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Hepatitis B Virus Profile among Blood Donors in the Federal Capital Territory Abuja, Nigeria

Agbesor. N. Innocent[1], Amala Smart E.[2], Zaccheaus. A. Jeremiah[3]

[1]Medical Laboratory Unit Department of Medical Services National Assembly Clinic Three Arm Zone, Garki, Abuja

[2]Department of Medical Laboratory Science Rivers State University of Science and Technology Nkpolu, Port Harcourt.

[3]Department of Medical Laboratory Sciences, College of Health Sciences, Niger Delta University, Wilberforce Island, Bayelsa State Nigeria

Abstract: ***This study was carried out to detect the prevalence of five markers of Hepatitis B virus (HBV) among prospective blood donors between the ages 18-65 years from Asokoro General Hospital Abuja, Nigeria. They were screened for Hepatitis B virus using a rapid stepwise HBV -5 panel immunoassay of Combo Cassette Manufactured by Lusys Laboratories Inc U.S.A. The overall prevalence rates of the five respective markers were: HBsAg 18(17.5), HBeAg 2(1.9), HBsAb 18(17.5), HBeAb 25(24.5), and HBc 63(61.2). Donors aged (30-40) years had the highest prevalence rate of hepatitis B virus infection compared to age group 21-30 years and 41 years and above. Statistically, there was significant relationship between the prevalence rate of HBsAg and frequency of donation at p(<0.05). A strong positive correlation was found to exist between HBsAg and HBeAg (r=0.36, p=0.002). No correlation was found to exist between HBsAg and other hepatitis B virus markers (P>0.01). Most of the samples that tested negative for HBsAg were found to be positive for other markers especially anti-HBc (IgG and IgM). While anti- HBc IgG is useful for the detection of chronic HBV infection, anti-HBc IgM is useful in detecting recent infection of HBV. Thus, this study has showed that screening for HBsAg alone may not be sufficient for the diagnosis of hepatitis B virus infection.***

Keywords: Hepatitis B; Blood donors; Serological markers

1. Introduction

Hepatitis B virus infection is arguably the most significant global public health problem (barker, 1996; engy, 2011). Of the approximately 2 billion people infected worldwide, 300 million infected patients are chronic carriers of hepatitis B virus (HBV) and it is the 10th leading cause of death (Lavenchy, 2004,). Hepatitis B virus was among the first virus to be transmitted by blood and blood products. HBV infection from transfusion became rare after the introduction of HBsAg in the early 1970, but remains one of the major complications of transfusion particularly in countries with high and intermediate prevalence rate (Durro, 2011). The residue risk of HBV through transfusion is higher, this is attributed to the interval between initial HBV infection and detection of HBsAg, resulting in a long window phase during which the virus is transmitted (Durro, 2011; Jeremiah, 2011). Development of sensitive assays to detect HBV-DNA shows that healthy HBsAg negative donors who are anti-HBc positive may harbour an occult HBV infection and maintain HBV-DNA sequence in their blood and liver. This present a potential source of HBV transmission. The absence of HBsAg in the blood of apparently healthy individuals may not be sufficient to ensure lack of circulating HBV, thus blood containing anti-HBc with or without detectable presence of HBsAg might be infectious(Japhet, 2011; Jeremiah, 2011). Studies from different parts of Nigeria have reported varying prevalence rate of HBsAg among blood donors, however, information on other markers of HBV is scare, because DNA testing of all collected units is not feasible because of the cost of running the test in Nigeria. This study was therefore conducted primarily to determine the prevalence of other markers of hepatitis B virus and to evaluate the reliability of using HBsAg marker alone in diagnosis of hepatitis B virus infection in screening blood donors in our transfusion centres in Nigeria.

2. Material and Methods

2.1 Subjects

One hundred and three apparently healthy blood donors were recruited randomly into this cross sectional study between March to June 2012. All the donors were those who came to donate blood in Asokoro General Hospital Abuja, Nigeria. Institutional ethical approval for this study was given by the department of Medical Laboratory Sciences, Rivers State University of Science and Technology, Port Harcourt. All the participants gave their written informed consents before blood samples were collected from them. 5 millilitres of blood was collected through the vein into the EDTA container. The plasma separated through the centrifugation at 1,000 rpm for 5 minutes for Hepatitis B virus antibodies immunoassay techniques testing. Combo Cassette HBV panel immunoassay manufactured by Lusys Laboratories Inc U.S.A were used in a stepwise order for the detection of HBsAg, HBeAg, HBsAb, HBeAb and HBcAb respectively in the blood. This method which is immunochromatographic and qualitative in nature, detects the presence of five markers of HBV in human blood and can be read in-vitro having more than 99.9% sensitivity and 99.75% specificity. The interpretation of test results was performed according to manufacturer's specification.

2.2 Statistical Analysis

The data was subjected to statistical analysis using SPSS computer software version 17.0 for windows to determine any significant relationship between infection rate, age, gender and frequency of donation for the different markers

of HBV. The result of the two tailed probability (p values). P<0.05.

3. Results

Prevalence of HBV markers

Of the 103 blood samples tested HBsAg was detected in 18(17.5%), HBeAg 2(1.9%), anti- HBs 18(17.5%), anti-HBe 25(24.5%) and anti-HBc is detected in 63(61.2%) respectively. The total prevalence of positive and negative markers detected are 24.5% and 75.5% respectively as summarized in table 1.

Table 1: The prevalence of HBV markers among blood donors

Serological markers	Total Samples	Total positive (%)	Total negative (%)
HBsAg	103	18(17.5)	85(82.5)
HBeAg	103	2(1.9)	101(98.1)
HBsAb	103	18(17.5)	85(82.5)
HBeAb	103	25(24.3)	78(75.7)
HBcAb	103	63(61.2)	40(38.8)

Table 2: The Prevalence of HBV Markers among blood donors by gender

		HBV POSITIVE MARKERS				
GENDER	NO	HBsAg (%)	HBeAg (%)	HBsAb (%)	HBeAb (%)	HBc (%)
Male	n=99	16(16.2)	2(2.0)	17(17.2)	24(24.2)	60(60.6)
Female	n=4	2(50.0)	0(0.0)	1(25.0)	1(25.0)	3(75.0)
P-value		0.140	1.000	0.542	1.000	1.000

Ns= not significant.

Of the 99 males blood donors enrolled for this study, 16(16.2%), 2(2.0%), 17(17.2%), 24(24.2%), and 60(60.6%) were positive for HBsAg, HBeAg, anti-HBs, anti-HBe and anti-HBc respectively. Among the 4 females enrolled for the study, 2(50.0%), 0(0.0%), 1(25.0%) and 1(25.0%) and 3(75.0%) were positive for HBsAg, HBeAg, anti-HBs, ant-HBe, anti-HBc respectively (table 2). There is no significant difference (p<0.05) between the distribution of HBV markers among blood donors in relation to gender.

Table 3: Prevalence of HBV Markers among blood donors by age

		HBV POSITIVE MARKERS				
AGE(yrs)	NO	HBsAg(%)	HBeAg(%)	HBsAb(%)	HBeAb(%)	HBcAb(%)
21-30	n=48	9(18.8)	1(2.1)	6(12.5)	13(27.1)	29(60.4)
31-40	n=39	8(20.5)	1(2.6)	8(20.5)	8(20.5)	25(64.1)
41+	n=16	1(6.3)	0(0.0)	4(25.0)	3(18.8)	9(56.3)
P-value		0.427	0.818	0.427	0.691	0.854
X		1.70	0.401	1.70	0.739	0.316

Ns = Not significant

Regarding age, HBV markers were significantly higher in age group 31-40 years compared to other age group. The difference in HBV markers for 31-40 years in comparison to other age group in the study was not significant. This is summarized in table 3.

Table 4: Influence of Frequency of Donation on the Prevalence of HBV Markers

		HBV POSITIVE MARKERS				
Frequency of donation	NO	HBsAg(%)	HBeAg(%)	HBsAb (%)	HBeAb(%)	HBcAb(%)
0	n=44	13(29.5)	1(2.3)	5(11.4)	8(18.2)	24(54.5)
1	n=27	1(3.7)	0(0.0)	6(22.2)	7(25.9)	18(66.7)
2	n=21	4(19.0)	1(4.8)	5(23.8)	5(23.8)	14(66.7)
3+	n=11	0(0.0)	0(0.0)	2(18.2)	4(36.4)	7(63.6)
X2		10.36	1.655	2.150	1.803	1.452
P-value		0.016*	0.647	0.542	0.614	0.693

*=significant at p<0.05

In relation to frequency of donation, it was found that first time donors had the highest prevalence of HBsAg marker compared to other donors. The frequency of HBV markers decreases as the number of donation increases. All exposed groups showed significant association with HBsAg at p<0.05 as shown in table 4.

Table 5: Pearson Correlation Matrix of the Hepatitis B Virus Markers

Parameter		HBsAg	HBeAg	HBsAb	HBeAb
HBeAg	R	.306			
	p-value	.002**	.		
HBsAb	R	-.144	-.065		
	P-value	.145	.516	.	
HbeAb	R	.049	-.078	-.072	
	P-value	.625	.436	.468	
HBcAb	R	.052	-.032	-.001	.156
	P-value	.602	.746	.996	.115

**=Significance at p<0.01

There is strong positive correlation between HBsAg and HBeAg at r=0.306 and p=0.002 while HBsAg has no significant correlation with other HBV markers. (table5).

4. Discussion

Out of the 103 blood samples tested, HBsAg was detected in 18(17.5%) HBeAg 2(1.9%), anti HBsAb 18(17.5%), anti-HBeAb 25(24.3%) and anti-HBc Ab 61.2% respectively.

Gender-specific difference showed that female blood donors had higher seropositivty for the five markers than the male counterpart, however there was no significant different (p> 0.05). The reason for this difference might be due to large number of male blood donors in this study than the females. This observation contradict what had been previously reported by some authors,(Mehmet, 2005) in his study reported higher prevalence rate in male than females in both rural and urban, with the observation that male sex is an important factor for HBV positivity. The same high prevalence rate of HBsAg was reported among males than the females in Lagos, Nigeria (Balogun , 2010). A similar study also reported a higher HBsAg prevalence in males than females among patients attending dental Clinic, University College Hospital, Ibadan, Nigeria, this was due to shorter carrier HBsAg rate in female than the males (Olubuyide,2007, Ola, 2004, Lawal, 2009). However, the observation in this study is comparable to a report by (Uneke, 2005), which state that females are more infected with HBsAg than the male. Another reason for the high infection rate among females may be due to habit such as multiple sexual partnership (Lawal, 2009). The lack of statistical difference in HBV markers suggests that they were equally exposed to HBV in corroboration with earlier findings (Agbede, 2007, Ugwuja and Ugwu, 2010).

Blood donors within the age group (31-40) years had the highest prevalence of HBV markers than (21-30) years and 41 years above as shown in table 2. This study support the earlier report with high prevalence of HBV in older subjects 40 years and above than in younger people (Lawal, 2009, Okonko, 2012).Also, Luka et al,(2008) in their study, reported higher HBV prevalence among older age group (30-34)years. The finding in this study contradict Buseri et'al (2009), who noted that HBV infection are more prevalent in younger subjects within ages 21-29 years, the possible reason for this high prevalence rate in older people than younger people may be attributed to their active sexual activities and drug abuse, however, we observed that HBV is not limited to any particular age group.

Out of the 103 blood donors as shown in table 4; 44(42.7%) samples were collected from first time donors, 27 (26.2%), second time donors, third and fourth time donor were 21(20.4%) and 11(10.7%) respectively. The prevalence of HBV markers was high among the first time donors than repeat donors and repeat donors are safest (Kanchan, 2013). This result is in agreement with previous study conducted among blood donors at Gondar University Teaching Hospital, Northwest Ethiopia (Tessema, 2010). This shows that HBV infection decreases as the frequency of donation increases. The possible reason is that the more an individual donates blood the more the donor becomes enlightened. There is statistical difference in HBsAg associated with frequency of donation at (p<0.05).

The result of this study showed that 63(61.2%) blood donors had anti-HBc as the only serological markers. This finding agrees with earlier report that testing blood donors for HBsAg alone is not sufficient to eliminate HBV from supply Geraldine, 2006; Chaudhiri, 2006 observed the presence of HBV-DNA in one fifth of anti-HBc only positive donors studied and stated that, reactivity to anti HBc only can predict cryptic HBV infection. It is possible that some of the blood donors are in their window period and may have HBc IgM antigen at the stage when HBsAg is not detectable in the blood. The only serologic evidence of infection with hepatitis B infection is the presence of IgM antibody to the core antigen. Blood from this anti-HBc only donors might have been transfused to innocent patients since the donors tested negative due to undetectable HBsAg in their blood thereby increasing the number of transmissible HBV. The screening test for detection of HBsAg does not rule out the transmission of Hepatitis B as the donors might be in the window period and detection of the antibody to hepatitis B core antigen (HBc IgM) type serves as a useful serological markers during window period. A prevalence of 61.2% observed for anti-HBc in this study is high compared with 0.56% in the united kingdom (Soldan ,1999), 0.84% in the United State (Kleinman, 2000), 1.13% in Canadian blood donors (O'Bran ,2007), 4.85% in Italy (Paola, 2007) .

In areas of high HBV infection, prevalence rate is about 20-70% positive for anti-HBc. The result from this study showed high anti-HBc prevalence compared to those obtained in Indian 18.9%, Pakistan 17.28% and Turkey 20.0% (Duygu,2007),18.1% in Maiduguri, Borno State, Nigeria (Jeremiah, 2011) but lower than 76.0% in Ghana(Allain , 2003). IgM class of the anti-HBc is a marker that indicates recent infection, IgG variety of anti HBc appears later during the infection and points to a past HBV infection. In this study, the anti-HBc only is 63(61.2%) which is comparable to 60.9% reported by (Akinbami ,2012). Anti HBc IgG may remain positive for life in an infected individual, although the individual has protective levels of anti HBs, the blood of such a donor might be free from transmitting HBV (Van Ditzhiyisen, 2010). Strong positive correlation was found to exist between HBsAg and HBeAg (r=0.306 and p=0.002). No correlation was found to exist between HBsAg and HBV markers as shown in table 5.

5. Conclusion

This study showed an overall prevalence rate of HBsAg to be 17.5%, HBeAg 1.9%, anti-HBc 63(61.2%), among prospective blood donors in Abuja, Nigeria. This study however, confirmed the presence of HBV markers among apparently healthy blood donors. Majority of them might have acquired the infection through sex and blood transfusion during window period or late phase chronic HBV, when HBsAg is at undetectable level. Thus the need for inclusion of HBc in routine screening of blood donors in Nigeria is necessary to reduce risk of transfusing HBV infection.

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