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Seroprevalence of markers and Risk factors of Hepatitis B Virus among blood donors in Brazzaville, Congo

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ABSTRACT: In Congo, it is estimated that between 9 to 11% of the general population present hepatitis B surface antigen (HBsAg). Little data are available on the seroprevalence of markers and risk factors for this virus in blood donors in Brazzaville. This study aimed to determine the prevalence markers and factors associated with HBV infection in blood donors. Six hundred and forty eight healthy blood donors samples collected from October 2013 to June 2014 were tested by enzyme-linked immunosorbent assay for HBsAg, HBeAg, anti-HBe, anti-HBs and anti-HBc. Demographic data of these donors was also studied.

Out of 648 patients included, overall prevalence estimates were 6,6%(95%CI:4.8-8.8) for HBsAg, 1,1%(95%CI:0.3-2) for HBeAg, 8.2%(95%CI:6.2-10.5) for anti-HBe, 13.6%(95%CI:11-16.4) for anti-HBs and 62.7%(95%CI:59-66.2) for anti-HBc. HBV infection was significant associated with Categories of blood donors (adjusted OR=1.70; 95%CI:1.08-2.67), age (adjusted OR=17.61; 95%CI:9.67-32.02), occupation (adjusted OR=2.25; 95%CI:1.53-3.31), sexual risk (adjusted OR=6.14; 95%CI:2.42-15.61) and families with a history HBV (adjusted OR=5.87; 95%CI:2.68-12.85).

The seroprevalence rates found in this study were higher than those in other countries, suggesting high rates of HBV infection and a persistent risk of transmission of HBV in blood donors in Brazzaville.

KEYWORDS: Prevalence, Hepatitis B virus, risk factors, blood donors, Brazzaville.

1 INTRODUCTION

Hepatitis B infection remains a major public health problem worldwide. The World Health Organization (WHO) reports that approximately 360 million of the 2 billion people infected worldwide are chronic hepatitis B virus (HBV) carriers, with over a million deaths annually [1]. Epidemiologically, three countries areas are classified based on the prevalence of hepatitis B surface antigen (HBsAg)): low prevalence area (<2%), intermediate prevalence area (2-7%) and area high prevalence (> 8%) [2-4].

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The Republic of Congo is one of the countries with highly prevalence of HBV infection. The positive rate of HBsAg and anti-HBc antibodies varies between 9-11% and 86% in the general population respectively [5-7]. This prevalence is even higher among hospitalized patients and HIV carriers [8, 9].

HBV infection is transmitted through contact with bodily fluids, sexual intercourse, from mother to child and through blood transfusions. The transmission of HBV from blood products is a major problem of blood safety in high-prevalence countries such as Congo. [2, 10].

Hence, it is mandatory to test all blood donors for serological markers. Screening for HBV markers on donated blood is of great importance in reducing the risk of transfusion-transmitted and helps in determining the safety of the blood products [11]. Several data based on HBsAg are available from blood donors in recent decades, there is necessary to know the level of transmission to search antigen hepatitis B e (HBeAg) and anti-HBc for detecting both acute and chronic infections and can be selective for HBV-infected samples even in the phase of viral clearance [4, 10, 12].

Hepatitis B virus infection has been partially explored in Republic of Congo, latest data on the safety of donated blood and hepatitis B were obtained for HBsAg [13]. Blood donors are generally considered a healthy population, due to the strict criteria of selection in blood banks. The proportion of blood donors with hepatitis and the risk factors associated with the disease among these healthy individuals may reflect the magnitude of chronic HBV infection in the general population and evaluate the transfusion risk. We conducted this study to determine the prevalence of HBV infection in a representative sample blood donors using HBsAg, HBeAg, anti-HBc, anti-HBs and anti-HBe serological assays in Brazzaville.

2 METHODS

2.1 STUDY AREA AND POPULATION

A cross sectional study was conducted at the blood transfusion center of Brazzaville (CNTS), between October 2013 to June 2014.

All the donors who satisfied the qualifying criteria (after a complete physical examination and satisfactorily answering the donor's questionnaire) for the donation were included in the study. The study included both the voluntary blood donors (altruistic donations "People who donate blood without expecting any favor in return or in voluntary blood donation camps") and the replacement blood donors (The family members, friends or relatives of the patients).

An individual questionnaire was prepared and used for each study subject. This was used to collect personal information (age and sex), categories of donor, socioeconomic data (such as marital status, education, and occupation), sexual behavior and disease risk factors.

From each subject, 5 ml of blood was obtained and serum was separated by centrifugation and maintained stored a`-20 ° C until analysis.

Exclusion criteria were: the high risk groups such as patients from thalassemia clinics, sexually transmitted diseases, drug abusers, dialysis patients, sex workers, pregnant women.

2.2 SEROLOGICAL ASSAYS

HBV serological markers were evaluated for HBsAg, HBeAg, antibody against hepatitis B e antigen (anti-HBe), hepatitis B surface antibody (anti-HBs) and anti-HBc. We used a commercial enzyme-linked immunosorbent assay (ELISA) (Bio-Rad Laboratories, Marnes La Coquette, France) according to the manufacturer's instructions.

2.3 STATISTICAL ANALYSIS

Data was analyzed using the Epi-Info software, version 7.0. Binary logistic regression analysis was done to determine the association between explanatory variables and the outcome variables. All explanatory variables with a p-value (p) less than or equal to 0.2 in the bivariate analysis were included in the multivariate logistic regression model to identify variables which were associated independently. Odds ratio (OR) and their 95% confidence intervals (95%CI) were calculated and the result was considered statistically significant at $p < 0.05$.

2.4 ETHICAL APPROVAL

Prior to the study, informed consent was obtained from each donor. The study was conducted in accordance with the principles of Good Clinical Practice and the Declaration of Helsinki. We obtained the opinion of the local ethics committee in Sciences of health research of Congo in order to carry out this work.

3 RESULTATS

A total of 648 blood donors were included, of which 482 male (74.4%) and 166 female (25.6%) with a sex ratio (H/F) of 2.9. The average age of patients was 31.1±8.8years (ranging; 18-55 years). The presence of HBV markers was found among 449 (69.3%) donors.

The prevalence of HBsAg was 6,6%(95%CI:4.8-8.8), 1,1%(95%CI:0.3-2) for HBeAg, 8.2%(95%CI:6.2-10.5) for anti-HBe, 13.6%(95%CI:11-16.4) for anti-HBs and 62.7%(95%CI:59-66.2) for anti-HBc (Table 1).

Table 1. Profile of hepatitis B virus markers among blood donor in Brazzaville, Congo

Serological markers present	N°	Percentage (n=648)	confidence intervals 95% CI
HBsAg	43	6,6	4,8-8,8
HBeAg	7	1,1	0,3-2
Anti-HBe Ab	53	8,2	6,2-10,5
Anti-HBs Ab	88	13,6	11,0-16,4
Anti-HBc Ab	406	62,7	59,0-66,2

In relation to risk factors associated with HBV infection, we found a statistically significant association with: age (adjusted OR=17.61;95%CI:9.67-32.02), categories of blood donors (adjusted OR=1.70;95%CI:1.08-2.67), occupation (adjusted OR=2.25; 95%CI:1.53-3.31), sexual risk (adjusted OR=6.14;95%CI:2.42-15.61) and outcomes donor families with a history HBV (adjusted OR=5.87;95%CI:2.68-12.85), but no significant difference was observed with level of education, marital status, dental care, socioeconomic conditions tattoos in our study population. All the results of the univariate and multivariate analyze are reported in Tables 2, 3 and 4 respectively.

Table 2. Characteristics of blood donors and their relation to the prevalence of HBV serological markers by univariate analysis

Characteristics	HBsAg +ve (%)	Anti-HBc +ve (%)	HBV +ve (%)	Odds Ratio (95% CI)	P-value
Sexe					
Male	32(74.4)	275(67.7)	310(69.0))	2.86(1.82-4.49)	<0.001
Female	11(25.6)	131(32.3)	139(31.0)	1.00(Reference)	
Category of Donors					
Family Replacement	34(79.1)	198(48.8)	212(47.2)	1.00(Reference)	
Voluntary	09(20.9)	149(36.7)	171(38.1)	3.13 (2.08-4.72)	<0.001
Regular	0(0)	59(14.5)	66(14.7)	3.90 (2.38-6.39)	0.001
Age					
18-25	9(20.9)	133(32.8)	147(32.7)	23.43(9.29-59.04)	<0.001
26-35	17(39.5)	144(35.5)	158(35.2)	1.00(Reference)	
36-45	11(25.6)	78(19.2)	86(19.2)	30.50(11.91-78.07)	<0.001
46-55	6(14.0)	51(12.6)	58(12.9)	1.09 (0.21-5.77)	0.92
Education					
University	17(39.5)	188(46.3)	199(44.3)	1.22(0.34-4.43)	0.763
High	9(20.9)	56(13.8)	64(14.3)	1.02(0.26-4.02)	0.928
Primary	15(34.9)	153(37.7)	173(38.5)	3.13(0.87-11.21)	0.081
No school	2(4.7)	9(2.2)	13(2.9)	1.00(Reference)	
Marital status					
Married	11(25.6)	79(19,5)	81(18,0)	1,04(0,68-1,60)	0.866
Single	32(74.4)	327(80,5)	368(82,0)	1.00(Reference)	
Occupation					
Student	5(11.6)	90(22.2)	92(20.5)	3.6(1.79-7.24)	<0.001
Professional	8(18.6)	143(35.2)	159(35.4)	2.37(1.20-4.67)	0.02
Military	11(25.6)	111(27.3)	120(26.7)	4.2(2.16-8.27)	<0.001
Laborer	19(44.2)	62(15.3)	78(17.4)	1.00(Reference)	

Table 3. Prevalence of HBV serological markers and risks factors by univariate analysis among blood donors

Risks factors	HBsAgs +ve(%)	Anti-HBc +ve(%)	HBV +ve (%)	Odds Ratio (95% CI)	P-value
Family history					
Yes	16(37.2)	74(18.2)	78(17.4)	1.69(1.02-2.81)	<0.0001
No	27(62.8)	332(81.8)	371(82.6)	1(Reference)	
Vaccination					
Yes	1(2.3)	3(1.0)	5(1.1)	1.11(0.21-5.77)	0.902
No	42(97.7)	403(99.0)	444(98.9)	1(Reference)	
Alcool					
Yes	15(34.9)	101(24.9)	119(26.5)	0.88(0.61-1.27)	0.486
No	28(65.1)	305(75.1)	330(73.5)	1(Reference)	
Dental Surgery					
Yes	11(25.6)	68(16.7)	71(15.8)	0.79(0.52-1.23)	0.303
No	32(74.4)	338(83.3)	378(84.2)	1(Reference)	
Chirurgy					
Yes	27(62.8)	277(68.2)	303(67.5)	2.23(1.58-3.13)	<0.001
No	16(37.2)	129(31.8)	146(32.5)	1(Reference)	
Scarification					
Yes	25(58.1)	311(76.6)	347(77.3)	1.47(1.01-2.14)	0.044
No	18(41.9)	92(22.7)	102(22.7)	1(Reference)	
Tattooing					
Yes	28(65.1)	268(66.0)	287(63.9)	1.34(0.80-1.62)	0.474
No	15(34.9)	138(34.0)	162(36.1)	1.(Reference)	
Risk sexual behavior					
Yes	24(55.8)	303(74.6)	337(75.1)	5.19(3.63-7.44)	0.0001
No	19(44.2)	103(25.4)	112(24.9)	1(Reference)	
Multiple partners					
Yes	33(76.7)	327(80.5)	364(81.1)	1.44(0.97-2.14)	0.073
No	10(23.3)	79(19.5)	85(18.9)	1(Reference)	

+ve: positive; CI: confidence interval

Table 4. Logistic regression analysis of risks factors associated with hepatitis B virus markers among blood donors in Brazaville, Congo

Risks factors	A.OR(95%CI)	P-value
AGE	17.61(9.67-32.09)	0.000
Occupation	2.25(1.53-3.31)	0.000
Risk sexual behavior	6.14(2.42-15.61)	0.000
Family history	5.87(2.68-12.85)	0.000
Scarification	0.36(0.11-1.20)	0.097
Tattooing	0.63(0.36-1.12)	0.113
Donneurs	1.70(1.08-2.67)	0.022
Sexe	0.02(0.01-0.10)	0.000

A. OR: Adjusted odds ratio

4 DISCUSSION

Little data are available on the seroprevalence of markers and risk factors for hepatitis B virus (HBV) infection in blood donors in Brazzaville. We assessed the prevalence of certain serological markers and factors associated with HBV infection in blood donors attending the CNTS of Brazzaville.

Our results showed that, nearly 70% of donors had at least one positive marker of HBV, revealing the significant risk of transmission of the virus in blood donors in Brazzaville.

HBsAg was detected in 6.6% of cases in our study, similar result was obtained by by Elira et al. at Brazzaville who found a prevalence of 7.2% [13], high prevalences were observed in some city in Cote d'Ivoire (12.5%) [14], Mali (14.9%) [15], Cameroun (15.02%) [16] and the lowest were observed in countries such as Greece (0,85%) [17], Pakistan (3.3%)[18] , Yemen (5.1%) [19].

The prevalence of anti-HBc with 62.7% was higher compared to studies in some countries, in Italy (8.6%) [20], Saudi Arabia (18.7%)[21], 51.7% in Vietnam [22], 8.3% in Pakistan [20] and lower to those obtained in Burkina Faso (76.4%)[23]. Several factors may explain these differences, the sample size, the recruitment strategy of blood donors, screening tests that have not used all the same single detection and finally the local epidemiology of HBV carrying. Global prevalence of HBV on porting hepatitis B surface antigen (HBsAg) is distributed by its endemicity into three zones, high (> 8%) in Africa, Asia, and the Western Pacific to 2–7% in Southern and Eastern Europe, and to <2% in Western Europe, North America, and Australia [24].

In this study, we evaluated vaccine coverage and HBV immunity in blood donors and prevalence of HBsAb was 13.6% including 42 (47.7%) had isolated, this may reflect an old infection or risk chronic carriers of the virus, the highest prevalence Was observed in Italy by Luisa ROMANO with 86.7% [20] among the blood donors. Every time the anti-HBs can disappear in a significant proportion in vaccinated after the initial success, a booster dose recommended by most national organizations[2].

The frequency of HBeAg (1.1%) was low compared to other markers of this study, similar studies in HBsAg positive blood donors were also obtained from low prevalence of HBeAg, Akinbami et al. in Nigeria (8.6%) [12], Kao et al. in China (27%)[25]. This can be explained by the fact that HBeAg is defined as a marker of infectivity that appears acutely ill, but blood donors are part of a very selective population before donations and those who bear the signs of disease are excluded.

The prevalence of HBV markers was higher among male donors with 69% and 31% for female. This is explained by the fact that the population of blood donors is composed largely of men with 74.4%. There's a lot of work in Africa that show a high prevalence of carriage of hepatitis B among women and even those who are pregnant with a risk of transmission to newborns [26].

The majority of HBV markers (35.2%) were in the age bracket 26-35 years, similar study by Tserenpuntsag at al. in Mogolia found aged 18-19 years [27], in some studies the prevalence increases with age of blood donors by Pillonel J. et al. in France [28] and Ben J. et al. in Tunisia [29], found high prevalence among blood donors aged 40-49, El Beltagy et al. in Saudi Arabia[21] found higer markers among âge > 40 years, Dettori at al. in Italy [30] most carriers of HBV donors are over 50 years of age. These results could be explained by the fact that the significant contamination of hepatitis B at birth and

early childhood in Africa [21, 31]. However, it is unlikely that age is a factor that can affect the quality of the results, because our study included the population of blood donors and blood donation is allowed from 18 years to 55 years.

The frequency of markers elevated in family replacement blood donors compared to other categories, which is identical to the data of the literature [13, 29, 32-34] but work done in Kumasi by Allain J et al. in Ghana [35] revealed no significant difference. However after stratification by age these studies report that older donors over 20 years, all HBV markers were elevated [36, 37]. WHO advocated the voluntary blood donation to ensure blood safety in countries [4, 38]. This donors in interest to save his sick relative, is more likely to hide risky behavior for transfusion transmissible infectious, fear of not being eligible for blood donation [33, 38, 39].

Among the risk factors for transmission of HBV no significant association between HBV markers and education as well as marital status this is in agreement with some studies [14] against by others have found a significant link to find out El Beltagy et al. in Saudi Arabia [21].

In our study population, the risk sexual behavior was predominant, they are similar to those obtained by Kra O et al. in Bouake [14, 31], other studies in do not have a significant association between HBV and the issue of having unprotected sex leading risk factors infectivity Nigeria [12, 21]. The practice of scarification was also found among blood donors, this is explained by the fact that these traditional practices widespread in our society were made in the recent past in precarious hygiene conditions, and other studies have found no link [27]. Pillonel J. et al. in France, found against by injecting drug use as the primary risk factor for hepatitis B with a significant difference by sex [31]. The difference with our study can be explained by the fact that intravenous drug use appears to be rare in our country [14]. The family history of HBV infection was found to be significantly associated with HBV markers. This finding could be due to the close contact between family members because objects such as toothbrushes, towels, and shaving items are common among families of a lower socioeconomic level [21, 39].

In our series 26.6% had isolated profile AcHBc among blood donors. This percentage is high compared to other studies in blood donors in Italy [20] and Pakistan [20, 40] with 10.4% and 12.4% respectively. The studies conducted by Allain et al. in Ghana [35] and Silva et al. in Brazil [41] found 45.5% and 42.7% respectively. Some studies report that viremia continues even after clinical recovery from acute HBV infection in some blood donors who were negative for HBsAg but positive for anti-HBc and can transmit HBV, leading to acute hepatitis [42]. These cases reflect the inability of HBsAg screening to identify cases of window period and justified the decision of some countries (USA, Germany and Japan) to continue the anti-HBc screening, which was initially implemented as a marker to prevent hepatitis non-A, non-B before the appearance of anti-HCV antibody screening. This profile is not only compatible with cured hepatitis B, but can also correspond to false positive or AcHBc to genuine called occult chronic hepatitis B [43].

5 CONCLUSION

These results show that HBV infection is high among blood donors in Brazzaville and HBsAg screening alone is not enough in this target population. Additional research of other markers of HBV infection could have a positive impact on blood safety in the Congo. However, other studies are needed in the country in order to provide global strategies adapted to our context.

COMPETING INTERESTS

The authors declare that they have no competing interests.

AUTHORS' CONTRIBUTIONS

BMA and LMAB conducted all handling and the overall design of the experiment. ABD and FRN L conceived and designed the study. GA, DM, MME and JRI were responsible for the implementation of the project. All authors critically reviewed the manuscript and approved the final version.

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