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Determinants of Adverse Transfusion Reactions at Delta State University Teaching Hospital, Oghara, Delta State, Nigeria

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Authors' contributions

This work was carried out in collaboration between all authors. Author NMU designed the study, wrote the protocol and interpreted the data. Author BME gathered the initial data and performed preliminary data analysis. Author IAI managed the literature searches and produced the initial draft. All authors read and approved the final manuscript.

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ABSTRACT

Background: Blood transfusion is a very essential part of medical practice. However, blood and blood component transfusions are associated with some adverse transfusion reactions. Some of these reactions can lead to loss of patients' lives and hence defeating the essence of blood usage in saving lives.
Objectives: This study aims to establish those factors promoting and increasing the susceptibility of patients for adverse transfusion reactions.
Methodology: Two-year records (July 2014-June 2016) of our patients reported to have blood transfusion reactions were retrieved, data collated and analysed using IBM SPSS version 22 software.
Results: Forty-six cases out of 5,342 transfusions were reported giving a prevalence of 0.86%.

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The youngest case was two years while the oldest was 70 years. The mean age was 38.69±14.95 years. Thirty five (76.1%) of the cases were females while 11(23.9%) were males. Chills/rigors (63%) and fever/pyrexia (58.7%) were the major presenting symptoms. Fourteen of the cases (30.4%) complained of itching/urticaria while 19.6% presented with nausea/vomiting. The clinical signs were hypotension (6.5%), tachypnea (4.3%) and tachycardia (2.2%). The adverse transfusion reactions were mainly associated with whole blood (93.5%) and 58.7% of the reactions occurred at night. Anaemia was the major indication for the transfusions (80.4%). Twenty-seven of the subjects (58.7%) had above the normal body temperature. Thirty four of the cases (73.9%) had earlier been transfused in the past while (26.1%) were being transfused the first time. On the other hand 93.5% of the cases have never experienced any form of adverse transfusion reactions while only 6.5% have had transfusion reactions previously.

Conclusion: We conclude that gender of the patient, age, component of blood being transfused and history of previous blood transfusions play determining factors on adverse transfusion reactions. Detailed transfusion history will go a long way in preventing adverse transfusion reactions.

Keywords: Determinants; transfusion; reactions; Delta State Nigeria.

1. INTRODUCTION

Blood transfusion was introduced in healthcare delivery system in the early 20th century, since then there has been some appreciable improvement in blood transfusion practice. Currently, blood transfusion has become an unavoidable tool in total care of patients in the hospital [1]. Historically, the practice of blood transfusion was first attempted in the 17th century using animal blood to humans. Despite the fact this resulted in fatalities, the practice of animal to human transfusion continued till 19th century [1] when it was established that same specie blood transfusion was safer and better. The first successful human to human blood transfusion was credited to James Blundell in 1819 [1]. The discovery of ABO blood groups in 1901 by Karl Landsterner marked a new dawn in transfusion practice because that led to blood transfusions between people with compatible blood groups [2]. Prior to discovery of ABO blood group systems, blood transfusion has been associated with disastrous consequences and lots of deaths [2].

The ABO blood groups and its knowledge have made blood transfusion a routine practice. However, the issue of safety has been a big problem and concern to healthcare providers due to the occurrence of complications and adverse transfusion reactions. Some of these adverse reactions include haemolytic transfusion reactions and febrile non-haemolytic reactions while transmission of infectious agents such as HIV, hepatitis, syphilis etc are some of the possible complications. There are immunological explanations to haemolytic transfusion reactions because the recipient develops antibodies against the blood antigens of the donor and this usually occured whenever the patient received a unit of blood or any of its components [3,4].

Febrile transfusion reactions can be haemolytic (FHTR) or non-haemolytic transfusion reaction (FNHTR) which is defined as a rise in temperature of 1℃ or more when a patient is transfused in the absence of any other cause of fever [5]. Febrile transfusion reactions are believed to be the commonest transfusion reactions [5] may occur during the transfusion or within 1-2 hrs after the transfusion. Other transfusion reactions include allergic transfusion reactions and urticarial reactions [6,7].

Haemolytic transfusion reactions are subdivided into immediate or delayed depending on the time of onset of signs and symptoms [3]. Immediate haemolytic transfusion reactions occur within 24hours of transfusion [3]. It occurs due to clerical mistakes or administrative errors and is usually due to incompatibility of ABO blood groups [3]. This type of reaction is very much avoidable but when it occurs it is the most dangerous reaction due to transfusion. Usually, the offending antibodies are IgM or IgG [3]. However, in delayed transfusion reaction the clinical features develop more than 24hrs after the transfusion [8]. The only sign of transfusion reaction, in most cases, is a progressive unexplained anaemia in the presence or absence of jaundice [8]. Delayed transfusion reaction is most often caused by anti-c or anti-JK or anti-c immunoglobulins [8].

It should be noted that transfused red blood cells can be destroyed without any detectable immunoglobulins [9,10]. Even self (autologous) blood transfusion is associated with one form of adverse transfusion reaction or the other [11]. In addition to all that have been mentioned, TRALI (Transfusion Related Acute Lung Injury) and post-transfusion purpura are also important transfusion reactions [11].

Studies have shown that some factors play a contributory role to the adverse transfusion reactions. These intervening factors include age, type of blood component, patient's co-morbidity and multiple transfusions [12]. In terms of gender, reaction incidence is same in both sexes for adults but are more in male children than female children [12]. Transfusion adverse reactions were most commonly associated with platelets transfusions, followed by red blood cells and transfusion of plasma [13]. Similarly, research on children carried out in France showed that aphaeresis platelet concentrates are the most common blood product involved in transfusion reactions, followed by the red blood cell concentrate and the methylene blue-treated fresh-frozen plasma [14]. Another French study showed that all types of blood products may be involved even though platelets have greater incidence [15]. Haemovigilance is very crucial for blood safety worldwide Nigeria is not an exception. However, the issue concerning side-effects and complications of blood transfusion is seriously downplayed and under-reported. The greatest challenges Nigeria faces in transfusion medicine are the non-availability of accurate data and the poor practice of blood safety.

The aim of this work was to analyze the profile of blood transfusion reactions in Delta State University Teaching Hospital (Delsuth) with a view to detecting the factors associated with the occurrence of such reactions and by so doing we can proffer preventive measures.

2. METHODOLOGY

This was a retrospective cross-sectional study which reviewed and analyzed all reported transfusion reactions during period of two years at the blood bank of Delta State University Teaching Hospital (DELSUTH), Oghara, Ethiope East Local Government area of Delta State, Niger-Delta region of Nigeria. The research protocol was approved by the hospital's Health Research Committee (HREC). The hospital is a relatively new centre commissioned in 2010 to provide specialised care for patients both in Delta state and other neighbouring states such as Edo, Bayelsa, Anambra and Rivers States. This work included all the reported cases of blood transfusion reactions among the total transfusions carried out within the study period from 1st July 2014 to 30th June, 2016. Each unit of blood given out for transfusion was accompanied by an Adverse Reaction Form (ARF). The ARF is designed in line with nationally accepted format in Nigeria. If there was any adverse reaction the transfusing physician would fill this form and return same immediately to the blood bank for appropriate investigations. On filling the form, the following information concerning the recipient were provided in each of the ARF: The age, gender/sex, component being transfused, complaints of the recipient, the ward, temperature and duration of the transfusion prior to the reaction. Other information provided include the recipient's blood group, period of the transfusion (morning/ afternoon/ night) and indication for the transfusion. The volume of blood transfused prior to transfusion reactions and whether or not there has been previous transfusion reactions should be provided. These ARFs for the two-year period were retrieved, the information collated and analysed.

2.1 Statistics

Data analysis was by computer using IBM SPSS version 22.0 software. Frequency distribution tables and pie charts were used for presentations of selected variables.

3. RESULTS

A total of five thousand three hundred and forty-two (5,342) transfusions were carried out for the two-year period. The number of reported cases of adverse transfusion reactions was forty-six giving an incidence of 0.86%. Among the 46 reported cases, the youngest was 2 years while the oldest was 70 years (age range 2-70 years). The mean age was 38.69±14.95 years. Most of the reactions, 39/46 (84.7%) occurred between 21-60 years (see Table 1). Thirty five (76.0%) of the cases were females while 11(24.0%) were males (see Fig. 1). This gave a female to male ratio of 3.16:1 Table 2 shows the symptomatology of the adverse transfusion reactions. Chills/rigors was the most frequent presenting symptom accounting for 29/46(63%) of the reactions. Next was fever/pyrexia presented by 27/46 (58.7%) of the recipients.

Fourteen of the cases {14/46(30.4%)} complained of itching/urticaria while 9/46(19.6%) presented with nausea/vomiting. Other complaints were various types of pains which included pains at the site of transfusion 5/46(10.9%), back pains 4/46(8.7%) and chest pains 3/46(6.5%). The clinical signs were hypotension 3/46(6.5%), tachypnea 2/46(4.3%) and tachycardia 1/46(2.2%). The adverse transfusion reactions were associated with two blood components, namely, the whole blood 43/46(93.5%) and packed red cells 3/46(6.5%) see Fig. 2. In terms of the period of the day these reactions occurred, 27/46 of the cases (58.7%) occurred at night followed by 12/46(26.1%) which occurred in the morning and the remaining 7/46(15.2%) occurred in the afternoon (see Table 3). Table 4 showed the various indications of transfusion among these cases. Anaemia was the major indication for transfusions (80.4%) this was followed by haemorrhage accounting for 3/46(6.6%). Anaemia in this study was defined as haemoglobin concentration below 13.0g/dl with features of decompensation. Preparation for chemotherapy and post-operative period each contributed 4.3%. In the same manner 1case each (2.2%) had transfusion as a result pre-operative period and sepsis. We also studied the temperature recorded when the adverse reactions commenced (Table 5). Twenty four of the cases (52.2%) had body temperature above the normal range while 14/46(30.4%) had normal temperatures. Only 8/46(17.4%) had below normal temperatures. The lowest temperature was 36℃ while the highest temperature recorded was 39.5℃. Table 6 showed that 34/46(73.9%) of the patients have earlier been transfused while 12/46 (26.1%) have never been transfused. On the other hand, 43/46(93.5%) of the subjects have never experienced any form adverse transfusion reactions while only 3/46(6.5%) have had transfusion reactions previously.

Table 1. Age distribution of the subjects

Age(years)	Frequency	Percent
≤ 20	4	8.8
21-40	20	43.5
41-60	19	41.2
≥ 61	3	6.5
Total	**46**	**100**

4. DISCUSSION

The present study reported a prevalence of 0.86 % which is similar to Japan (0.6%) [16] and Iran (0.4%) [17]. However, a very recent study from Pakistan reported much high prevalence rate of 26.3% [18] which is in contrast to our study. The big difference is attributable to the multi-transfused patients involved in the Pakistan study. Some African studies showed a much lower incidence than our study, for example work done in Zimbabwe [19] and South Africa [20] reported incidence of 0.046% and 0.049%, respectively. This disparity can be explained by the population size of these studies. For example the Zimbabwe study was for a long period of twelve years where 308 transfusion adverse events were reported for 670,625 blood components distributed. A Nigerian study at Ile-Ife, Nigeria [21] had an incidence of 8.7%, about ten times higher than our finding. This can be explained by the high number of children involved in Ile-Ife study. Their work population had 39.1% children unlike our study that had only

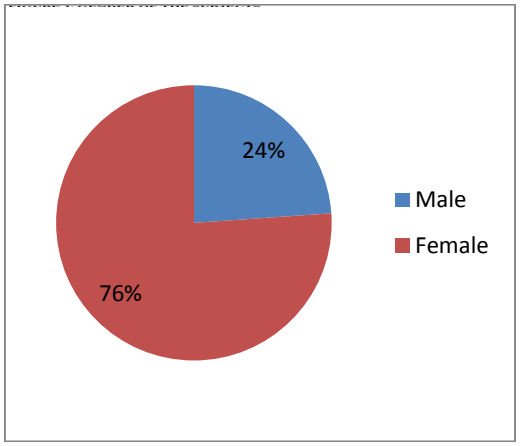

Fig. 1. Gender of the subjects

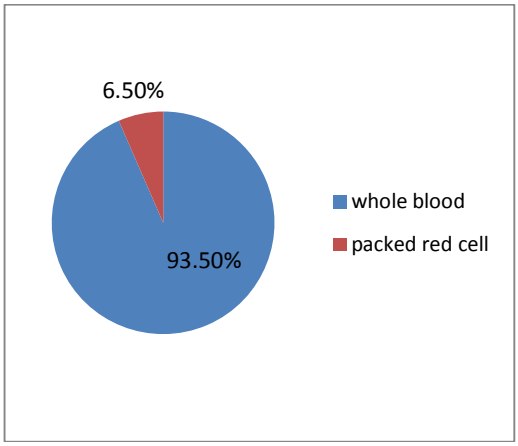

Fig. 2. Blood components received

3.5% as children. Research has demonstrated a general increase in the incidence of transfusion reactions in children compared to adult population [13]. Females have more transfusion reactions 76.1% than their male counterparts from our study. This is similar to the study by Nyashadzaishe et al. in Zimbabwe [19] where 61.6% of adverse reactions came from females. Unlike males, females are known to have more transfusion reactions because of the effect of multiparity [22]. In addition, the hospital admission in Delsuth is tilted more towards the female gender because of the on-going free maternal and under-five health care being provided by Delta state government. However, study by Oakley FD and colleagues did not show any difference between the sexes for adverse transfusion reactions [13]. Chills/rigors and fever/pyrexia were the chief presenting symptoms of the subjects followed by itching and urticaria. This is same pattern in various previous studies [4,19,21]. Whole blood transfusion is implicated in 93.5% of all the reported cases. The machinery for blood components' preparation is still rudimentary in our hospital, a call for fully-established blood component separation and preparations followed by proper awareness and sensitization programmes to the physicians on the need for component requests instead of whole blood. Our study also revealed that most of the reactions occur at night. This is the first time such a finding is made in the Niger-Delta region and by extension the southern part of Nigeria. Health care providers had earlier been implored to avoid night and over-night blood transfusions [22,23]. More than eighty percent of the transfusions were as a result of anaemia. The causes of these anaemias were not known. This is the limitation of this study. However, this study for the first time in Niger-Delta region of Nigeria showed the factors promoting adverse transfusion reactions contributing immensely to the establishment of haemovigilance in the region. We recommend another study to determine the causes of anaemia among patients attending DELSUTH Oghara. Finding and treating the underlying cause(s) of anaemia would reduce blood transfusions and possible adverse transfusion reactions. During the adverse transfusion reactions fifty-two point two percent (52.2%) of the cases had their body temperatures greater than normal. This further supports the fact that febrile reactions are among the leading cases of transfusion reactions. In most cases, unfortunately, this leads to stoppage of transfusions and wastage of scarce and unavailable blood. Slowing the rate of transfusion and simple administration of anti-pyretics are sufficient management procedures. Blood should not be wasted. Our study was able to show that in terms of susceptibility to adverse transfusion reactions, previous blood transfusion (73.5%) has more determining influence than having previous transfusion reactions (3.5%). This is important as it will help families and transfusionists make informed decisions when considering the option of blood transfusion.

Table 2. Signs and symptoms in the reported cases

Signs and symptoms	Frequency	Percent
Chills/rigors		
Yes	29	63.0
No	17	37.0
Total	**46**	**100.0**
Fever/pyrexia		
Yes	27	58.7
No	19	41.3
Total	**46**	**100.0**
Itching/urticaria		
Yes	14	30.4
No	32	69.6
Total	**46**	**100.0**
Nausea/vomiting		
Yes	9	19.6
No	37	80.4
Total	**46**	**100.0**
Pain at infusion site		
Yes	5	10.9
No	41	89.1
Total	**46**	**100.0**
Back pains		
Yes	4	8.7
No	42	91.3
Total	**46**	**100.0**
Chest pains		
Yes	3	6.5
No	43	93.5
Total	**46**	**100.0**
Hypotension		
Yes	3	6.5
No	43	93.5
Total	**46**	**100.0**
Tachypnea		
Yes	2	4.3
No	44	95.7
Total	**46**	**100.0**
Tachycardia		
Yes	1	2.2
No	45	97.8
Total	**46**	**100.0**

Table 3. Day period of transfusion

Day/Time	Frequency	Percent
Morning	12	26.1
Afternoon	7	15.2
Night	27	58.7
Total	**46**	**100**

Table 4. Indications of blood transfusion among the cases

Indications	Frequency	Percent
Anaemia	37	80.4
Bleeding	3	6.6
Postoperation	2	4.3
Prechemotherapy	2	4.3
Preoperation	1	2.2
Sepsis	1	2.2
Total	**46**	**100**

Table 5. Temperature of all the reported cases

Temperature	Frequency	Percent
Hypothermia	8	17.4
(<36.4℃)	14	30.4
Normal (36.4-37.6℃)	24	52.2
Hyperthermia		
(>37. 6℃)	**46**	**100**
Total		

Table 6. Previous blood transfusion and previous adverse reaction

Status	Previous blood transfusion	Previous adverse reaction
YES	34(73.9%)	3(6.5%)
NO	12(26.1%)	43(93.5%)
Total	46 (100%)	46(100%)

5. CONCLUSION AND RECOMMENDA-TIONS

We concluded that gender/sex of the patient, age, component of blood being transfused and history of previous blood transfusions play determining factors in adverse transfusion reactions. We recommend that detailed history of previous transfusions should be taken prior to decision to transfuse. In situations of a patient who have been previously (multi) transfused, it is advised such patient(s) are given premedications before transfusion. This will go a long way saving the blood banks wastage of blood which are hitherto scarce in our blood banks. It has earlier been mentioned we discard a lot of blood following a transfusion reactions in a patient. In addition, very close monitoring should be observed on all patients while on blood transfusion especially children and multiparous women.

CONSENT

It is not applicable.

ETHICAL APPROVAL

The research protocol for this study was approved by the Health Research Ethics Committee (HREC) of the Delta State University Teaching Hospital, Oghara and this work was performed in accordance with the ethical standards laid down in the 1964 Declaration of Helsinki.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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