



Prevalence and Trends of HIV Infection Among Blood Donors in Republic of Congo from 2016 to 2022

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Abstract: Human immunodeficiency virus (HIV) is a lentivirus, a member of the retrovirus family, which primarily invades the human immune system and causes immunodeficiency syndrome (AIDS). HIV infection is one of the major public health problems associated with blood transfusion. The objective of this study is to estimate prevalence and trend of HIV among blood donors in Republic of Congo. A retrospective cross-sectional study design was used to collect data from January 2016 to December 2022 among blood donors in Republic of Congo. For each blood donor, data including age, sex and type of blood donation (volunteer or family/replacement) were collected during a predonation examination. Samples were tested for anti-HIV antibodies using a fourth-generation ELISA. Data were analyzed using SPSS v21 software with a significance level of $p < 0.05$. A total of 520823 blood donors were enrolled and the overall prevalence of HIV was 2.35%. The trend of HIV infection has decreased from 2016 (3.6%) to 2022 (2.1%). The prevalence of HIV among male (2.5%) was higher than in female donors (1.8%). The age groups 31-45 years and family/replacement donors were the highest prevalence of HIV infection, with a statistically significant difference ($P < 0.05$). This study shows that the prevalence of HIV infections among blood donors remains high and needs constant monitoring to evaluate prevention strategies to reduce the burden of transfusion-transmissible HIV infections.

Keywords: Blood Donor, HIV, Prevalence, Transfusion

1. Introduction

Human immunodeficiency virus (HIV) is a lentivirus, a member of the retrovirus family, which primarily invades the human immune system and causes immunodeficiency syndrome (AIDS), followed by a high risk of opportunistic infections and tumors [1, 2]. HIV infection is a serious threat to health worldwide, with an estimated 39.0 million (33.1-45.7 million) people living with HIV in the WHO region in 2022 [1]. HIV can be transmitted through direct contact with blood, unprotected sexual intercourse with an infected person, use of contaminated needles, transfusion of infected blood and mother to child during delivery [3, 4]. Blood transfusion is a

life-saving procedure that saves millions of lives worldwide every year. However, it is also known to be a vector for harmful infectious diseases, such as HIV infection and viral hepatitis [5]. HIV is of particular concern as a transfusion transmissible infection due to its prolonged viraemia and latent state [6]. Transfusion of HIV-infected blood is one of the most effective ways of transmitting HIV [7]. The HIV prevalence through blood donation ranges from 0.001% to 0.04% in high-income countries, and from 0.56% to 2.69% in low-income countries [8]. Despite considerable efforts worldwide to reduce transfusion-transmitted infections, blood-borne HIV can still account for up to 10% of HIV infection in sub-Saharan Africa [9]. Moreover, sub-Saharan Africa bears the greatest burden of

HIV and AIDS in the world [10, 11]. In the Republic of Congo (RC), HIV prevalence is estimated at 3.2% in general population and 2.8% among blood donors [12, 13]. HIV infection is a major threat to the safety of blood transfusions. It is therefore important to constantly monitor its extent in order to optimize donor recruitment strategies and screening programs. Therefore, the current study aimed to assess the prevalence and trend of HIV among blood donors.

2. Methods

2.1. Study Population

We conducted a retrospective cross-sectional study of people who donated blood between January 1, 2016 and December 31, 2022 to the National Blood Transfusion Center (NBTC) in Republic of Congo (RC). The current study included all blood donations for seven years and respecting blood donation criteria: age between 18 and 60 years, body weight above 55 kg and physically healthy. For each blood donor, data including age, sex and type of blood donation (volunteer or family/replacement) were collected during a predonation examination. All the patients recruited for the study were asked to sign a written informed consent form. All the patients recruited for the study were asked to sign a written informed consent form.

2.2. Laboratory Procedures

Testing was performed on blood tubes taken after each donation, and consisted of the measurement of antibodies for HIV-1 and HIV-2 (Genscreen VIH1/2 version 2, BioRad, France). All the tests were done following the manufacturer's instructions.

2.3. Statistical Analysis

Data analysis for linear trend was performed using the statistical package for the social sciences version 21 software. The odd ratio (OR) for HIV infection between participants was calculated with the confidence interval (CI). All hypothesis tests were two-tailed and a P value of less than 0.05 was considered statistically significant.

3. Results

3.1. Demographic Characteristics of Participants

A total of 520823 donations were received at National Blood Transfusion Centre in RC between January 2016 and December 2022. About 82% of the donations were received from men and 18% from women. Moreover, donors in the 18-30 age group and family/replacement were the highest to donate blood, with a percentage of 43.4% and 58%, respectively (Table 1).

Table 1. Socio-demographic characteristics of blood donors in Republic of Congo, 2016–2022.

Characteristics	Number	%
Gender		
Male	426836	82.0
Female	93987	18.0
Age group (years)		
18 - 30	226246	43.4
31 - 45	223238	42.9
46 - 60	71339	13.7
Types of donation		
Regular	62978	12.1
First-time	155829	29.9
Replacement	302016	58.0
Center		
Brazzaville	223220	42.9
Pointe Noire	191241	36.7
South West Coordinate	52209	10.0
North Coordinate	54153	10.4

%. percentage.

3.2. Prevalence and Trends of HIV

The HIV prevalence among blood donors in this study was 2.35% (95% CI: 2.31-2.39). As shown in Figure 1, HIV prevalence among blood donors has fluctuated over the past seven years. The highest HIV prevalence was 3.6% in 2016, the lowest HIV prevalence was 1.9% in 2019 and 2.1% in 2022. In Table 2, from 2016 to 2022, HIV prevalence in men (2.5%) was higher than in women (1.8%), with a significant association between sex groups throughout the study period ($p < 0.05$) (Table 2).

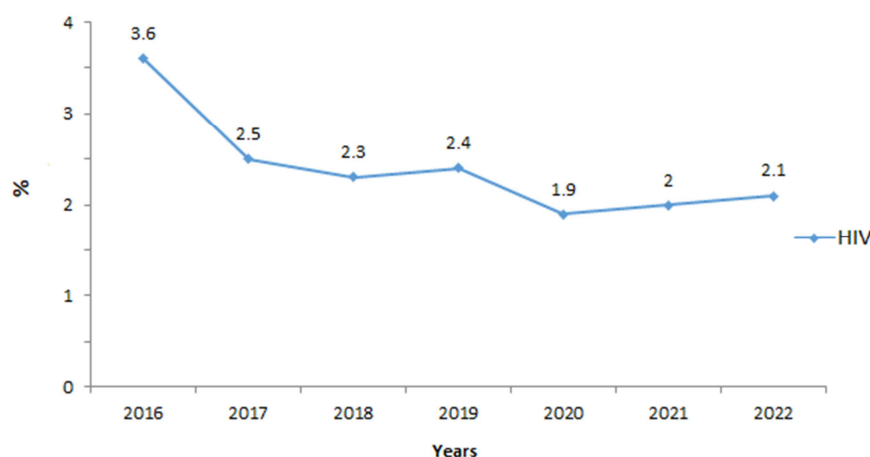


Figure 1. Trend of HIV prevalence among blood donors in Republic of Congo, 2016–2022.

Table 2. Prevalence of HIV by gender, age and category of donation among blood donors in Republic of Congo, 2016-2022.

Characteristics	HIV positive (%)	HIV negative (%)	OR (95% CI)	p-values
Gender				
Male	10563 (2.5)	416273 (97.3)	1.38 (1.31-1.46)	0.0001
Female	1687 (1.8)	92300 (96.7)	1	
Age groupe (years)				
18 - 30	4265 (1.9)	221981 (97.7)	1	
31 - 45	6440 (2.9)	216798 (96.7)	1.54 (1.49-1.61)	0.0001
46 - 60	1545 (2.2)	69794 (97.4)	1.52 (1.09-1.22)	0.0001
Types of donation				
Regular	407 (0.6)	62571 (99.3)	1	
First-time	3650 (2.3)	152179 (97.8)	3.69 (3.32-4.09)	0.0001
Replacement	8193 (2.7)	293823 (96.5)	4.28 (3.88-4.74)	0.0001

OR: odds ratio; CI: confidence interval; 1: reference.

The age distribution and percentage positivity among blood donors show that donors aged 18 to 30 accounted for 1.9%, followed by those aged 31 to 45% (2.9%), while the last (2.2%) were in the range 46-60 years. Odds ratio analysis indicates a significant association between the different age groups (Table 2). Family or replacement donors (OR= 4.28:3.88-4.74) were at greater risk of HIV infection than regular blood donors (Table 2).

4. Discussion

Human immunodeficiency virus (HIV) represents a major challenge to blood safety due to its prolonged viremia, chronic latent carrier state and potentially fatal complications. The prevalence of HIV in the present study was 2.35%. This result was higher than a similar study reported from Egypt, which was 0.1% [14], 0.21% in Brazil [15], 0.31% in China [16] and 1.2% in Mauritania [17]. On the other hand, the HIV prevalence among blood donors in the present study was lower than in a similar study conducted in Cameroon which was 4.1% [18], 7.43% in Equatorial Guinea [19], 4.06% in Ghana [20] and 8.5% in Mozambique [21]. The differences might be due to differences in geographical location, the burden of the disease in the society and study participants' awareness of HIV transmission and prevention.

In the current study, HIV infection was highest among male blood donors, which is similar to studies carried out in Burkina Faso [22], Eritrea [23] and Cameroon [20]. This might be due to most women may know their HIV status at prenatal care which is mandatory for all pregnant women in our country. Furthermore, the number of female blood donors was low in the current study, which can be attributed to behavioral, socio-cultural factors and numerous contraindications to donation, which limits women to donate blood and result in men donating more blood than women [24].

This study observed the highest HIV positivity in the 31-45 age group. This finding is consistent with those from similar studies by Al-Nafakh *et al.*, in Iraq, who reported the highest positivity in the 30-39 age group, while Boushab *et al.*, in Mauritania reported the highest prevalence in the 31-40 years age group [17, 25]. These age groups represent young people, who are the most sexually active age group, and who are more inclined to adopt certain risk behaviors,

such as multiple sexual partners, unprotected sex, tattooing, intravenous drug abuse and alcoholism, than any other age group within the same population.

Our findings also indicate that HIV was more prevalent among family/replacement blood donors. This is in agreement with other studies, which report that in sub-Saharan Africa, blood collection is mainly hospital-based, and comes largely from replacement family donors and paid commercial donors [9, 18, 24]. These types of donors are generally subject to undue pressure to donate, and may not reveal risk behavior during donor screening. In addition, they are generally at greater risk of HIV infection than voluntary unpaid donors [26]. WHO recommends transfusion from voluntary non-remunerated blood donors as it is the safest among the three classes of donors. The goal of the WHO is for all countries to obtain all their blood supplies through unpaid voluntary donors [8].

5. Conclusion

This study shows that the prevalence of HIV infection among blood donors remains high and requires constant monitoring to evaluate strategies for its prevention through blood transfusion. Thus, it is therefore imperative to apply strict criteria to blood donor recruitment, promoting a culture of voluntary blood donation and screening blood and blood products for these pathogens using sensitive laboratory test kits.

Conflicts of Interest

Authors have declared that no competing interests exist.

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