

Original Research Paper

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.

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31 **Conclusion** We conclude that gender of the patient, age , component of blood
32 being transfused and history of previous blood transfusions play determining
33 factors on adverse transfusion reactions. Causes of anaemia should be identified
34 and treated.

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

37 INTRODUCTION

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

49 people with compatible blood groups². Prior to discovery of ABO blood group
50 systems, blood transfusion has been associated with disastrous consequences
51 and lots of deaths²

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

62 Febrile transfusion reactions can be haemolytic (FHTR) or non-haemolytic
63 transfusion reaction (FNHTR) which is defined as a rise in temperature of 1⁰C
64 or more when a patient is transfused in the absence of any other cause of fever⁵.
65 Febrile transfusion reactions are believed to be the commonest transfusion
66 reactions⁵ may occur during the transfusion or within 1-2hrs after the
67 transfusion. Other transfusion reactions include allergic transfusion reactions
68 and urticarial reactions^{6,7}.

69 Haemolytic transfusion reactions are subdivided into immediate or delayed
70 depending on the time of onset of signs and symptoms³. Immediate haemolytic
71 transfusion reactions occur within 24hours of transfusion³. It occurs due to
72 clerical mistakes or administrative errors and is usually due to incompatibility
73 of ABO blood groups³. This type of reaction is very much avoidable but when it
74 occurs it is the most dangerous reaction due to transfusion. Usually, the
75 offending antibodies are IgM or IgG³. However, in delayed transfusion reaction
76 the clinical features develop more than 24hrs after the transfusion⁸. The only
77 sign of transfusion reaction, in most cases, is a progressive unexplained anaemia
78 in the presence or absence of jaundice⁸. Delayed transfusion reaction is most
79 often caused by anti-c or anti-JK or anti-c immunoglobulins⁸.

80 It should be noted that transfused red blood cells can be destroyed without any
81 detectable immunoglobulins^{9,10}. Even self (autologous) blood transfusion is
82 associated with one form of adverse transfusion reaction or the other¹¹. In
83 addition to all that have been mentioned, TRALI (Transfusion Related Acute
84 Lung Injury) and post-transfusion purpura are also important transfusion
85 reactions¹¹.

86 Studies have shown that some factors play a contributory role the adverse
87 transfusion reactions. These intervening factors include age, type of blood
88 component, patient's co-morbidity and multiple transfusions¹². In terms of
89 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 and transfusion of plasma¹³. Similarly, research on children carried out in France showed that apheresis platelet concentrates are the most common blood product was the most involved blood component in transfusion reactions, followed by the red blood cell concentrate and the methylene blue-treated fresh-frozen plasma¹⁴. Another French study showed that all types of blood products may be involved even though platelets have greater incidence¹⁵. Haemovigilance is very crucial for blood safety worldwide and 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.

No work has been done to our knowledge to reveal the determinants and factors promoting adverse transfusion reactions in the Niger-Delta region of Southern Nigeria. The aim of this work was to determine those factors and provide ways to avoid them in our transfusion practice.

OBJECTIVES

To analyze the profile of blood transfusion reactions in Delta State University Teaching Hospital (Delsuth) with a view to detecting the factors associated with

110 the occurrence of such reactions and by so doing we can profer preventive
111 measures.

112 METHODOLOGY

113 | This was a retrospective cross-sectional study, which reviewed and analyzed all
114 reported transfusion reactions during period of two years at the blood bank of
115 Delta State University Teaching Hospital (DELSUTH), Oghara, Ethiope East
116 Local Government area of Delta State, Niger-Delta region of Nigeria. The
117 hospital is a relatively new centre commissioned in 2010 to provides specialised
118 care for patients both in Delta state and other neighbouring states such as Edo,
119 Bayelsa, Anambra and Rivers States. ~~This work involved~~work included all the
120 reported cases of blood transfusions reactions among the total transfusions
121 carried out within the ~~givesstudy~~period ~~between,from~~ 1st July 2014 to 30th
122 June, 2016.

123 Each unit of blood given out for transfusion was accompanied by an Adverse
124 Reaction Form (ARF). The ARF is designed in line with nationally accepted
125 format in Nigeria. If there was any adverse reaction the transfusing
126 physician would fill this form and return same immediately to the blood bank
127 for appropriate investigations. On filling the form, the following information
128 concerning the recipient were provided in each of the ARF: the age,
129 gender/sex, component being transfused, complaints of the recipient, the ward,
130 temperature and duration of the transfusion prior to the reaction. Other
131 information provided include the recipient's blood group, period of the
132 transfusion (morning/afternoon/night) and indication for the transfusion. The
133 volume of blood transfused prior to transfusion reactions and whether or not
134 there has been previous transfusion reactions should be provided. These ARFs
135 for the two-year period were retrieved, the information collated and analysed.

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137 | **Statistics:** Data analysis was by computer using IBM SPSS version 22.0
138 | software. Frequency distribution tables and pie charts were used for
139 | presentations of selected variables.

140 | RESULTS

141 | A total of ~~Five~~ five thousand three hundred and forty-two (5,342) transfusions
142 | were carried out for the two-year period. The number of reported cases of
143 | adverse transfusion reactions was forty-six giving an incidence of 0.86%.
144 | Among the 46 reported cases, the youngest was 2years while the oldest was
145 | 70years (age range 2-70years) (see table I). The mean age was
146 | 38.69±14.95years. Most of the reactions, 32/46(69.5%) occurred between 21-50
147 | years. Thirty five (76.0%) of the cases were females while 11(24.0%) were
148 | males(see fig 1). This gave a female to male ratio of 3.18.
149 | Table 2 shows the symptomatology of the adverse transfusion reactions.
150 | Chills/rigors was the most frequent presenting symptom accounting for
151 | 29/46(63%) of the reactions. Next was fever/pyrexia presented by 27/46(58.7%)
152 | of the recipients. Fourteen of the cases {14/46(30.4%)} complained of
153 | itching/urticaria while 9/46(19.6%) presented with nausea/vomiting. Other
154 | complaints were various types of pains which included pains at the site of
155 | transfusion 5/46(10.9%), back pains 4/46(8.7%) and chest pains 3/46(6.5%).
156 | The clinical signs were hypotension 3/46(6.5%), tachypnea 2/46(4.3%) and
157 | Tachycardia.1/46(2.2%). The adverse transfusion reactions were associated with
158 | two blood components, namely, the whole blood 43/46(93.5%) and packed red
159 | cells 3/46(6.5%) see Fig.2. In terms of the period of the day these reactions
160 | occurred 27/46 of the cases(58.7%) occurred at night followed by 12/46(26.1%)
161 | which occurred in the morning and the remaining 7/46(15.2%) occurred in the

162 afternoon(see table 3).Table 4 showed the various indications of transfusion
163 among these cases. Anaemia was the major indication for transfusions (80.4%)
164 this is followed by haemorrhage accounting for 3/46(6.6%). **Anaemia in this**
165 **study was defined as haemoglobin concentration below 13.0g/dl with features**
166 **of decompensation.** Preparation for chemotherapy and post-operative period
167 **each contributed 4.3%.** In the
168 same manner 1case each (2.2%) had transfusion as a result pre-operative period
169 and sepsis respectively.We also studied the temperature recorded when the the
170 adverse reaction commenced (Table 5). Nineteen of the recipients 19/46
171 (41.3%) had body temperature equal to or below the normal of 37⁰C. Twenty-
172 seven of the subjects, 27/46(58.7%) had above normal body temperature
173 greater than 37⁰C. The lowest temperature was 36⁰C while the highest
174 temperature recorded was 39.5⁰C .Table 6 showed that 34/46(73.9%) of the
175 patients have earlier been transfused while 12/46 (26.1%) has never been
176 transfused. On the other hand, 43/46(93.5%) of the subjects has never
177 experienced any form adverse transfusion reactions while only 3/46(6.5%) have
178 had transfusion reactions previously.

179 DISCUSSION

180 **The present study reported This work showed** a prevalence of 0.86 % **similar**
181 **which is to value got elsewhere insimilar to**
182 **Japan (0.6%)¹⁶ and Iran(0.4%)¹⁷. However, a very recent study from Pakistan**
183 **reported much high prevalence rate which is in contrast to our study. Some**
184 **African studies showed a much lower**
185 **Incidence than our study,** for example work done in Zimbabwe¹⁸ and South
186 Africa¹⁹ reported
187 incidence of 0.046% and 0.049%, respectively. **This** disparity can be
188 explained by the population size of these studies. For example the Zimbabwe

Comment [UW1]: Add this reference:
<http://www.apims.net/Volumes/Vol12-1/Surveillance%20of%20Adverse%20Transfusion%20Reactions%20in%20Multi-transfused%20Thalassaemia%20Patients.pdf>

189 study was for a long period of twelve years where 308 transfusion adverse
190 events were reported for 670,625 blood components distributed. A Nigerian
191 study at Ile-Ife, Nigeria²⁰ had an incidence of 8.7%, about ten times higher
192 than our finding. This can be explained by the high number of children involved
193 in Ile-Ife study. Their work population had 39.1% children unlike our study that
194 had only 3.5% as children. Research has demonstrated a general increase in
195 the incidence of transfusion reactions in children compared to adult
196 population¹³. Females have more transfusion reactions (76.1%~~→~~%) than their
197 male
198 counterparts from our study. This is similar to the study by Nyashadzaishu *et al*
199 in Zimbabwe¹⁸ where 61.6% of adverse reactions came from females. Unlike
200 males, Females are known to have more transfusion reactions because of the
201 effect of multiparity²¹. In addition, the hospital admission in Delsuth is tilted
202 more towards the female gender because of the on- going free maternal and
203 under-five health care being provided by Delta state government. However,
204 study by Oakley FD and colleagues did not show any difference between the
205 sexes for adverse transfusion reactions¹³.
206 Chills/rigors and fever/pyrexia were the chief presenting symptoms of the
207 subjects followed by itching and urticaria. This is same pattern in various
208 previous studies^{4,18,20}. Whole blood transfusion is implicated in 93.5% of all the
209 reported cases. The machinery for blood components' preparation is still
210 rudimentary in our hospital, a call for fully- established blood component
211 separation and preparations followed by proper awareness and sensitization
212 programmes to the physicians on the need for component requests instead of
213 whole blood. Our study also revealed that most of the reactions occur at night.

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214 This is the first time such a finding is made in the Niger-Delta region and by
215 extension the southern part of Nigeria. Health care providers had earlier been
216 implored to avoid night and over-night Blood transfusions . More than eighty
217 percent of the transfusions were as a result of anaemia. The cause of these
218 anaemias were not known. This is the limitation of this study. We recomend
219 another study to determine the causes of anaemia among patients attending
220 DELSUTH Oghara. Finding and treating the underlying cause(s) of anaemia
221 would reduce blood transfusions and possible adverse transfusion reactions.
222 During the adverse transfusion reactions more than fifty percent (58.7%) of the
223 cases had their body temperatures greater than normal. This further supports the
224 fact that febrile reactions are among the leading cases of transfusion reactions.
225 In most cases, unfortunately, this leads
226 to stoppage of transfusions and wastage of scarce and unavailable blood.
227 Slowing the rate of transfusion and simple administration of anti-pyretics are
228 sufficient management procedures. Blood should not be wasted. Our study was
229 able to show that in terms of susceptibility to adverse transfusion reactions,
230 previous blood transfusion(73.5) has more determining influence than having
231 previous transfusion reactions(3.5%). This is important as it will help families
232 and transfusionists make informed decisions when considering the option of
233 blood transfusion.

234 **CONCLUSION/RECOMMENDATIONS**

235 We concluded that gender/sex of the patient, age , component of blood being
236 transfused and history of previous blood transfusions play determining factors
237 in adverse transfusion reactions. We recommend that causes of anaemia should
238 be determined and treated as a way of reducing rate of blood transfusions and
239 adverse transfusion reactions.

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TABLES AND FIGURES

247 **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

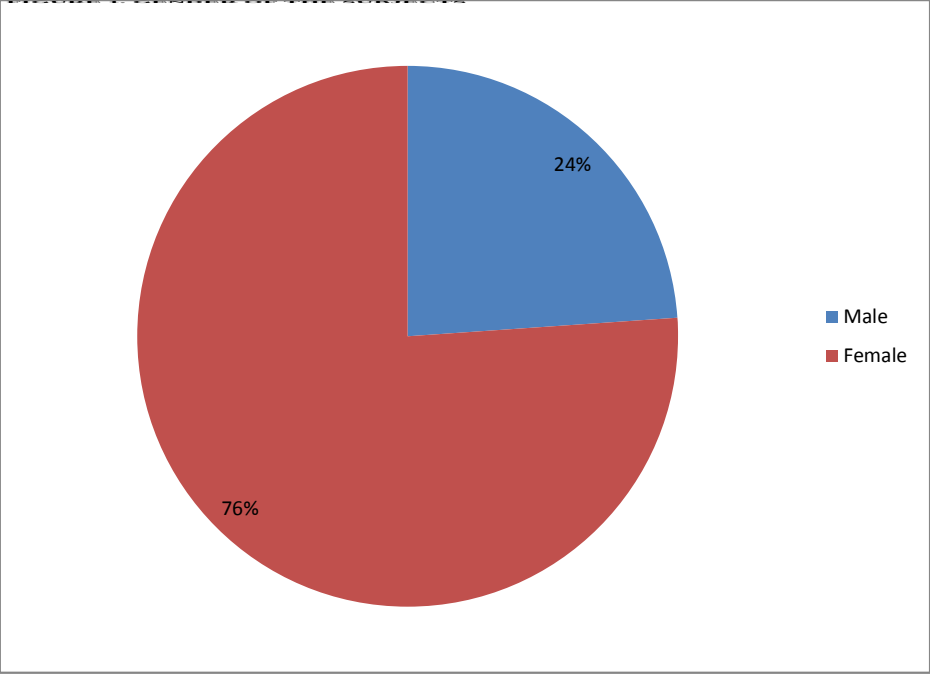


FIG.2 BLOOD COMPONENTS RECEIVED

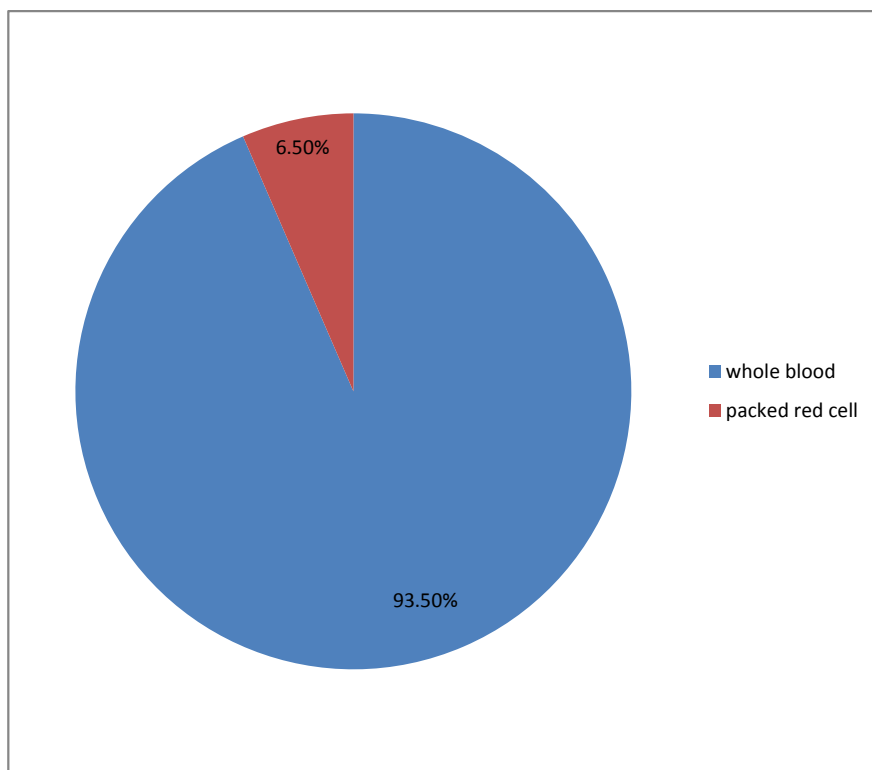


TABLE 2. SIGNS AND SYMPTOMS IN THE REPORTED CASES

Signs and syptoms	Frequency	Percentage
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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	81.3
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	100.0

TABLE 4.

INDICATIONS OF BLOOD TRANSFUSION AMONG THE CASES

Indications	Frequency	Percent
Anemia	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	100.0

TABLE 5. TEMPERATURE OF ALL THE REPORTED CASES

Temperature	Frequency	Percent
36.00	7	15.2
36.10	1	2.2
36.50	1	2.2
36.80	1	2.2
37.00	9	19.6
37.20	1	2.2
37.30	1	2.2
37.60	1	2.2
37.80	6	13.0
38.00	6	13.0
38.20	4	8.7
38.30	1	2.2
38.40	1	2.2
38.70	1	2.2
38.80	2	4.3
38.90	2	4.3
39.50	1	2.2
Total	46	100.0

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277 **Table 6. Previous blood transfusion and previous transfusion reaction**

	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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