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Prevalence and Factors Associated with Hepatitis B Virus Carriage among Blood Donors at the Coyah Hospital Blood Transfusion Unit (Guinea)

Ansoumane Oulare[1*], Ibrahima Sayon Cissé[2], Tanou Valdez Bah[2,3], Saran Camara[2], Baba Kallé[2], Amadou Sekou Camara[1], Alseny Diallo[2], Mamady Diakité[1,2]

[1]Department of Clinical Hematology, Ignace Deen University Hospital, Conakry, Republic of Guinea
[2]Department of Medicine, Gamal Abdel Nasser University of Conakry, Conakry, Republic of Guinea
[3]Guinea Institute for Research and Development of Medicinal and Food Plants, Conakry, Republic of Guinea
Email: *aoulare354@gmail.com, ibrahimaempereur@gmail.com, tanouvaldez@gmail.com, sarahramaca@gmail.com, baba.kalle.79@gmail.com, amscaletoubib@gmail.com, alsenycherifdiallo2040@gmail.com, mamadydiankana@yahoo.fr

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Abstract

Introduction: This study aims to determine the prevalence of HBV and identify associated demographic and clinical risk factors among blood donors. **Methods:** This was a cross-sectional study with an analytical focus. Donor demographic data were collected and multivariate logistic regression was performed to identify predictors of HBV positivity. **Results:** In univariate analysis, age, level of education, risky sexual behaviors, and HIV infection were significantly associated with the outcome of interest. Schooled donors had a significantly lower likelihood compared with non-schooled donors (OR = 0.53; 95% CI: 0.32 - 0.87; p = 0.013), suggesting a protective effect of education. In multivariate analysis, after adjustment for potential confounding factors, age (31 - 40 years and 51 - 60 years), risky sexual behaviors, and HIV infection remained significantly associated with the outcome, while education persisted as an independent protective factor (OR = 0.36; 95% CI: 0.20 - 0.63; p < 0.001). **Conclusion:** Demographic and clinical factors, such as age, educational level, risky sexual behaviors, and HIV positivity, are significant determinants of HbsAg positivity in blood donors. These results highlight the importance of taking these factors into account in the management of blood donations.

Keywords

Hepatitis B Virus, Prevalence, Guinea

1. Introduction

Hepatitis B is an acute viral infection of the liver caused by the hepatitis B virus (HBV), which can progress to chronic infection and lead to serious complications such as liver cirrhosis and hepatocellular carcinoma [1]. The virus is primarily transmitted through infected blood and other body fluids, including vertical transmission (mother-to-child), sexual contact, unsafe injections, blood transfusions, and dialysis [2]. Despite the availability of an effective vaccine, HBV infection remains a major global public health problem, particularly in Africa. In 2022, it was estimated that approximately 254 million people worldwide were living with chronic HBV infection, with nearly 1.1 million deaths annually, mainly due to cirrhosis and primary liver cancer [3]. Sub-Saharan Africa bears a disproportionate burden, with about 60 million chronically infected individuals, and HBV-related liver cancers accounting for nearly 600,000 deaths worldwide each year [4] [5]. Individuals infected with HBV are at high risk of developing chronic disease and long-term hepatic complications, particularly in settings with limited access to early diagnosis and care [6]. In sub-Saharan Africa, the residual risk of HBV transmission remains a major concern due to the high prevalence of blood-borne infectious agents and inadequate blood donor selection processes [7]. Current HBV screening strategies used by blood banks are generally based on the detection of hepatitis B surface antigen (HBsAg) and, in some settings, antibodies to hepatitis B core antigen (anti-HBc) [8]. Blood transfusion is a common medical practice in the Republic of Guinea and continues to represent a significant risk factor for HBV transmission from donors to recipients. In this context, and in order to contribute to improving blood donor selection criteria particularly in regions outside Conakry where pre-donation screening and monitoring measures remain limited and given the lack of previous studies in this setting, the present study was conducted to assess the seroprevalence and factors associated with hepatitis B virus carriage among blood donors.

2. Methods

2.1. Study Setting

The study was conducted at the Coyah Hospital Blood Transfusion Unit (UHTS).

2.2. Materials

The study materials consisted of blood donors and their blood samples.

2.3. Type and Duration of Study

This was a descriptive cross-sectional study with an analytical component, conducted over a four-month period from October 1, 2024, to January 1, 2025.

2.4. Study Populations

The study included all blood donors who presented them to the Coyah Blood Transfusion Unit during the study period.

2.5. Inclusion Criteria

All voluntary and replacement blood donors registered at the laboratory during the study period were included. Eligible donors were aged between 18 and 60 years and weighed more than 55 kg.

2.6. Exclusion Criteria

Donors with previously known serological results were excluded, as well as pregnant or breastfeeding women.

2.7. Sampling

An exhaustive sampling method was applied, including all eligible donors who attended the unit during the study period.

2.8. Laboratory Analysis

Screening for hepatitis B surface antigen (HBsAg) was initially performed using the Bioline rapid diagnostic test (RDT), which has a reported sensitivity of 91.7% and a specificity of 98.9%. All samples that tested positive in the initial screening were subsequently retested for confirmation using a second rapid diagnostic test from a different manufacturer (CYPRESS), with a sensitivity of 98.84% and a specificity of 98.94%. Both assays are rapid in vitro immunochromatographic tests designed for the qualitative detection of hepatitis B surface antigen in serum or plasma.

2.9. Statistical Analysis

Data analysis was performed using RStudio software (version 4.4.1). The normality of quantitative variables was assessed using the Shapiro-Wilk test.

For bivariate analysis, the Chi-square test was used to compare categorical variables, and the Wilcoxon rank-sum test was applied for quantitative variables. To identify factors associated with hepatitis B virus seropositivity, a multivariate binary logistic regression model was constructed. Variables with a p-value < 0.20 in univariate logistic regression were included in the multivariate model. Statistical significance was set at a 5% level ($p < 0.05$). Adjusted odds ratios (aORs) were reported with their 95% confidence intervals (CIs). The significance of regression coefficients was assessed using the Wald test, and the goodness of fit of the final model was evaluated using the Hosmer Lemeshow test.

2.10. Ethical Considerations

All donors were informed in advance about the analyses performed on their blood samples. Written informed consent was obtained from each participant prior to donation, ensuring confidentiality and the use of data solely for blood donation and research purposes during the pre-donation medical interview. Test results were communicated to donors confidentially, when appropriate.

3. Results

A total of 307 blood donors were included in the study, of whom 278 (90.6%) were seronegative and 29 (9.4%) were seropositive (Table 1). The study population was predominantly male (67.8%), with a mean age of 31 ± 9 years. No statistically significant differences were observed between seronegative and seropositive donors in terms of gender (p = 0.3) or mean age (p = 0.3). In terms of education level, 62.5% of participants had no schooling, with no significant difference between the groups (p = 0.2). The most common occupations were military personnel (37.5%) and drivers (25.7%), with no significant association with HIV status (p > 0.9). The majority of donors were married (59.0%), and 78.5% resided in Coyah. Marital status and place of residence were not significantly associated with HIV-positive status (p > 0.3).

Table 1. Sociodemographic and clinical characteristics of blood donors.

	Total N = 307		Negative N = 278		Positive N = 29		p-value[2]
	Total	Percentage	Number	Percentage	Number	Percentage	
Variable							
Sex							0.3
Feminine	99	32.2%	92	33.1%	7	24.1%	
Male	208	67.8%	186	66.9%	22	75.9%	
AGE		31 ± 9		30 ± 9		32 ± 8	0.3
Level of education							0.2
Not attending school	192	62.5%	171	61.5%	21	72.4%	
Schooled	115	37.5%	107	38.5%	8	27.6%	
Profession							>0.9
Driver	79	25.7%	72	25.9%	7	24.1%	
Pupil/Student	38	12.4%	35	(12.6%)	3	10.3%	
Teacher	11	3.6%	10	(3.6%)	1	3.4%	
Civil servant	22	7.2%	19	6.8%	3	10.3%	
Military	115	37.5%	102	36.7%	13	44.8%	
Housekeeper	21	6.8%	20	7.2%	1	3.4%	
Healthcare personnel	11	3.6%	11	4.0%	0	0.0%	
Unemployed	10	3.3%	9	3.2%	1	3.4%	

Continued

Marital Status							>0.9
Single	124	40.4%	112	40.3%	12	41.4%	
Divorced	2	0.7%	2	0.7%	0	0.0%	
Married	181	59.0%	164	59.0%	17	58.6%	
Place of residence							0.3
Coyah	241	78.5%	216	77.7%	25	86.2%	
Outside Coyah	66	21.5%	62	22.3%	4	13.8%	

The results of the univariate and multivariate logistic regression analyses are presented in Table 2. In the univariate analysis, donors aged 31 - 40 had a significantly higher risk of HIV positivity compared to the reference group aged 18 - 30 (OR = 2.67; 95% CI [1.64 - 4.39]; $p < 0.001$). Similarly, risky sexual behaviors were significantly associated with HIV positivity (OR = 1.82; 95% CI [1.10 - 3.02]; $p = 0.020$). HIV infection was also strongly associated with HIV-positive status (OR = 5.78; 95% CI [1.86 - 25.4]; $p = 0.006$). After adjustment in the multivariate model, several factors remained independently associated with HIV-positive status. The 31 - 40 age group (OR = 6.14; 95% CI [3.19 - 12.5]; $p < 0.001$) and the 51 - 60 age group (OR = 7.83; 95% CI [2.29 - 29.8]; $p = 0.001$) had a significantly increased risk. Educated participants had a significantly lower risk of HIV infection (OR = 0.36; 95% CI [0.20 - 0.63]; $p < 0.001$). Risky sexual behaviors remained strongly associated with HIV infection (OR = 6.26; 95% CI [3.09 - 13.3]; $p < 0.001$), as was HIV infection (OR = 10.2; 95% CI [2.71 - 52.7]; $p = 0.002$).

Table 2. Results of multivariate logistic regression analysis.

Characteristic	Univariate model			Multivariate Model		
	OR	95% CI	p-value	OR	95% CI	p-value
Age group						
18 - 30	-	-		-	-	
31 - 40	2.67	1.64, 4.39	<0.001	6.14	3.19, 12.5	<0.001
41 - 50	0.00		>0.9	0.00	0.00, 0.00	>0.9
51 - 60	2.64	0.87, 8.95	0.10	7.83	2.29, 29.8	0.001
Level of education						
Not in school	-	-		-	-	
Schooled	0.53	0.32, 0.87	0.013	0.36	0.20, 0.63	<0.001
Risky sexual behaviors						
No	-	-		-	-	
Schooled	0.53	0.32, 0.87	0.013	0.36	0.20, 0.63	<0.001

Continued

Risky sexual behaviors						
No	-	-		-	-	
Yes	1.82	1.10, 3.02	0.020	6.26	3.09, 13.3	<0.001
HIV infection						
Negatives	-	-		-	-	
Positive	5.78	1.86, 25.4	0.006	10.2	2.71, 52.7	0.002

Abbreviations: CI = Confidence Interval, OR = Odds Ratio.

4. Discussion

Our descriptive cross-sectional study with an analytical component was conducted prospectively over a three-month period and included a total of 307 blood donors. Blood samples were collected from donors at the Blood Transfusion Unit of Coyah Prefectural Hospital (UHTS). During the study period, all 307 donors met the inclusion criteria. Donors aged 18 - 28 years constituted the largest age group, followed by those aged 29 - 39 years, accounting for 59.6% and 28.7% of the study population, respectively, and representing a combined proportion of 88.3% of the total sample. These findings are consistent with those reported by Maiga *et al.* in 2024 in Mali [9], who reported a mean age of 38.5 years, reflecting a predominantly young donor population. This distribution is commonly observed in blood transfusion settings, where donors are more frequently recruited from younger age groups.

In our study, male donors were more represented, accounting for 67.8% of the sample, which corroborates the findings of Gake *et al.* [10]. in 2024 in Cameroon, who reported a male-to-female ratio of 1.48 in favor of males. This predominance of male donors may be explained by several physiological factors that limit female eligibility for blood donation, such as menstruation, pregnancy, and breastfeeding.

Regarding occupation, manual workers were the most represented group (37.5%), similar to the findings of Maquessene *et al.* [11] in 2025, in which the majority of donors did not attend school or had only completed secondary education. The study found 29 cases positive for HBsAg, with a prevalence of 9.4%. These results were significantly higher than those found by Mody *et al.* [12] n 2023 in Guinea, who reported an HBsAg prevalence of 4% in a sample of 250 donors. This difference could be explained by the sample size.

The frequency of HBsAg was higher in men than in women, at 10.5% and 7.0%, respectively. The same observation was made by Gake *et al.* [10] in 2024. This could be explained by the fact that men are more likely to require blood transfusions than women, as certain physiological situations such as breastfeeding, pregnancy, menstruation, and hormonal factors could cause women to eliminate HBV more readily, explaining the difference between the two sexes. Despite this disparity observed in our study, the chi-square statistical analysis did not show a signif-

icant difference, with a p-value of 0.3. The prevalence of HBsAg was higher among donors aged 18 - 28 years (41.4%) and 29 - 39 years (51.7%). The same observation was made by Loua *et al.* in 2011 among blood donors at the National Blood Transfusion Center in Conakry, where the prevalence was 15.77% in the 18 - 29 age group [13]. This could be explained by the fact that these age groups represent the most sexually active population.

The HBsAg rate was significantly higher among individuals with no education (72.4%), which could be explained by the fact that these individuals receive less information about the disease and therefore do not take or apply preventive measures. Four (4) donors, representing 13.8% of HBsAg-positive patients, had co-infection with HIV and hepatitis, and HIV-infected donors had more hepatitis B virus infections, with a p-value of less than 0.05. Our prevalence was higher than that reported by Sylvestre *et al.* in 2022, which was 6.47% [14]. This could be explained by the fact that the two viruses share the same routes of transmission, and the difference could also be explained by the difference in sample size between the two studies.

5. Limitations of the Study

One limitation of this study is the probable underestimation of the seroprevalence of viral hepatitis B. The absence of additional HBV marker testing, particularly viral load by PCR, did not allow for the identification of occult hepatitis B characterized by HBsAg negativity, which could have altered the overall estimate of seroprevalence among blood donors and also the size of our sample.

6. Conclusion

Our study on the prevalence of HBsAg among blood donors at the blood transfusion unit of Coyah Prefectural Hospital (UHTs) found a hospital frequency of 9.4%. The majority of donors were men. The frequency of HBV + HIV co-infection was 13.8%. Despite the existence of a safe and effective vaccine and molecules that are active against the virus, hepatitis B remains a real public health problem in Africa. This result is of great importance for prevention strategies, hence the need to strengthen HBV information, education, and communication programs.

Conflicts of Interest

The authors declare that they have no conflicts of interest in relation to this article.

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