

Risk Factors of the Transmission of the HIV, Hepatitis B and C and Syphilis among Blood Donors at the Saint Luc General Hospital of Kisantu, Democratic Republic of Congo

Lupande Mwenebitu David^{1,2,3}, Busa Mabaya Gael⁴, Pululu Christian⁵, Mukuku Olivier⁶, Phoba Marie-France^{4,7} and Lunguya Metila Octavie^{4,7*}

¹Service of Microbiology, Bukavu Provincial Referral Hospital, Democratic Republic (DR) Congo

²University Center for Management of Outbreaks, Catholic University of Bukavu, DR Congo

³MEPHI, UMR63, CNRS 7278, IRD 198 IHU-Mediterranean Infection, Aix-Marseille University, France

⁴Department of Medical Microbiology, University of Kinshasa Teaching Hospital, University of Kinshasa, Kinshasa, DR Congo

⁵Laboratory of Clinical Biology, Saint Luc General Hospital of Kisantu, Kisantu, DR Congo

⁶Department of Microbiology, National Institute for Biomedical Research, University Teaching Hospital of Kinshasa, Kinshasa, DR Congo

⁷Department of Medical Microbiology, University of Kinshasa Teaching Hospital, Kinshasa, DR Congo

*Corresponding author: Lunguya Metila Octavie

✉ octmetila@yahoo.fr

Department of Medical Microbiology, University of Kinshasa Teaching Hospital, DR Congo

Tel: +243815181121

Citation: David LM, Gael BM, Christian P, Olivier M, Marie-France P, et al. (2018) Risk Factors of the Transmission of the HIV, Hepatitis B and C and Syphilis among Blood Donors at the Saint Luc General Hospital of Kisantu, Democratic Republic of Congo. J HIV Retrovirus Vol. 4 No.3:18

Abstract

Introduction: The blood donation is an altruistic but dangerous act. The Human Immunodeficiency Virus (HIV), the Hepatitis B Virus (HBV), the Hepatitis C Virus (HCV) and Syphilis must be subjected to a regular epidemiological monitoring in order to reduce the infectious risk of their transmission. This study aims to determine the epidemiological and serological profile of blood donors of to the Saint Luc General Hospital of Kisantu.

Methods: This retrospective study from November 2010 to November 2014 conducted among blood donors at the Saint Luc Hospital in KISANTU. For the screening, only the rapid tests were used (Determine HIV 1 and 2, Determine HBsAg, HCV One Step and RPR). Statistical analysis was performed using SPSS 21.0, the chi-square test or Fisher exact test (when recommended) was used to find a relationship between epidemiological parameters and seropositivity to tested antigens. The significance level was set at $p < 0.05$.

Results: A total of 7434 blood donors were collected including 6787 male (91.30%) and 647 female (8.70%). The majority of donors were between 26-35 years of age (39.52%); the mean age was 31.1 ± 9.1 years. The age group of 36-45 years was a protective factor for HBV (OR < 1 , $p < 0.05$), seroprevalence of HIV, HCV and syphilis were 2.93%, 1.86% and 0.66%.

Conclusions: A high prevalence of Hbs antigen has been found in our series. Epidemiological surveillance must be strengthened within the national blood transfusion program in DR Congo in order to reduce the infectious risks that are transmitted during blood transfusions.

Keywords: Transfusion; Hepatitis B and C; Kisantu; Blood donors; Syphilis

Received: July 24, 2018; **Accepted:** September 24, 2018; **Published:** September 30, 2018

Introduction

Blood transfusion is a medical and beneficial practice by solving lives for those who are in need, which correct an hematological failure induced by the lack of blood product; but this treatment is likely to be responsible for the transmission of certain infectious agents, such as Human Immunodeficiency Virus (HIV), hepatitis B and C, and *Treponema pallidum* (syphilis). These transmissible infectious agents are among the greatest threats to blood safety in recipients [1,2].

Blood transfusion accounts for 5% to 10% of the transmission of HIV infection in sub-Saharan Africa [3]. According to the World Health Organization, in 2016, 37 million people were living with HIV worldwide, of which 70% or 25 million people live in resource-poor countries [4].

Hepatitis B and C viruses infect 350 and 170 million people around the world, respectively. These viruses are a public health problem because they are responsible for the majority of liver cancers in the world. More than 80% of those infected with the hepatitis C virus are chronic carriers of the virus and a potential reservoir for transmission [5].

For the hepatitis B virus, the geographical distribution of prevalence among blood donors in Congo is not different from that of other African countries, as demonstrated by numerous studies. This condition is a public health problem, since the prevalence of chronic carriage of HBs antigen varies between 8% and 15% in the general population, and is 5.8% among blood donors in Kinshasa; for the hepatitis C virus, its prevalence among blood donors in Kinshasa is 4.8% and 2.68% in Brazzaville, a neighboring city of Kisantu; in the Republic of Congo [6,7].

Syphilis is also a systemic disease caused by *Treponema pallidum* that can be transmitted through sexual contact, blood transfusion and vertical transmission. In sub-Saharan Africa, syphilis remains a serious public health problem. The prevalence of active syphilis among African countries was 12.8% in Tanzania and 3.8% in Kenya. In Democratic Republic of the Congo, the prevalence of syphilis among blood donors in Kisangani was 1.4% in 2014 [2,8].

Unlike the hepatitis B virus, no effective vaccine is available against the hepatitis C virus and the treatment offered to the patient with hepatitis C is expensive, however, the infection can now be permanently cured in more 99% of patients who achieve a sustained virological response with marketing authorization for Direct-Acting Antivirals (DAA) [9].

Advances in screening for HIV, Hepatitis B and C, and Syphilis have significantly reduced the risk of contamination when donating blood; in sub-Saharan Africa, two factors account for difficulties in achieving optimal blood transfusion safety, the relatively high prevalence of blood-borne infections in the population, and the still insufficient proportion of voluntary blood donors who are the safest group [6].

In developed countries, this infectious risk is almost zero because they have robust diagnostic and infrastructure equipment for an efficient laboratory screening, which is still a big challenge in many African countries, including the DRC. The purpose of this study is to document the seroprevalence of HIV infection, hepatitis B and C, and syphilis among volunteer blood donors at Saint Luc General Hospital of KISANTU (HSLK), 120 km away, South of Kinshasa.

Methodology

This is a retrospective study based on the data recorded in the laboratory that took place over a period from November 2010 to November 2014. Included in our study were all blood donors

registered at the HSLK Blood Bank during the study period. Age and sex the blood group of each subject included; serological results from HIV, Hepatitis B and C and Syphilis tests were sought. All data were collected and processed anonymously after authorization was obtained from the HSLK authorities. The study being retrospective and documentary, the opinion of the ethics committee was not necessary and the principles of Helsinki had been respected.

The detection of infectious markers has been carried out according to the recommendations of the national blood transfusion program and the national program against AIDS and STIs, which advocate the use of the following rapid tests: The presence of HIV1 and HIV2 antibodies has been searched with a quick test (Alere Medical CO. Ltd). Hepatitis B surface antigen (Ag Hbs) was tested using HBsAg One Step Hepatitis B Surface Antigen Test Device (serum/plasma) rapid test. Anti- Hepatitis C Virus antibodies were investigated with HCV one step Hepatitis C Virus Test Strip (serum/plasma). Rapid Plasma Reagin carbon is the test used for the diagnosis of *Treponema pallidum* infection. The Simonin-Machon and Beth-Vincent methods were used for ABO blood grouping performed on slides using red cells and monoclonal antisera (Anti-A, Anti-B, Anti-AB and Anti-D). The data was analyzed using Excel 2010 and SPSS 21.0 software. The mean and standard deviation were calculated and the chi-square or Fischer Exact test to find the association between socio-demographic parameters and the seropositivity of the antigens and/or antibodies sought. The $p < 0.05$ was set at significance level.

Results

During the study period, 7434 blood donors registered at the HSLK blood bank were collected. Of the 7434 blood donors that were collected, 6787 (91.30%) were male, 647 (8.70%) were female. With respect to age, 2400 (32.28%) were between the ages of 18-25, 2938 (39.52%) were between the ages of 26-35, and 1524 (20.5%) were between 36-45 years, and 572 (7.69%) were older than 45 years. With regard to the blood group, 3812 (51.28%) are of blood type O, 1845 (24.82%) are of blood group A, 1476 (19.85%) are of blood group B, and 301 (4.05%) are of AB blood group.

For the seroprevalence rate, it was high for HBV with a population of 354 (4.76%), followed by HIV and HCV with a population of 218 (2.93%) for HIV, 138 (1.86%) for HCV. Seroprevalence rate of syphilis was lower with 49 (0.66%).

Discussion

HIV, HBV, HCV and Syphilis infections are the major communicable infections considered to be public health problems in the low-income country. Those four main infections are transmitted parentally; blood transmission is therefore, a potential route of transmission [1].

In this study, 7434 blood donors were identified with a majority of male donors (91.30%) (**Table 1**). These results are similar to those found by other authors who incriminate certain beliefs or

Table 1: Sociodemographic data of volunteer donors of Kisantu blood bank.

Variable	Manpower (n=7434)	Percentage
Age (years)		
18-25	2400	32.28
26-35	2938	39.52
36-45	1524	20.5
> 45	572	7.69
Average ± ET	31.1 ± 9.1	
Sex		
Male	6787	91.3
Female	647	8.7
Blood group		
O	3812	51.28
A	1845	24.82
B	1476	19.85
AB	301	4.05

ET: standard deviation

ancestral african beliefs, for whom; in comparison with women, men are more likely to be in better health, according to these same authors the physiological constraints in women such as the menstrual cycle and certain obstetric factors, especially pregnancy, are restrictive parameters for the woman to do a blood donation [1,10]. And everything suggests that the donors in our study are a reflection of these claims.

Our series reports seroprevalence of 2.93% for HIV, 4.7% for Hbs Antigen, 1.86 for hepatitis C and 0.66% for syphilis (**Table 2**).

The seroprevalence for HIV encountered in our study is higher compared to that found at the University Clinics of Lubumbashi by Christian and Olivier [1], and in the study of X. Dray in Djibouti [11].

However, it is weaker than that obtained by Batina in Kisangani

Table 2: Seropositivity to HIV, hepatitis B and C Virus, and syphilis among blood donors (N = 7434).

Markers	Manpower (n)	Percentage	IC 95%
HIV	218	2.93%	2.57-3.34
HBV	354	4.76%	4.30-5.27
HCV	138	1.86%	1.57-2.19
RPR	49	0.66%	0.50-0.87

HIV: Human Immunodeficiency Virus; HBV: Hepatitis B Virus; HCV: Hepatitis C Virus; RPR: Rapid Plasma Reagin

Table 3: Association between socio-demographic characteristics of blood donors and seropositivity to *Treponema pallidum*, HIV, hepatitis B and C.

Variable	RPR		HBV		HCV		HIV	
	n (%)	OR (IC95%)	n (%)	OR (IC95%)	n (%)	OR (IC95%)	n (%)	OR (IC95%)
Age (years)								
18-25	14 (0.58)	0.47 (0.19-1.18)	111 (4.63)	1.03 (0.76-1.41)	45 (1.88)	0.97 (0.50-1.89)	68 (2.83)	0.95 (0.55-1.63)
26-35	21 (0.71)	0.58 (0.24-1.37)	149 (5.07)	1.14 (0.85-1.53)	42 (1.43)	0.74 (0.38-1.44)	93 (3.17)	1.07 (0.63-1.80)
36-45	7 (0.46)	0.37 (0.13-1.07)	68 (4.46)	0.13 (0.07-0.22)*	40 (2.62)	1.37 (0.70-2.69)	40 (2.62)	0.88 (0.49-1.56)
>45	7 (1.22)	1	26 (4.55)	1	11 (1.92)	1	17 (2.97)	1
Sex								
Female	8 (1.24)	2.06 (0.96-4.41)	27 (4.17)	0.86 (0.57-1.28)	13 (2.01)	1.09 (0.61-1.94)	23 (3.55)	1.25 (0.80-1.93)
Male	41 (0.60)	1	327 (4.82)	1	125 (1.84)	1	195 (2.87)	1

*P<0.0001, RPR: Rapid Plasma Reagin; HBV: Hepatitis B Virus; HCV: Hepatitis C Virus; HIV: Human Immunodeficiency Virus

[12], and that obtained by S. Mole in Cameroon [13]. Donors aged between 26-35 years old have a high prevalence, while those between 36-45 years of age have a low prevalence. Other authors have made the same observation as we [11]. This can be explained by the fact that the young population in general, precisely whose age varies between 20 and 35 years old, largely ignores how HIV is transmitted and how to protect themselves from it, the level of education being a sub-basement not negligible. The lack of sufficient information about HIV/AIDS in our environment could explain this ignorance.

Different seroprevalence rates of HBV infection are reported among blood donors in Africa. The highest rates were found in some countries, such as Nigeria (18.6%), Guinea Bissau (16.2%) and Burkina Faso (14.96%) [1].

The seroprevalence of HBV infection observed in our study is high compared to that observed by Malam Abdou in Niger [14] and that obtained by Rakotoniama in Antananarivo in Madagascar [15]. However, it is weaker than that obtained by Batina in Kisangani [12] and those obtained by O. Kra in Côte d'Ivoire [16] and Mbendi in Kinshasa [17]. The 36-45 age group is the least affected compared to the others, making it a protective factor (OR <1) with a statistically significant relationship (p<0.0001) (**Table 3**). Variations in the incidence of hepatitis B are thought to be related to poorly known hepatitis transmission patterns and cultural traditions including tattooing, multiple sexual partners, and educational attainment.

The seroprevalence of HCV infection is 1.86%. This is higher than that found by Malese in Ethiopia [2] and that obtained by Malam Abdou in Niger, but less important than that obtained by Baleka in Kinshasa [7], and that obtained by Kabinda and all. At the eastern part of DRC [18]. This proves a very high prevalence of hepatitis C virus in the DRC compared to other african countries including Ethiopia and Niger. And this high rate is explained by the fact that the majority of the Congolese population is unaware of the mode of transmission of the hepatitis C virus, the late introduction of the HCV test and the various means to prevent it.

The seroprevalence for syphilis obtained during our study is 0.66%, which is higher than that reported by Christian in Lubumbashi [1], but much lower than that encountered by Osinga in Kisangani [8] and Baidy in Mauritania [19]. The ignorance of the population about syphilis and its different modes of transmission could explain this high rate.

This study has some limitations, including the use of rapid diagnostic tests in the diagnosis of these different post-transfusion infections. Parameters such as the number of blood donations per donor and the categorization of volunteer blood donors as first-time donors and regular or family donors were not taken into account, as the data were retrospective.

Conclusion

This study confirms that infections transmitted by blood transfusion are a public health problem and show a very high prevalence of hepatitis B and HIV and a low tendency for hepatitis C and syphilis. It shows a high prevalence of these

different infectious markers in young subjects. For hepatitis B, the age group of 36-45 years was a protective factor; no risk factors were found for the other infectious markers. In addition, this study showed a marked increase in male donors as opposed to female donors. In addition, donors of blood group O were in the majority.

Scientific Valorization

These data were valued in the form of a Poster at the 2nd ICART Symposium (International Center for Advanced Research and Training), held in Bukavu in the Democratic Republic of Congo, from 19 to 21 August 2017.

References

- 1 Kakisingi NC, Mukuku O, Matanda SK, Manika MM, Kyabu VK, et al. (2016) Seroprevalence and epidemiological profile of blood donors at the Lubumbashi University Clinics, Democratic Republic of Congo. *Pan Afr Med J* 23: 175.
- 2 Abate M, Wolde T (2016) Seroprevalence of human immunodeficiency virus, hepatitis B virus, hepatitis C virus, and syphilis among blood donors at Jigjiga Blood Bank, Eastern Ethiopia. *Ethiop J Health Sci* 26: 153-60.
- 3 UNAIDS (2002) Report on the global AIDS epidemic. Geneva, Joint United Nations program on HIV/AIDS.
- 4 WHO (2016) Global health sector strategy on HIV 2016–2021 Towards ending AIDS.
- 5 Zeba TA (2012) Co-infection des virus des hépatites B et C au Burkina Faso: prévalence, marqueurs viraux et caractérisation moléculaire. *Thèse de doctorat* de l'Université de Ouagadougou.
- 6 Nzaji MK, Ilunga BK (2013) Prévalence des marqueurs infectieux chez les donneurs de sang en milieu rural. Cas de l'hôpital général de référence de Kamina. *Santé Publique* 25: 213-7.
- 7 Baleka F, Pukuta E, Lay Y, Mwema G, Mumba M, et al. (2014) Prevalence and coinfection of HIV, HCV and HBV among blood donors in Kinshasa, DRC. *Congo sciences* 2: 37-40.
- 8 Bassandja JO, Botwafine CM, Katawandja AL, Batina AS, Likwela JL (2014) Séroprévalence de la syphilis chez les donateurs bénévoles de sang à Kisangani, RDC. *Kisangani Médical* 5: 82-5.
- 9 European Association for the Study of the Liver (2015) Recommandation de l'EASL sur le traitement de l'hépatite C. *J Hepatol* 63: 199-236.
- 10 Fasola FA, Otegbayo IA (2002) Post-transfusion hepatitis in sickle cell anemia, retrospective-prospective analysis. *Nig J Clin Pract* 5: 16-9.
- 11 Dray X, Dray-Spira R, Bronstein JA, Mattera D (2009) Prevalences of HIV, hepatitis B and hepatitis C in blood donors in the Republic of Djibouti. *Med Trop* 65: 39-42.
- 12 Batina A, Kabemba S, Malengela R (2007) Infectious markers in blood donors in the Democratic Republic of Congo (DRC). *Rev Med Brux* 28: 145-9.
- 13 Mole S, Onana E, Biholong D (2011) HIV and risk factors for the blood donors at the central hospital of Yaounde, Cameroon. *Bull Soc Pathol Exot* 104: 226-31.
- 14 Brah S, Malam-Abdou B, Chefou ME, Djibrilla A, Andia A, et al. (2016) Post-transfusion infectious risk: A comparative study on the seroprevalence of HIV, hepatitis B and C and syphilis: About 202 patients tested at the National Hospital of Niamey (HNN). *Health Sci Dis* 17: 1-4.
- 15 Rakotonaiaina AI, Randriamanantsany ZA, Ranaivosoa KHM, Andriambelo V, Fortune H, et al. (2013) Self-Evaluation of HIV, VHB, VHC and *Treponema pallidum* thanks to the donors of the Honorary Songs of the National Transfusion Center of Antananarivo 1992 to 2010. *The Medieval Journal of Madagascar* 3: 264-8.
- 16 Nlombi CM, Longo-Mbenza B, Nsukini SM, Tamfum JJM, Nanituma HS, et al. (2001) Prevalence of HIV and HBsAg in blood donors. Residual risk of transfusion transmission for blood receivers in East-Kinshasa, Democratic Republic of Congo. *Med Trop* 61: 139-42.
- 17 Kra O, N'Dri N, Ehui E, Ouattara B, Bissagnene E (2007) Prevalence of HBs antigen in blood donors in the Bouaké regional centre of blood transfusion in 2001. *Bull Soc Pathol Exot* 100: 127-9.
- 18 Kabinda JM, Miyanga SA, Misingi P, Ramazani SY (2014) Hepatitis B and C among volunteer non-remunerated blood donors in Eastern Democratic Republic of Congo. *Transfus Clin Biol* 21: 111-5.
- 19 Lo BB, Diagne A, Amadou S (2008) Séroprévalence tréponémique chez les donateurs de sang au centre hospitalier national de Nouakchott (Mauritanie). *Med Afr Noire* 45: 8-9.