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Pattern of Blood Transfusion Reactions in Sokoto Specialist Hospital, Sokoto, Nigeria

Ahmed, H.M.*[1], Salahudeen, A.[1], Erhabor, O.[1], Umar, I.S.[1], Maishanu, N.[3], Mohammed, S.Y.[2], Ibrahim, A.B.[1], Onigwe, F.U.[1], Abdulrahman, Y.[1] and Horo, J.[2]

Department of Haematology, SMLS Usmanu Danfodiyo University, Sokoto, Nigeria [1], Department of Hematology and Blood Transfusion, Specialist Hospital, Sokoto, Nigeria [2], Department of Ophthalmology, Specialist Hospital, Sokoto, Nigeria [3]

*Author for Correspondence *: babanabdul1968@gmail.com/ +234-806-971-9703/ORCID Number: 0000-0003-0738-6762.*

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Abstract

Advancement in transfusion medicine has led to the use of large quantities of blood and blood components in modern clinical practice. The purpose of this study was to determine the pattern of blood transfusion reactions among adults in Sokoto Specialist Hospital in North-Western Nigeria. This was a descriptive observational study over a 3-month period that evaluated 42 patients who had a blood transfusion reaction in Specialist Hospital Sokoto. Data was analyzed using student's t- test and chi-square. P-values of $\leq$ 0.05 were regarded as significant. The mean age of the recipients was 30.26 ± 12.02 years. The incidence of febrile non-hemolytic transfusion reaction (FNHTR) was 78.6%; allergic reaction (AR) was 19.0% and acute haemolytic transfusion reactions (AHTR) was 2.4%. All the recipients that reacted presented clinically with fever and more than 90% of them had associated chills or rigors, itching and rashes. There was a significant relationship between ABO blood type and transfusion reaction (p = 0.01). Also, there was a significant relationship between pre-transfusion incompatibility and post-transfusion incompatibility in the crossmatch (p = 0.01). In a similar manner there was a statistically significant difference between the pre-transfusion and post-transfusion temperature (p = 0.01). The study concluded that protocol involving the implementation of ABO and Rhesus D blood group and crossmatching using the pre- and post-transfusion sample following a suspected blood transfusion reaction in conjunction with clinical signs will contribute immensely in establishing the pattern of reactions. There is need to implement alloantibody screening for all patients in whom a red cell transfusion is indicated in Nigeria. There is the need for the availability of other laboratory testing such as lactate dehydrogenase testing, direct antihuman globulin test and haptoglobin testing that can potentially help to detect a haemolytic transfusion reaction. Post transfusion reaction investigation should involve investigations in other Departments like chemical pathology and medical microbiology, where analysis of urine samples for haemoglobinuria, lactate dehydrogenase, haptoglobin and blood culture are needed to support the haematological findings.

Keywords: Pattern, Blood Transfusion Reaction, Specialist Hospital, Sokoto

Introduction

Blood transfusion reaction refers to any undesirable, unintended, adverse response to the administration of blood, blood components, or derivatives that are well thought-out to be definitely probable or possibly related to this product. About 0.5–3% of all transfusions results in transfusion reaction. Blood transfusion reactions can basically be categorized as infectious or non-infectious. The majority of blood transfusion reactions are, nonetheless, non-infectious with outcomes ranging from non-significant consequences to death. However, the infectious effects are given more prominence than other adverse reactions (John, 2019).

For emphasis, when any unexpected or untoward symptom or sign occurs during or shortly after

the transfusion of a blood component, a transfusion reaction must be considered as the precipitating event until confirmed otherwise (John, 2019).

Transfusion of blood and blood components is not without risks and it can lead to complications. Though blood transfusion can be life-saving, it can also lead to certain adverse reactions which can be fatal. Knowledge about various types of adverse transfusion reactions (AHTRs) will help not only in early identification and management, but also in putting adequate preventive measures in place (Kumar *et al*., 2013).

Blood transfusion is a common, safe medical procedure in which blood from a healthy blood donor are given to recipient through an intravenous (IV) line that has been inserted in one of the blood vessels. Four types of blood products may be given through blood transfusions: whole blood, red blood cells concentrate, platelets concentrate, and plasma [fresh frozen plasma (FFP) and Cryoprecipitate]. Most of the blood used for transfusions in Nigeria comes from whole blood donations given by volunteer blood donors. Blood transfusions usually take 1 to 3 hours to complete. Recipient of transfusion will be monitored during and after the procedure (NBTS,2006). Parameters that are monitored at baseline in patients having a blood transfusion and regularly during the blood transfusion include; temperature, respiratory rate, pulse rate and blood pressure.

Blood transfusions are usually very safe, because donated blood is carefully tested (ABO and Rhesus grouping, alloantibody screen, identification, selection of antigen negative blood for patients with alloantibodies and crossmatching), handled, and stored appropriately (red cells at 2-6^{0}C, FFP and cryoprecipitate at -30^{0}C and platelet at 22± 2^{0}C in a platelet incubator). Despite the implementation of these best practices, there is a small chance that a mild to severe reaction to the donor blood can still occur. Other complications may include fever, heart or lung complications, alloimmunization, and rare but serious reactions in which donated white blood cells attacks the healthy tissues. Health problems may occur due to getting too much iron from frequent transfusions. There is also a very small chance of getting an infectious disease such as hepatitis B or C or HIV through a blood transfusion. For the HIV, the risk is less than one in 1 million (Ejele *et al.*, 2005; Erhabor *et al*., 2005). The risk of transfusion-related HIV risk is high in developing nations like Nigeria where the use of antibody-based screening of HIV thrives and this predispose to the risk of transfusion donor units from donors in the window phase of HIV infection (Erhabor and Adias, 2001). Scientific research and careful medical controls make the supply of donated blood very safe. Blood transfusions are among the most common medical procedures in the nation (WHO, 2011). This study evaluated the pattern, clinical presentation, and risk factors associated with blood transfusion reactions in Specialist Hospital Sokoto, Northwestern, Nigeria.

Materials and Methods

Study Location

This study was conducted in Specialist Hospital Sokoto (SHS), situated within Sokoto metropolis in Sokoto State, North-Western Nigeria over a 3-month period from June to September 2019.

Study population

Blood recipients of all age groups and gender who presented with signs of blood transfusion reaction were recruited for this study. All patients had pre-transfusion blood grouping (ABO and Rhesus D), crossmatching, direct antihuman globulin test (DAT) and post transfusion screening involving regrouping, re-crossmatching, antihuman globulin test and the type of reaction were determined with the aid of laboratory investigations and clinical signs. In patients with suspected Febrile Non-Haemolytic Transfusion Reactions (FNHTRs), Patients were characterized by an oral temperature $\geq$ 38 °C, a rise of $\geq$ 1 °C from the baseline or severe reactions with oral temperature $\geq$ 39 °C or a rise of $\geq$ 2 °C from the baseline and rise in temperature accompanied with systemic signs or symptoms such as chills, rigors, myalgia, nausea or vomiting.

Ethical Approval

The approval for this study was given by ethical committee in Specialist Hospital Sokoto (SHS).

Results

A total of 42 patients who presented with signs of blood transfusion reaction participated in this study, out of which 29 (69.05%) were females and 13 (30.95%) were males as shown in figure 1. The average age of the blood recipients was 30.26 ± 12.02 years as shown in table 1. Three (7.1%) recipients were within the 0-15year age group, twenty-two (52.4%) recipient was within 16-30year age group, thirteen (31.0%) recipients were within 31–45-year age group, three (71%) recipients were within 46–60-year age group, one (2.4%) recipient was within 61-75 age group. The blood groups of subjects varied significantly based on their ABO and Rhesus D group as shown in table 2. It shows that of the 42 samples, 13 (31.0%) were A+, 1 (2.4%) were A-, 7 (16.7%) were B+, 1 (2.4%) were B-, 5 (11.9%) were AB+, 1 (2.4%) were AB-, 13 (31.0%) were O+, 1 (2.4%) were O- and it is statistically significant (p = 0.01). Table 3 shows that 41 of the patients shows compatibility for crossmatch using the post transfusion sample while 1 patient showed incompatibility (p value = 0.01). The mean post transfusion temperature was significantly higher than the baseline pre-transfusion temperature as shown in table 4 (t=646.607, p=0.01). Table 5 shows the different pattern of transfusion reactions and their percentages. Febrile non-haemolytic transfusion reaction (**FNHTR)** constituted the most frequent type of the transfusion reactions while acute haemolytic transfusion reaction (AHTR) was the least frequent type (2.4%).

Table 1: Age Distribution of the participants

Age (Years)	Frequency	Percent%
0-15	3	7.1
16-30	22	52.4
31-45	13	31.0
46-60	3	7.1
61-75	1	2.4
Total	42.0	100.0

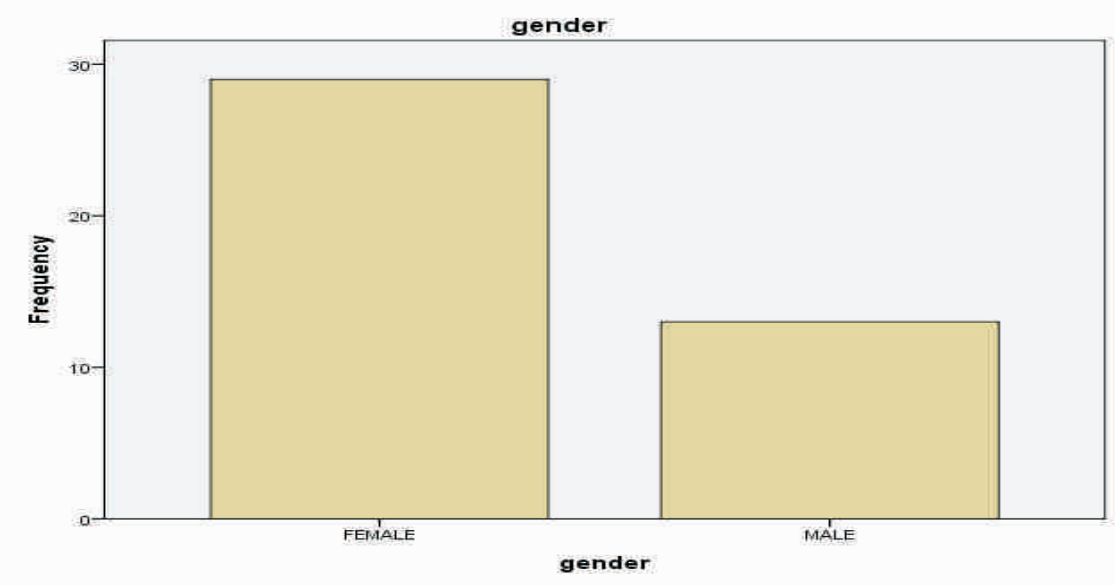

Figure 1: Gender distribution of the Subjects

Table 2: Blood Group of Donor Unit associated with the Transfusion Reaction

Blood Group	Number	Percentage (%)
A+	13	31.0
A-	1	2.4
B+	7	16.7
B-	1	2.4
AB+	5	11.9
AB-	1	2.4
O+	13	31.0
O-	1	2.4
Total	**42**	**100**

Key: A+: A Rh "D" Positive; A-: A Rh "D" Negative; B+: B Rh "D" Positive; B- Rh "D" Negative; AB+; A Rh "D" Positive; AB-: AB Rh "D" Negative; O+: O Rh "D" Positive; O-: O Rh "D" Negative; Significant difference; $p \leq 0.05$

Table 3: Compatibility Result using pre- and post-transfusion sample

Compatibility	Crossmatch using Pre-Transfusion Sample N (%)	Post Transfusion using Post-Transfusion Sample N (%)
Compatible	42 (100)	41 (87.6)
Incompatible	0 (0)	1 (2.4%)
Total	42	42

Table 4: Pre – Transfusion and Post – Transfusion Temperature

Parameter	Pre-Temperature (Mean ±SEM)	Post-Temperature (Mean ± SEM)	t- Value	P-Value
Temperature	36.8048 ± 0.05692	38.2143 ± 0.12585	646.607	0.01

Key: SEM; Standard error of mean; Statistical difference; $p \leq 0.05$

Table 5: Different Pattern of Transfusion Reactions and Their Percentages

Reaction Type	Number	Percentage (%)
FNHTR	33	78.6
ALLERGIC	8	19.0
AHTR	1	2.4
Total	42	100

Key: FNHTR: Febrile non haemolytic transfusion reaction; AHTR: Acute haemolytic transfusion reaction; ALLERGIC: Allergic reactions.

Discussion

Access to a safe supply of blood and the knowledge, skill, and resources for the appropriate use of blood are essential for medical services (Wake and Cutting,1998). Providing safe blood is a herculean challenge in developing countries compounded by lack of blood donors, high frequency of transfusion-transmissible infections, suboptimally-equiped laboratories and inadequate number of Medical Laboratory Scientist particularly in remote facilities. Transfusion therapy can cause adverse reactions, which are classified on the basis of their aetiopathogenesis and the time of occurrence with respect to the transfusion. This study evaluated the pattern, clinical presentation, and risk factors associated with blood transfusion reactions in Specialist Hospital Sokoto, Northwestern, Nigeria.

This study recorded incidence of febrile non haemolytic transfusion reaction (FNHTR) of 78.6%, Allergic reaction were 19.0% and Acute haemolytic transfusion reactions (AHTR) were 2.4% respectively. FNHTR were the commonest observed 78.6%. Our finding is consistent with earlier reports that FNHTR are generally the commonest reactions to blood transfusion (Baffa *et al*., 2012; Arewa *et al*., 2009; Ahmed *et al*., 2007). Febrile non-haemolytic transfusion reactions (FNHTRs) caused by the presence of antibodies to white blood cells (Liumbruno, et al., 2009). The high prevalence of FNHTR in our study may be due the fact that in Nigeria, best practices of component therapy and universal leucodepletion of donated blood is not implemented. Nigeria is one of the nations where whole blood still thrives despite the risk associated with leucocyte -rich whole blood transfusion. A considerable literature has accumulated over the past decade indicating that leukocytes present in allogeneic cellular blood components, intended for transfusion, are associated with adverse effects to the recipient. These include the development of febrile transfusion reactions, graft-versus-host disease, alloimmunization to leukocyte antigens, and the immunomodulatory effects that might influence the prognosis of patients with a malignancy. Moreover, it has become evident that such leukocytes may be the vector of infectious agents such as cytomegalovirus (CMV), Human T-Lymphotrophic Virus 1/11 (HTLV-I/II), and Epstein Barr (EBV) as well as other viruses. Effective stewardship of blood ensuring that several patients potentially benefit from components derived from one unit of donated whole blood is important for economic, supply/demand reasons and to protect the national inventory at times of national blood shortage (Erhabor and Adias, 2011).

The incidence of Allergic reaction in this study was 19.0%. Allergic reaction was the second most common type of blood transfusion reaction observed among our subjects. Our finding is consistent with previous reports (Baffa *et al*., 2012; Arewa *et al*., 2009; Ahmed *et al*., 2007; Siegenthalar *et al*., 2005) which indicated that allergic reactions featured as the second most common type of transfusion reactions and this may not be unconnected with the unscrupulous nature of prescribing whole blood transfusion in all cases of blood use. To further support this finding, Knowles *et al* .(2014), indicted that, platelet and plasma are the major cause of allergic reactions. In Specialist Hospital Sokoto and in other centres in Nigeria, plasma rich donor whole blood is transfused instead of evidenced-based plasma poor red cell concentrate. And even the RBCs where indication called for the use of packed RBCs, they are not washed and re-suspended in saline as demanded by the guidelines, thus further explaining the high rate of allergic reactions.

In this study, AHTR was having a frequency 2.4%. Our finding is at variance with previous reports (Ahmed *et al*., 2007; Climent-Peris and Velez-Rosario, 2001). Haemolytic transfusion reactions are often associated with the rupture of red blood cells intravascularly. Immune haemolytic transfusions reactions often occur due to mismatch or incompatibility between the patient and the donor products (Harewood et al., 2021). Immune haemolytic transfusion reactions are divided into acute versus delayed haemolytic reactions. Acute haemolytic reactions happen

within 24 hours of transfusion and delayed haemolytic reactions happen after 24 hours (Molthan et al., 1984). The severity of the haemolytic reaction is dependent on the type and quantity of red cell antigens, alloantibodies and ability of the antibody to bind to complement (Merle et al., 2019). ABO blood group antibodies and antibodies of other blood groups, including Duffy, Rh, Kidd, MNS, and Kell, can also precipitate severe haemolytic reactions. AHTR is often due to presence of antibodies in the recipient that bind to donor RBCs containing the group specific antigens. The antibodies can be ABO blood group IgM or IgG antibodies. IgM antibody is a pentamer and thus a single molecule can efficiently bind complement in the intravascular space. Human or analyser errors are common causes of these forms of haemolytic transfusion reaction. Non-compliance to WHO and ICSH standard and also lack of qualified, appropriately trained and competency tested staff can lead to technical errors.

In this study, we observed that the post transfusion temperature was significantly higher among the subjects compared to the pre-transfusion temperature among the subjects. Transfusion pyrexia (fever) is an important clinical sign/symptom occurring either as an isolated event or as part of a constellation of signs and symptoms in relation to blood transfusion. Pyrexia (fever) is an important clinical sign/symptom that occurs either as an isolated event or as part of a constellation of signs and symptoms of some hazards of blood transfusion (Widmann, 1994). Transfusion pyrexia (TP) is the elevation of temperature $\geqq$ 1°C from baseline or temperature >38°C, with or without chills or rigors occurring in a recipient of a unit of blood or blood component with no other explanation other than the transfused unit (Lin et al., 2002).

Conclusion

The study has shown that Febrile non-haemolytic transfusion reaction (FNHTR) is the most frequent pattern of reaction observed in Specialist Hospital Sokoto followed by Allergic transfusion reaction (19.0%) and Acute haemolytic transfusion reaction (AHTR) respectively. The data obtained from re-grouping and re-crossmatching using the pre and post-transfusion samples of the recipients in conjunction with clinical signs can be useful in the diagnosis of a transfusion reaction. There is the need for the availability of other laboratory testing such as lactate dehydrogenase testing, direct antihuman globulin test and haptoglobin testing that can potentially help to detect a haemolytic transfusion reaction. Post transfusion reaction investigation should involve investigations in other Departments like chemical pathology and medical microbiology, where analysis of urine samples for haemoglobinuria, lactate dehydrogenase, haptoglobin and blood culture are needed to support the haematological findings.

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