnancy.

A total of 7,513 units of blood were transfused. In our study, most patients with blood group B (36.1% cases) had an adverse transfusion reaction. The association of a particular blood group with adverse transfusion reactions is different in different studies. Akhter N et al. has reported involvement of O positive and B positive blood group in 43.47% cases each and A positive blood group in 13.04% cases.[19]

Whole blood is made up of RBC, WBC and platelets suspended in plasma. The extra plasma in whole blood can cause Transfusion associated circulatory overload therefore, PRBC are preferred when needed to increase the mean haemoglobin concentration alone. Whole blood is preferred in conditions where volume expansion, platelets and coagulation factors are needed along with the increase in mean haemoglobin concentration e.g., in cases of massive haemorrhage. FFP transfusion can cause allergic reactions in 1-3% cases if the patient is allergic to plasma. FFP can also cause fluid overload in patients with circulatory or renal failure.[24] Amongst the blood components, most adverse transfusion reactions in our study were reported to be caused after transfusion of packed red blood cells (86.1%), followed by FFP (8.3%) and platelets (5.5%). Internationally, the estimated incidence rate of blood transfusion reactions per 1000 transfusions for whole blood and packed red blood cells is estimated to be 0.69 and 0.25 respectively. However, no reactions have been reported with the transfusion of FFP and platelets.[25] Similar findings have been reported by Chavan S et al. with 57.77% transfusion reactions occurring with whole blood, 42.22% with packed red blood cells and none with FFP and platelets.[26] In Pakistan, whole blood was reported to cause most adverse reactions 73.91% and 42.7% followed by packed red blood cells 26.09% and 36.9%.[19,21] Khalid et al, has reported transfusion reactions occurring with highest frequency from whole blood 86.8% followed by platelets (7.5%), FFPs (4.7%) and cryoprecipitate (0.09%).[18] Two studies from Pakistan have reported the occurrence of transfusion reactions following transfusion of FFP, platelets and cryoprecipitate.[18,21]

The limitation of our study is that it is "retrospective". Several demographic features were not listed in the data and therefore the risk factors predisposing to blood transfusion could not be identified. Secondly, the lack of hemovigilance system in most third world countries can be a huge factor for under reported cases.

Conclusions:
The incidence of blood transfusion as estimated by our study is low. The establishment of proper hemovigilance surveillance system that screens, categorizes, inspects and evaluates the adverse reactions related to blood transfusion is mandatory and the issue of unreported cases might be solved with proper scrutiny. The health professionals should be properly trained to identify report and manage transfusion reactions timely. There should be a standard operating protocol for documentation of any adverse reaction. Every transfusion should be monitored vigilantly. In short, the aim of this study is to make blood transfusions safe for the patients.

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Role and contribution of authors:
Ayesha Kashmala Ghauri, substantial contributions to conception, study, design, acquisition of data, manuscript writing, has given final approval of the version to be published, agree to be accountable for all aspects of work, ensuring that questions related to accuracy or integrity of all parts of the work are investigated and resolved

Sehrish Khurshid, substantial contributions to acquisitions, analysis and interpretation of data, manuscript writing, has given final approval of the version to be published, agree to be accountable for all aspects of the work.

Mehwish Zehravi, substantial contributions to analysis and interpretation of data, manuscript writing, has given final approval of the version to be published, agree to be accountable for all aspects of the work.

Abdul Qadir, substantial contribution to conception of study, critical review, has given final approval of the version to be published, agree to be accountable for all aspects of the work.

Beenish Hussain Nomani, substantial contribution to study design, critical review, has given final approval of the version to be published, agree to be accountable for all aspects of the work.

Arif Memon, substantial contribution to concept of study and data analysis, critical review, has given final approval of the version to be published, agree to be accountable for all aspects of the work.

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