

(RESEARCH ARTICLE)



Prevalence of transfusion-transmissible infections among Blood Donors Attending the Regional Hospital Center of Franceville (Southern Gabon)

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Open Access Research Journal of Biology and Pharmacy, 2023, 09(02), 014–020

Publication history: Received on 03 October 2023; revised on 21 November 2023; accepted on 24 November 2023

Article DOI: <https://doi.org/10.53022/oarjbp.2023.9.2.0054>

Abstract

Background: Transfusion transmissible infections (TTI) constitute a worldwide threat to blood donation, especially in developing countries.

Objective: To determine the prevalence of HIV, hepatitis C virus (HCV), hepatitis B virus (HBV), and *Treponema palladium* among prospective blood donors attending the Amissa Bongo Regional Hospital Center of Franceville (ABRH).

Methods: CTKBiotech test strips were used to detect blood transmissible infections. Antibodies to HIV 1/2 (HIV), hepatitis C virus (HCV), Hepatitis B virus (HBV) and *T.pallidium* were detected using respectively OnSite HIV 1/2 Ab Plus Combo Rapid Test, the OnSite HCV Ab Plus Combo Rapid Test, the OnSite HBsAg Combo Rapid Test, the OnSite Syphilis Ab Rapid Test.

Results: A total of 447 prospective blood donors attending the ABRH was included in this study. The age ranged between 18 and 50 with a median age of 30. Male and family donors made up more than 88% and 83% of the study population, respectively. HBV was the most prevalent TTI with 2.68%, followed by HIV, HCV, and Syphilis, with respectively 2.23%, 1.56%, and 0.89%. Among the examined blood transmissible pathogens, only HIV was significantly associated with unemployment. Females were 3.47, 1.3, and 2.62 times more prone to test positive to respectively HIV, HCV, *T.pallidium* compared to males. None of the risk factors considered in this study was significantly associated with any transfusion transmissible infection.

Conclusion: The present results confirm the decline of syphilis among blood donors in Gabon. Co-infection cases reported here raise concerns as they are known to complicate the patient care.

Keywords: Blood donors; Hepatitis; HIV; *Treponema palladium*; Transfusion transmissible infection

1. Introduction

Blood transfusion is a lifesaving treatment mainly for patients suffering from serious health complications including but not limited to severe childhood anemia, pregnancy complications, cardiovascular surgery, and trauma (1). However, its safety remains a worldwide health concern especially in developing countries due to poor national blood policies and infrastructures (2). Blood receivers are at risk of being infected by Human immunodeficiency virus (HIV), Hepatitis B

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virus (HBV), Hepatitis C virus (HCV), and Syphilis (*Treponema Pallidum*); the major transfusion transmissible infections (TTI) for which the World health Organization recommend a universal screening (WHO, 2010). It is estimated that about 1% of new HIV cases are due to transfusion(4). In the world , more than 3 million new cases of viral hepatitis per year are due to Hepatitis B and C (5). If left untreated these infections can lead to life-threatening complications. Indeed, according to the 2015 WHO report, 720,000 people died from cirrhosis and 470,000 from liver cancer due to hepatitis B et C, respectively (6). Over five (5) million new cases of Syphilis occurs worldwide each year(7). Untreated syphilis can evolve to tertiary syphilis with its clinical manifestations (cardiac or neurological complications, skin or visceral lesions, etc.), exposed the patients to HIV infection, and lead to congenital syphilis (8).

In Gabon, recent studies conducted in blood centers revealed seroprevalences of (1.3%- 3.1%), (3.3 % -7.28 %) , (4.9 %- 6.2 %) , and (1.6 % - 3.3 %) respectively for HIV, HBsAg, HCV, and syphilis (9–11). These studies were conducted in only two out the nine provinces of Gabon, namely the Ogooué-Lolo province, in the city of Koulamoutou, and the Estuary Province, in the capital city Libreville. Thus, the current study was undertaken to provide recent data on the aforementioned TTI in the largest blood center of the Haut-Ogooué province (Southeastern Gabon).

2. Material and methods

2.1. Study site and design

A cross-sectional study was conducted at the Amissa Bongo Regional Hospital Center of Franceville (Southern Gabon) from September 13th to October 30th of year 2021 to determine the seroprevalence of HIV, HBV, HCV, and *Treponema pallidum*. The hospital was created twenty (20) years ago and fully plays its role as a reference hospital in the Haut - Ogooué Province, with good level services and basic specialties present. Indeed, patients come remote regions and even neighboring provinces to seek medical care. The Haut- Ogooué province covers an area of 20,740 Km² with a population estimated at 250,799 inhabitants (2013 population census).

2.2. Study population

All prospective blood donors attending hospital during the study period were subjected to a structured questionnaire containing socio-demographic information, history of blood donation, and risk factors associated with transfusion-transmitted infections.

2.3. Serological assays

Antibodies to HIV 1/2, hepatitis C and *T.pallidum*, and Hepatitis B surface antigen (HBV) were detected using CTKBiotech test strips (CTKBiotech, Poway, California).

HIV was screened for using the OnSite HIV 1/2 Ab Plus Combo Rapid Test, HBV the OnSite HBsAg Combo Rapid Test, HCV the OnSite HCV Ab Plus Combo Rapid Test, and *Treponema palladium* the OnSite Syphilis Ab Rapid Test. The HIV positive status of screened donors was confirmed by the Accu-Tell ® Rapid Anti-HIV 1/2 Test (Accubiotech, Beijing, China).

2.4. Statistical analysis

All participants were subjected to a standard blood donor questionnaire containing information about socio-demographic data, blood donor history, and potential risk factors before providing a blood sample. Blood samples were tested for HIV, HBV, HCV, and Syphilis. The generated data were enter into Excel spread sheets, exported and analyzed using MedCalc® Statistical Software version 20.027 (MedCalc Software Ltd. Ostend. Belgium; <https://www.medcalc.org>; 2022). The characteristics of the study population were described using descriptive statistics. ODDS ratio and Pearson's Chi square test used to determine the degree of association between the disease and independent variables. A P-value ≤ 0.05 was considered statistically significant

2.5. Ethical consideration

All prospective blood donors who signed an inform consent were included in the study. Participants' identities were kept secret and permission was obtained from the hospital internal review board. The study protocol was conducted in line with ethics rules contained in the Declaration of Helsinki.

3. Results

3.1. Sociodemographic characteristics of CHRAB blood donors (Table 1)

In total 447 prospective blood donors were included in the study; of which 88.60% (396) were males. The age ranges from 18 to 50 with a median age of 30. The age groups 18-28 and 29-38 were the most represented with respectively 38.5% and 40.70%. More than 57% (256) of blood donors were workers, followed by students (25.72%), and unemployed (17%). Among donors, 83.67% (374) were family donors and 15.22 % (68) first time donors.

Table 1 Socio-demographic characteristics of prospective blood donors attending the Amissa Bongo Regional Hospital Center, Southern Gabon

Variable	Frequency (%)
Gender	
Female	51 (11.40)
Male	396 (88.60)
Age	
18-28	172 (38.50)
29-38	182 (40.70)
39-50	93 (20.80)
Occupation	
Student	115 (25.72)
Unemployed	76 (17)
Formal	105 (23.50)
Informal	151 (33.78)
Type of donors	
VNRD	73 (16.33)
Family donor	374 (83.67)
Donated blood previously	
Yes (repeat donor)	379 (84.78)
No (first time)	68 (15.22)

VNRD: Voluntary Non Remunerated Donor

3.2. Seroprevalence of transfusion transmissible infections (HIV, HBV, HCV, syphilis) (Table 2)

Table 2 Association of HIV, HBV, HCV, and Syphilis with socio-demographic variables

Variables	HIV+		HBV+		HCV+		TP+	
	n (%)	OR (95%CI)	n (%)	OR (95%CI)	n (%)	OR (95%CI)	n (%)	OR(95%CI)
Gender								
Female	3 (5.9)	3.47 (0.87-13.9)	0 (0)	0.29 (0.2 - 5.1)	1 (1.96)	1.30 (0.15-11.0)	1 (1.96 %)	2.62 (0.26 - 25.7)
Male	7(1.8)	1	12(2.42)	1	6(1.51)	1	3 (0.75)	1
Age								
18-28	6(1.74)	1	6 (3.48)	1	4(2.32)	1	0 (0 %)	1

29-38	3(2.75)	1.6 (0.37-6.76)	3 (1.65)	0.46 (0.11- 1.88)	2 (1.09)	0.46 (0.08 - 2.6)	4 (2.19)	8.7 (0.46-162.76)
39-50	3(2.15)	1.24 (0.20 -7.54)	3 (3.22)	0.92 (0.22- 3.77)	1 (1.07)	0.45 (0.05 - 4.1)	0 (0 %)	1.84 (0.04 - 93.73)
Occupation								
Student	0 (0)	1	5 (4.34)	1	1 (0.87)	1	0 (0 %)	1
Unemployed	6 (7.9)	21.29 (1.2 - 383.8)	2 (2.63)	0.61 (0.11 - 3.23)	4 (5.26)	6.33 (0.7 - 57.8)	2 (2.63 %)	7.75 (0.36-(63.73)
Formal	2 (1.9)	5.58 (0.3 - 117.6)	4 (3.81)	0.88 (0.23 - 3.40)	1 (0.95)	1.1 (0.07 -17.8)	0 (0 %)	1.1 (0.02 - 55.66)
Informal	2 (1.3)	3.86 (0.2 - 81.25)	1 (0.66)	0.15 (0.02 - 1.27)	1 (0.66)	0.76 (.05 - 12.3)	2 (1.32 %)	3.86 (0.2 - 81.25)
Type of donor								
VNRD	2(2.74)	1	1 (1.37)	1	0 (0)	1	0 (0)	1
Family donor	8(2.14)	0.77 (0.16- 3.73)	11 (2.94)	2.18 (0.27 - 17.1)	7 (1.87)	3.00 (0.17 -53.1)	4 (1.07)	1.78 (0.09 - 33.52)
History of blood donation								
Repeat donor	7(2.20)	1	7 (2.19)	1	5 (1.57)	1	2 (0.62)	1
First time donor	3(2.34)	1.07 (0.27-4.20)	5 (4.90)	1.81 (0.56 - 5.81)	2 (1.56)	1.00 (0.2 - 5.20)	2 (1.56)	2.51 (0.35 - 18.05)

VNRD: Voluntary Non Remunerated Donor

Table 3 Association of HIV, HBV, HCV, and Syphilis with Risk factors

	HIV+		HBV+		HCV+		TP+	
Risk factors	n (%)	OR (95%CI)	n (%)	OR (95%CI)	n (%)	OR (95%CI)	n (%)	OR (95%CI)
Tattooed?								
Yes	3 (1.97)	0.83 (0.21 -3.25)	7 (4.60)	2.80 (0.87-8.97)	2(1.31)	0.77 (0.5 -4.0)	2 (1.32)	1.95 (0.27 - 14.0)
No	7 (2.37)	1	5 (1.69)		5 (1.69)	1	2 (0.67)	1
Recent surgery operation?								
Yes	2 (3.12)	1.51(0.31 - 7.28)	1 (1.56)	0.52 (0.06- 4.13)	2(3.12)	2.43 (0.5- 12.9)	0 (0)	0.65(.03- 12.28)
No	8 (2.08)	1	11 (2.87)	1	5 (1.30)	1	4 (1.03)	1
Recent blood Transfusion?								
Yes	2 (7.69)	4.30 (0.86- 21.37)	0 (0)	0.62 (.04 - 10.72)	0 (0)	1.04 (.06- 18.8)	0 (0)	1.75(.09 - 33.38)
No	8 (1.9)	1	12 (2.85)	1	7 (1.66)	1	4 (0.95)	1

The overall seroprevalences of HIV, HCV, HBV, and TP were respectively 2.23 % (10/447), 1.56 % (7/447), 2.68 % (12/447), and 0.89 % (4/447). Out of 447 screened donors, 33 (7.38 %) tested positive for at least one of the transfusion transmissible infections and four were co-infected: one HIV/HCV, two HBV/Syphilis, and one HBV/HCV. Females were 3.47, 1.3, and 2.62 times more likely to test positive to HIV, HCV, and TP, respectively, compare to men; however, the difference was not statistically significant (95% CI= 0.87-13.9, 0.15- 11.0, 0.26 - 25.7).

Female donors, workers, donors aged 29 and above were respectively 3.47, nearly (4 - 5.6), and (1.2-1.6) times at higher risk of testing positive to HIV compare to male (95% CI= 0.87-13.9), students (95% CI=0.3 - 117.6, 0.2 - 81.25), and donors aged 18-28 (95%CI=0.37- 6.76, 0.20 - 7.54). Unemployed donors were more than 21 times more likely to test positive to HIV compare to students and the difference was significant (OR= 21.29, 95% CI= 1.2 - 383.8). Whereas, no association was found between HIV and the type of donor (OR= 0.77, 95% CI= 0.16- 3.73).

HBV was not associated with the gender, the age, or the occupation (OR<1). In contrast, family and first time donors were respectively 2.18 and 1.81 times more likely to test positive to HBV compared to voluntary non remunerated (95% CI= 0.27 - 17.1) and repeat donors (95% CI= 0.56 - 5.81). However, there was no significant difference.

Females, unemployed, and family donors were respectively 1.3, 6.3, and 3 times more likely to test positive to HCV than males (95% CI= 0.15- 11.0), students (95% CI= 0.7 - 57.8), and voluntary donors (95% CI= 0.17 -53.1); but, the differences were not statistically different. In contrast, HCV was not associated with the age (OR<1).

The age groups 29-38 and 39-50 were 8.7 and 1.84 times more likely to test positive to TP than donors aged 18- 28; however not statistical difference was found (95% CI= 0.46 - 162.76, 0.04 - 93.73). Females, unemployed and workers from the informal sector were respectively 2.62, 7.75 and 3.85 times more prone to test positive to TP than males and students; but the differences were not significant (95% CI= 0.26 - 25.7, 0.36 -163.73, 0.2 - 81.25, respectively).

The odds of testing positive to TP were 1.78 and 2.51 times higher in family and first time donors, respectively; but, the difference was not significant (95% CI= 0.09 - 33.52, 0.35 - 18.05, respectively).

3.3. Association of HIV, HBV, HCV, and Syphilis with Risk factors

Being tattooed was neither associated with HIV nor HCV (OR <1). Whereas, tattooed blood donors were nearly 3 and 2 times more likely to test positive to HBV and TP, respectively; but, no statistical difference was found (95% CI= 0.87- 8.97, 0.27 - 14.0, respectively).

There was no association between having a recent surgery and HBV or TP (OR <1). In contrast, donors who underwent a recent surgery were respectively 1.51 and 2.43 times at higher risk of testing positive to HIV and HCV; but, no statistical difference was found.

Donors who were recently transfused were 4.3, 1.04, and 1.75 times more likely to test positive to HIV, HCV, and TP, respectively; however, the difference was not statistically different (95% CI= 0.86-21.37, 0.06- 18.8, 0.09 - 33.38).

4. Discussion

The objective of this study was to determine the prevalence of transfusion transmitted viral infections (HIV, HBV, and HCV) and syphilis among prospective blood donors of the Amissa Bongo Regional Hospital of Franceville. Sociodemographic characteristics revealed that more than 88% (396/447) of blood donor candidates were males. This finding is line with the rates of 83%; 83.5%, 85.1 % reported respectively in Ghana, Gabon, and Nigeria (12, 9, 14). Various factors such as menstruation, breastfeeding, or childbirth could account for the observed discrepancy. The data also showed that only 16.33 % (79) of prospective blood donors were voluntary non remunerated donors (VNRD), a result that is consistent with the 2011- WHO report that revealed less than 25 % VNRD in Gabon (WHO, 2011).

The study reported prevalences of 2.23 %, 1.56 %, 2.68 %, and 0.89 % respectively for HIV, HCV, HBV, and syphilis. These findings are similar to the prevalences of 2.5 % and 3.3% reported for HIV and HBV, respectively , in Ethiopia and Southern Gabon (10,16,17) .*Treponema palladium* prevalence of 0.8% found in this study was similar to 1.1% reported in Nigeria by Buseri et al(14), and is in line the value of 1.2% recently reported by the WHO in the African region(1). But, it is lower than the prevalences of 1.85% and 3.3% reported respectively in Tanzania(19) and Southern Gabon (9). The HCV prevalence of 1.56% found in the current study is within the same range as the prevalences of 1.6% and 1.13% reported respectively in Ethiopia(17), and Tanzania (19).However, it was lower than the prevalences of 4.9% and 6.2% reported in previous studies conducted in the city of Koulamoutou, Southern Gabon (9,10). The observed discrepancies

in the aforementioned transfusion transmissible infections could be explained by the difference in the sample size, the geographical location(20), the sensibility/specificity of the ELISA used , and the risk behavior habits(21).

Being unemployed was significantly associated with HIV infection (OR= 21.2; CI= 1.2 - 383.8), a finding that is consistent with a study conducted in Ethiopia by Biagdo (22) .

Analysis of blood transmissible infections revealed that tattooed donors were nearly three (3) and two (2) times more likely to test positive to HBV and *T.pallidum*, respectively. Likewise, those who received blood recently were four (4) times more prone to test positive to HIV. Prospective blood donors who have been recently operated were 2.4 times more likely to be infected with HCV. However, none of the risk factors examined in this study was significantly associated with any of the transfusion transmissible infection. The observed trends are in line with previous studies that reported a link between blood transfusion and HIV (23,24), surgery and HCV (25), and tattooing and HBV(26). The present study also reported four cases of co-infections, namely HIV/HCV (1), HBV/Syphilis (2), and HBV/HCV (1). These results are consistent with the fact that they do share common modes of transmission: sex, blood transfusion, and sharing needles/blades.

5. Conclusion

This study confirms the declined of Syphilis among blood donors in Gabon. Although small, co-infections cases reported here should raise the haemovigilance level in blood centers across the nation as they are known to worsen patient's clinical outcome. Efforts should be made by health care personnel and decision makers to increase the number of voluntary non remunerated donors. Transfusion transmitted infection markers reported in this study does not reflect the trend in the general population as blood donors are a small fraction of the population. A large scale study is needed to fulfill that objective. This study on viral infections and syphilis among prospective blood donors is the first one, to our knowledge, to be conducted in the city of Franceville.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

Statement of ethical approval

All prospective blood donors who signed an inform consent were included in the study. Participants' identities were kept secret and permission was obtained from the hospital internal review board. The study protocol was conducted in line with ethics rules contained in the Declaration of Helsinki.

Statement of informed consent

Informed consent was obtained from all individual participants included in the study.

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