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Frequency of hepatitis and HIV co-infection markers in blood donors at the Hospital Professor Bocar Sidy Sall of Kati-Mali

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Abstract

The transmission of infectious agents such as human immunodeficiency virus (HIV), hepatitis B (HBV), and hepatitis C (HCV) represents the greatest threat to the safety of blood transfusion to the recipient. The association of HIV infection with HBV and/or HCV is common worldwide, due to shared modes of transmission. The prevalence of HIV-HBV co-infection is estimated to be 5-10% in the United States and 20-30% in Asia and parts of sub-Saharan Africa. Other studies report HCV co-infection in 9-25% of HIV-infected patients.

The aim of this study was to determine the frequency of markers of co-infection between hepatitis (B,C) and human immunodeficiency virus in blood donations collected at the CHU Kati blood transfusion center. It was a retrospective study conducted from October 1 to December 31, 2018. Data were collected from blood donors aged 18 to 60 years. The Pre-donation medical interview was the first barrier for the selection of subjects at risk. The sample was composed of 92% males and 8% females out of a total of 507 individuals sampled. Biological screening was performed by ELISA (Enzyme Linked Immuno Sorbent Assay). The results revealed a prevalence of 0.86% of HIV-HBV co-infection only in rhesus negative donors. No co-infection between HIV and HCV was found. This study showed that at the Kati University Hospital, only rhesus-negative donors presented cases of HIV-HBV co-infection.

Keywords: Co-infection; HIV; HBS; HCV; Blood donors; Mali

1. Introduction

In developing countries, many deaths are due to the lack of safe blood, even in some urban health facilities. Blood transfusions save lives and improve health, but millions of patients do not have timely access to safe blood due to a lack of reliable blood donors. Transfusions are an essential aspect of health care and everyone should have equitable access to uncontaminated blood. In sub-Saharan Africa two major problems are encountered in achieving optimal transfusion safety, the existence in the population of a high frequency of various infections, some of which are transmissible by blood transfusion, and an insufficient proportion of voluntary donors who constitute the safest group [1]. Over the past twenty years, safety in blood transfusion has made great progress with regard to the infectious and immunological risk. Screening for human immunodeficiency virus (HIV), hepatitis B virus (HBV), and C virus (HCV) and syphilis are among

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the mandatory tests on the donated blood. According to the estimation of the World Health Organization (WHO), around 2 billion people are living with HBV, more than 240 million are carriers of chronic hepatitis B and between 500,000 and 700,000 people die each year due to HBV infection. Nearly 170 million people are chronic carriers of HCV and more than 350,000 people die of HCV-related liver disease each year. Worldwide, 33.4 million people are infected with HIV [2].

In Africa more than 70 million people are affected by hepatitis B and C [3].

The association of human immunodeficiency virus (HIV) infection with hepatitis B virus (HBV) and/or hepatitis C virus (HCV) is common worldwide, following common modes of transmission. The prevalence of HIV-HBV co-infection is estimated at 5-10% in the United States and at 20-30% in Asia and certain regions of sub-Saharan Africa, according to a recent review. Other studies have reported HCV co-infection in 9-25% of HIV-infected patients. Co-infections with HIV, HBV and/or HCV currently constitute a major public health problem, especially through the interaction of one and the other in the natural history of chronic hepatitis, which they aggravate (evolution towards cirrhosis and hepatocarcinoma) responsible for significant mortality and difficult therapeutic problems [4].

The prevalence of the main markers transmissible by transfusion among blood donors in Bamako in 2018 is estimated to 1.9% for HIV, 10.17% for HBV, 2.22% for HCV (unpublished data from CNTS Mali).

Studies on HIV and hepatitis co-infections are rare in Mali and no study has taken place in this direction at the Laboratory of the Hospital of Prof Bocar Sidy Sall in Kati, Mali.

The objective of this study was to estimate the prevalence of the co-infection of hepatitis B and C viruses with the HIV virus among blood donors at the Kati University Hospital.

Research question: Is there a relationship between HIV/hepatitis co-infection and rhesus negative?

2. Methods

This is a retrospective cross-sectional study of serum markers for HIV/AIDS, hepatitis B and C in blood donors at the Hospital of Professor Bocar Sidy Sall in Kati. The data was collected from the hospital case report forms and from the the blood donor register. Our study was spread over a period of 3 months, from October 1 to December 31, 2018. The data was collected in July 2019.

The study population was composed of all blood donors, family volunteers who presented for a blood donation during the period covering our study. We proceeded to the determination of the size of the sample for the estimate of the proportion of HIV co-infection and viruses responsible for hepatitis with a specified precision. Knowing that the precision can be determined using the following formula:

$$precision = Z \times \sqrt{\frac{p(1-p)}{n}}$$

With a 95% confidence interval, we can determine the sample size using the following formula:

$$n = 3.84 \times \frac{p(1-p)}{precision^2}$$

Since we do not have data on the prevalence of co-infection in our study population, to maximize the size of our sample, we estimated it at 0.5. Thus, with an accuracy of 4.4%, the minimum sample size needed for our study was 475 blood donors. Assuming that 7% of the data could be unusable, we estimated our final sample size at 507. This is an exhaustive non-random consecutive sampling.

The qualitative variables used are: Sex, Origin, Ac.HIV, AgHBS, Ac.HCV, Group, Rhesus.

The quantitative variable used was age

Screening for HIV, HCV and HBV markers was performed by the ELISA technique using appropriate kits for each marker: Genscreen® ULTRA HIV Ag-Ab from BIO-RAD France laboratories for HIV, Monolisa® Ag HBS ULTRA for HBS, Murex for HCV.

Data entry was done on Excel and analysis were performed by using R software. The χ^2 test was used to compare the proportions, the significance threshold was set at 5%. For cases where the theoretical numbers were less than 5, we used the Fischer test.

Data were collected on result sheets and in donor registers with codes to maintain anonymity for confidentiality. The results of this work will only be used for scientific purposes to improve patient care.

3. Results

Five hundred and seven (n=507) consenting blood donors were included in this study.

Table 1 Sociodemographic Characteristics

Features		Number	Percentage
Sex	Male	464	91.52
	Female	43	8.48
Origin	Kati	260	51.28
	Bamako	177	34.91
	Other localities	70	13.81
Age categories	18 – 25 years	166	32.74
	26 – 35 years	195	38.46
	36 – 45 years	106	20.91
	46 – 60 years	40	7.89

The male sex was largely in the majority with 91.52%, with a sex ratio of 10.79. The population of Kati recorded the highest number of donors during this period with 51.28%. The age group 26 to 35 was the most represented with 38.46%. The average age was 31.05 with extremes (18-60).

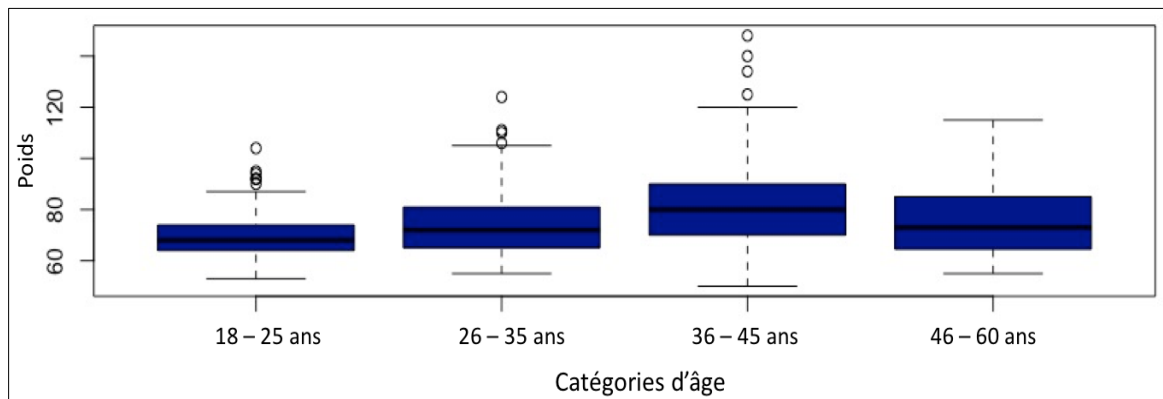


Figure 1 Weight distribution by age groups of blood donors at Kati UHC from October 1 to December 31, 2018.

The age group between 36 and 45 years had the highest number of high values in weight.

Table 2 Distribution of groupings and rhesus of blood donors at Kati UHC from October 1 to December 31, 2018.

Features		Number	Percentage
Blood Group	A	114	22.49
	B	159	31.36
	AB	39	7.69
	O	195	38.46
Rhesus	Positive	470	92.70
	Negative	37	7.30

Blood group O and Rhesus positive are in the majority with 38.46% and 92.7%.

Table 3 Frequencies of HIV and HBs co-infection markers according to sex and age groups in blood donors at UHC Kati from 1 October to 31 December 2018.

		N=507	VIH+ HBS+ n(%)	VIH+ HBs- n(%)	VIH- HBS+ n(%)	VIH- HBs- n(%)
Sex	Female	43	0 (0.00)	1 (2.32)	3 (6.98)	39 (90.70)
	Male	464	4 (0.86)	6 (1.30)	73 (15.73)	381 (82.11)
Age categories	18 – 25 ans	166	2 (1.20)	5 (3.01)	24 (14.46)	135 (81.32)
	26 – 35 ans	195	1 (0.51)	2 (1.02)	25 (12.82)	167 (85.64)
	36 – 45 ans	106	1 (0.94)	0 (0.00)	17 (16.04)	88 (83.02)
	46 – 60 ans	40	0 (0.00)	0 (0.00)	10 (25.00)	30 (75.00)

All four positive cases of co-infection (HIV+HBS+) were male, representing a prevalence of 0.86%. The age group 18-25 years had the highest prevalence with 1.20%.

Table 4 Frequencies of HIV and HCV co-infection markers by sex and age groups among blood donors at Kati UHC from October 1 to December 31, 2018

		N=507	VIH+VHC+ n (%)	VIH+ VHC - n(%)	VIH- VHC+ n (%)	VIH- VHC- n (%)
Sexe	Femme	43	0 (0.00)	1 (2.32)	0 (0.00)	42 (97.67)
	Homme	464	0 (0.00)	10 (2.15)	19 (4.09)	435 (93.75)
Catégories d'âge	18 – 25 ans	166	0 (0.00)	7 (4.22)	1 (0.60)	158 (95.18)
	26 – 35 ans	195	0 (0.00)	3 (1.54)	11 (5.64)	181 (92.82)
	36 – 45 ans	106	0 (0.00)	1 (0.94)	5 (4.71)	100 (94.34)
	46 – 60 ans	40	0 (0.00)	0 (0.00)	2 (5.00)	38 (95.00)

We did not find any cases of co-infection between HIV and HCV.

Table 5 Frequencies of HIV and Hepatitis co-infection markers according to blood grouping and rhesus in blood donors at Kati UHC from October 1 to December 31, 2018.

		Co-infection				No Co-infection
		HIV+HCV+	HIV+HBs+	HBs+HCV+		
		N=507	n (%)	n (%)	n (%)	n (%)
Blood grouping	A	114	0 (0.00)	0 (0.00)	0 (0.00)	114 (100)
	B	159	0 (0.00)	2 (1.27)	5(3.14)	152 (95.60)
	AB	39	0 (0.00)	0 (0.00)	0 (0.00)	39 (100)
	O	195	0 (0.00)	2 (1.02)	1 (0.51)	192 (98.50)
Rhesus	Positif	410	0 (0.00)	0 (0.00)	1 (0.20)	409 (99.80)
	Négatif	37	0 (0.00)	4 (10.81)	5 (13.51)	28 (75.70)

The prevalence of co-infection was higher in group B with 1.27% (HIV+HBS+) and 3.14% (HBS+HCV+). Rhesus negative had the highest number of co-infection with 10.81% (HIV+HBS+) and 13.51% (HBS+HCV+).

4. Discussions

The majority of donors were male with a sex ratio of 10.79. This result is comparable to those observed by Mayomo et al [5] in 2019 in Cameroon, Bah et al [6] in 2016, Conde [7] in 2018 in an epidemiological study of HBV/HIV co-infection among PLWHIV at the UHC Kati, Traore [8] in 2014 at the department of infectious diseases at point G, Kone [9] 2010 at CESAC Bamako and Commune IV all in Mali, Namululi et al [10] 2012 in Congo, Olawumi et al [11] 2016 in Nigeria, Kra et al [12] in 2007 in Ivory Coast; who had found respectively 14.45; 15.63; 0.67; 1.3; 3.11; 2.3; 4.94 and 2.75 in favor of men, on the other hand different from those observed by Kamande et al [13] in 2016 in Kenya, BA [14] in 2003 in a study carried out in three populations (CESAC, pregnant women of the CPN, INRSP) in Mali, Ntagirabiri et al [15] in 2012 in Burundi in a study of HIV/HCV co-infection within a population of PLWHA, Bivigou-Mboumba et al [16] in 2017 in Gabon; who had found 1.05; 1.88; 2.18 and 2.77 in favor of women. The fact that there are fewer female donors could be explained by the presence of certain contraindications specific to women, such as pregnancy, childbirth, breastfeeding for less than 6 months and the menstrual period.

The age group (26 to 35 years) was the most represented with 38.46%. This result is comparable to those observed by Mayomo et al [5] (46.2%) in 2019 in Cameroon and Nzaji et al [17] (57.1%) in 2013 in Congo for the same age group; however, differ from those reported by Traoré H[18] in 2014 at the CNTS Mali and Solange Zacalusni et al [19] in 2014 in Brazil; who found a predominance of the (18 - 25 years) and (36-45 years) age group. The mean age was 31.05 years with extremes ranging from 18 to 60 years.

Donors from the population of the circle of Kati were in the majority with 51.28%. This could be explained by the fact that the hospital that hosts our blood transfusion unit is located in the center of Kati.

In our study blood group O held the largest share of phenotypes in the entire study population with a prevalence of 38.46%. This result is similar to those observed by Drame [20] (42.2%) in 2019 in Mali and Ayad [21] (45.71%) in 2019 in Morocco.

Rhesus positive (anti D) was the majority with 92.70% of donors. This result is comparable to Drame [20] (98.1%) in 2019 in Mali. These results confirm the high prevalence of O group and the positive rhesus in Mali: 39,7% and 85%.

Regarding HIV-HBs and HIV-HCV bi-infections, in our study the respective frequencies of 0.86% (HIV-HBs) in male donors and 0% (HIV-HCV) for all donors were found.

The prevalence of HIV-HBs co-infection was higher than those observed by Traoré [18] (0.5%) in 2014, Samira et al [22] (0.5%) in 2019 and Jean U et al(2) in 2016 in Morocco, Jocelijin et al [23] in 2011 in Mozambique. This high rate could be explained by the fact that more than 95% of blood donations at Kati University Hospital are compensatory

donations and that most donors are unaware of the contraindications of blood donation at the time of medical screening on the one hand and concealment of serological status on the other. Half of the HIV/HBV co-infected donors were male, all of them included in the age group (18-25 years). This could be explained by the high percentage of male donors (91.52%) compared to female donors, and the fact that the young population is the one most in demand for blood donations in Mali.

It was lower than those reported by Condé [7] (33.25%) in 2018 in Mali; Makuwa et al [24] (8.6%) in 1996 in Congo; Seyed Ahmad et al [25] (44.3%) in 2011 in Iran; Yong Chan et al [26] (5%) in 2017 in Korea; Klaus et al [27] (28.8%) in 2015 in Germany; Marcelo et al [28] (10.5%) in 2016 in Asia; Ruth Y et al [29] in 2018 in Venezuela; all of these HIV/Hepatitis co-infection prevalence studies conducted among PLHIV show a higher prevalence of HIV/HBV co-infection and their literature asserts that there is a relationship between HIV and HBV and that HIV infection is a risk factor for exposure to hepatitis B.

Concerning HIV-HCV co-infection the prevalence was similar to that was observed by Jean et al [2] (0%) in 2016 in Morocco. It was lower than those observed by Traoré [18] (0.1%) in 2014 in Mali; Ntagirabiri et al [15] (10.6%) in 2012 in Burundi; Kabinda et al [30] (10%) in 2010 in Congo; Rakotozafindrabe et al [31] (1.25%) in 2017 in Madagascar; Bosali et al [32] (0.7%) in 2012 in Congo, Yong Chan et al [26] (1.7%) in 2017 in Korea.

Blood type B and Rh-negative donors were more affected.

The prevalence of co-infection was higher in group B with 1.27% (HIV+HBS+) and 3.14% (HBS+HCV+).

Rhesus-negative had the highest number of co-infections with 10.81%(HIV+HBS+) and 13.51%(HBS+HCV+).

The frequency of co-infection in rhesus-positive patients was lower at 0.2% (HIV+HBS+) and zero at 0% (HBS+HCV+).

When we compare the frequency of co-infection in rhesus positive (0% and 0.2%) to the frequency of co-infection in rhesus negative (10.81% and 13.51%) we can say that there could be a relationship between HIV/hepatitis co-infection and rhesus negative.

5. Conclusion

In this study, we observed a high frequency of HIV-HBV co-infection among blood donors. It is much more frequent among young men in the 18 to 25 age group.

A higher frequency of HIV-HBV and HBV-HCV co-infection in group B and rhesus-negative blood donors.

We did not find co-infection between HIV and hepatitis C.

Compliance with ethical standards

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Disclosure of conflict of interest

The authors declare that there is no conflict of interest regarding any aspect of this document.

Statement of informed consent

Data from the current study were collected from agree participants from which Informed consent was individually obtained by the hospital authorities.

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