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BLOOD TRANSFUSION IN CRITICALLY ILL PATIENTS IN AN INTENSIVE CARE UNIT OF A TERTIARY HOSPITAL IN NIGERIA
K. U. Tobi, MBBS, DA, FMCA, FWASC, Consultant Anaesthesiologist and C. O. Imarengiaye, MBBS, DA, FWACS, FWCA, Consultant Anaesthesiologist, Department of Anaesthesiology and Intensive Care, University of Benin Teaching Hospital, Benin City, Nigeria.

Request for reprints to: Dr. Kingsley Tobi, Department of Anaesthesiology and Intensive Care, University of Benin Teaching Hospital, Benin City, Nigeria, Email: tobikingsley@yahoo.com; kingsleytobi@gmail.com

BLOOD TRANSFUSION IN CRITICALLY ILL PATIENTS IN AN INTENSIVE CARE UNIT OF A TERTIARY HOSPITAL IN NIGERIA

K. U. TOBI and C. O. IMARENGIAYE

ABSTRACT

***Objective*: To evaluate the use of whole blood and blood products in our ICU to determine patterns and outcome after transfusion.**
***Design*: A retrospective, case-control study.**
***Setting*: The Intensive care unit (ICU) of the University of Benin Teaching Hospital, a seven-bed open unit for the management of surgical, medical and paediatric patients.**
***Subjects*: Patients who received blood transfusion in the ICU. Every patient who received blood transfusion was matched for a similar case without blood transfusion. Patients' socio-demographic characteristics, number of units of blood transfused, length of stay and outcomes were determined.**
***Result*: Approximately 30% of all patients admitted during the study period were transfused with blood. Majority of these patients (83.2%) had one to three units of blood. Obstetrics and neuro-surgical patients had more blood transfused than others. Whole blood constituted >85% of blood transfused while packed cells and fresh frozen plasma constituted 11.8% and 2.8% respectively. Blood transfusion did not have any significant impact on patients' length of stay and mortality. The number of units of blood transfused appears to be associated with poor outcome (P=0.006).**
***Conclusion*: Obstetric and neuro-surgical patients utilised blood and blood products in the ICU more than any other patients. The number of units of blood transfused was more predictive of mortality than the blood transfusion per se. A judicious use of blood and blood products, giving patients what they need and the development of transfusion guideline in the ICU is expedient.**

INTRODUCTION

Blood transfusion is a commonly practiced intervention in the Intensive Care Unit (ICU). Blood transfusion rates of 30.9 and 48.6% in the ICU, were reported by Sakr *et al* (1) and Koch and co-workers (2) respectively. Furthermore, anaemia has been shown to be present in about 60% of patients admitted in the ICU (3). It has been shown that by the end of the first week in ICU, almost all critically ill patients have developed anaemia (4). In a study involving 146 ICUs across Western Europe, mean haemoglobin (Hb) concentration was found to be 11.3g/dl (4) and 29% of patients had Hb concentration of <10g/dl.

There is an increasing demand for blood and blood products in the ICU despite declining supply especially in developing countries (5). In addition concerns over complications of blood transfusion which include fluid overload, pulmonary oedema, fever, infection, multiple organ failures, transfusion-related lung injury, hypothaermia and coagulopathy (6-9) remain a challenge. A direct relationship between the number of units of blood transfused and mortality has also been established (2).

Critically ill patients tend to tolerate anaemia fairly well due to the efficient compensatory mechanism of their microcirculation. However, many ICU patients are being transfused with either whole blood or blood components. Corwin and colleagues (2) noted in their study that almost a third of all red blood cells transfused were without a clear-cut indication. Nevertheless, in many centres, blood

transfusion continue to be employed on the basis of an arbitrary transfusion trigger without an objective and physiological need for blood.

It is imperative therefore to document the transfusion practices in a tertiary hospital in Nigeria. Evidence from such evaluation may assist in the formulations of policy and procedures for the care of the critically ill patients.

MATERIALS AND METHODS

The study was conducted at the Intensive Care Unit of the University of Benin Teaching Hospital, a seven-bed open, level III multidisciplinary facility. Patients from surgery, internal medicine, obstetrics/gynaecology and paediatric departments are managed in the unit.

This study was a retrospective case-control study of all admissions in the ICU of the hospital between June 2011 and May 2013. A patient before and after each transfused patients served as controls. Patients with incomplete data were excluded from the study.

Clearance was obtained from the Hospital Research and Ethics Committee for the conduct of the study. The hospital records of the patients including case notes, nurses' report books, and blood transfusion registers were retrieved for data collection. Data collected included patients' demographic characteristics such as name, sex and age. Clinical variables like diagnosis, number of units of blood transfused, length of stay and outcome were also collected in a proforma.

Primary outcome variable: The number of patients who had blood transfusion during their ICU stay.

Secondary outcome variables: outcome of blood transfusion in the critically ill in terms of length of stay and mortality. Prolonged ICU stay was defined as a stay in ICU greater or equal to 14 days (10). Blood transfusion rate was considered as the percentage of patients who received blood transfusion over the total number patients admitted in the ICU. For the purpose of this study, blood transfusion was defined as transfusion of whole blood or blood component, when the Hb concentration was below 10g/dl. This may involve several units of blood transfused to a patient while on admission in the ICU.

Data obtained were entered into SPSS version 16.0 for analysis. Independent t-test was used for parametric data while chi-square and Fisher's exact test were used to determine the association between categorical data. A regression analysis was employed to determine the relationship between the number of blood units transfused and outcome. P-value less than 0.05 was considered to be of statistical significance.

RESULTS

A total of Six hundred and forty five (645) patients were admitted into the ICU during the period under review. Out of these, 191(29.6%) patients received blood transfusion during their stay in the unit. One hundred and ninety patients (190) served as controls. The socio-demographic characteristics of patients in both the case and control groups were comparable. Male to female ratio was approximately 1:1. Majority of the patients transfused with blood (34.6%) were in the age group 30 – 39 years with an age range of 1 – 88 years and median age of 34 years. Table 1.

Table 1
Socio-demographic characteristics of patients transfused with blood

Age (years)	Frequency	Percentage (%)
0-9	12	6.3
10-19	12	6.3
20-19	37	19.4
30-39	66	34.6
40-49	21	11.0
50-59	18	9.4
60-69	17	8.9
70-79	5	2.5
80-89	3	1.6
Sex		
Male	96	50.3
Female	95	49.7
Total	191	100

The total units of blood transfused in the ICU during this study period were 424. Whole blood was the highest blood transfused (85.4%), followed by packed cells and fresh frozen plasma, 11.8% and 2.8% respectively (Figure 1). Blood group O positive constituted 66% of total blood used, followed by A positive blood (18.1%). Blood group O negative and AB were the least used representing 6.1% and 0.5% respectively (Table 2). The amount of blood units received by patients during the study period is represented in Table 2. The majority of the patients (83.2%) received between one to three units of blood with a median of 2 and a range of 1 – 10 pints.

Figure 1
Distribution of blood components

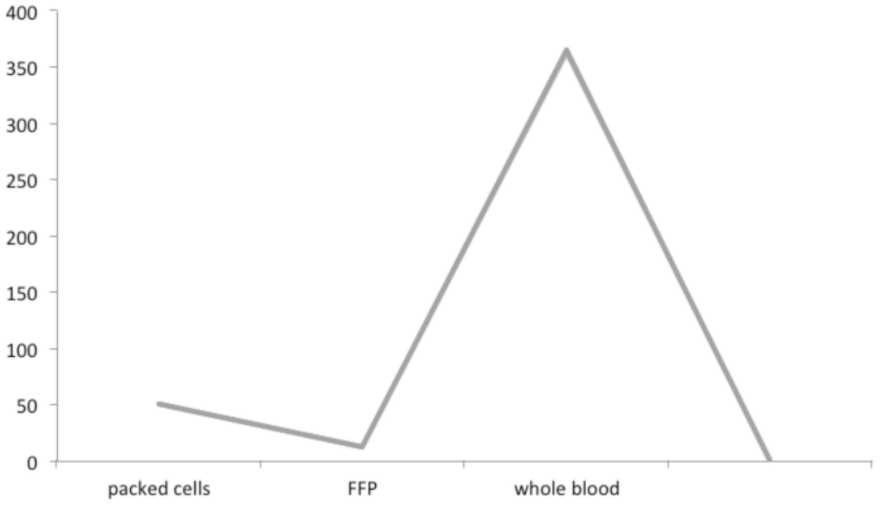

Table 2
Distribution of blood group transfused

Blood group	Frequency	Percentage (%)
O +ve	280	66.03
A +ve	77	18.1
B +ve	39	9.1
O-ve	26	6.1
AB	02	0.5
Total	424	100

Table 3
Blood utilisation by admitting units

Admitting units	Frequency	Percentage (100%)
Obstetric/Gynaecology	129	30.4
Neurosurgical	100	23.6
General surgery	75	17.7
Orthopaedics/trauma	39	9.2
Internal medicine	29	6.8
Cardiothoracic surgery	20	4.7
Others	32	7.5
Total	424	100

Figure 2
Outcomes of blood transfusion

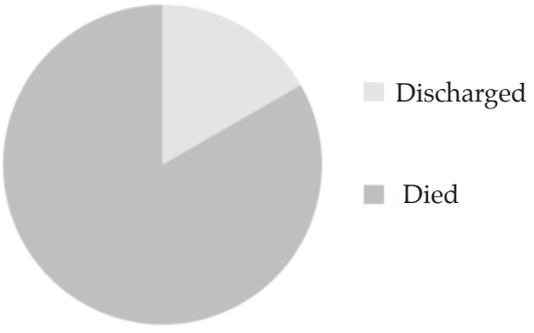

Table 4a

Outcome	Frequency	Mean+/-SD	P value
Discharged	112	2.11(1.53)	0.082
Died	79	2.53 (1.81)	

Table 4b
Predictor of outcome

Predictor	B(regression coefficient)	Odd ratio	P value
Amount of blood	0.155	1.167	
Constant	-0.705	0.494	0.006

Table 5
Blood transfusion and outcome

Out come	No of patients not transfused	No of patients not transfused	Total
Died	79	82	161
Discharge	112	108	220
Total	191	190	381

P=0.507, OR=1.159

Table 6
Blood transfusion and prolonged stay

Duration of stay in ICU	No of patients transfused	No patients not transfused	Total
Patient with prolonged	14	22	36
Patients with shorter stay	176	169	345
Total	190	191	381

P=0.165 OR=1.637

Figure 3
Blood transfusion by months

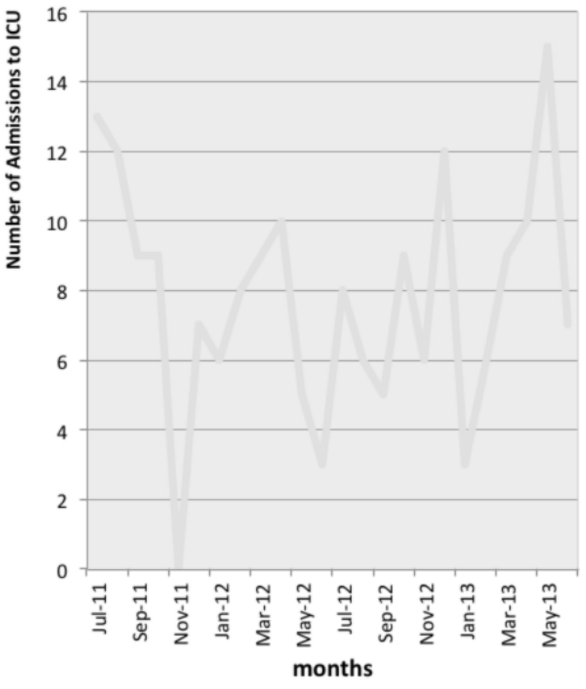

Table 3 showed that obstetrics/gynaecology and neuro-surgical patients were the most transfused with blood, 30.4% and 23.6% respectively. General-surgical patients accounted for 17.7% of patients given blood in the ICU. The outcome of patients who had blood transfusion is shown in Figure 1. The mortality rate among patients who had blood transfusion in the ICU was 41% while 59% were discharged from the unit. The mortality rate among patients who did not have blood transfusion in the unit was 43.2%. The number of units of blood transfused had a significant effect on mortality (p = 0.006) (Table 4b). The amount of blood received by the patients in ICU, predicted 1.6% - 2.1% of the outcome. With a unit increase in the amount of blood received, the patients were more likely to die (B = 0.155), compared to those who were discharged alive (p = 0.087) Table 4.

Table 5 shows the impact of blood transfusion on outcome. Seventy nine (79) patients among those transfused died while 82 of those without transfused died, p=0.723, OR=1.076. Blood transfusion did not have any significant impact on duration of stay in ICU. Among patients who had blood transfusion, 22(11.5%) had prolonged ICU stay, that is, >14 days, while 41 patients had prolonged ICU stay among those not transfused, p=0.166 and OR=1.64 Table 6.

DISCUSSION

This study revealed that about 30% of patients admitted into the ICU during the study period had blood transfusion consuming a total of 424 units of blood. This finding is consistent with a similar study by Sakr *et al* 1. Another study however reported higher blood transfusion rates of 48.6% (2). The probable explanation for this difference in blood transfusion rates is the different transfusion triggers employed by different centres. Traditionally, our centre uses a transfusion trigger of haemoglobin concentration of less than 10g/dl.

An earlier report had suggested that blood transfusion was more common among the elderly (5). This can been attributed to the presence of associated co-morbidities and the low circulatory reserve in this age group. Our finding however showed that a higher proportion of young adults (30-39years) constituting 34.6% of patients received blood transfusion in ICU while the geriatric age group (>60 years) constituted only 13%. The reason for this is that the majority of patients who had blood transfusion in this study were obstetrics and traumatic brain injured patients, in their third and fourth decade of life.

The finding that obstetric patients constituted the most transfused patients in our study may be a reflection of the incidence of post-partum haemorrhage (PPH) in our environment. Post-partum haemorrhage remains a significant cause of maternal morbidity in the developed world and mortality in our environment (11,12). Many factors could be responsible for this ranging from inadequate antenatal care and late presentation to the healthcare facility. Prompt attention to the prevention of PPH and early

intervention may improve outcome. However, the limited availability of options for the management of the third stage of labour may be a factor. The situation non-availability of PGFα is worrisome. In a similar study, Volpato and colleagues (13) found that polytrauma and sepsis were the most frequent pre-transfusion diagnosis as opposed to our findings.

There have been conflicting reports on the impact of blood transfusion on mortality in the critically ill. Vincent and co-workers (14) demonstrated that blood transfusion significantly contributed to the overall mortality in patients transfused with blood. Some others (2) did not find such significant association but reported an increased risk of adverse outcome with increased number of red blood cells transfused. We did not find any significant effect of blood transfusion on patients' outcome in terms of mortality, however, we observed that a unit increase in the amount of blood received, increased the likelihood of mortality. There is a need to delay blood transfusion in the critically ill until there are evidences of haemodynamic instability and biochemical markers of shock. A haemoglobin concentration of 7g/dl before blood transfusion has been reported to be associated with better survival rates, lesser nosocomial infection and acute respiratory distress (13).

Furthermore, our study showed that blood transfusion had no direct effect on the length of stay. This appears worrisome. Indeed, it is not clear if the relationship between blood transfusion and length of stay in the ICU is casual or effect. It has been established that the longer a patient stays in the ICU, the higher the predisposition to anaemia and consequently the need for blood transfusion (15,16). Some of the reasons are, longer ICU stay predisposes to nosocomial infections, inadequate nutritional support in the critically ill patients and the high catabolism associated with critical illness (15). The explanation for our finding could be that, the primary pathology and other interventions like the need for mechanical ventilation in the ICU were more important in influencing length of stay. However, it is noteworthy that strict infection control practices in the ICU and provision of adequate nutrition for the critically ill patients would reduce the incidence of anaemia and obviate the need for blood transfusion.

Whole blood constituted the highest number of blood transfused in the unit. There is an urgent need to review our current blood transfusion practices among the critically ill due to the fact that blood and blood products are scarce and costly (5, 17). A judicious use of these commodities, giving the patients what they require is of utmost importance. There should be clinical and clear risk benefits assessment before utilisation of blood in the critically ill patients. In addition, it is necessary to develop a protocol for better obstetric and neuro-surgical care in our environment.

This study is not without limitations. It may have been necessary to control for each pathology necessitating transfusion in the ICU. This is cumbersome and may not have been of additional value. However, the observation of the rate of blood transfusion in the ICU, the incessant use of whole blood and the lack of association between length of stay and transfusion underscore the relevance of this study.

In conclusion, obstetric and neuro-surgical patients utilise blood and blood products in the ICU more than any other patients. The number of units of blood transfused was more predictive of mortality than blood transfusion per se. A judicious use of blood and blood products, giving patients only what they need in the ICU is expedient.

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