

ORIGINAL ARTICLE

Transfusion Services in Nigeria: Blood Banking Techniques and Availability of Facilities for Blood Component Therapy

¹Ugwu AO, ²Efobi CC

¹Department of Haematology & Immunology, College of Medicine, University of Nigeria Ituku/Ozalla, Enugu, Enugu State, Nigeria.

²Department of Haematology & Blood Transfusion, Nnamdi Azikiwe University Awka, Anambra State, Nigeria.

Corresponding Author: Angela Ogechukwu Ugwu, Department of Haematology & Immunology, College of Medicine, University of Nigeria Ituku/Ozalla, Enugu Email: angelao.ugwu@unn.edu.ng

ABSTRACT

Background: To determine blood banking techniques and availability of facilities for blood product preparations in Nigeria.

Aim and Objectives: To determine the safety of blood and blood products in blood banks in Nigeria; assess the availability of equipment and reagents; and the utilisation of resources to provide for the transfusion needs of our patients.

Materials and Methods: This was a descriptive cross-sectional study of some healthcare professional attendees at the 2018 Annual Scientific Conference of the Nigerian Society for Haematology and Blood Transfusion (NSHBT) in Calabar, Cross River State, Nigeria. A self-administered, structured questionnaire to determine blood

transfusion practice in Nigeria, was used to obtain demographic data of the participants, data on haemovigilance and the availability of resources for the preparation of safe blood and blood components in blood banks across Nigeria. Data was analysed using descriptive and inferential statistics and $p \leq 0.05$ defined the level of significance.

Results: A total of 93 (75.6%) participants responded to the questionnaire out of 119 professionals (consultant haematologists, haematology resident doctors and medical laboratory scientists). None of the participants used Gel-cards or microtitre plates for blood typing in their centres. Less than one fifth (19.4%) and 23.4% reported having either an apheresis machine or a refrigerated centrifuge respectively in their centres, while 25.8% had neither equipment. Majority (52.7%) reported non-functionality of available equipment. The commonest reason given for the nonfunctionality or non-usage of these machines were mechanical breakdown (46/49, 93.9%), lack of reagents (19/49, 38.8%), absence of uninterruptible power supply (17/49, 34.7%), and lack of trained personnel to operate the machines (11/49, 22.4%). All the participants reported nonavailability of cryoprecipitate, while 16.1%, 12.95%, and 12.2% reported availability of fresh frozen plasma, red cell concentrates, and platelet concentrates respectively. Majority (79%) of the participants

that prepared platelet concentrates did so on demand, but did not store them.

Conclusion: Standard blood banking techniques, component therapy and facilities for component preparations are not readily available in most blood banks in Nigeria. Provision of modern blood banking

INTRODUCTION

In recent years, there has been a global advancement in medical practice and techniques. These innovations have also been felt in the blood banking services where several techniques including use of nucleic acid testing, pathogen inactivation of blood components, introduction and use of component therapy and more efficient storage of blood components are currently being practiced.[1,2] The advancement in transfusion services aims to provide safe and available blood products for the increasing number of recipients who require blood transfusion. [3,4] Blood transfusion is, without doubt, a life-saving aspect of healthcare delivery.[5- 7] However, it is not without hazards including red cell alloimmunization, circulatory overload, acute and delayed transfusion reactions and often errors beginning with patient identification and involving the whole transfusion chain.[8,9] These errors must be overcome in order to achieve safe and accessible blood products. Great care should therefore be taken in procuring blood products beginning from donor selection, blood processing, screening for transfusion transmissible infections (TTIs) and blood storage.[10] In Nigeria and other low- and middle-income countries (LMIC), blood is still very much a limited resource.[11] LMIC have myriad of medical conditions

equipment/materials, staff training, and uninterruptible power supply may ameliorate some of the observed drawbacks in blood transfusion services in Nigeria.

Keywords: apheresis, blood typing methods, refrigerated centrifuge, component therapy

requiring urgent blood transfusion including obstetric haemorrhages, sickle cell anaemia and severe malaria.[12] According to the Nigerian National Blood Transfusion Service (NBTS), only about 1.5 million units of blood are used annually in a country with over 150 million population.[13] The World Health Organization (WHO) also estimated that only about 4 million blood units are collected in sub-Saharan Africa (SSA).[14] This is grossly inadequate for its population. There is therefore a very important need to maximise the utilization of every unit of blood donated through adequate screening using standard methods, the use of blood component therapy and proper storage to avoid wastage of these scarce resources. This study aims to determine the safety of blood products in the Nigerian blood banks vis-à-vis the availability of equipment and reagents; and utilisation of available resources for optimum satisfaction of the transfusion needs in Nigerian hospitals. We also aimed at identifying the areas requiring improvement in blood banking services. This will serve as a useful tool for making policies on blood use in Nigeria since blood and its components is a very scarce resource in our environment.

MATERIALS AND METHODS

A descriptive cross-sectional study was conducted in which physicians

(haematologists and haematology resident doctors) and medical laboratory scientists who attended the 2018 Annual Scientific Conference of the Nigerian Society for Haematology and Blood Transfusion (NSHBT) which held in Calabar, Nigeria, participated. The NSHBT is an association of healthcare professionals who provide care in adult and paediatric haematology clinics in Nigeria. Attendees at the conference were from all the six geographical zones of the country: South South, South East, South West, North East, North West, and North Central. A pretested, self-administered, structured questionnaire was given to participants who gave verbal consent. Ethical clearance for this

version 24 for windows. Data was analysed using descriptive and inferential statistics and $p \leq 0.05$ defined the level of significance.

RESULTS

A copy of the questionnaire was given to all the 119 haematologists, haematology resident doctors and medical laboratory scientists at the

study was obtained from the Institutional Review Board of the University of Nigeria Teaching Hospital, Ituku/Ozalla, Enugu, Nigeria. Among the information obtained for socio-demographic characteristics of the respondents were age, sex, religion, and number of years of practice. Other information obtained included: blood banking practices, blood typing methods, screening techniques for infectious diseases, donor screening practices, availability of facilities for component therapy and availability of blood components. The responses of the participants were collated and analysed using Statistical Package for Social Sciences (SPSS Inc. Chicago, Illinois, USA)

conference, however, 93 were returned completely filled, giving a response rate of 75.6%. The respondents were from all the six geopolitical regions of the country as shown in Table 1. Socio-demographic characteristics: The mean age of the participants was 42.3 ± 8.7 (range: 36 - 68) years. They were made up of 42 (45.2%) males and 51 (54.8%) females (Table 1).

Table 1: Socio-demographic Characteristics of participants

Variable	Variable Sub-Group	Frequency n = 93 (%)
Age (years)	31 – 40	16 (17.2)
	41 – 50	23 (24.7)
	51 – 60	39 (41.9)
	61- 70	15 (16.1)
Sex	Male	42 (45.2)
	Female	51 (54.8)
Length of Experience (years)	≤ 10	59 (63.4)
	11- 20	25 (26.9)
	21 – 30	6 (6.5)
	31 – 40	3 (3.2)
Geographical location	South South	19 (20.4)
	South East	16 (17.2)
	South West	23 (24.7)
	North East	10 (10.8)
	North West	14 (5.1)
	North central	11 (11.8)

Blood banking practices: Nineteen (20.4%) participants reported that blood units issued out for transfusion could not be returned to the blood banks if unused. Most participants (74, 79.6%) had no policy in their centres for the length of time that blood units could stay outside the blood bank refrigerator before being returned, if not used. Fourteen (15%) participants reported the adoption of 1 hour, while five (5.4%) adopted 2 hours after which the blood unit would be rejected. Less than one third (28; 30%) reported that they have established haemovigilance protocol in their blood banking practices and 48 (51.6%) reported having a hospital transfusion committee.

Blood typing methods: Majority of the participants (57, 61.3%) used the Tile-method, while (36; 38.7%) used

the Tube-method. None of the participants used Gel-cards or microtitre plate methods for blood typing.

Screening techniques for infectious diseases: All the participants (93; 100%) used the enzyme linked immunosorbent assay (ELISA) technique for screening for transfusion transmissible infections (TTI), such as, HIV, HBsAg and HCV, while 84 (90.3%) used ELISA for syphilis (VDRL) testing. Screening using double test strip was reported by 72 (77.4%), while routine screening using the single rapid test strip was reported by 27 (29.0%).

Blood donor screening practices: Majority of the participants (58, 62.4%) practiced pre-donation screening, while the remaining 35 (37.6%) practiced post-donation screening.

Availability of facilities for component therapy: The availability of facilities for component therapy as reported by participants is shown in Table 2. A total of 69 participants had facilities for blood component preparation. Only 18 participants (19.4%) had an apheresis machine, 22 (23.7%) had a refrigerated centrifuge, 29 (31.2%) had both apheresis and refrigerated centrifuge, while the remaining 24 (25.7%) neither had apheresis nor a refrigerated centrifuge. Of the 18 participants with apheresis machines, four (22.2%) had a functional machine, while of the 22 participants that had refrigerated centrifuges, seven (31.8%) reported at least a functional.

Table 2: Availability and functionality of facilities for blood component

preparation centrifuge each. (Table 2). The commonest reasons for non-functional/unused machines were mechanical fault, 46 (46/49, 93.9%) and lack of reagents, 19 (19/49, 38.8%), respectively. Other reasons given were absence of uninterrupted power supply (17/49, 34.7%) and lack of trained personnel to operate the machines (11/49, 22.4%).

Availability of blood components: All the participants (93, 100%) reported availability of whole blood in their centres. The available components reported included fresh frozen plasma (15, 16.1%), red cell concentrates (12, 12.9%), and platelet concentrates (12, 12.9%). No centre reported availability of cryoprecipitate. Majority (79%) of the participants who prepare platelet concentrates

reported that platelet concentrates were prepared on demand in their centres and thus do not store platelets for a long time. All

participants stored platelets for up to 5 days on a platelet agitator at room temperature.

Table 2: Availability and functionality of facilities for blood component preparation

Facility	Availability n = 93 (%)	Functional (%)	Non-functional (%)
Apheresis machine	18 (19.4)	4 (4.3)	14 (15.1)
Refrigerated centrifuge	22 (23.7)	7 (7.5)	15 (16.1)
Both machines	29 (31.2)	9 (9.7)	20 (21.5)
No machine	24(25.7)	-	-

DISCUSSION

This study documents the blood banking techniques practiced in Nigeria and the availability of facilities for the preparation of blood components. The observations that less than one third (30%) of the participants had established haemovigilance protocols in their centres [18,19] and slightly more than half (51.6%) had a hospital transfusion committee, call for the need to enforce the national policy on blood transfusion, which prescribed these establishments in blood bank facilities in view of their enormous benefits.[20-22] Dahourou et al and Ugwu *et al* noted that transfusion services in Africa are

fraught with many problems and as such haemovigilance was not seen as a priority.[23,24] The transfusion committee no doubt ensures that haemovigilance is maintained throughout the whole transfusion process from the donor to the recipient amongst other functions.

It was observed that no participant reported the use of Gel-cards or microtitre plates for typing blood in their centres. These blood typing methods though expensive give higher quality control and more reliable results.[25-27] This underscores the need for better funding of our blood bank facilities and healthcare institutions in general.

A reassuring observation was that all the participants reported the use of ELISA screening for HIV, HBV & HCV infections. This technique has higher accuracy than the rapid tests, which were less commonly used by centres of some participants. The ELISA technique also has high specificity and sensitivity since the principle is based on antigen-antibody reaction. [28-30]

Blood component therapy has been in practice for years in most

developed countries of the world, [31,32] but our study shows that 31.2% of the participants had both refrigerated centrifuges and apheresis machines for the preparation/processing of blood components in their centres. Majority of the participants reported that platelet concentrates were prepared on demand and thus were not stored at room temperature for a long time. This observation is different from what is commonly obtained in developed countries where platelet

concentrates are stored at room temperature for up to 5-7 days [15-17]. The reason for this practice in Nigeria, may be related to the limited number of functioning apheresis machines and refrigerated centrifuges when compared to developed countries. Other possible reasons could also be due to the shortage of sustainable blood donor pool and unavailability of blood product storage facilities. Consequently, only a few units of platelets concentrates are produced at any given time, which are usually released immediately on request. Considering the importance of these equipment in modern-day blood banking practice, the need to make them available in our blood banks cannot be overemphasized. The high percentage of non-functional equipment due to decay and/or poor maintenance culture in our healthcare system is similar to the report by Okoye et al on the availability of facilities for component therapy in Nigeria. [33]

This study also observed that many blood banks in Nigeria do not have available blood components to transfuse to patients on demand. All participants still transfused whole blood routinely to their patients. This observation is similar to the report by Lund that over 70% patients in Sub-Saharan Africa, are still transfused with whole blood despite its associated enormous risks.[12] The reason for the poor availability of blood products may be because of the limited number of functioning apheresis machines and refrigerated centrifuges, in addition to the lack of relevant equipment and sustainable power supply for the storage of some of these components. Component therapy is highly encouraged because it allows several patients to benefit from one donation, reduces

fluid overload and minimizes adverse reaction from unnecessary transfusion of components not needed by the patient.[34]

The major limitation of this study is that it did not collect data according to individual health facilities. Despite this limitation, the study is very relevant as it has commenced the process of filling the knowledge gap in blood banking techniques and availability of component therapy and facilities for component preparations in Nigeria. The strength of the study also includes the enrolment of participants at the Annual Scientific Conference of the Nigerian Society for Haematology and Blood Transfusion (NSHBT), which is the largest gathering of haematologists in Nigeria.

CONCLUSION

In conclusion, standard blood banking techniques, component therapy and facilities for component preparations are not readily available in most Nigerian blood banks. Provision of modern blood banking equipment/materials, staff training, and uninterrupted power supply may ameliorate some of the observed drawbacks. Establishment of haemovigilance and hospital transfusion committee could help improve the efficiency of the day-to-day running of blood banking services in Nigeria.

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Conflict of Interest:

The authors have no conflicts of interest to declare.

Author's Contributions:

UAO and ECC made substantial contributions to research design, acquisition, analysis and interpretation of data. Both authors were involved in drafting the paper and revising it critically.

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