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Epidemiology of Syphilis Among Blood Donors in Brazzaville, Republic of Congo

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Abstract: Syphilis is a bacterial infection caused by *Treponema pallidum* and its transmission through blood transfusion poses a considerable risk to transfusion safety. The aim of this study was to assess the prevalence of syphilis among blood donors in Brazzaville, Republic of Congo. This was a cross sectional study conducted from September 2022 to February 2023. Data were collected from the national blood bank in Brazzaville. A structured questionnaire was designed and presented to each donor at the time of sample collection. The demographic data, including age, gender, educational, occupation, marital status and types of donors were routinely collected. During the donation procedure, 5 mL of peripheral blood was collected in a sterile EDTA test tube. All the donor samples were screened by ELISA test. Out of the 2560 blood donors included, 2258 donors (88.2%) were males while 302 (11.8%) were females. The mean age was 32±8.62 years. The overall prevalence of syphilis antibodies was 18 (0.7%). Majority of positive donors were females and in the age group 45-65 years, with a statistically significant correlation ($p<0.05$). Although, we found a high rate of syphilis carriage among donors in secondary education level, laborer, single and replacement donors, no significant relationship was found ($p>0.05$). This study provides crucial information on the epidemiology of syphilis among blood donors in Brazzaville and underscores the importance of strengthening screening and prevention strategies among this population.

Keywords: Syphilis, Prevalence, Blood Donors, Brazzaville

1. Introduction

Syphilis is a bacterial infection caused by *Treponema pallidum* (*T. pallidum*) and is one of the most common sexually transmitted infection around the world [1]. Although transmission is mainly sexual, syphilis can also be transmitted via contaminated blood and blood components [1, 2]. Syphilis is a major public health problem worldwide, and its most dangerous form is neurosyphilis, which can cause sudden blindness, paralysis and even death if left untreated. Its importance is compounded by the fact that the risk of contracting HIV infection through sexual contact is increased 3–5 times in people infected with syphilis [3]. According to the World Health Organization (WHO), 6 million new syphilitic infections occur each year, despite the existence of effective preventive and therapeutic measures [4]. In sub-Saharan Africa (SSA), syphilis is widespread in the general population, and its seroprevalence among blood donors can reach 25% in some countries [5]. However, prevalence is highly dependent on the testing algorithm and test quality [6]. Blood donation is an important procedure that saves millions of lives. However, unsafe transfusion practices carry a risk of

transfusion-transmissible infections (TTIs). An unsafe blood transfusion is very costly in economic and human terms, not only for the recipients themselves, but also for their families [7]. Very few recent studies have been carried out on the epidemiology of syphilis in the Republic of Congo. Previous studies showed a seroprevalence of 15.1% in various populations of Brazzaville in 1990 [8]; in 2017, 3.92% in pregnant women [9] and 7.1% in men who have sex with men in 2019 [10]. The aim of this study was to assess the seroprevalence of syphilis among blood donors in Brazzaville, Republic of Congo.

2. Material and Methods

2.1. Study Design and Sample Collection and Analysis

This was a cross sectional study conducted from September 2022 to February 2023. Data were as collected from the national blood bank in Brazzaville, Republic of Congo. A structured questionnaire containing dichotomous questions was designed and presented to each donor at the time of sample collection. The demographic data, including age, gender, educational, occupation, marital status and types of donors were routinely collected.

During the donation procedure, 5 mL of peripheral blood was collected in a sterile EDTA test tube. All the donor samples were screened by enzyme linked immunosorbent assays (ELISA) (Bio-Rad SYPHILIS Total Ab) for *T. pallidium* infection. The testing process followed the technical operation procedures in National Blood Transfusion Center of Brazzaville.

2.2. Statistical Analysis

The data obtained was tabulated in a Microsoft Excel spreadsheet and analyzed using Social Sciences Statistical System (SPSS) version 21.0. Descriptive analysis was used to summarize the data on the basis of percentages and chi-square tests. Bivariate analysis was performed to establish associations between sociodemographic and *T. pallidum* infection in blood donors. Odds ratios (OR) were calculated at 95% confidence intervals (CI). *P*-values < 0.05 were considered statistically significant.

3. Results

Sociodemographic data

A total of 2560 blood donors were enrolled in the study having mean age of 32±8.62 years. The gender distribution of the blood donors showed that 2258 (88.2%) were men and only 302 (11.8%) were women. The age distribution of the surveyed showed that the highest proportion of donors was between 31and 45 years of age 1259 (49.2%), followed by 18-30 years 941 (36.7%) and 46-65 years 360 (14.1%). Voluntary blood donors were 557 (21.8%) while 1626 (63.5%) were family/replacement donors. The marital status of the study participants showed that majority of blood donors 595 (81.9%) were married or cohabiting. The level of education of the study subjects revealed that the majority of blood donors had higher level of education 1493 (58.3%) and that 1245 (48.6%) were professionals (Table 1).

Seroprevalence of syphilis and association with study parameters

The overall seroprevalence of syphilis antibodies was 0.7% (18/2560). The cross tabulation of sociodemographic characteristics of the blood donors with seropositivity of the syphilis showed that age group 46-65 ($p<0.043$) and gender ($p=0.044$) were significantly associated with the syphilis seropositivity. Despite the fact that we found a high rate of syphilis carriage in secondary education, laborer occupation, single donors and replacement donors, no significant relationship was found ($p>0.05$) (Table 2).

Table 1. *Sociodemographic characteristics of blood donors at Brazzaville, Republic of Congo.*

Characteristics	n	%
Gender		
Female	302	11.8
Male	2258	88.2
Age groups (years)		
18-30	941	36.8
31-45	1259	49.2
46-65	360	14.1
Education		
University/Graduate	1493	58.3
Secondary	954	37.3
Primary	113	4.4
Occupation		
Shopkeeper	346	13.5
Laborer	144	5.6
Informal employee	360	14.1
Government employees	1245	48.6
Student	117	4.6
Unemployed	348	13.6
Marital status		
Married/Cohabiting	1865	72.9
Single	695	27.1
Blood donor type		
Family/replacement	1630	63.7
Voluntary	554	21.6
Regular	376	14.7

n: number; %: percentage

Table 2. *Seropositivity of syphilis in relation to the demographic characteristics of donor population.*

Characteristics	Prevalence (%)	OR (95%IC)	*p*-value
Gender			
Female	5 (1.7)	2.90 (1.03-8.21)	0.044
Male	13 (0.6)	1	
Age groups (years)			
18-30	3 (0.3)	1	
31-45	10 (0.8)	2.50 (0.69-9.12)	0.164
46-65	5 (1.4)	4.4 (1.04-18.52)	0.043
Education			
University/Graduate	7 (0.5)	0.17 (0.04-0.67)	0.012
Secondary	8 (0.8)	0.31 (0.08-1.19)	0.087
Primary	3 (2.7)	1	
Occupation			
Shopkeeper	2 (0.6)	0.67 (0.06-7.51)	0.749
Laborer	3 (2.1)	2.47 (0.25-24.04)	0.437
Traders	1 (0.3)	0.32 (0.02-5.20)	0.426

Characteristics	Prevalence (%)	OR (95%IC)	*p*-value
Professional	8 (0.6)	0.75 (0.90-6.05)	0.787
Student	1 (0.9)	1	
Unemployed	3 (0.9)	1.01 (0.10-9.79)	0.994
Marital status			
Married/Cohabiting	11 (0.6)	0.58 (0.22-1.51)	0.267
Single	7 (1.0)	1	
Blood donor type			
Family/replacement	15 (0.9)	3.48 (0.46-26.45)	0.223
Voluntary	2 (0.4)	1.36 (0.12-15,04)	0.803
Regular	1 (0.3)	1	

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

4. Discussion

Syphilis is a Sexually Transmitted Disease (STD) that represents a major public health problem spreading worldwide in developing countries [11]. In our study, 18/2560 blood donors was found with syphilis antibodies, corresponding to the seroprevalence of 0.7%. According to several data in the literature, the rate of syphilis among blood donors varies considerably from one region of the world to another, and even within the same country, from one region to another. The rate found in our study is higher than that found by Ankouane et al., in Cameroon [12], Sarr et al., in Senegal [11] and Mayaki et al., in Niger [13] with 0.2%, 0.04% and 0.4% respectively. Our result is lower than that of Bah et al., in Mali [14], Batina et al., in Democratic Republic of Congo [15] and Doungous et *al*., in Chad [16], who reported 5.4%, 3.7% and 4.9% respectively. These variations can be explained on the one hand by risky sexual behavior, sample size during surveys and donor selection criteria. On the other hand, the differences in sensitivity and specificity of the laboratory tests used by the researchers may also explain this situation.

Our study indicates that the rate of syphilis is significantly higher in women donors than in men donors ($p<0.05$). This result is consistent with some previous studies performed among blood donors [16–18]. However, this result could be influenced by the configuration of our study, in which the number of women was not representative (11.8%). Some previous studies found that women were more likely to be affected by STDs partly because of the different physiology and anatomy of the genital organs between both sexes [18].

The seroprevalence in the 46-65 age group was higher than in other age groups ($p<0.05$). Furthermore, this result is also close to that reported by Mayaki et al., in Niger [13]. In contrast, this result differs from that of Doungous et al., in Chad [16], who reported an age range of 21-30 years old with higher seroprevalence rate, and Chen in China [18], who reported a 35-44 age group. This may be explained by the fact that young people are sexually active and at greater risk of contracting sexually transmitted diseases more than older people.

In this study, the rate of *T. pallidum* antibody positivity decreased with increasing level of education. In similar studies performed by Singhal et *al.*, in India and Zheng et *al.*, in China [17, 19], the percentage of syphilis was highest in uneducated donors, while the lowest was observed in graduates. This phenomenon may be linked to the fact that when the level of education is relatively high, the rate of awareness of health knowledge is relatively high and the risk of infection is low.

When considering the occupation, laborer was the most represented with 2.1%, followed by unemployed with 0.9% than other socio-professional groups. This result differs from that of Alharazi et *al.*, in Yemen, who reported that participants working as military personnel had the highest level (3.0%) of antibodies against syphilis [20]. On the other hand, in the study performed by Chen et *al.*, in China, farmers and government employees had the highest rate of seropositivity [18]. This could be explained by the high representation of the informal sectors, which predominate in professional activities.

In the present study, the rate of syphilis was higher in family donors compared to other donor categories. However, no statistically significant relationship was obtained ($p>0.05$). Other authors have made the same observation [13, 14, 21]. Indeed, replacement blood donors may have limited knowledge or awareness about the risks and modes of transmission of syphilis. This may lead to a lower uptake of preventive measures such as condom use or regular screening tests. Insufficient education and awareness campaigns specifically targeting family members may contribute to the higher prevalence of syphilis.

5. Conclusion

This study provides crucial and updated information on the epidemiology of syphilis among blood donors in Brazzaville, and underscores the importance of strengthening screening and prevention strategies among this population. Further studies are needed to better understand the risk factors associated with this infection and to develop targeted interventions to reduce the prevalence of syphilis among blood donors.

Authors' Contributions

BMA: Study design, data collection, analysis and interpretation, drafting of manuscript. SOM: Study design, supervision of data collection, critical revision of manuscript. FKK: Data analysis and interpretation, critical revision of the manuscript. BF: Data collection, Critical revision of manuscript. BSB: Supervision of data collection, critical revision of the manuscript. GBB: Supervision of data collection, Critical revision of the manuscript. FRN: Supervision of data analysis, Critical revision of the manuscript. AV: Study conception, Critical revision of the manuscript. All authors have read and approve of the final manuscript.

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Conflicts of Interest

Authors have declared that no competing interests exist.

References

[1] Mabey D. Epidemiology of STIs: worldwide. Medicine 2005; 33(9): 4-7.

[2] Norris SJ, Cox DL, Weinstock GM. Biology of Treponema pallidum: correlation of functional activities with genome sequence data. Journal of molecular microbiology and biotechnology 2001; 3(1): 37-62.

[3] Kassutto S. HIV and syphilis coinfection: Trends and interactions. AIDS Clinical Care 2003; 15: 9-15.

[4] Rowley J, Vander HS. Korenromp E, Low N, Unemo M, Abu-Raddad LJ, Taylor MM. Chlamydia, gonorrhoea, trichomoniasis and syphilis: global prevalence and incidence estimates, 2016. Bulletin of the World Health Organization 2019; 97(8): 548-562.

[5] Tagny CT. Syphilis and blood safety in developing countries. In Tech 2011: 123-130.

[6] Sarkodie F, Hassall O, Owusu-Dabo E, Owusu-Ofori S, Bates I, Bygbjerg IC, Owusu-Ofori A, Harritshøj LH, Ullum H. Improving the screening of blood donors with syphilis rapid diagnostic test (RDT) and rapid plasma reagin (RPR) in low- and middle-income countries (LMIC). Transfusion Medicine 2017; 27: 52–59.

[7] Tagny CT. Le dépistage biologique de la syphilis chez le donneur de sang d'Afrique subsaharienne: quelle stratégie?. Transfusion clinique et biologique 2009; 16(5-6): 448-453.

[8] Mbongolo NL, Niama FR, Issamou MP, Kombo EB, Nzingoula FK, Mboussou FF, Kobawila SC. Infections à VIH, Syphilis, Hépatites B et C chez les Hommes ayant des Rapports Sexuels avec d'autres Hommes en République du Congo. Health sciences and disease 2019; 20(6): 49-54.

[9] Niama RF, Bongolo NCL, Kombo ESB, Yengo R, Mayengue PI, Kosso EBM, Parra HJ. Syphilis and HIV infections among pregnant women attending antenatal clinics in Republic of Congo. Pan African Medical Journal 2017; 28(1): 1-8.

[10] Biendo M, Yala F. Etude séro-épidémiologique de la syphilis à Brazzaville. Médecine et Maladies Infectieuses 1990; 20(1): 6-8.

[11] Da Ros CT, da Silva Schmitt C. Global epidemiology of sexually transmitted diseases. Asian journal of andrology 2008; 10(1): 110-114.

[12] Ankouane F, Noah DN, Atangana MM, Simo RK, Guekam PR, Sida MB. Séroprévalence des virus des hépatites B et C, du VIH-1/2 et de la syphilis chez les donneurs de sang de l'hôpital central de Yaoundé, région du centre, Cameroun. Transfusion Clinique et Biologique 2016; 23(2): 72-77.

[13] Mayaki Z, Dardenne N, Kabo R, Moutschen M, Sondag D, Albert A, Gérard C. Séroprévalence des marqueurs de l'infection chez les donneurs de sang à Niamey (Niger). Revue d'épidémiologie et de santé publique 2013; 61(3): 233-240.

[14] Bah A, Traoré MK, Kassogué A, Coulibaly D, Sogodogo I, Diallo H, Diallo M. Séroprévalence des donneurs de sang à l'hôpital Nianankoro Fomba de Ségou. Rev Mali Infect Microbiol 2019; 13(1): 41-46.

[15] Batina A, Kabemba S, Malengela R. Marqueurs infectieux chez les donneurs de sang en République Démocratique du Congo (RDC). Revue Medicale de Bruxelles-Nouvelle Serie 2007; 28(3): 145-149.

[16] Doungous DM, Doutoum AA, Chatté A, Dounbe RL, Gabdibe EG, Saleh O, Njintang NY. Prévalence de la syphilis chez les donneurs de sang à la Banque du Sang d'Abéché au Tchad. International Journal of Biological and Chemical Sc 2020; 1085-1092.

[17] Singhal S, Sharma DC, Rai S, Arya A, Gupta P. Seroprevalence and Risk Factors of Syphilis among Blood Donors. Journal of College of Medical Sciences-Nepal 2021; 17(2): 185-194.

[18] Chen X, Liu Q, Sun P, Yuan S, Liao H, Zhang X. Prevalence of Syphilis Infections Among Volunteer Blood Donors in Jinan Blood Center, China: A 15-Year Retrospective Study. Infection and Drug Resistance 2022; 6431-6440.

[19] Zheng X, Ding W, Ling X, Shi J, Dong J, Yu G, Hu W. Prevalence of Treponema Pallidum Antibody among Volunteer Blood Donors in China. Canadian Journal of Infectious Diseases and Medical Microbiology 2022; 2022.

[20] Alharazi T, Alzubiery TK, Alcantara JC, Qanash H, Bazaid AS, Altayar MA, Aldarhami A. Prevalence of transfusion-transmitted infections (HCV, HIV, Syphilis and Malaria) in blood donors: a large-scale cross-sectional study. Pathogens 2022; 11(7): 1-12.

[21] Yesha Shah, Farzana Kothari, Milind Dighe, Chirag Chaudhari. Demographic profile of syphilis among blood donors at a tertiary care hospital. International Journal of Research in Medicine 2018; 7(2): 25-29.