

**DETERMINANTS OF ADVERSE TRANSFUSION REACTIONS AT DELTA STATE
UNIVERSITY TEACHING HOSPITAL, OGHARA, DELTA STATE, NIGERIA**

SUMMARY

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%. The youngest case was two years while the oldest was 70years. 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%)

26 were being transfused the first time. On the other hand 93.5% of the cases have
27 never experienced any form of adverse transfusion reactions while only 6.5%
28 have had transfusion reactions previously.

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

33 **KEY WORDS: Determinants Transfusion Reactions Delta State Nigeria**

34 **INTRODUCTION**

35 Blood transfusion was introduced in healthcare delivery system in the early 20th
36 century, since then there has been some appreciable improvement in blood
37 transfusion practice. Currently, blood transfusion has become an unavoidable
38 tool in total care of patients in the hospital¹. Historically, the practice of blood
39 transfusion was first attempted in the 17th century using animal blood to
40 humans. Despite the fact this resulted in fatalities, the practice of animal to
41 human transfusion continued till 19th century¹ when it was established that same
42 specie blood transfusion was safer and better. The first successful human to
43 human blood transfusion was credited to James **Blundell** in 1819¹. The
44 discovery of ABO blood groups in 1901 by Karl Landsterner marked a new
45 dawn in transfusion practice because that led to blood transfusions between
46 people with compatible blood groups². Prior to discovery of ABO blood group

47 systems, blood transfusion has been associated with disastrous consequences
48 and lots of deaths²

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

59 Febrile transfusion reactions can be haemolytic (FHTR) or non-haemolytic
60 transfusion reaction (FNHTR) which is defined as a rise in temperature of 1⁰C
61 or more when a patient is transfused in the absence of any other cause of fever⁵.

62 Febrile transfusion reactions are believed to be the commonest transfusion
63 reactions⁵ may occur during the transfusion or within 1-2hrs after the
64 transfusion. Other transfusion reactions include allergic transfusion reactions
65 and urticarial reactions^{6,7}.

66 Haemolytic transfusion reactions are subdivided into immediate or delayed
67 depending on the time of onset of signs and symptoms³. Immediate haemolytic

transfusion reactions occur within 24hours of transfusion³. It occurs due to clerical mistakes or administrative errors and is usually due to incompatibility of ABO blood groups³. 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 IgG³. However, in delayed transfusion reaction the clinical features develop more than 24hrs after the transfusion⁸. The only sign of transfusion reaction, in most cases, is a progressive unexplained anaemia in the presence or absence of jaundice⁸. Delayed transfusion reaction is most often caused by anti-c or anti-JK or anti-c immunoglobulins⁸.

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 other¹¹. In addition to all that have been mentioned, TRALI (Transfusion Related Acute Lung Injury) and post-transfusion purpura are also important transfusion reactions¹¹.

Studies have shown that some factors play a contributory role the adverse transfusion reactions. These intervening factors include age, type of blood component, patient's co-morbidity and multiple transfusions¹². In terms of gender, reaction incidence is same in both sexes for adults but are more in male children than female children¹². Transfusion adverse reactions were most commonly associated with platelets transfusions, followed by red blood cells

89 and transfusion of plasma¹³. Similarly, research on children carried out in
90 France showed that aphaeresis platelet concentrates are the most common blood
91 product involved in transfusion reactions, followed by the red blood cell
92 concentrate and the methylene blue-treated fresh-frozen plasma¹⁴. Another
93 French study showed that all types of blood products may be involved even
94 though platelets have greater incidence¹⁵. Haemovigilance is very crucial for
95 blood safety worldwide Nigeria is not an exception. However, the issue
96 concerning side-effects and complications of blood transfusion is seriously
97 downplayed and under-reported. The greatest challenges Nigeria faces in
98 transfusion medicine are the non-availability of accurate data and the poor
99 practice of blood safety.

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

104 **METHODOLOGY**

105 This was a retrospective cross-sectional study which reviewed and analyzed all
106 reported transfusion reactions during period of two years at the blood bank of
107 Delta State University Teaching Hospital (DELSUTH), Oghara, Ethiope East
108 Local Government area of Delta State, Niger-Delta region of Nigeria. The
109 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.

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.

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 2years while the oldest was 70years (age range 2-70years). 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 3.18. 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 36⁰C while the highest temperature recorded was 39.5⁰C .Table 6 showed that 34/46(73.9%) of the patients have earlier been transfused while 12/46 (26.1%) has 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.

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 Zimbabwe¹⁹ and South Africa²⁰ 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, Nigeria²¹ 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 3.5% as children. Research has demonstrated a general increase in the

183 incidence of transfusion reactions in children compared to adult population¹³.
184 Females have more transfusion reactions 76.1% than their male counterparts
185 from our study. This is similar to the study by Nyashadzaishe *et al* in
186 Zimbabwe¹⁹ where 61.6% of adverse reactions came from females. Unlike
187 males, Females are known to have more transfusion reactions because of the
188 effect of multiparity²². In addition, the hospital admission in Delsuth is tilted
189 more towards the female gender because of the on-going free maternal and
190 under-five health care being provided by Delta state government. However,
191 study by Oakley FD and colleagues did not show any difference between the
192 sexes for adverse transfusion reactions¹³. Chills/rigors and fever/pyrexia were
193 the chief presenting symptoms of the subjects followed by itching and urticaria.
194 This is same pattern in various previous studies^{4,19,21}. Whole blood transfusion is
195 implicated in 93.5% of all the reported cases. The machinery for blood
196 components' preparation is still rudimentary in our hospital, a call for fully-
197 established blood component separation and preparations followed by proper
198 awareness and sensitization programmes to the physicians on the need for
199 component requests instead of whole blood. Our study also revealed that most
200 of the reactions occur at night. This is the first time such a finding is made in the
201 Niger-Delta region and by extension the southern part of Nigeria. Health care
202 providers had earlier been implored to avoid night and over-night Blood
203 transfusions^{22,23}. More than eighty percent of the transfusions were as a result
204 of anaemia. The cause of these anaemias were not known. This is the limitation
205 of this study. However, this study for the first time in Niger-Delta region of
206 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.

CONCLUSION/RECOMMENDATIONS

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.

TABLES AND FIGURES

TABLE 1: AGE DISTRIBUTION OF THE SUBJECTS

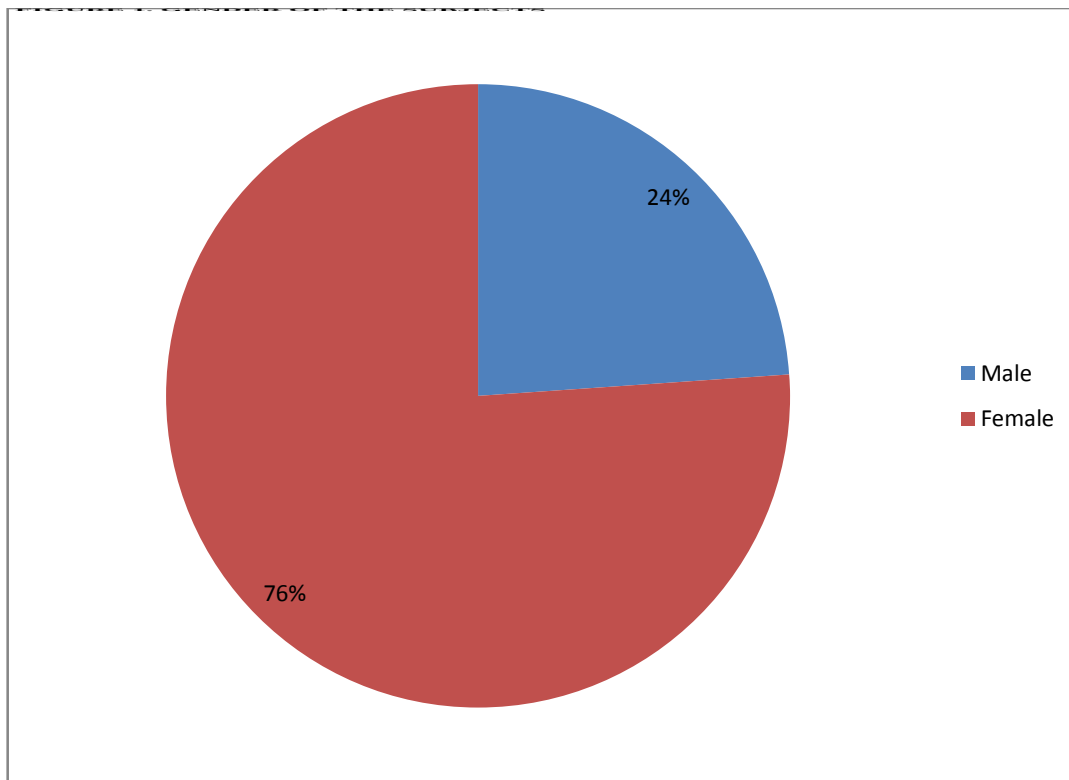
Age(years)	Frequency	Percent
≤ 20	4	8.8
21-40	20	43.5
41-60	19	41.2
≥ 61	3	6.5
Total	46	100

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FIGURE 1. GENDER OF THE SUBJECTS



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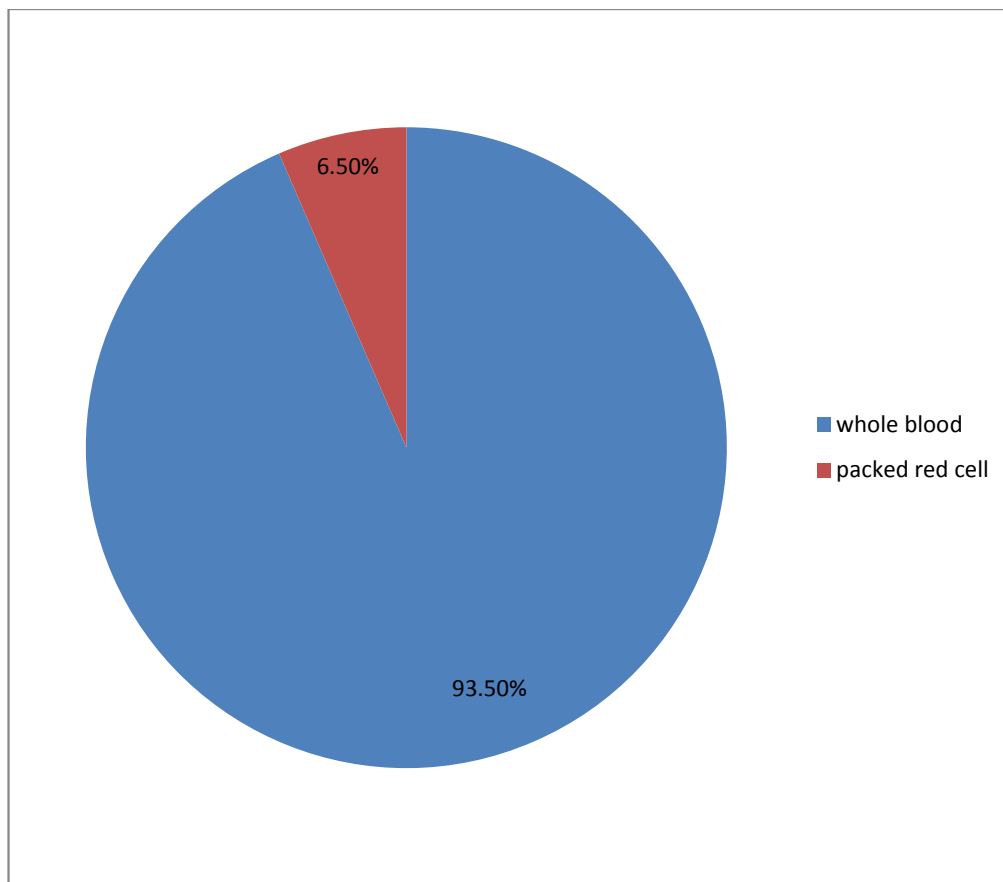
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FIG.2 BLOOD COMPONENTS RECEIVED



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275 **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
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TABLE 3. DAY PERIOD OF TRANSFUSION

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DAY/TIME	FREQUENCY	PERCENT
Morning	12	26.1
Afternoon	7	15.2
Night	27	58.7
Total	46	100

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TABLE 4. INDICATIONS OF BLOOD TRANSFUSION AMONG THE CASES

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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
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TABLE 5. TEMPERATURE OF ALL THE REPORTED CASES

Temperature	Frequency	Percent
Hypothermia (<36.4°C)	8	17.4
Normal (36.4-37.6°C)	14	30.4
Hyperthermia (>37.6)	24	52.2
Total	46	100

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%)

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HEALTH RESEARCH ETHICS COMMITTEE
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2nd Sept 2016

Our Ref: DELSUTH/HREC/2016/019

Dr. Nwagu M.Uchechuwku

Sir,

LETTER OF ETHICAL APPROVAL FOR RESEARCH STUDY

Your proposed research study titled: **“Determinants Of Adverse Transfusion Reactions At Delta State University Teaching Hospital, Oghara, Delta State, Nigeria”** was considered in the Health Research Ethics Committee meeting held on the 1st September 2016. An approval has been granted.

You are therefore requested to carry out the research in accordance with the approved protocol.

Thank you.


Dr Patrick I. Okonta
Chairman


Dr Ebele Abadom
Secretary

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HEALTH AND SERVICE