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Demographic characteristics of blood and blood components transfusion recipients and pattern of blood utilization in a tertiary health institution in southern Nigeria

Henshaw Uchechi Okoroiwu* and Ifeyinwa Maryann Okafor

Abstract

Background: An insight into the utilization pattern helps in future planning of blood drive. This study was conducted to describe the demographic characteristics of the transfusion recipients and pattern of blood and blood product utilization in Nigeria.

Methods: Blood bank registers of University of Calabar Teaching Hospital (UCTH) Calabar were analysed for a 12 month period. Number of blood units requested, number of units issued, Cross-match to transfusion ratio (C/T), age, gender, blood group, blood components received, patients ward and clinical diagnosis were computed. Diagnoses were grouped into broad categories according to the disease headings of International Classification of Diseases (ICD-10).

Results: Majority of the 2336 transfusion recipients studied were females (69.09%) and are in the reproductive age group; 15–49 years (75.23%). The median age of the recipients was 35 years (range, 0–89). Most of the recipients (n = 1636; 70.04%) received whole blood transfusion. Majority (94.46%) of the cross–matched units were issued giving C/T ratio of 1.06. The common blood group type was O Rhesus positive (62.63%). Obstetrics and Gynecology had the highest blood requisition (41.40%). The majority of the patients were diagnosed with conditions related to pregnancy and childbirth (38.70%), conditions originating in prenatal period (14.38%). The age range of 25–54 years had the highest blood transfusion requests (n = 501; 51.07%), of these, females were majority (n = 390;77.84%).

Conclusions: Our study recorded mostly young patients who received mostly whole blood. Most of the patients in the reproductive age group received transfusion for pregnancy and child-birth related cases.

Keywords: Transfusion, Blood utilization, Blood usage, Whole blood, International classification of disease (ICD)

Background

Blood transfusion plays important role in medical and surgical practice [1]. In order to achieve these, critical review and continuous evaluation of the use of blood and its components becomes essential [2]. These entails studying the pattern of blood components use, the clinical conditions and wards requiring blood transfusion, the risks associated with blood transfusion and the demographic characteristics of the blood transfusion recipients in a population. Evaluation of blood requisition and utilization is essential in assessing the present and future demands for blood and avoiding unnecessary requests and transfusions [3]. Despite the development of national blood service policy [4], most medical facilities in Nigeria still find it difficult in establishing viable and efficient blood banking system [5]. On this premise, it becomes necessary to ensure judicious utilization of this scarce commodity. Data on blood utilization is helpful in resource limited settings in which there is always competing needs for scarce resources [6]. Information on blood utilization will assist in establishing clinical practice guidelines, strategizing on new donor recruitment, streamlining resources for the therapeutic benefit of the patient [3, 7]

* Correspondence: okoroiwuhenshaw@gmail.com
Haematology Unit, Department of Medical Laboratory Science, University of Calabar, Calabar, Nigeria

and conducting cost effective analysis [8]. Various studies have shown variable distribution in demand for blood and its components [9, 10], but none has looked into the variability in the blood use based on diseased classification (1CD-10) as well as blood group type of the recipients. Hence, this study sets off to establish local use pattern of blood and blood product to aid in effective management of patient need.

Methods

Study setting

This study was conducted in the blood bank unit of the Hematology Department of University of Calabar Teaching Hospital, Calabar, Cross River State, Nigeria which happens to be the only tertiary institution in the state.

Study design

This study employed retrospective analysis of blood transfusion recipients' data covering all blood and blood components transfused within the period from March 2016 to February, 2017.

Data collection

Data were collected retrospectively from the register of the blood bank for the 12 months period from March 2016 to February 2017 and covered all blood and blood components recorded in the blood bank during this period. Cross-match and issue registers were accessed to retrieve the required information such as gender, age, blood group, product requested, ward and clinical diagnosis.

Statistical analysis

The data collected were analyzed using SPSS version 20 software (Armonk, NY. IBM Corp.). Frequency and percentages were used to summarize categorical demographic and clinical variables.

Result

A total of 2473 units were requested within the study period consisting of 1770 whole blood, 468 packed cells and 235 plasma. About 94.46% (2336) of the cross matched requests were issued consisting of 1636 (70.04%) whole blood, 467 packed cells (19.99%) and 233 (9.97%) plasma resulting in a cross match to transfusion (C/T) ratio of 1.06 (Table 1).

Most transfusion recipients were female (1614; 69.09%) of whom 475 (29.43%) were in the reproductive age group (15–49 years). Approximately 20% of the transfusion recipients were under the age of 15 while 7% were at least 65 years (Table 2).

The most common blood group type observed in the blood/blood component recipients was O Rhesus Positive (1463; 62.63%) while the least was AB Rhesus Negative (0; 0%) (Table 3).

Table 1 Frequency of blood transfusion requests and dispatch based on blood products

Blood component	Units cross matched		Units issued		C/T Ratio
	N	(%)	*N*	(%)	
Whole blood	1770	(71.57)	1636	(70.04)	1.08
Packed cell	468	(18.93)	467	(19.99)	1.00
Plasma	235	(9.50)	233	(9.97)	1.01
Total	2473	(100.00)	2336	(100.00)	1.06

C/T ration cross-match to transfusion ratio, % percentage, *N* absolute number

The top six broad 1CD-10 diagnosis categories accounting for most blood transfusion recipients were pregnancy and child birth ($n = 904$; 38.70%), condition originating in perinatal period ($n = 336$; 14.38%), diseases of the genito-urinary system ($n = 184$; 7.88%), diseases of the blood and blood forming organs ($n = 182$; 7.79%), Neoplasm ($n = 156$; 6.68%) and injury and poison ($n = 102$; 4. 37%) (Table 4).

Obstetrics and Gynecology ward had the highest (967; 41.40%) blood recipients while Eye and Dental/MFU had the least (5; 0.21%) (Table 5).

A category of the transfusion recipients based on the four broad category showed that more blood requisition in Obstetrics and gynecology ($n = 967$; 41.40%) while the least was pediatrics ($n = 178$; 7.62) (Table 6).

Further stratification of blood components showed that whole blood was utilized more ($n = 947$; 57.89%) in obstetrics and gynecology, while packed cells and plasma were utilized more ($n = 374$; 80.09% and $n = 188$; 80.69%, respectively) in medicine (Table 7).

Discussion

This study provided information on the pattern of blood and blood components utilization and demographic characteristics of blood transfusion recipients in University of Calabar Teaching Hospital, Nigeria.

This study comprised much of younger cohort of transfusion recipients. This observation is similar to the report of a study in Zimbabwe [6] but in contrast with

Table 2 Distribution of age groups of blood transfusion recipients according to age and gender

Age range (years)	Recipient		Males		Females	
	N	(%)	*N*	(%)	*N*	(%)
0–14	197	(20.08)	106	(58.81)	91	(46.19)
15–24	123	(12.54)	38	(30.89)	85	(69.11)
25–54	501	(51.07)	111	(22.16)	390	(77.84)
55–64	91	(9.28)	52	(57.14)	39	(42.86)
65+	69	(7.03)	43	(62.32)	26	(37.68)
Not recorded	1355		372		912	
Total	2336		722		1614	

N absolute number of subjects, % percentage
Table percentages, exclude non recorded values

Table 3 The distribution of ABO blood groups of blood transfusion recipients according to gender

Blood group	Recipient		Males		Females	
	N	(%)	*N*	(%)	*N*	(%)
A^+	463	(19.82)	159	(34.34)	304	(65.66)
A^-	47	(2.01)	16	(34.04)	31	(65.96)
AB^+	4	(0.17)	2	(50.00)	2	(50.00)
AB^-	0	(0.00)	0	(0.00)	0	(0.00)
B^+	274	(11.73)	73	(26.64)	201	(73.36)
B^-	19	(0.81)	11	(57.89)	8	(42.11)
O^+	1463	(62.63)	442	(30.21)	1021	(69.79)
O^-	66	(2.83)	19	(28.79)	47	(71.21)
Total	2336	(100.00)	722	(30.91)	1614	(69.09)

N absolute number of subjects, % percentage

Table 4 Distribution of blood transfusion recipients based on the broad ICD-10 diagnosis categories

Diagnostic category (ICD-10 code)	Recipients	
	N	(%)
Infectious and parasitic diseases	78	(3.34)
Neoplasms	156	(6.68)
Disease of blood & blood forming organs	182	(7.79)
Endocrine, nutritional & metabolic diseases	26	(1.11)
Mental and behavioral disorders	0	(0.00)
Diseases of the nervous system	8	(0.34)
Eye and adnexa diseases	6	(026)
Ear and adnexa diseases	2	(0.09)
Circulatory system diseases	76	(3.25)
Respiratory system diseases	22	(0.94)
Digestive system diseases	92	(3.94)
Skin and subcutaneous tissue diseases	14	(0.60)
Musculoskeletal system & connective tissue diseases	44	(1.88)
Genitourinary system diseases	184	(7.88)
Pregnancy, childbirth & puerperium	904	(38.70)
Condition originating in the perinatal period	336	(14.38)
Congenital malformations	34	(1.46)
Symptoms, signs and abnormal clinical and laboratory findings	62	(2.65)
Injury and poison	102	(4.37)
External causes of morbidity	8	(0.34)
Total	2336	(100.00)

ICD International classification of diseases
n absolute number, % percentage

Table 5 Distribution of blood transfusion recipients based on clinical wards

Ward	Recipients	
	N	(%)
Medical	378	(16.18)
Orthopedic	114	(4.88)
Cardiothoracic	12	(0.15)
Surgical	198	(8.48)
ENT	18	(0.78)
Eye	5	(0.21)
O & G	967	(41.40)
Pediatrics	22	(0.94)
SCBC	55	(2.35)
ICU	21	(0.90)
CHER	101	(4.32)
Casualty	375	(16.05)
HDCU	65	(2.78)
Dental/MFU	5	(0.21)
Total	2336	(100.00)

ENT Ear, Nose and Throat, *O* and *G* Obstetrics and Gynecology, *SCBU* Special care baby unit, *ICU* intensive care unit, *CHER* children Emergency Room, *HDCU* Haematology Day Care unit, *MFU* Maxillofacial unit

studies reported from developed countries in which majority of the transfusion recipients were above the age of 60 years [8, 10, 11]. This low median age reflects the age trend of the Nigerian population which comprised mainly of young people with only 3.12% being above the age of 65 years [12]. The life expectancy at birth for Nigeria is currently estimated at 54 years whereas the global population average is 70 years [13]. Developed countries are mainly characterized by ageing population owing to higher mean life expectancies.

This study recorded greater number of female transfusion recipients. Blood transfusion recipients in sub-Saharan Africa are mostly children in malaria endemic areas, and women of childbearing age due to complications of labour [14, 15]. Women, especially the childbearing age group (15–49 years) received the majority of the blood and blood components transfused. This observation is in consonance with findings in other countries in sub-Saharan Africa where women receive more blood for pregnancy-related

Table 6 Distribution of blood transfusion recipients based on broad sections of the hospital

Broad Hospital section	Recipient	
	N	(%)
Pediatrics	178	7.62
Surgery	317	13.57
O & G	967	41.40
Medicine	874	37.41

Table 7 Distribution of blood components based on broad sections of the hospital

Broad Hospital section	Blood component		
	Whole blood (%)	Packed cell (%)	Plasma (%)
Pediatrics	82 (5.01)	71 (15.20)	25 (10.73)
Surgery	295 (18.03)	8 (1.71)	14 (6.01)
O & G	947 (57.89)	14 (3.00)	6 (2.57)
Medicine	312 (19.09)	374 (80.09)	188 (80.69)

complications consequent to intra-partum and post-partum hemorrhage [15, 16]. In contrast, studies from developed countries reported that more men than women receive blood transfusion [8, 17]. This may be attributed to advanced health care services which reduced the associated complications of child bearing requiring transfusion [6].

Majority of the transfusion recipients in this study (71.57%) received whole blood transfusion. This is consistent with earlier study in Jigawa Nigeria [18] which reported 87.3%. This is a reflection of common practice of requesting for whole blood in resource limited settings owing to non-availability of facilities to practice component separation. In standard practice, whole blood is only issued for transfusion following cases of massive hemorrhages and exchange transfusion.

This study recorded an average C/T ration of 1.06 which is an indication of effective and efficient utilization of blood and blood products. This finding is similar to 0.9 reported in Ibadan Nigeria [19] but lower than 2.2 reported in Ibadan, Nigeria [20]. The observed differences may be due to the varying levels of availability of blood and indications for blood transfusion as judged by the requesting physician [19, 20].

The top six diagnoses for which patients received blood transfusion in this study were pregnancy and childbirth, conditions originating in perinatal period, diseases of the genitourinary system, diseases of blood and blood forming organs, neoplasm and injury and poison. This finding is similar to earlier report in Zimbabwe [6] with conditions originating in perinatal period being replaced by infections and parasitic diseases. However, other studies in Nigeria did not classify diagnosis according to ICD-10 making direct comparisons with the findings of this study impossible. Studies from non-African decent reported neoplasms, injury and poison, digestive system diseases and circulatory system diseases as the main diagnosis associated with transfusion [21, 22]. This strongly portrays that blood utilization pattern vary significantly within regions and according to practice as well as patients clinical findings. More so, diseases burden, level of organization and advancement of healthcare in the different settings also contribute to the significant differences in blood utilization [6].

The obstetrics and Gynecology ward had the highest blood requisition (41.40%). This finding is similar to previous reports [18, 23]. This observation may be related to the fact that most obstetric and gynecological events may be bleeding related. Peri-partum hemorrhage has been reported as common indication for blood transfusion in obstetric events [24]. More so, the fact that majority of the subjects were females of child bearing age contributed to this outlying peak. Further classification of the blood transfusion recipients based on the four broad classification showed obstetrics still had the highest requisition (41.40%) while pediatrics had the least (7.62%). This finding is similar to previous report by Musa et al. [9] who reported 42.79 and 11.67%, respectively in a study in Zaria, Nigeria. However, their study made 6 broad classification; splitting some areas of internal medicine into trauma and emergency.

Whole blood was mostly used by obstetrics and gynecology while packed cells and plasma were mostly used in medicine. Ideally, blood is effectively used by processing it into components such as red cell concentrates, platelet concentrates, plasma (fresh frozen plasma) and cryoprecipitate [25], but lack of facility for component separation as in our institution makes such difficult. Published guidelines based on "expert opinion" recommends transfusion of plasma for the following clinical indications: active bleeding in the setting of multiple coagulation factor deficiencies (massive transfusions, disseminated intravascular coagulation); emergency reversal of warfarin in patients with active bleeding in settings where prothrombin complex concentration with adequate level of factor VII is not available; and for use as replacement when performing plasma exchange [26–30]. Specifically, these are seen in burns [31, 32], oncology [33], obstetric events [34–36], and more. Packed red cells are indicated in conditions requiring prevention of anemia related tissue hypoxia [37]. Indications for packed cell transfusion include acute sickle cell crisis (for prevention of stroke), acute blood loss greater than 1500 mL or 30% of blood volume [38].

The distribution of ABO blood groups among blood recipients in this study is consistent with that reported in donor population in Nigeria [39]. Acute blood shortage of specific group is a common event in Nigerian hospitals, hence making an understanding of the distribution of blood groups among transfusion recipients important. This information is essential in planning for blood drive as well as distribution of blood and blood components; subsequently ensuring that patients receive blood matching their ABO blood group and Rhesus type [6]. Of the 33 blood group systems representing over 300 antigens as listed by International Society of Blood Transfusion, ABO and Rhesus blood groups are the first two most clinically important blood groups [40, 41].

This study has a number of potential limitations. However, this study was carried out in a major tertiary health institution in Calabar, Nigeria, but the extrapolation of

the entire findings of this study to Nigeria may need some caution. More so, this study made the assumption that issued blood units were transfused.

Conclusion

This study recorded greater number of women receiving blood and blood product transfusion for conditions associated with pregnancy and childbirth. The blood recipients were mostly young patients of reproductive age group. We found that the most indications for blood transfusion based on ICD-10 were pregnancy and child birth, conditions originating in perinatal period, diseases of genitourinary system and diseases of blood and blood forming organs. Whole blood was the major blood component recorded in this study. This shows a lag in healthcare improvement and unnecessary waste of blood. Although this study was based on a single blood bank, the findings provided an insight into the characteristics of blood transfusion recipients and as well aid in future planning of better blood and blood product utilization.

Abbreviations

C/T: Cross match to transfusion ratio; CHER: Children Emergency Room; ENT: Ear, Nose and Throat; HDCU: Haematology Day Care Unit; HREC: Health Research Ethical Committee; ICD: International Classification of Disease; ICU: Intensive Care Unit; MFU: Maxillofacial Unit; O & G: Obstetrics and Gynecology; SCBC: Special Care Baby Unit; UCTH: University of Calabar Teaching Hospital

Availability of data and material

The datasets supporting the finding of this study is available from the corresponding author on reasonable request.

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Authors' contributions

HUO conceived and designed the study. HUO and IMO analysed and interpreted the data. HUO drafted the initial manuscript. IMO reviewed the manuscript. Both authors read and approved the final manuscript.

Competing interest

The authors declare they have no competing interest.

Ethics approval and consent to participate

This study was approved by Health Research Ethical Committee (HREC) of the University of Calabar Teaching Hospital. As only secondary data was used in this study, consent to participate was not required following HREC guidelines.

Consent for publication

Not applicable.

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