Rural-urban variation in willingness to donate blood in Ibadan Region, Nigeria

Faithwin I. Gbadamosi[1]*, **Yusuf Popoola[2]***, **Femi Olaniyan[1]#**, **Ridwan O. Adesola[3]#** and **Brigid Unim[4]**

[1]*Department of Geography, University of Ibadan, Ibadan, Nigeria*
[2]*Department of Computer Science, Adeleke University, Ede, Nigeria*
[3]*Department of Veterinary Medicine, University of Ibadan, Ibadan, Nigeria*
[4]*Dipartimento Malattie Cardiovascolari, Endocrino-metaboliche e Invecchiamento, Istituto Superiore di Sanità, Rome, Italy*
*Co-first Authors. These Authors contributed equally to this work
#Co-second Authors. These Authors contributed equally to this work

Abstract
Background. Although there are ongoing blood donation campaigns in Nigeria, the prevalence of voluntary blood donation is about 10% and there is limited information about the determinants of blood donation behavior, especially across rural-urban geographic areas. This study examines the rural-urban differences in willingness to donate blood.
Method. A cross-sectional study addressing adults from three rural and three urban communities was performed in 2021 to evaluate willingness, knowledge, attitude and practice of blood donation.
Results. A total of 287 individuals were surveyed. Most of the respondents across all communities have never donated blood (72%). Females aged 18-25, highly educated, and from urban communities were more incline to donate blood compared to their counterparts. The main reasons for not donating blood for rural dwellers were: never thought of it (39% *vs* 34.7%) and no one asked (34.4% *vs* 17%); fear of needles was declared mostly by urban dwellers (21.8% *vs* 12.5%) (p=0.02).
Conclusions. Willingness to donate blood varies across rural and urban communities and is influenced by socio-demographic characteristics. The gap between willingness to donate and actual blood donation has consequences for the establishment of blood transfusion services. Targeted public health interventions are required to enhance awareness and knowledge and modify attitudes towards blood donation.

INTRODUCTION

Blood donation, the process of collecting, testing, preparing, and storing blood and blood components from a donor and transfusing to another person (the recipient), is the main means of acquiring blood in emergencies, major surgeries, and blood-related obstetric complications [1]. It is an indispensable component of healthcare that saves millions of lives each year in both routine and emergency medical practices and permits complex medical and surgical interventions to improve life expectancy and reduce human afflictions [2]. Although the demand for blood transfusion far exceeds the supply, advanced medical technologies and the availability of more donors have improved healthy

life expectancy [3]. The strategy recommended by the World Health Organization (WHO) to ensure the availability of safe blood supply worldwide is to promote blood donations from voluntary unpaid donors [4]. However, the goal of "100% voluntary non-remunerated donation of blood and blood components" set for 2020 has not been achieved yet [5].

In developing countries, chronic blood shortage is common and blood donations are largely dependent on blood provided by families or friends of patients who require transfusion [3]. Willingness to donate blood is mostly high in developed countries and generally low in developing countries. The average blood donation rate in high income countries is 31.5/1,000

Address for correspondence: Brigid Unim, Dipartimento Malattie Cardiovascolari, Endocrino-metaboliche e Invecchiamento, Istituto Superiore di Sanità, Via Giano della Bella 34, 00162 Rome, Italy. E-mail: brigid.unim@iss.it.

population and 5.0/1,000 population in low income countries [4].

In the African region, blood requirements were estimated at 8 million units in 2006, but only 3.2 million units were collected – about 41.5% of the demand [6]. According to the Nigeria's National Blood Transfusion Service (NTBS), the prevalence of voluntary blood donation in Nigeria is 10% [7], *i.e.*, only four in 1,000 people are voluntary donors although up to half of the total population are medically fit to donate [8]. According to the WHO, with over 200 million population, Nigeria needs an average of 1.8 million pints of blood annually [7], but the NBTS collects only 500,000 pints of blood every year, leaving a shortfall of about 73%. Moreover, only about 25,000 blood units sourced exclusively from voluntary donations of unpaid blood donors were collected, screened and distributed in 2019 and 2020 [9]. Nigeria has not been able to bridge the gap between the demand and supply of blood transfusion [7]. Therefore, it is essential to find the motivating factors among the current donors and the deterrents towards blood donation among nondonors. An empirical examination of whether socio-demographic and attitudinal factors influence the willingness to donate blood in the future, especially across rural-urban geographic areas, has not been adequately performed. The aim of this study is therefore to examine the rural-urban variation in the willingness to donate blood and to examine if the variation is associated with socio-demographic variables, attitudes, and personal motivators, incentives, or concerns in Ibadan region (southwest Nigeria).

MATERIALS AND METHODS

Data were collected among active blood donors, infrequent blood donors, and nondonors, using a pre-tested and structured interviewer-administered questionnaire *(available online as Supplementary Material 1)*. The questionnaire was composed of six sections. The first section was designed to collect information on the respondents' residential area. The second section collected information on socio-demographic characteristics, including gender, age, ethnicity, occupation, education, religion, income, and marital status. The third section collected data on respondents' history of blood donation, reasons for donating or not donating blood, and frequency of blood donation. The fourth section evaluated respondents' blood donation knowledge according to four items: i) knowledge of blood donation; ii) categories of people that can donate blood; iii) appropriate age for blood donation; and iv) blood donating centers. The fifth section collected information on respondents' attitudes and perceptions towards blood donation. Responses were graded on a 5-point Likert-type scale; namely, strongly agree, agree, undecided, disagree, and strongly disagree. The last section assessed respondents' willingness to donate blood, which was ranked based on categories: Yes, Maybe, and No. A question was designed to collect information regarding respondents' opinions on factors or motivational determinants that influence blood donation.

The first version of the questionnaire was administered to 10 randomly selected participants to test and refine the questions for clarity and comprehensiveness. The items were slightly edited after the pre-test. The final version of the questionnaire was administered from August to September 2021. Questionnaires were shared from house to house in each community, and all respondents were contacted personally. Oral consent was obtained from each participant prior to the survey. According to departmental rules, the approval of the lead researcher's advisor was the only required approval to conduct the study, and this was properly obtained.

Sample size and sampling

A multi-stage sampling method was used to select the study subjects for the quantitative survey. The total population of Ibadan region, based on the last official national population census in 2006, is 1,991,367 with an annual growth rate of 3.5% per year; the total population of Ibadan for the year 2021 is an estimated 3,552,000 [10]. Two Local Government Areas (LGAs), *i.e.*, Ibadan North and Akinyele representing urban and rural spatial areas respectively, were randomly selected from the list of 11 LGAs in the Ibadan region. Three communities were selected randomly from each of the LGAs. This was followed by the selection of random samples of neighborhoods at a regular interval of 2 buildings. Finally, an individual was selected randomly from the eligible adult population (18-60 years of age) in the selected households and was interviewed. Participants were considered eligible only on the basis of their age group, their medical conditions were not taken into account.

The selected communities differed significantly in population size; hence, a stratified proportional sampling technique was used to determine the sample size of the study. The population of the last census for each of the selected urban and rural communities, as well as the projected population, are reported in *Table 1S available online as Supplementary Material*. The projected population was used in calculating the sample size for each community. The six communities were divided into two population subgroups, which included group 1: population size of 20,001-40,000, and group 2: population size of 100-20,000. To obtain a realistic sample representation for each area, sampling ratios of 0.2% and 10.0% were used for urban and rural communities respectively.

Statistical analysis

Data were entered into the IBM statistical software SPSS v.26.0 for Windows (SPSS Inc. Chicago, Illinois, USA). Descriptive statistics (frequencies and percentages) was used to examine all variables in the study. The differences between urban and rural communities were calculated with the Chi-squared test. A binary logistic regression analysis, with backward elimination, was performed to assess the association between the dependent variable *willingness to donate blood* and the following covariates: *sex, age, ethnicity, marital status, educational qualification, occupation, religion,* and *urban-rural communities*. The crude (cOR) and adjusted (aORs) odds ratios of the covariates were calculated with 95% confidence interval (CI 95%). The analysis was carried out at the $p<0.05$ significance level. The model's goodness of

fit was evaluated using the Hosmer and Lemeshow Test [11]. Reliability, the measure of internal consistency of the constructs in the study, was assessed using Cronbach's alpha (α).

RESULTS

The highest value of Cronbach's alpha was obtained for the section on willingness to donate blood with 4 items (alpha=0.759), followed by willingness and knowledge sections with 7 items (alpha=0.640). Cronbach's alpha value above 0.6 is generally acceptable [12].

General characteristics of the sample

A total of 312 copies of the questionnaire were administered and 287 were retrieved, with a 92% response rate. Of the 287 respondents *(Table 1)*, the majority were from urban communities (69.7% *vs* 30.3%; p<0.001). Most respondents were male, especially in urban areas (75% *vs* 65.5%). Individuals aged 18-25 years (72.5%) were the majority in urban areas, while those aged 34-40 years (31%) were predominant in rural communities (p<0.001). A large proportion of the respondents were from the Yoruba ethnic group (79%)

Table 1
Socio-demographic characteristics of the respondents across rural and urban communities

Socio-demographic characteristics		Urban (N=200) N (%)	Rural (N=87) N (%)	p-value
Sex	Male	150 (75.0)	57 (65.5)	0.11
	Female	50 (25.0)	30 (34.5)	
Age	18-25	145 (72.5)	17 (19.5)	<0.001*
	26-33	22 (11.0)	13 (14.9)	
	34-40	17 (8.5)	27 (31.0)	
	41-48	12 (6.0)	22 (25.3)	
	>49	4 (2.0)	8 (9.2)	
Ethnicity	Yoruba	158 (79.0)	71 (81.6)	0.22
	Igbo	29 (14.5)	15 (17.2)	
	Hausa	8 (4.0)	0 (0.0)	
	Others	5 (2.5)	1 (1.1)	
Marital status	Single	153 (76.5)	23 (26.4)	<0.001*
	Married	45 (22.5)	61 (70.1)	
	Divorced	0 (0.0)	2(2.3)	
	Widowed	2 (1.0)	1(1.1)	
Educational qualification	No formal education	3 (1.5)	2 (2.3)	<0.001*
	Qur'anic	8 (4.0)	5 (5.7)	
	Primary	3 (1.5)	13 (14.9)	
	Secondary	65 (32.5)	40 (146.0)	
	Tertiary	120 (60.0)	27 (31.0)	
	Others	1 (0.5)	0 (0.0)	
Religion	Christianity	152 (76.0)	54 (62.1)	0.05
	Islam	45 (22.5)	31 (35.6)	
	Others	3 (1.5)	2 (2.3)	
Occupation	Farming	12 (6.0)	11 (12.6)	<0.001*
	Artisan	22 (11.0)	17 (19.5)	
	Civil/public servant	34 (17.0)	20 (23.0)	
	Trading/business	45 (22.5)	27 (31.0)	
	Student/unemployed	87 (43.5)	12 (13.8)	
Income (N=84)	<25,000	26 (40.0)	10 (52.6)	0.13
	26,000-50,000	26 (40.0)	5 (26.3)	
	51,000-75,000	5 (7.7)	0 (0.0)	
	76,000-100,000	6 (9.2)	1 (5.3)	
	>101,000	2 (3.1)	3 (15.8)	

*p<0.05.

and Christians (76%), particularly in urban areas. Regarding marital status, most respondents in urban areas were single (76.5%) while married participants (70%) were predominant in rural areas (p<0.001). Higher educational qualifications (tertiary education) were achieved by individuals residing in urban areas compared to their counterparts (60% *vs* 31%; p<0.001). The most encountered occupational category in urban communities was student/unemployed (43.5%), as opposed to rural communities where trading/business (31%) was the most common category (p<0.001). Information about income was provided by 84 (29.3%) of the sample, of which 65 (80%) urban dwellers declared an annual income ranging from less than 25,000 to 50,000 Nigerian Naira (NGN). Most rural dwellers (52.6%) declared an income under NGN 25,000/year.

Knowledge of blood donation

Regarding knowledge of blood donation, 167 (83.5%) in urban and 73 (83.9%) in rural communities declared that they had heard about blood donation *(Figure 1a)*. Most respondents (80.5% urban and 87.4% rural) stated that both females and males can donate blood. However, more urban respondents did not know who could donate blood compared to rural respondents (13% *vs* 2.3%; p=0.03) *(Figure 1b)*. Adult age resulted the most appropriate for blood donation across communities (85% urban and 83.9% rural). The second appropriate period for blood donation was during childhood according to 24 (12%) of urban participants, while 9 (10.3%) of rural participants indicated the elderly age (p=0.01)

(Figure 1c). Most respondents knew where to donate blood, especially those in rural communities (78.2% *vs* 57.5%; p=0.001) *(Figure 1d)*.

Practice of blood donation

Most of the respondents across all communities have never donated blood (72%). In urban areas, 53 (26.5%) of respondents had donated blood, likewise for 23 (26.4%) in rural communities. The most prominent reason for not donating blood *(Figure 2)*, especially for rural dwellers, was that they never thought of it (39.1% *vs* 34.7%). Another reason for most rural respondents was that no one asked them (34.4% *vs* 17.0%), while fear of needles was indicated mostly by urban respondents (21.8% *vs* 12.5%) (p=0.02). Of 76 (26.5%) blood donors in the sample, 36 (47.4%) donated for relatives or friends, 34 (44.7%) on voluntary basis and 6 (7.9%) in exchange for a remuneration. Among blood donors, 52 (68.4%) had donated only once.
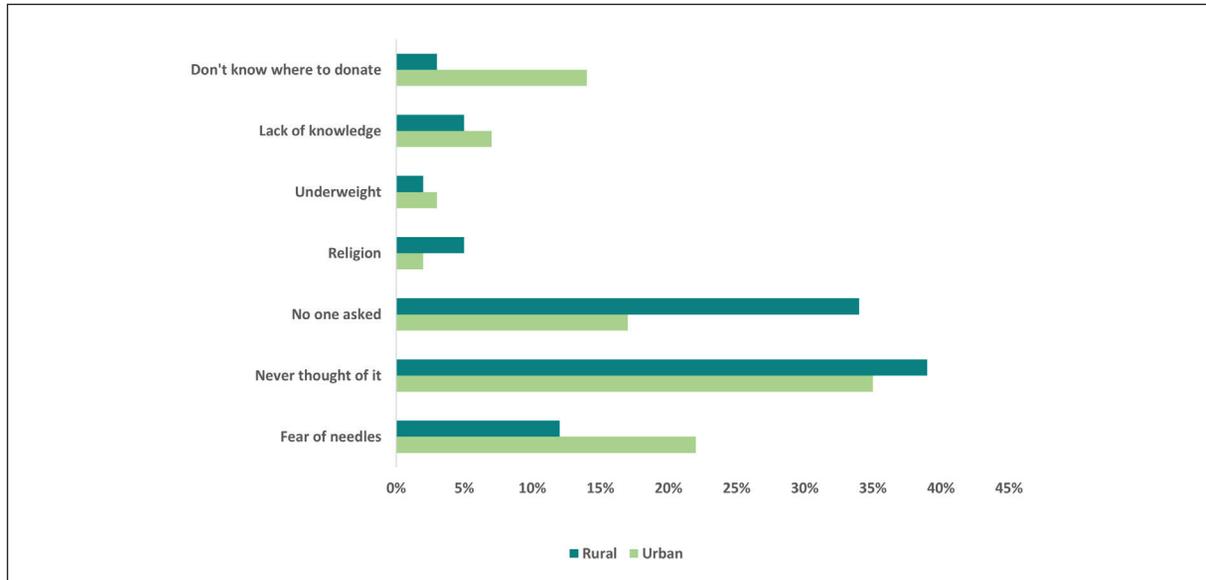
Attitude and perception toward blood donation

The majority of the sample considered blood donation a safe practice (90% and 86.2%) and agreed that blood donation should be encouraged (91% and 81.6%) in both urban and rural settings respectively *(Table 2)*. Regarding the statement "donating blood can save other people's lives", most participants agreed but 14 (7%) of urban respondents were undecided and 4 (4.6%) of the rural participants disagreed (p=0.007). Most respondents from rural areas declared that blood donors should be paid (82.8% *vs* 48.5%; p<0.001).
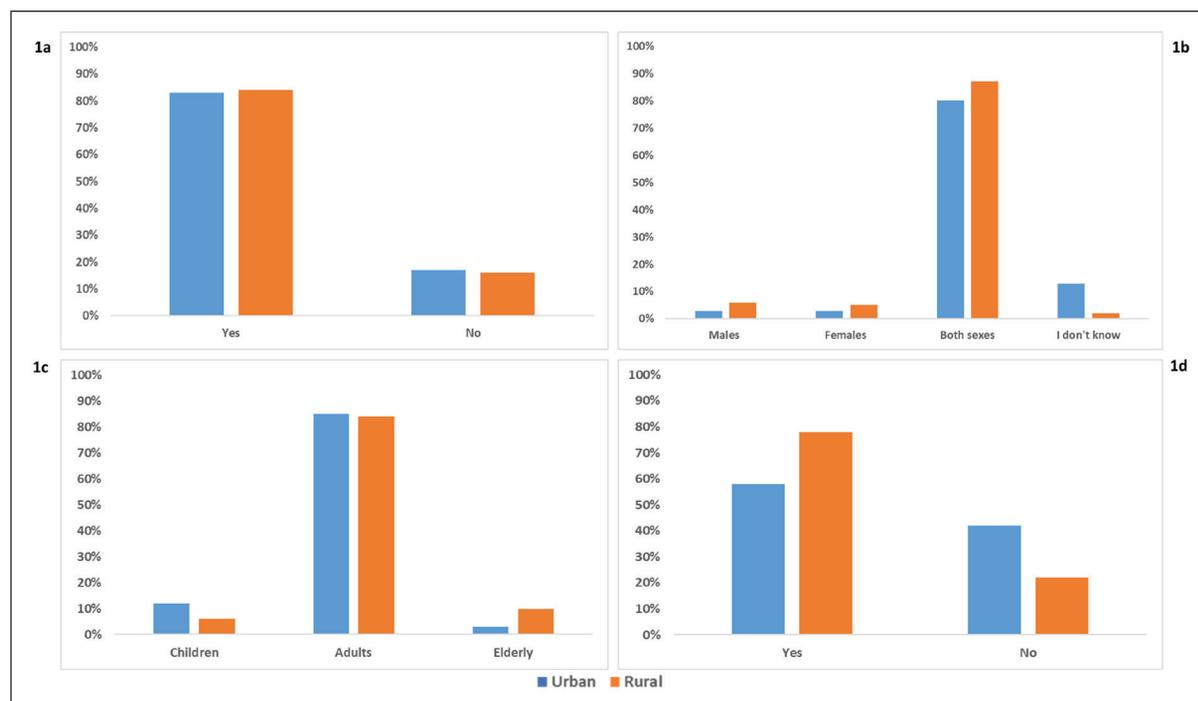
Figure 1
Knowledge of blood donation.
1a: awareness of blood donation; 1b: individuals that can donate blood; 1c: appropriate age for blood donation; 1d: knowledge of blood donation venues.

Figure 2
Urban-rural reasons for not donating blood.

Table 2
Attitude and perception towards blood donation in urban and rural communities

Attitudinal statement	Urban N (%)			Rural N (%)			
	Agree	**Disagree**	**Undecided**	**Agree**	**Disagree**	**Undecided**	**p-value**
Blood donation is safe	180 (90.0)	8 (4.0)	12 (6.0)	75 (86.2)	4 (4.6)	8 (9.2)	0.59
Donating blood can save other people's lives	184 (92.0)	2 (1.0)	14 (7.0)	83 (95.4)	4 (4.6)	0 (0.0)	0.007*
Blood donation causes health problems for the donor	39 (19.5)	100 (50.0)	61 (30.5)	15 (17.2)	54 (62.1)	18 (20.7)	0.14
People should be paid for donating their blood	97 (48.5)	41 (20.5)	62 (31.0)	72 (82.8)	10 (11.5)	5 (5.7)	<0.001*
Blood donation should be encouraged	182 (91.0)	5 (2.5)	13 (6.5)	71 (81.6)	6 (6.9)	10 (11.5)	0.06

*p<0.05.

Willingness to donate blood

Most urban dwellers were willing to donate blood (67% *vs* 58.6%; p=0.03) and declared that relatives or friends should not be the only recipients (62.5% *vs* 51.7%; p=0.03) *(Table 3)*. However, rural dwellers were more willing to donate blood to anonymous recipients (57.5% *vs* 46%; p=0.01) but were less incline to donate without any form of remuneration (41.4% *vs* 13.5%; p<0.001). The respondents were willing to encourage their relatives to donate blood, particularly the urban dwellers (66.5% *vs* 50.6%; p=0.001).

In the logistic regression analysis *(Table 4)*, three statistically significant factors associated with willingness to donate blood were retained in the final model: ethnicity, occupation, and rural-urban community. Respondents from the Yoruba ethnic group (cOR=0.16, aOR=0.20) and students/unemployed (cOR= 0.43, aOR=0.35) seem to be less prone to donate blood, while respondents from urban communities are more incline to donate blood (cOR=2.39, aOR=3.25) compared to their counterparts considered as reference.

Although not statistically significant, the analysis showed that females (cOR=2.22; aOR=2.02), 18-25 years old (cOR=0.82, aOR=1.25), with high educational qualification (cOR=1.74; aOR=1.94) are more likely to donate blood. Singles (cOR=0.74; aOR=0.68) and Christians (cOR=1.06; aOR=0.70) seem to be less prone to blood donation. The Hosmer and Lemeshow Test gave a good value for the regression model, p=0.868.

For most participants, especially rural dwellers, offering incentives could encourage people to donate blood (85.1% *vs* 67.5%; p=0.002).

DISCUSSION

Addressing the concerns related to blood donation might help to bridge the gap between supply and demand. To this end, great importance has been placed on understanding the determinants of blood donation behavior [13]. The analysis of socio-demographic and motivation-related variables associated with the willingness to donate blood is considered one of the decisive

Table 3
Willingness to donate blood across urban and rural communities

Variables	Urban N (%)			Rural N (%)			
	Yes	Maybe	No	Yes	Maybe	No	p-value
Are you willing to donate blood if required?	134 (67%)	44 (22)	22 (11)	51 (58.6)	16 (18.4)	20 (23.0)	0.03*
Do you think blood should be donated ONLY for relatives/friends?	26 (13)	49 (24.5)	125 (62.5)	22 (25.3)	20 (23.0)	45 (51.7)	0.03*
Are you willing to donate blood for anonymous persons?	92 (46.0)	71 (35.5)	37 (18.5)	50 (57.5)	16 (18.4)	21 (24.1)	0.01*
Are you willing to donate blood without any form of remuneration?	109 (54.5)	64 (32.0)	27 (13.5)	38 (43.7)	13 (14.9)	36 (41.4)	<0.001*
Are you willing to encourage your family and friends to donate if necessary?	133 (66.5)	61 (30.5)	6 (3.0)	44 (50.6)	31 (35.6)	12 (13.8)	0.001*

*p<0.05.

Table 4
Results of the binary regression analysis with willingness to donate as the dependent variable

Covariates		Crude OR (95% CI)	Adjusted OR (95% CI)
Sex	Male (reference)	1	1
	Female	2.22 (0.93-5.31)	2.02 (0.79-5.15)
Age	>26 (reference)	1	1
	18-25	0.82 (0.42-1.60)	1.25 (0.38-4.08)
Ethnicity	Not Yoruba (reference)	1	1
	Yoruba	0.16 (0.04-0.67)	0.20 (0.04-0.87)
Marital status	Married (reference)	1	1
	Single	0.74 (0.37-1.47)	0.68 (0.24-1.91)
Educational qualification	*Low (reference)	1	1
	**High	1.74 (0.72-4.24)	1.94 (0.70-5.38)
Religion	Other religions	1	1
	Christianity	1.06 (0.51-2.19)	0.70 (0.30-1.62)
Occupation	Workers	1	1
	Students/unemployed	0.43 (0.22-0.86)	0.35 (0.16-0.77)
Community	Rural	1	1
	Urban	2.39 (1.20-4.74)	3.25 (1.49-7.09)

*Low, qur'anic and primary education; **High, secondary and tertiary education.

elements for the understanding of these determinants [14]. With the aim to close the knowledge gap, the present study examined the factors associated with the willingness to donate blood across urban and rural dwellers in Ibadan region. According to findings, geographical area (urban or rural), ethnicity and occupation are significantly associated with willingness to donate blood. In other words, students/unemployed are less prone to donate blood while urban dwellers and non-Yoruba ethnic groups are more incline to blood donation. Likewise, though non statistically significant, females aged 18-25 years, with high educational level are more likely to donate blood. Young age, high educational level [13, 15, 16] and female gender [16] have also been found in other studies as main factors associated with the intention to donate blood. Generally, individuals of younger age have higher educational qualification than

the elderly, therefore the main influencing factor on the intention to donate blood could be education rather than young age. Similarly for the geographic area, individuals with higher academic achievements are mostly urban dwellers, hence urban communities are associated with higher willingness to donate blood. It was also observed that rural dwellers are not aware that donating blood can save other people's lives. Targeted public health interventions to improve knowledge about blood donation, especially in rural areas and among the disadvantaged population (*e.g.,* unemployed, elderly) are required.

According to the findings, non-Yoruba ethnic groups (*i.e.,* Igbo, Hausa) were more incline to blood donation. This is in contrast with the study by Salaudeen *et al.,* 2019 where Yoruba ethnic groups were more likely to donate blood [13]. This could be related to the different

composition of the samples. Although Yoruba ethnic group was predominant in the two studies, the present study had more students/unemployed participants that are less likely to donate blood. The study by Salaudeen *et al.*, 2019 [13] was composed mostly of traders/farmers and civil servants/professionals.

There is a gap between willingness to donate blood in the future and effective blood donation across the communities. Although the willingness is high, blood donors were about 26% of the sample and the majority have donated only once and mainly for relatives or friends. In accordance with the present findings, positive attitudes towards blood donation have been found in the literature [1, 17, 18]. Nonetheless, a substantial portion of the population was not willing to donate blood [1, 18, 19]. This is related to the fact that the intention to donate blood is complex and influenced by individual and social factors, such as the desire to be useful and help others, but also by the desire for recognition or incentives, and the cultural context [20]. Approaches to improve blood donation should be adapted to local or regional geographical areas and culture, while targeting motivating and deterring factors for blood donation.

Most rural dwellers declared that blood donors should be paid; consequently, they consider incentives as the most encouraging factor to enhance blood donation. This could be due to their low income. However, the main reasons for not donating blood were that they never thought of it, no one asked them, and fear of needles. Physical fear of harm and/or infection was also the most common reason for not donating blood [17, 19]. Other significant deterrents to donating blood where the health status of the individuals [17, 21], lack of knowledge about blood donation venues and operating hours [22], distance of blood collection sites and lack of time [17]. In accordance with the present study, non-donors in Pakistan and Trinidad and Tobago indicated that the main reason they had not donated blood was that no one had ever asked [23, 24]. The disparity between willingness to donate and the real practice of blood donation has implications for the establishment of blood transfusion services in Nigeria [9] and should be addressed through public health campaigns to increase awareness and modify attitudes and perceptions that undermine blood donation. Offering incentives, in terms of blood screening services, and a scrupulous use of monetary incentives could increase the rate of blood donation.

Limitations of this study are inherent to its cross-sectional design that could cause misinterpretation of the questionnaire items, underreporting, or recall bias. However, the survey was conducted face-to-face and trained interviewers administered the questionnaire and assisted the respondents when necessary. The presence of an interviewer could raise concerns of the respondents that their responses may not be correct, leading to socially favorable and biased responses [25]. Notwithstanding, the presence of an interviewer could motivate respondents to be more attentive to the survey questions, and limit respondents' tendency to respond quickly and with little effort to the questions [26]. To reduce interview bias, the interviewer's opinion should not be included into questions or explanations about the questionnaire items. Clear and concise definitions should be provided to the respondents, using plain language to avoid misinterpretation. Another limitation is the lack of inclusion in the questionnaire of other factors that could influence blood donation, such as distance from the collection sites and their opening hours. These are barriers to access to health care services and to active participation of the population in health campaigns. Future research studies should include these aspects by incorporating specific questions regarding access to and characteristics of blood donation centers in the survey instrument (*e.g.,* donation location, opening hours, waiting times, skills of the healthcare personnel, provision of invitations to donate blood, provision of monetary or non-monetary awards). In addition, questions about safety or willingness to donate blood could be influenced by the inclusion in the analysis of respondents who declared they had never heard of blood donation. However, an interviewer-administered approach was adopted in this study. During the face-to-face interview, which allows the respondents to ask for clarification about the items on the questionnaire, the definition of blood donation was given by trained interviewers to the participants, when requested. It appears that they could be familiar with the act of blood donation but not with the terminology, especially rural dwellers with low educational level. Consequently, this category of respondents was included in all analysis in order to assess how much needs to be done in terms of sensitization, hence, to educate and encourage the population about blood donation. Similar research approach was also applied in the study by Pule *et al.,* 2014 [15].

CONCLUSIONS

Blood donation was regarded as a positive and safe practice by both donors and non-donors, despite the fact that most respondents have never donated blood because no one had asked them, they had never considered it, or due to fear of physical harm. Willingness to donate blood is complex and influenced by socio-demographic factors, but also by the cultural context, and the need for incentives. As a result, high willingness to donate blood does not translate to active practice of blood donation. The lack of motivations and incentives, and misconceptions toward blood donation could be modified through adequate knowledge and information. To this end, local governments and civil society organizations should increase awareness about blood shortage, encourage and retain blood donors through public health interventions. The provision of incentives should be taking into consideration in areas where blood shortage is high. Approaches to improve the rate of blood donation should be targeted to the cultural context and geographical area.

Authors' contributions

FIG: conceptualization, methodology, investigation, writing – original draft, writing – review & editing. YP: conceptualization, methodology, writing – original

draft, writing – review & editing, project administration. FO: investigation, formal analysis, visualization, writing – review & editing. ROA: investigation, resources, validation, writing – review & editing. BU: validation, formal analysis, visualization, writing – review & editing, supervision.

Conflict of interest statement

The Authors declare that they have no conflict of interest.

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