

Original Article

Pattern of Blood Donation and Characteristics of Blood Donors in Enugu, Southeast Nigeria

AO Ugwu, AJ Madu, CC Efobi¹, OG Ibegbulam

Department of Haematology and Immunology, Faculty of Medical Sciences, College of Medicine, University of Nigeria Ituku/Ozalla Campus, Enugu, Enugu State, ¹Department of Haematology and Immunology, College of Medicine Chukwuemeka Odumegwu Ojukwu University, Awka, Anambra State, Nigeria

ABSTRACT

Background: Despite increasing need for blood donation in medical practice, little is known about pattern of blood donation and characteristics of blood donors in some African populations like Nigeria. This information is necessary in designing strategies and policies for improving blood transfusion services in Africa. **Aim:** The aim of this study is to determine the pattern of blood donation and characteristics of blood donors in Enugu, Southeast, Nigeria. **Materials and Methods:** A cross-sectional study of 3377 blood donors at a tertiary hospital in Enugu, Nigeria from May 1, 2016 to April 30, 2017. Information sought included donors' sociodemographic characteristics; type of blood donor: Voluntary nonremunerated donor (VNRD), family replacement donor (FRD), or paid donor (PD); willingness to become VNRD in the future after counseling and education (at point of entry to blood bank) on its benefits to clinical practice; hemoglobin (Hb) level; and transfusion transmissible infections (TTIs). **Results:** Mean age of blood donors was 28.8 ± 8.5 years, majority were male (3011, 89.2%) and students (1289, 32.8%). FRDs were the highest in number (1998, 59.2%), followed by PDs (746, 22.1%) and finally VNRDs (633, 18.7%). Of the 3377 persons that came for blood donation, 2537 (75.1%) were found eligible to donate while 840 (24.9%) were deferred on account of low Hb (602/3377, 17.8%) or positive infectious screening test (238/3377, 7.0%). The odds of a male donor being a VNRD were about one and half times that of a female donor (582/3011 [19.3%] vs. 51/366 [13.9%]; odds ratio: 1.48; 95% confidence interval: 1.09–2.02; $P = 0.01$). After counseling of FRDs and PDs, majority (54.3%) were willing to become VNRDs in the future. Donors' age >30 years, being of male sex, having tertiary level of education, and being employed were strongly associated with willingness to become VNRDs in the future ($P < 0.001$). **Conclusion:** VNRD made up <20% of the total number of donors in Enugu, Nigeria. There is a need for improvement in public enlightenment on the need for VNRDs and employment opportunities of the populace to improve voluntary blood donation.

KEYWORDS: Blood donation, blood donors, donor characteristics, pattern

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INTRODUCTION

There is a critical need for the use of blood and blood components in the management of clinical conditions such as hemorrhagic shock, trauma, and other clinical states of chronic or acute blood loss.^[1] Donor blood has been used to save many lives and has over the years been improved in its safety to the recipient.

There are several types of blood donors, such as voluntary nonremunerated donors (VNRDs), family

Address for correspondence:

Dr. AO Ugwu,
Department of Haematology/Immunology, Faculty of Medical Sciences, College of Medicine, University of Nigeria Ituku/Ozalla Campus, PMB 01129, Enugu 400001, Enugu State, Nigeria.
E-mail: angelao.ugwu@unn.edu.ng

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replacement donors (FRDs), and paid donors (PDs). Among these, the VNRDs are the safest in terms of possibility of transmission of transfusion transmissible infections (TTIs).^[2-4]

The World Health Organization (WHO) encourages all nations to work toward achieving 100% VNRDs as the major source of blood for transfusion purposes.^[3,4] While we acknowledge the attendant risks of blood transfusion, it is of utmost importance to stress that it is most often a lifesaving process. Blood no doubt is a very precious and scarce commodity and should thus be handled with great care and best practices to avoid wastages.^[5]

At present, many hospital blood banks are unable to meet up with the demands of the hospitals^[4] as they find it difficult to recruit new blood donors and are unable to keep the old donors as regular donors.^[6] Therefore, the blood needed for transfusion services are mainly provided by FRDs who donate blood for their relatives in need. These donations are usually requested by the attending physicians on emergency basis.^[7] There is a paucity of VNRDs in African countries, instead the practice of commercial blood donation or blood touting also known as PDs flourishes in many centers.^[8,9] The issue of paucity of VNRD is not limited to Africa. In 2016, the WHO published a report on blood safety where it reported that “71 countries (22 in Africa, 22 in the Americas, 10 in Europe, 9 in the Eastern Mediterranean, 5 in the Western Pacific, and 3 in Southeast Asia) remained considerably dependent on FRDs and PDs”.^[10]

The availability of VNRDs in any society seems to be related to the level of literacy and knowledge of clinical usefulness of blood and blood products in that society. The possible reasons for poor availability of VNRDs in poor resource settings range from ignorance and religious beliefs to fear of harm or illness following blood donation.^[11]

Despite the remarkable increase in the need for blood donation in medical practice, there is a poor understanding about the pattern of blood donation and characteristics of blood donors in Enugu, Nigeria. This information is required in designing strategies and policies aimed at improving blood donation and transfusion services in the locality. This study was to determine the pattern of blood donation and characteristics of blood donors in Enugu, Southeast Nigeria.

MATERIALS AND METHODS

This was a questionnaire-based cross-sectional study of 3377 consecutive prospective blood donors at the blood donor unit of the University of Nigeria Teaching Hospital (UNTH) Ituku/Ozalla, Enugu state, Nigeria,

from May 1, 2016 to April 30, 2017. The UNTH, Enugu, is a federal teaching hospital in Southeastern Nigeria, located at Ituku-Ozalla town, on the outskirts of Enugu City. It has about 576 beds and an average of 9000 units of blood transfused per annum.

Data were obtained using interviewer-administered questionnaires. The questionnaire was administered at “entry to the blood bank” before the screening was done. The results of the screening tests and hemoglobin were retrieved afterward. The information sought for included the donors’ sociodemographic characteristics: age, sex, educational level, occupation; type of blood donor: VNRD, FRD, or PD; willingness of FRDs and PDs to become VNRDs following counseling and education; hemoglobin (Hb) level estimation; and screening tests for TTIs including human immunodeficiency virus (HIV), hepatitis B virus (HBV), hepatitis C virus (HCV), and syphilis.

As soon as a donor comes into the blood bank, he/she is counseled and interviewed by a registered nurse/counselor whose duty was to take down donor information such as last time he/she donated blood, age, weight, blood pressure, and pulse rate. The counseling aspect was aimed to affirm consent of the donor and discuss sexual habits and practice of blood donation. The FRDs and PDs were further counseled and educated on benefits of VNRDs to clinical practice and society in general. They were encouraged to join the VNRD pool. Pretest and posttest counseling for the TTIs was also included in the counselor’s schedule.

The donor then went into the bleeding room where his or her blood sample was collected for hemoglobin level/packed cell volume and TTIs screening (HIV, HBV, HCV, and syphilis). Those who had negative results from TTIs screening and had Hb concentration of more than 13.5 g/dl (males) or 12.5 g/dl (females) were bled.

The VNRDs were defined as blood donors who donate blood without any relationships to the recipients or remuneration. FRDs are blood donors who donate blood without remuneration but for their family members or friends. PDs are those blood donors who donate blood after receipt of remuneration.^[3,8] The identities of the PDs were discovered during the process of administering the questionnaires. Many of them disclosed easily that they were PDs, however, some were already known as PDs by the blood bank staff. A few that disguised initially as FRDs were later identified and classified as PDs when they could not provide sufficient details regarding the name, relationship, place of origin, place of residence, etc., of their “so-called family members or relatives” who needed the blood transfusion.

Low Hb level was defined as Hb concentration <12.5 g/dl^[3] for females and <13.5 g/dl for males.^[12] The predonation Hb concentration was determined from a sample of capillary blood obtained by pricking the fingertip, using portable hemoglobinometers (HemoCue® 201/301). Occupation of the participants was defined as any job done in order to help earn a living, such as trading or farming, while employment was defined as a “paid job” for which a wage (salary) is paid at specific intervals, for example, monthly.^[13]

An approval for this study was sought and obtained from the Institutional Review Board of UNTH before the commencement of the study. Written informed consent was obtained from each participant before recruitment into the study.

Data obtained were entered into statistical software (SPSS 23.0) and analyzed. Continuous variables were analyzed using the Student's *t*-test. The discrete variables were analyzed using Chi-square or Fisher exact tests and associations expressed using odds ratio and confidence intervals as applicable. All tests were two-sided, and statistical significance was considered to be at probability value of $P \leq 0.05$.

RESULTS

The mean age of the donors was 28.8 ± 8.5 (range: 19–56 years). Majority of the participants were male (3011/3377, 89.2%). Majority had tertiary education (2137/3377, 63.3%) and students constituted the largest proportion (1289/3377, 32.8%). The number of the unemployed donors was 1497 (44.30%). Details of the sociodemographic characteristics of the donors are as shown in Table 1.

The FRDs were the highest (1998/3377, 59.2%), followed by PDs (746/3377, 22.1%) and finally VNRDs (633/3377, 18.7%). Of the 3011 male donors, FRDs, PDs, and VNRDs accounted for 55.9% ($n = 1683$), 24.8% ($n = 746$), and 19.3% ($n = 582$), respectively. On the other hand, the distributions of 366 (10.8%) female donors were FRD 86.1% ($n = 315$), PDs 0% ($n = 0$), and VNRDs 13.9% ($n = 51$). The odds of a male donor being a VNRD about one and half times that of a female donor [582/3011 (19.3%) vs. 51/366 (13.9%); odds ratio (OR): 1.48; 95% confidence interval (CI): 1.09–2.02; $P = 0.01$].

Overall, male donors accounted for 49.8% (1683/3377), 22.1% (746/3377), and 17.2% (582/3377) of FRDs, PDs, and VNRDs, respectively, while female donors accounted for 9.3% (315/3377), 0% (0/3377), and 1.5% (51/3377) of FRDs, PDs, and VNRDs, respectively.

After counseling of the FRDs (males), PDs (males) and FRDs (females) on the benefits of VNRDs to clinical practice and society in general, majority (1489/2744, 54.3%) of them were willing to become VNRDs in the future while 45.7% (1255/2744) insisted they would not. The reasons given by those participants not willing to become VNRDs ($n = 1255$) in future included: Personal/private reasons (533/1255, 42.5%), economic reasons (512/1255, 40.8%), and because they would not want nonrelated patients to use their blood (210/1255, 9.7%).

Age, sex, educational level, and employment status of the donors were strongly associated with willingness to become VNRDs in future ($P < 0.001$). Details are as shown in Table 2.

Majority of the donors belonged to the O Rhesus (Rh)-positive blood group (1985/3377, 58.8%), followed by the A Rh-positive (702/3377, 20.8%). The AB Rh-negative blood group constituted the least (3/3377, 0.1%). Majority of the donors' Hb concentration was between 13 and 15 g/dl (2737/3370, 81.0%). Details of the donors' Hb level distribution are as shown in Table 3.

The mean Hb level of all the donors was 13.7 ± 2.3 (range: 10.3–15.4) g/dl. However, the mean Hb level of the donors that were bled was 13.9 ± 2.7 (range:

Table 1: Sociodemographic characteristics of the blood donors

Variable	Frequency	(%)
Age (years)		
18-27	1819	55.0
28-37	1071	31.7
38-47	336	9.9
48-57	111	3.3
Sex of donors		
Male	3011	89.2
Female	366	10.8
Educational level		
Primary	53	1.6
Secondary	1187	35.1
Tertiary	2137	63.3
Occupation		
Students	1289	38.2
Civil servants	591	17.5
Artisans	567	16.8
Traders	441	13.1
Clergy	252	7.5
Jobless	237	7.0
Employment status		
Employed	591	17.5
Unemployed	1497	44.3
Students	1289	38.2

Table 2: Donors' variables associated with willingness to become voluntary nonremunerated donors after education and counselling (n=2744)

Variable	Variable sub-group	Willingness		P	OR (CI 95%)
		Yes (%)	No (%)		
Age (years)	>30	594 (63.0)	349 (37.0)	<0.001	2.11 (1.80-2.48)
	≤30	804 (44.6)	997 (55.4)		
Sex	Males	1309 (53.2)	1150 (46.8)	<0.001	2.43 (1.87-3.15)
	Females	91 (31.9)	194 (68.1)		
Level of education	Tertiary education	1065 (59.1)	737 (40.9)	<0.001	2.61 (2.21-3.07)
	≤ secondary education	335 (35.6)	607 (64.4)		
Occupation*	Employed	211 (71.3)	85 (28.7)	<0.001	2.80 (2.14-3.68)
	Unemployed	703 (47.0)	794 (53.0)		

*significant = < 0.001. The 951 students who were not VNRDs excluded from analysis. VNRDs=Voluntary non-remunerated donors; OR=Odds ratio; CI=Confidence interval

Table 3: Distribution of donors' haemoglobin levels

Haemoglobin concentration (g/dl)	Frequency	Percentage
7-9	12	0.4
10-12	427	12.6
13-15	2737	81.0
16-18	201	6.0

12.5–16.4) g/dl: Males 14.1 ± 2.2 (range: 13.5–16.4) g/dl and females 12.8 ± 2.4 (range: 12.5–14.9). More than one-tenth of the donors (602/3377, 17.8%) were disqualified (deferred) from donating blood due to low Hb level. The mean Hb level of the deferred donors was 10.9 ± 1.8 (range: 8.7–13.3) g/dl: Males 11.3 ± 2.1 (range: 10.2–13.3) g/dl, females 10.5 ± 1.7 (range 8.7–12.2) g/dl. Among the 602 deferred donors due to low Hb level, 68.9% (415/602) were males, equivalent to 13.8% (415/3011) of the total male donors, while 31.1% (187/602) were females, equivalent to 51.1% (187/366) of the total female donors.

On the other hand, less than one-tenth (238/3377, 7.0%) were deferred due to positive screening test for TTIs: HBV (132/3377, 3.9%), HCV (71/3377, 2.1%), HIV (21/3377, 0.6%), and syphilis (14/3377, 0.4%). Three donors (3/3377, 0.09%) were deferred due to HBV and HCV co-infection, and one (1/3377, 0.03%) due to HIV and HBV coinfection.

DISCUSSION

This study found that less than one-fifth (18.7%) of blood donors in Enugu, Nigeria, are VNRDs and that approximately one quarter of the donors (24.8%) are deferred due to low Hb or TTIs. The study noted that majority (55%) of the donors fell within 18–27 years age bracket. This age group which is usually made up of students is similar to findings by Pondei *et al.* in Bayelsa, Nigeria in 2014,^[4] Ekwere *et al.* in South–South Nigeria in 2014,^[14] Song *et al.* in Western China in 2014,^[15] and Garg *et al.* in Kumaon Region of Uttarakhand

in 2014.^[16] It suggests that campaigns to increase the donor population should strongly consider the youths in this age bracket. However, such campaigns should extend to older populations as they also have capacity to donate blood. The unemployed constituted as much as 44.7% while the employed constituted only 17.5% suggesting that encouraging the employed to become blood donors via public enlightenment campaigns could improve the donor population in the study area. Females formed the minority (10.8%) of the donor population with female-to-male ratio of 1:8. This observation is not different from findings from Kaoje *et al.* in Sokoto in 2017,^[17] Anyanwu-Yeiyi *et al.* in Ibadan in 2015,^[18] Erhabor *et al.* in Sokoto in 2013,^[19] and Salaudeen and Odeh in Ilorin in 2011.^[20] who noted a similar pattern. The reasons for this wide discrepancy in male to female ratio may not be unconnected to lower Hb values recorded by the women, and to the general lack of awareness in most populations that females could donate blood.^[12,14] It could also be due to the erroneous perception that females are not fit to donate blood because of their cyclical menstrual periods.^[12,14] No doubt many families shield their female ones from donating blood because of their misconceptions that because females lose blood during menstruation and pregnancy they would always not have adequate Hb level for blood donation.^[18] According to Anyanwu-Yeima in Ibadan in 2015,^[18] the erroneous assumption that males are healthier than females may also discourage women from donating blood. This study also observed that the odd of a male donor being a VNRD was about one and half times that of a female donor. This observation is different from the study by Anyanwu-Yeima *et al.* in Ibadan in 2015^[18] where it was observed that the odd of a female being a VNRD was three times that of a male donor.

The reason for this difference in sex disposition to VNRD is difficult to explain, and may need further studies.

The commonest blood group observed amongst the donors was O Rh D positive, similar to observations by

Arshad *et al.* in Pakistan in 2016,^[21] and Song *et al.* in Western India in 2013.^[15] Nevertheless, some authors have observed B Rh D-positive blood group to be most prevalent.^[16,22] These differences may be due to genetic variations in blood group antigens amongst the different study populations.

A significant number (17.8%) of the potential blood donors were deferred due to low Hb levels. This figure is higher than 10% “low Hb deferral” observed by Mast in 2014^[12] in a review of demographics of “low Hb deferrals” in blood donors.

Another reason may be due to the high proportion of PDs (22.1%) in this study. These individuals may have poor nutritional habits or underlying illnesses which were beyond the scope of this study. However, there is a need for improvements in nutritional status of people in the study area through health education so as to improve their eligibility for blood donation. Furthermore, it was observed that over half (51.1%) of the total female donors were deferred due to low Hb level. This may largely be due to the cutoff value of 12.5 g/dl used as “low Hb level” for the females. This Hb level which is higher than 12.0 g/dl used in a related study by Pondei *et al.* in Bayelsa, Nigeria in 2013,^[4] may have excluded some healthy women who may not be anemic from donating blood. Furthermore, the possible impact of pregnancy and lactation on women’s Hb levels has been noted by previous authors.^[18] This suggests that any efforts at improving the eligibility of women to donate blood in the study population should also consider improving their Hb level through nutrition education. TTIs were among the reasons for deferrals in this study. Infections by HBV and HCV were prevalent, while HIV and syphilis were rare, similar to reports by Ekwere *et al.* in South-South Nigeria in 2014,^[14] Garg *et al.* in Kumaon Region of Uttarakhand, in 2014,^[16] and Mast *et al.* in 2010.^[23] However, a study by Eboumbou-Moukoko *et al.* in 2014^[24] found syphilis to be the most common TTI in Cameroon. The reason for the rare incidence of syphilis among the donors in the study population is difficult to explain. However, a study by Ikeako *et al.* in Southeast, Nigeria in 2014, found a very low prevalence of syphilis (0.08%) among pregnant women attending antenatal care.^[25] This suggests that the prevalence of syphilis may be low in the general population of Enugu state. There was no deferral on account of co-TTIs (coinfections) in this study, similar to observation by Pondei *et al.* in Bayelsa, Nigeria in 2014.^[4]

With respect to the type of donors, FRDs ranked highest in this study, similar to previous studies from developing countries: Ekwere *et al.* in Uyo, South-South

Nigeria in 2014,^[14] and Garg *et al.* in Kumaon Region of Uttarakhand, in 2014.^[16] However, the proportion contributed by FRDs in this study (59.2%) is much less compared the previous studies by Ekwere *et al.* in Uyo, South-South Nigeria in 2014^[14] (89.1%), and Garg *et al.* in Kumaon Region of Uttarakhand, in 2014^[16] (99.7%). The lower rate of FRDs recorded in this study may be due to the availability of commercial PDs in the study center. This type of donors constituted a whole 22.1% of the total blood donors. This high percentage of PDs was also observed in Benin, Nigeria, by Enosolease *et al.* in 2004^[26] and Nwogoh *et al.* in 2013.^[27] The PDs are readily available and often hang around the hospital blood bank premises, scouting for patients who may need blood donors.

Despite the WHO recommendation that all nations should work towards achieving 100% VNRDs as source of blood for transfusion purposes,^[3] VNRDs constituted less than one-fifth (18.7%) of the total blood donors in the study population. This suggests the need for vigorous public enlightenment campaigns in order to dispel the current misconceptions surrounding blood donation in our environment. This measure would help increase the willingness of people to donate blood voluntarily without any remuneration. Interestingly, this study observed that over half (54.3%) of the FRDs and PDs are willing to become VNRDs in future following education and counseling on the benefits of becoming VNRDs to clinical practice and society. This observation is further supported by the finding that FRDs and PDs who have been educated to tertiary level are more likely to become VNRDs in future than those whose education had been limited to primary and/or secondary level. It is likely that donors with higher education are more likely to appreciate the benefits of becoming VNRDs to clinical practice and society in general. The observation of a significantly higher willingness to become VNRDs among the employed donors may be related to the expected effect of income on certain human decisions.^[13]

The limitation of this study includes the fact that it was carried out in one hospital and as such limits generalization of the findings to the entire population.

CONCLUSION

VNRD made up <20% of the total number of donors in our study. However, majority of FRDs and PDs are willing to become VNRDs in future. Thus, public enlightenment campaigns should be carried out to improve awareness and ultimately increase the number of VNRD in Enugu, Nigeria.

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Conflicts of interest

There are no conflicts of interest.

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