



Seropositivity of Human Immunodeficiency Virus among Intending Blood Donors in Rivers State, Nigeria

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Authors' contributions

This work was carried out in collaboration among all authors. Authors NFP, OEA, IOO and BAA designed the study, performed the statistical analysis and wrote the protocol. Authors IOO and TIC managed the analyses of the study. Authors IOO, BAA and SAA managed the literature searches and wrote the first draft of the manuscript. Authors NFP and OEA supervised the whole study which Author BAA used as part of her M.Sc. dissertation in the Department of Microbiology, University of Port Harcourt, Nigeria. All authors read and approved the final manuscript.

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ABSTRACT

Aims: Provision of constant and safe blood has been a public health challenge in Sub-Saharan Africa with a high prevalence of transfusion-transmissible infections (TTIs). This study aimed at determining the seroprevalence of the Human Immunodeficiency Virus (HIV) among prospective blood donors at two Hospitals (government and private-owned) in Rivers State, and also to relate some demographic studies to the screening results.

Study Design: Cross-sectional study.

Place and Duration of Study: Two Hospitals (a government-owned and private-owned) in Rivers State, Nigeria, between January 2018 and April 2019.

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Methodology: Two hundred and eighty-two (185 males and 97 females) blood donors were recruited for this study. Sera samples were screened for antibodies to HIV-1 and -2 using enzyme-linked immunosorbent assay (ELISA) based kits following the manufacturer's description.

Results: Of the 282 screened prospective donors (males and females) in this study, the overall prevalence of HIV from both hospitals was 6.0% with a seronegativity of 94.0%. There was a significant relationship ($p < 0.05$) between the overall seroprevalence of HIV concerning gender ($p = 0.006$) all other demographics had no significant association with HIV. Age group 21-30 had the highest prevalence of HIV (53.80%). Donors with tertiary education had the highest prevalence rate (52.90%) of HIV. About marital status, the unmarried donors had higher HIV prevalence (64.70%) when compared with the married donors (35.30%). However, family donors had the highest prevalence of HIV (52.90%). Finally, concerning occupation, students had a higher HIV prevalence (47.10%).

Conclusion: The seroprevalence of HIV in Port Harcourt, Rivers State, Nigeria was high. This shows that HIV remains a threat to safe blood transfusion and public health in Nigeria. Strict adherence to selection criteria and algorithm of donor screening is hereby advocated.

Keywords: Blood donors; HIV; seroprevalence; Rivers State; Nigeria.

1. INTRODUCTION

Blood safety continued to be a major public health problem in Sub-Saharan Africa due to insufficiencies of national blood transfusion policies and services, appropriate infrastructures, qualified personnel and financial resources [1-2]. The World Health Organization (WHO) projected that by 2012 [3]. Nigeria and other sub-Saharan African countries would attain sustainable safety in blood transfusion by implementing a set of rules [4]. One hindrance of blood banking is the presence of infections as a result of unscreened blood. Though blood screening has improved tremendously, there still exists the possibility for the presence of pathogens such as HIV in blood component donated at the blood bank. Human immunodeficiency virus (HIV) among other pathogens such as hepatitis B virus (HBV), hepatitis C virus (HCV) and syphilis have remained a big threat to safe blood transfusion in Nigeria and Sub-Saharan Africa at large [2].

HIV, HBV and HCV are of great concern as transfusion transmissible infections because of their prolonged viraemia and carrier or latent state [5]. They also cause fatal, acute, chronic and life-threatening disorders. Blood transfusion accounts for 5-10% of HIV infections in sub-Saharan Africa [5-6]. Knowledge of this HIV among intending blood donors, especially, in Africa is empirical in the planning of preventive strategies, especially through blood transfusion.

Transmission of HIV is determined by the virus location and how it is shed. It might be in the form of blood, secretions or body fluids. The existence of HIV in blood and genital secretions in a small amount is enough to cause its spread.

However, the existence of HIV in other body fluids such as tears, saliva, urine, and sweat is of no major transmission medium as they have a tiny pocket of the virus [7]. The risk for HIV spread by genital-oral sex activities is a lot lower than genital-genital or genital-anal acts because exposure to saliva carries lesser harm compared with exposure to blood because of inhibitory factors in saliva to HIV. Oral inflammation, ulceration, and bleeding can elevate HIV transmission [8]. Though infectious particles of HIV are frequent in cerebrospinal fluid, contact with this fluid in daily life is extremely rare [9].

The risk of transmitting HIV via blood transfusion can be reduced by screening donors' blood and asking important questions about their lifestyle and general health preceding the donation process. Thus, this study aimed at determining the seroprevalence of HIV among prospective blood donors at the two Hospitals (a government-owned and a private-owned) in Rivers State, and also to relate some demographic studies to the screening results.

2. MATERIALS AND METHODS

2.1 Study Design

A cross-sectional study was carried out among blood donors in Rivers State, Nigeria from January 2018 to April 2019. Ethical approval was obtained from the hospitals and the Health Research and Ethics Committee of the University of Port Harcourt, Nigeria. A structured questionnaire was administered to consenting blood donors to obtain information on socio-demographic factors before sample collection.

2.2 Sample Size Determination

The sample size for this study was determined using the formula: $N = Z^2PQ/d^2$ [10]. Where N is the desired sample size, P is the expected prevalence in the target population, $Q = 1 - P$, $Z = 1.96$ standard error, d is the level of statistical significance (0.05). A P-value of 3.8% (reported for HIV in Rivers State as of 2019 by NAHS survey [11] and was used for representing maximum uncertainty.

Z= Normal standard deviation at 1.96 (standard error at 95%)

P= Prevalence of HIV (3.8% for blood donors in Rivers State as at 2019) = 0.038

q= $1 - p (1 - 0.038) = 0.962$

d= degree of accuracy/precision expected = 0.05
 N= 56 (estimated).

Hence, the estimated sample size was 56 with an additional 10% sampled (5.6) to take care of data inconsistencies [12], providing a total sample size of 61.6 approximately a minimum of 62 samples for the study.

2.3 Study Population

A sum of 282 blood donors (185 males and 97 females) were recruited for this study. Both males and female were included in the study. Under-age individuals were, however, excluded. Before the recommendation of donors for blood donation, blood samples were screened for HIV by following the manufacturer's guidelines. Potential donors who tested positive were referred for treatment.

2.4 Sample Collection

A sum of 282 (185 males and 97 females) intravenous blood samples were obtained aseptically using a 5-ml syringe and allowed to clot at room temperature in plain tubes. Serum specimens were separated by centrifugation at 3000rpm (resolution per minute) for 5 min. The sera were stored at -20°C and used for the serological analysis.

2.5 Laboratory Analysis of HIV-1 and HIV-2 Antibodies Analysis

Third generation Genscreen ULTRA HIV Ag-Ab test kit by BIO-RAD was used for this analysis. The manufacturer's directions were strictly adhered to.

2.6 Statistical Analysis

Data were analyzed using Microsoft Excel spreadsheet (Microsoft Corporation). The seroprevalence was calculated. Pearson's Chi-square test was used to establish relationships between demographic factors and HIV prevalence. The level of significance was set at $P \leq 0.05$.

3. RESULTS AND DISCUSSION

3.1 Results

3.1.1 Demographic factors of blood donors in both hospitals

The total of 282 intending blood donors was screened for HIV. The demographic factors obtained from donors and their association with the screening results are shown in Table 1 with a significant relationship between HIV and gender $p = 0.006$ ($p < 0.05$).

Fig. 1 shows overall HIV prevalence from both hospitals $n = 17$ (6.0%), while Fig. 2 shows the prevalence of HIV among the intending donors in Hospital 1 $n = 12$ (6.6%) and Fig. 3 indicates the HIV prevalence of the intending donors in Hospital 2 $n = 5$ (5.0%).

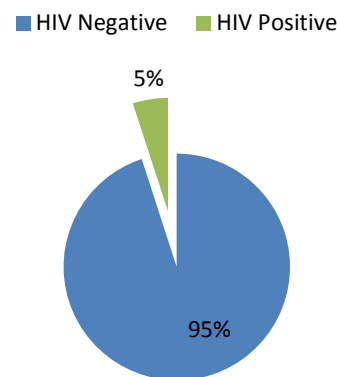


Fig. 1. The overall prevalence of HIV from intending blood donors in two hospitals in Rivers State, Nigeria

3.2 Discussion

Infection arising from HIV is a serious health menace worldwide with about 37.9 million (32.7 - 44.0 million) people living with HIV by WHO

region in 2019 [13]. In our study, an entire 6.0% (n=17) among 282 prospective blood donors had the virus in this precinct of Rivers State, Nigeria. This was higher than 4.6%, 3.8%, 3.5% and 2.8% reported in other Nigerian studies in Sokoto State [14], Kano State [15], Enugu State [16] and Kaduna State [17]. But, lower than 10.6% in Abia State [18] and 8.3% in Edo State [19].

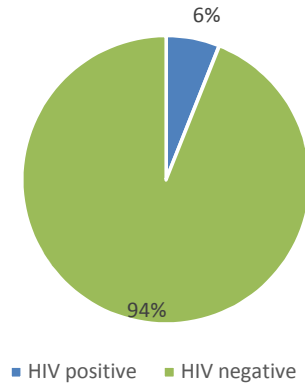


Fig. 2. HIV prevalence among intending blood donors in hospital A, Rivers State, Nigeria

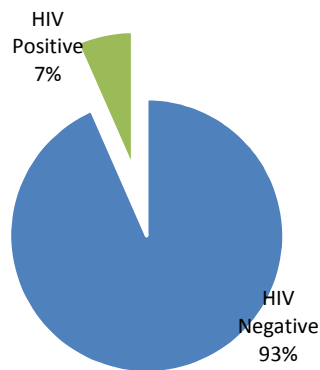


Fig. 3. HIV prevalence among intending blood donors in hospital B, Port Harcourt Rivers State, Nigeria

Data from other Sub-Saharan region have also reported lower results, 4.9% in Ghana [20], 0.1% and 2.21% in Ethiopia [21] and Burkina Faso [22], respectively. These variations might come from the sample population, population size, length of time studies were done and different socio-cultural practices.

More males presented as donors than females in this study. This gender bias has been

documented in other studies within the country [23-24]. This observation might stem from the cultural belief that women are officially not allowed to donate blood. A similar result has been reported in India (95.20%) [25], Pakistan (99.62%) [26], Cameroon (82.0%) [27], Ethiopia (86.8%) [28], and Mexico (81.86%) [29]. The only significant relationship between HIV and the demographic factors was found between HIV and the gender of the blood donors with a p value of 0.006.

The male donors showed higher positives compared to female donors. This is comparable to report from Okocha et al. [23], and Okoroiwu et al. [2] which found more HIV among men compared to women. The explanation for this male gender-related predisposition is unknown. It could be linked to male dominance or preponderance. Cultural and religious beliefs may also influence male gender predisposition to HIV observed in this study. Men in many African countries are culturally permitted to have multiple wives and concubines. On the other hand, it is an abominable act for a married woman to keep an extramarital affair. Also, the alarming rate of homosexuality and trauma that comes with anal sex may be a reason as well. This, however, does not translate to more men being infected with HIV in our population, even though studies in Nigeria proved so [30].

Major cases of HIV were centred in the 21-30 age group. Our finding correlates with Baba et al. [31], Ejele et al. [32], Erhabor et al. [14] and Buseri et al. [33] who all recorded more HIV among the youth. Lack of detailed and consistent orientation, high-risk behaviour among youths having unprotected sexual intercourse, body inking and other dangerous lifestyles might be responsible. This is disturbing because the most vibrant and viable population is affected. Though the outcome of chi-square analysis of HIV with age was not significant ($p=0.765$), there is the immediate need for massive campaign and introduction of preventive methods aimed at curbing immoral and risky behaviours among youth.

Concerning marital status, single blood donors had more seropositivity than the married. The fact that singles are more sexually active and have the freedom to explore (keeping various sex partners, having unprotected sexual intercourse,) that put them in danger of HIV.

Table 1. Summary of the relationship between the overall HIV prevalence concerning the demographic factors of the intending blood donors of both hospitals

Demographic factors	categories	Total no tested (%)	HIV positive (%)	p value
Gender	Males	185 (65.6)	15 (8.1)	P=0.006
	Females	97 (34.4)	2 (2.1)	
Age groups	< 20	92 (32.6)	7 (7.6)	P=0.765
	21 – 30	83 (29.4)	4 (4.8)	
	31 – 40	75 (26.6)	5 (6.7)	
	41 - 50	32 (11.3)	1 (3.1)	
Marital status	Single	172 (61.0)	11 (6.4)	p=0.746
	Married	110 (39.0)	6 (5.5)	
Educational level	Primary	10 (3.5)	2 (20.0)	p=0.105
	Secondary	143 (50.7)	6 (4.2)	
	Tertiary	129 (45.7)	9 (7.0)	
Occupational risk	Student	90 (31.9)	8 (8.9)	p=0.481
	Business	86 (30.5)	5 (5.8)	
	Civil servants	41 (14.5)	1 (2.4)	
	Unemployed	65 (23.0)	3 (4.6)	
Donor types	Paid	91 (32.3)	6 (6.6)	p=0.708
	Family	136 (48.2)	9 (6.6)	
	Voluntary	55 (19.5)	2 (3.6)	
Awareness	Yes	88 (31.2)	6 (6.8)	P=0.707
	No	194 (68.8)	11 (5.7)	
Total		282 (100.0)	17 (6.0)	

This study comprised mostly of family and remunerated donors. Male donors are motivated by altruism and monetary gain [34]. However, this result contrast reports from America (51.7%) [35], Spain (54.0%), Portugal (57.0%), Belgium (54.6%), Netherlands (50.0%), Denmark (50.0%), France (50.0%), United Kingdom (47.0%) and Finland (45.0%) [34], where the equal ratio in gender was obtained. This can be explained as the majority of the blood donations in these developed countries is purely for altruistic reasons shared by both sexes [36]. Females more often donate by altruism, unlike males who do mainly for the money [36]. Male donors recorded the highest number of TTIs. This is consistent with the report of Okocha et al. [23], and Zaheer et al. [26] who linked this to the notion that more women are confined to home settings, and therefore, are comparatively less exposed to the dangers imminent with transfusion compared to males.

We observed a very low turnout of voluntary donors. The voluntary donation has continued to deplete as a result of decreasing patriotism of the general population and organizational faults on the part of national blood transfusion service. Hence, paid donation becomes the order of the day. This finding is corroborated by earlier results [23,33]. But differs from that of Damulak et al.

[36]. in Jos. This disparity is because the study in Jos was done in the National Blood Transfusion Service Centre whereas ours was done in a hospital-based blood bank. A blood drive for voluntary blood donation is a routine in national blood transfusion centres in Nigeria, unlike hospitals that bank on walk-in volunteers. Family donors recorded the major frequency of TTIs, while voluntary donors had the least. This finding confirms the statement by the World Health Organization (WHO) that voluntary donors are unlikely to transmit pathogens compared to family replacement and commercial donors would [3]. No statistical relation exists between donor type and HIV as its p value exceeded the 0.05 significance level.

In our study, we observed higher HIV turn out among students (47.1%) and lowest in civil servants (5.9%). No significant relationship was found in this regard, the cause of this occupation-related predisposition is unknown. It could be due to the lower socio-economic class being compelled to indulge in risky alternatives (to survive) that could predispose them to these viruses compared to those of middle to high financial standards. With regards to awareness, almost all the participants had heard of HIV and its risk factors.

4. CONCLUSION

The study has shown the presence of HIV infection among intending blood donors from two hospitals in Port Harcourt to be 6.0%. The differences in infection rates among the general population in the different studies within and outside Nigeria may be linked to sample size, the sensitivity of the different test kits, duration of research, socio-cultural behaviours like circumcision, sexual and marital practices and lastly, access to antiretroviral therapy. Strict adherence to selection criteria and algorithm of donor screening is hereby advocated. We recommend the government and private organizations involved with a blood donation to create publicity among common people for screening and donation of blood, to ensure donation according to international standards, to enforce compulsory blood scrutiny using sensitive assays to abolish post-transfusion diseases like HIV and finally to upgrade facilities in tertiary health centres for easy diagnosis, viral typing, viral load and neonatal or infant diagnosis of these viruses to prevent a loss to follow-up which is a common occurrence in our country.

CONSENT

All authors declare that 'written informed consent was obtained from the blood donors for publication of this study.

ETHICAL APPROVAL

All authors hereby declare that all experiments have been examined and approved by the Hospital Research Ethics committees of University of Port Harcourt Teaching Hospital (UPTH) and Meridian Hospital and have, therefore, been performed following the ethical standards laid down in the 1964 Declaration of Helsinki.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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