

Hepatitis B Virus Surface Antigen Carriage Among Blood Donors in Ziguinchor, Senegal: Prevalence and Associated Factors

Manga NM^{1,2*}, Fortes-Deguenonvo L¹, Dia-Badiane NM¹, Diop-Nyafouna SA¹, Ndow G¹, Faye O³, Benzekri N⁴, Ndour CT¹ and Seydi M¹

¹Unit of Training and Research, Assane Seck University, Ziguinchor, Senegal

²Hospital of Peace, Ziguinchor, Senegal

³Laboratory and Transfusion Unit, Regional Hospital, Ziguinchor, Senegal

⁴Department of Medicine, University of Washington, Seattle, WA, USA

*Corresponding author: Noël Magloire Manga, MD, Infectious Diseases specialist, Unit of Training and Research on Health Sciences, Assane Seck University, BP: 523 Ziguinchor, Senegal, Tel: +221-77-645-56-09; Fax: +221-33-991-68-09; E-mail: noel.manga@univ-zig.sn

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Abstract

Introduction: Hepatitis B virus is endemic in Senegal, West Africa, however the prevalence of hepatitis B virus surface antigen (HBsAg) carriage in Ziguinchor, Senegal is unknown. This study was conducted in order to determine the prevalence of HBsAg carriage among blood donors in Ziguinchor and to identify factors associated with HBsAg carriage.

Methodology: A retrospective study was conducted in the blood donation unit of the Ziguinchor Regional Hospital in 2013. Screening for HBsAg was performed with kits from Rapid Signal™ HBsAg Serum/Plasma Dipstrip (Organics Ltd Israel).

Results: A total of 2122 donors were included in this study, of which 1715 (80.8%) were male and 407 (19.2%) were female. The overall prevalence of HBsAg carriage among all donors was 12.1% (n=256). Carriage was higher among male donors, (n=223, 13%) compared to female donors (n=33, 8.1%) (p=0.04). Carriage was lower among regular voluntary donors (n=24, 5.8%) compared to new voluntary donors (n=101, 14.1%) and replacement donors (n=131, 13.2%) (p<0.001).

Conclusion: This is the first study to report the prevalence of HBsAg carriage in Ziguinchor, Senegal. HBsAg carriage is highly prevalent among blood donors in Ziguinchor, especially among males and new voluntary or replacement donors.

Keywords: HBsAg carriage; Blood donors; Ziguinchor; Senegal

Abbreviations: HBsAg: Hepatitis B virus surface Antigen

Introduction

Hepatitis B is a major public health problem in developing countries of sub-Saharan Africa. The World Health Organization (WHO) estimates that more than 2 billion people have been infected with hepatitis B virus (HBV) worldwide and 350 million (5%) are chronic carriers, of which one million die each year from complications such as cirrhosis and hepatocellular carcinoma [1,2]. The prevalence of chronic HBV carriage is between 8% and 20% in Africa and Asia [3]. Hepatitis B virus can be transmitted by blood transfusion. According to WHO recommendations, donated blood must be screened for HBV, in addition to human immunodeficiency virus (HIV), hepatitis C virus (HCV) and syphilis, prior to use [1]. The prevalence of HBV in Ziguinchor is not well known. However, blood donor screening for HBV can be used as an indicator of the prevalence of hepatitis B in the general population. This study was conducted in order to determine the prevalence of HBsAg carriage among blood donors in Ziguinchor and to identify factors associated with HBsAg carriage.

Material and Methods

Ziguinchor is located in the southern region of Senegal. It is separated from the rest of the country by the Gambia to the north, Guinea-Bissau to the South, and the Atlantic Ocean to the west. It is an isolated and remote area with unique sanitary conditions and epidemiological characteristics. Our study was conducted in the laboratory of the Ziguinchor Regional Hospital which has a small blood transfusion unit. Donations are made daily at the unit or during campaigns organized outside the hospital. We conducted a retrospective study using data from all blood donations received in this unit from the January 1st to December 31st, 2013. Individuals who were <16 or >60 years of age, those with diabetes or recent high-risk sexual activity, and women who were pregnant, breast-feeding, or menstruating were not eligible to donate blood. For all donors, information regarding age, sex and the type of donor was collected.

We distinguished between three types of donors, “regular voluntary donors” who regularly donate blood and have a blood donor card, “new voluntary donors” who donated blood for the first time, and “replacement donors” who were parents or relatives of a patient in need of a blood transfusion.

We used the RapidSignal™ HBsAg Serum / Plasma Dipstrip (Organics Ltd ISRAEL) provided by the National Blood Transfusion

Center. This is a qualitative rapid test used for the detection of HBsAg in whole blood, serum or plasma. The membrane is pre-coated with anti-HBs antibodies (anti-HBsAb) on the test line (T) region of the strip. During testing, serum or plasma containing HBsAg reacts with the particle coated with anti-HBsAb and generates a colored line. A control line (C) confirms the validity of the test. Results are available within 15-30 minutes. This test has a higher sensitivity (99.8% [98.6%-100%]) and specificity (99.2% [98.1-99.7%]) compared to a reference test as HBsAg Enzyme ImmunoAssay (HBsAg EIA). The sensitivity and specificity of HBsAg EIA are 97.8% and 97.9% respectively [4]. The manufacturer notes that the limitations of the test are that it is qualitative rather than quantitative and very low HBsAg concentrations (<1 ng/mL) cannot be detected.

Data were entered and analyzed with EPI Info 3.3.5 software. Chi-square or Fisher tests were used where appropriate and a p-value <0.05 was considered significant.

Results

A total of 2,122 blood donors were included, of which 1715 (80.8%) were male and 407 (19.2%) were female. HBsAg carriage was identified in 256 donors, resulting in a prevalence of 12.1%.

The characteristics of HBsAg carriers are summarized in Table 1. HBsAg carriers were predominantly male (87.1%) with a sex-ratio of 6.7. The majority (82%) were 20-39 years of age. More than half (51.2%) were replacement donors, 39.4% were new voluntary donors, and 9.4% were regular voluntary donors. The majority (60.5%) weighed 60-74 kg. The most common blood group was O+ (53.4%).

Variables	Number	Percent (%)
Sex (n=256)		
Male	223	87.1
Female	33	12.9
Age group (years) (n=250)		
16-19	16	6
20-29	142	57
30-39	62	25
≥ 40	30	12
Type of donor (n=256)		
Replacement donors	131	51.2
New voluntary donors	101	39.4
Regular voluntary donors	24	9.4
Weight (kg) (n=248)		
<60	59	23.8
60-74	150	60.5
75-90	30	12.1
>90	9	3.6
Blood group and Rhesus (n=256)		

O+	137	53.4
A+	47	18.5
B+	46	17.4
AB+	13	4.9
O-	7	2.7
A-	6	2.2

The predominant sex among HBsAg carriers was male (87.1%). The majority (82%) of carriers were 20-39 years old. Among carriers, replacement donors (51.2%) and new voluntary donors (39.4%) were predominant. Most carriers (60.5%) weighed 60-74 kg. The majority of carriers were from the O+ blood group (53.4%).

Table 1: Characteristics of HBsAg carriers in Ziguinchor, Senegal, 2013.

Factors associated with HBsAg carriage are shown in Table 2. The prevalence of HBsAg carriage was higher among male donors, (n=223, 13%) compared to female donors (n=33, 8.1%) (p=0.04). The prevalence of HBsAg carriage was lower among regular voluntary donors (n=24, 5.8%) compared to replacement donors (n=131, 13.2%) and new voluntary donors (n=101, 14.1%) (p<0.001).

Variables	HBsAg carriage		P-value
	Yes n (%)	No n (%)	
Sex (n=2122)			
Male	223 (13)	1492 (87)	0.04
Female	33 (8.1)	374 (91.9)	
Age (years) (n=2122)			
0-29	159 (12.4)	1123 (87.6)	0.3
≥ 30	97 (11.5)	743 (88.5)	
Type of donor (n=2122)			
Replacement donors	131 (13.2)	863 (86.8)	<0.001
New voluntary donors	101 (14.1)	616 (85.9)	
Regular voluntary donors	24 (5.8)	387(94.2)	
The prevalence of HBsAg carriage was significantly higher among males (13%) compared to females (8.1%), p=0.04. The prevalence of HBsAg carriage was significantly lower among regular voluntary donors (5.8%) compared to others type of donors (13.2 and 14.1%), p<0.001. No relation was found between age and HBsAg carriage.			

Table2: Comparison of HBsAg carriers and non-carriers among blood donors in Ziguinchor, Senegal 2013.

There was no association between age and HBsAg carriage.

Discussion

HBsAg carriage is highly prevalent among blood donors in Ziguinchor, with a prevalence of 12.1% in this study. A similar prevalence of HBsAg carriage was reported in 2006 at the Senegal National Transfusion Center in Dakar, where 12% of donors were

found to be carriers [5]. Hepatitis B is endemic in Senegal where the first contact with HBV occurs during the early years of childhood [5-8]. Previous studies have reported that up to 90% of the general population has at least one hepatitis B serologic marker [5,6,8].

Compared to neighboring countries in the region, the prevalence of HBsAg carriage in our study is comparable to the prevalence reported in the Ivory Coast (11-12.5%) [9], but lower than the prevalence reported in Mauritania (20.3%) [10]. The fact that HBV is highly endemic in this region necessitates more rigorous screening of blood donors and the use of highly sensitive tests. The use of other HBV markers such as Anti HBc and viral DNA would improve screening and reduce the risk of transmission [11]. In a recent study among blood donors in Nigeria, the prevalence of occult hepatitis B as determined by DNA testing was 17% [12]. Our findings demonstrate that high sensitivity screening of donated blood, including screening for occult HBV, is indicated in our population. This is of particular importance for individuals in need of repeated transfusions, such as those with sickle cell disease or renal insufficiency, who are at greater risk of transfusion related transmission.

Distribution of carriers by sex

In our study the rate of HBsAg carriage was higher among men (13%) compared to women (8.1%). A higher prevalence of carriage among men has been noted in other studies in the sub-region [9,10,13]. The male predominance may be the result of high risk exposures during recreational or professional activities.

Distribution of carriers by type of donor

We found that the prevalence of HBsAg carriage was significantly lower among regular voluntary donors compared to new voluntary donors and replacement donors. This finding is of particular importance in resource-limited settings and suggests that when blood supply is limited, blood from regular voluntary donors may pose the lowest risk. Our findings are in line with the WHO statement that regular voluntary donors are safer [14]. However, our findings differ from a recent study in Ghana which suggested that replacement donors may provide a low-risk blood supply when resources are scarce [15]. The observed positive results among regular voluntary donors in our study could indicate acute infection. This finding suggest that immunization against HBV should be consider for all non-HBsAg carriers regular blood donors who are not protected.

Conclusion

This is the first study to report the prevalence of HBsAg carriage in Ziguinchor, Senegal. We found a high prevalence of HBsAg carriage in our population of blood donors, especially among male donors, new voluntary donors, and replacement donors. Future studies are needed to provide a greater understanding of additional factors associated with HBsAg carriage in this region. Our blood banks need greater resources to provide high-quality donor screening and ensure access to a safe and sufficient blood supply for our region. The utilization of new markers such as anti-HBc Ab and viral DNA will enhance the detection of hepatitis B in donors. Furthermore, enhanced advocacy is needed to encourage regular blood donation within the community and the general population.

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Ethical Statement

This study used data collected during routine screening, and did not require ethical approval. Personal data from donors was kept strictly confidential. We obtained authorization from the director of the blood transfusion unit and the health workers who participated in the study.

Authors' Contributions

MNM* conceived the study and contributed to all steps of the study, DBB -NSA participated in data collection and writing the manuscript, KO and KC performed testing, DK, DA and NAB gave important intellectual contributions to the final manuscript.

Competing Interests

The authors declare that they have no competing interests.

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