



Seroprevalence of HIV, HBV and HCV Infections among Blood Donors at the CNTS in Bamako in 2022

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Abstract

Introduction: Blood transfusion saves lives and improves quality of life for some patients, but it is not without risks, particularly infectious risks, and can be the source of transmission of many pathogens to the recipient. In Mali, blood transfusion faces difficulties due to a shortage of blood donors and limited resources. The aim of this study was to investigate the seroprevalence of HIV and Hepatitis Band C viruses among blood donors at the Centre National de Transfusion Sanguine (CNTS) in Bamako.

Methodology: This was a prospective, cross-sectional study conducted at the CNTS in Bamako between January and June 2022. 382 blood donations were screened for HIV antibody, HCV antibody and HBsAg using the chemiluminescence (Architect) technique. Data were entered and analyzed using Excel version 2007 and SPSS 20.0. The ethical rules governing research on human subjects in force in the Republic of Mali were respected.

Results: Of the 382 blood donations tested for serological markers, the prevalence of serological markers for HIV was 1.30% (5/382), for hepatitis B and C viruses 13.08% (50/382) and 1.83% (7/382) respectively. Among these positive donations, we observed cases of HIV-HBV co-infection at 0.52% (2/382) and HIV-HCV at 0.26% (1/382).

Conclusion: The quality of transfusion care depends on the quality of labile blood products. This study shows that the positivity rate of serological markers in blood donations at the CNTS in Bamako is high. It would be worthwhile stepping up awareness-raising activities to recruit and retain blood donors, who are the key to improved transfusion safety.

Keywords: HIV; HBV; HCV ; Chemiluminescence ; Transfusion safety

INTRODUCTION

Blood transfusion is a replacement therapy that consists in giving a recipient the blood component he or she needs from a donor [1]. The act of transfusion is never harmless, as the transfusion of labile blood products and their derivatives can be the source of transmission of certain infectious agents, including HIV (Human Immunodeficiency Virus) [1]. Moreover, transfusion-related safety is a serious public health issue [1]. Systematic screening of donated blood for these viruses before use is one of the recommendations of the World Health Organization (WHO). Testing blood donors for viral markers makes it possible to screen out contaminated blood products in order to reduce the transmission of infectious diseases by transfusion to recipients [2]. According to the WHO, the prevalence of HIV, HBV and HCV among blood donors in high-income countries is 0.003%, 0.03% and 0.02% respectively. Those in low-income countries are 1.08% (HIV), 3.70% (HBV) and 1.03% (HCV) [3]. In Africa, 990,000 new hepatitis B infections and 210,000 new hepatitis C infections are recorded each year recorded every year [4]. It is clearly recognized that blood transfusion is one of the modes of transmission and

contamination of B and C viruses [4]. This contamination is particularly high in Sub-Saharan Africa and East Asia, around 5 to 10% [5]. HIV infection HIV infection is highest in sub-Saharan Africa, accounting for 51% of new infections [5].

In Mali, in 2020, HIV prevalence was estimated at 1.1% [6], while 66.2% of cancer cases and 71% of cirrhosis cases were due to hepatitis B virus [6]. The prevalence of HIV, HBV and HCV among blood donors was 2.6%, 13.9% and 3.3% respectively [7]. According to a WHO report, Mali's population will be 19.7 million in 2021, with a hepatitis B prevalence of 10.8% and a hepatitis C prevalence of 1.3% [8]. To reduce this risk, it is the responsibility of blood transfusion centers to guarantee transfusion safety by ensuring a safe and clinically effective supply of blood and Labile Blood Products (LBCs). This risk reduction also involves strategies for recruiting low-risk donors, screening for transfusion-transmissible and appropriate clinical use of blood [9]. Despite these precautions, the residual risk remains relatively high in Sub-Saharan Africa [4]. It is in this context that this study was carried out to determine the seroprevalence of HIV, HBV and HCV infections among blood donors at the Centre National de Transfusion Sanguine de Bamako in order to contribute to the reinforcement of transfusion safety in Mali.

MATERIAL AND METHODS

This was a prospective, descriptive, cross-sectional study from January to June 2022. It was conducted at the Centre National de Transfusion Sanguine (CNTS) in Bamako. Due to budgetary constraints, the study did not include all blood donors received during the study period. The CNTS is the reference center for the collection, processing and distribution of Labiles Blood Products (PSL) in Mali. In 2021, between January and September, the center collected 42416 blood bags and distributed 8069 units of blood products, not counting supplies from blood bank depots in healthcare facilities.

Submitted: 07 May 2024 | **Accepted:** 01 June 2024 | **Published:** 05 June 2024

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Citation: Kamissoko N, Diarra AB, Koné A, (2024) Seroprevalence of HIV, HBV and HCV Infections among Blood Donors at the CNTS in Bamako in 2022. SM Virol 5: 4.



Study population

The study population consisted of all blood donors received at the CNTS during the study period from January to June 2022. These donors were made up of voluntary, altruistic donors on the one hand, and “replacement” family donors on the other, who came to donate blood for a family member.

The present study involved 382 donations made by subjects meeting the criteria required in Mali: age between 18 and 60 years, weight ≥ 55 kg, good physical health, no history of chronic illness, general condition and medical/surgical history, risks related to transmissible agents, and having given their informed and free consent.

Excluded from donation were blood donors unfit to donate blood, blood donors who had not given their free and informed consent, and all samples insufficient for serological testing.

Analysis techniques

Serological tests : Serological tests were carried out using the chemiluminescence technique for the detection of HIV, HBV and HCV markers. The instrument used was the ARCHITECT/System i1000SR. Biological screening, performed on two tubes of blood taken after each donation, included testing for anti-HIV-1 and HIV-2 antibodies, anti-HCV antibodies and HBs antigen, all from Abbot, France. This technique did not enable us to distinguish between HIV1 and HIV2. All positive results were confirmed by a second test from the same manufacturer on a second sample (but not by a confirmatory test, such as the western-blot for HIV, which is the case in most African blood banks).

Chemiluminescence techniques are based on the detection of classical antigen-antibody reactions on the surface of magnetic microparticles, followed by an electrochemical reaction on the surface of an electrode, resulting in measurable and quantifiable light emission in Relative Units of Light (RLU).

Data processing

Data were entered into Microsoft Excel Version 2007, processed and analyzed by SPSS Version 20.0, with a significance threshold set at 5% (*p* less than or equal to 0.05).

Ethical considerations

The study was conducted in accordance with the ethical rules for research involving human subjects in force in Mali. Written informed consent was sought from all participants. It was requested after explanation of the purpose and procedures of the study in local languages or in French if necessary.

Results

A total of 382 blood donors were included in our study. All donors were individually selected. The socio-demographic results show that the majority of donors were male, 90.05% with a sex ratio of 9.95. The age group [26-39] was the most represented with 55.76% (Table 1).

Table 1: Socio-demographic characteristics of blood donors at the CNTS in Bamako

Socio-Demographic Data	Effective (n = 382)	(%)
Sex		
Male	344	90,05
Female	38	9,95
Age groups		
[18-25]	92	24,1
[26-39]	213	55,76
[40-59]	77	20,14

Age moyen 32, 41 ans

The prevalences of HIV, HBV and HCV infections among blood donors were 1.30%, 13.08% and 1.83% respectively. Co-infection was 0.52% for HIV-HBV, 0.26% for HIV-HCV and 0.26% for HBV-HCV. HIV-HBV co-infection was predominant (Figure 1).

Depending on the type of donation, prevalences among family compensation donors were 1.04%, 9.94% and 1.30% for HIV, HBV and HCV respectively. On the other hand, they were lower than in voluntary donors, with 0.26% for HIV, 3.14% for HBV and 0.52% for HCV (Figure 2).

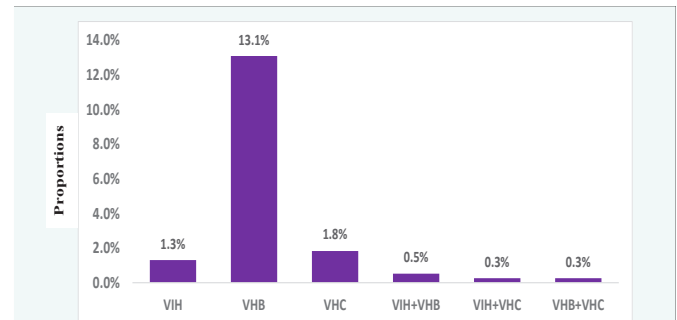


Figure 1 : Seroprevalence of viral markers and co-infections among all blood donors at the CNTS in Bamako.

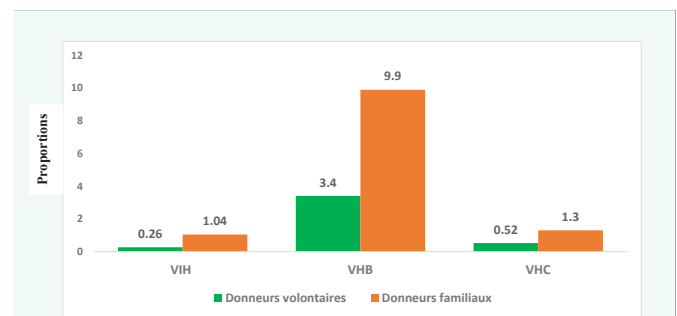


Figure 2: Seroprevalence of viral markers in blood donors by type of donation at the CNTS in Bamako.

Discussion

The aim of this study was to determine the seroprevalence of HIV, HBV and HCV infections among blood donors at the CNTS in Bamako, in order to implement efficient strategies for improved transfusion safety. To ensure transfusion safety, the CNTS must use sensitive, specific and highly reliable methods for the detection and identification of viral markers. Indeed, blood transfusion must be able to meet labile blood product viral safety standards [2].

Socio-demographic characteristics of blood donors :

The majority of blood donors were male, with a proportion of 90.05%. This result is higher than the study carried out in Mali by H. Traoré, 83.3% [6], and in Côte d’Ivoire by Kra O, et al. [10]. This male predominance could be explained by the various contraindications to blood donation in women, including pregnancy, menstruation, breastfeeding, etc. In addition, there is the fear of needles and traditional beliefs. The age group (26-39) was the most represented with 55.76%. This result is similar to many other studies carried out in Mali and elsewhere [(6) (8)], and can be explained by the fact that the Malian population is predominantly young, and that young people are much more willing and able to give blood. Targeted donation promotion campaigns aimed at other age groups in the population are needed to increase their share of regular voluntary donations. Compensatory family donations were the most numerous, at 60.47%, a situation that has remained constant for years in Mali and many other countries in sub-Saharan Africa. Indeed, voluntary



and altruistic donation is low in most of these countries, mainly due to insufficient financial and human resources to ensure awareness-raising, communication and blood collection activities in mobile teams, which are better strategies for recruiting and retaining voluntary and altruistic donors, thus ensuring a regular, high-quality supply of blood products [11].

HIV seroprevalence: Seroprevalence of blood-borne infections was higher among family compensation donors than among regular voluntary donors (Table 1).

This result hardly differs from that of previous studies carried out at the CNTS in Bamako, and is comparable to that of many Sub-Saharan African countries [12]. This could be explained by good information and education of volunteers on the safety issues associated with transfusion-transmissible infections, and consequently the adoption of favorable attitudes towards blood donation.

In this study, HIV seroprevalence among all donors was 1.30%.

Tene et al. reported in 2014 a prevalence of 1.84% among the blood donor population in Cameroon [13], this result is slightly higher than the prevalence in our study. The male sex was the most infected with 1.30%. We observed no cases of among the 39 female donors. Traoré H's study at the CNTS in Bamako also showed that men were infected at 2.1%, compared with 1.5% for women [6]. Contrary to many other studies, the female sex has the highest prevalence. Indeed, female predominance has been reported by some African authors [10,14].

Seroprevalence of HBsAg : HBsAg has been routinely tested in blood donors for decades, and later in pregnant women as part of the prenatal check-up. The seroprevalence of hepatitis B virus was 13.08% for all donors, a result lower than those achieved in Mali in 2019 (8). This trend will be reversed in the coming years, following the introduction of hepatitis B vaccine in Mali's Expanded Program on Immunization (EPI) in 2000. First-time donors were the most infected (9.94%), as shown by a study in Côte d'Ivoire (15). The prevalence of HBV in the general population in Mali is estimated at 8.5% (6). This prevalence is explained by the fact that Mali is one of the countries with a high level of HBV endemicity and limited resources. We observe a decrease in HBV prevalence among blood donors at the Bamako CNTS between 2019 and 2023, from 18.1% to 13.6%.

This may be explained by differences in blood donor selection strategies, methodology, biological qualification and sample size.

Compensatory family blood donors were more infected with hepatitis B (9.68% vs. 3.40% among voluntary donors). This prevalence is lower than another study carried out in Mali, which found 19.9% among compensation donors and 9.5% among volunteer donors (16). This could be explained by the fact that volunteer donors are more aware of the need to prevent diseases transmissible by blood transfusion, and are supervised by the CNTS's specialized services, than are compensation donors, who occasionally come to the donation centers to help a relative, acquaintance or neighbor.

HCV seroprevalence: HCV seroprevalence was 1.83% among all blood donors in the study. Previous studies in Mali and elsewhere in Africa have reported higher prevalences than our study [(6)]. This prevalence is higher than that of the Diarra A. study in Mali, which was 1.53% (7). The difference in prevalence in these different countries could be explained by a difference in the algorithm for routine screening of donations, or a difference in the sensitivity and specificity of the techniques used in the different centers.

Co-infections: Blood donors with both anti-HIV antibodies and HBV Ag were 2, or 0.52%, and the presence of anti-HIV and anti-HCV antibodies was detected in one blood donor, or 0.26%. These results are similar to those reported by Traoré H et al. 2019 at the CNTS in Bamako, which were 0.5% for HIV-HBV co-infection and 0.1% for HIV-

HCV. This is lower than those observed by Noubiap JJ, et al. [15] (1.10%), Tounkara A, et al. [16] (1.13%), and Mavyenyengwa RT et al. in Namibia (0.9%) [17]. Concerning HIV-HCV co-infection, our result of 0.26% is lower than that of Mavyenyengwa RT, et al. [17] with 1%. The prevalence of HIV/HBV and HIV/HCV co-infection among blood donors in Mali is relatively low, compared with that of HIV, HBV and HCV infection taken separately in the same population of blood donors. We believe that the mode of contamination by the three viruses must be different in the blood donor population; hepatitis B, in addition to being sexually transmitted, has other routes of contamination, notably oral. HIV, on the other hand, is transmitted essentially via unprotected sexual relations, blood transfusions and other contaminated instruments.

The size of the study population, the method of donor selection and the absence of a confirmatory test to detect pathogens were limitations of this study.

CONCLUSION

Between January and June 2022, we conducted a prospective study of HIV, HBV and HCV screening at the Bamako national blood transfusion center. The frequency of Ag HBS is high in the Bamako blood donor population, and Ag HBS/HIV, HCV/HIV and VHB/VHC co-infections are low among blood donors, with respectively The prevalence of HBV among blood donors at the CNTS in Bamako remains high. Vaccination of the general population against viral hepatitis B, which is responsible for a number of particularly fatal liver diseases in Africa, could reduce the high prevalence of this disease, with a critical mass of the population vaccinated. As for HIV, stepping up information and awareness campaigns on modes of transmission and how to protect oneself, combined with early ARV treatment, could have an impact on this prevalence.

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