



Research Article

# High Rate of HBV and HIV Infections among Pregnant Women in a Semi-Urban Community of Oyo State, Nigeria

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Received: September 2018; Accepted: June, 2019

## Abstract

To determine the prevalence of HIV and HBV co-infection among pregnant women and to identify factors that may enhance transmission of both infections in a semi-urban community in Nigeria, a cross sectional study was carried out in four hospitals in Saki, a semi-urban community in Oyo State, Nigeria from March to April 2013. Blood samples were collected from 236 consenting pregnant women attending the various hospitals for antenatal care. Presence of HBV and HIV infections was detected using commercially available ELISA kits. Structured questionnaire was used to capture demographic and risk related information from participants. Data were analyzed using Chi square and Fishers exact test at  $p = 0.05$ . Out of the 236 participants, 16 (6.8%) and 28 (11.9%) were positive for HIV and HBV respectively. Two (0.85%) of the individuals tested positive for both viruses, with higher rate of coinfection among HIV positive 12.5% (2/16) than HBV positive 7.1% (2/28) pregnant women. The highest prevalence of HBV (18.2%) was found in women < 20 years while the highest HIV prevalence (33.3%) was in women between 40 – 49 years old. Rate of HBV was higher among those with history of blood transfusion. The rate of HIV infection among pregnant women in this study is higher than the rate earlier reported in the national sentinel survey. The high rate of HBV infection found reinforces the need to vaccinate women of child bearing age in sub-Saharan Africa against the infection in order to prevent mother to child transmission.

**Key Words:** HIV/HBV co-infection, risk factors, pregnant women, semi-urban community

## INTRODUCTION

In 2016, it was estimated that 36.7 million people are living with human immunodeficiency virus (HIV) globally (UNAIDS 2017). Sub-Saharan Africa has the highest burden of HIV in the world, with South Africa and Nigeria contributing a significant number to the people living with HIV/AIDS (PLWHA). Also, it has been estimated that over 240 million individuals world-wide are chronically infected with hepatitis B virus (HBV) (WHO 2015). The rate of vertical transmission of HBV is higher among infants whose mothers are HBsAg and HBeAg positive, with approximately 90% of the children becoming chronically infected (Chen et al. 2004). Studies have shown that 15 – 40% of chronic HBV carriers eventually develop cirrhosis, hepatocellular carcinoma (HCC) or liver failure (Seeger and Mason 2000). Prevalence of HIV and HBV infection varies in different geographic areas, as well as among various population groups, with high endemicity in sub-Saharan Africa, the Pacific and Asia (Lopez et al. 2006). HBV and HIV share common modes of transmission which include vertical (mother to child), parenteral, and sexual routes (Matthews et al. 2014). Immune suppression caused by HIV infection accelerates the course of liver disease in HBV-infected individuals, resulting in increased mortality compared to HBV mono-infected patients (Sun et al. 2014). The risk of developing chronic HBV infection is greater in cases of

HBV/HIV co-infection and management of both conditions is often life-long (Alter 2006). Although HBV/HIV co-infection rates have been reported among various populations including pregnant women (Okeke et al. 2012; Opaleye et al. 2016), HIV-infected patients (Otegbayo et al. 2008) and blood donors in Nigeria (Uneke et al. 2005; Egah et al. 2007), most of these studies were carried out in tertiary health facilities in urban cities, with little or no information on co-infection in rural and semi urban communities in the country. This study was designed to determine the prevalence of HBV and HIV among pregnant women attending anti-natal clinics in primary and secondary health care facilities in a semi-urban community in Nigeria.

## MATERIALS AND METHODS

### Study design/Area

A multicenter, cross-sectional study was carried out between March and April 2013 among consenting pregnant women attending four antenatal clinics. The health facilities included two secondary hospitals; Baptist Medical Centre (BMC) and State General Hospital Saki (SHS) and two primary health centers; Isaletaba Model Centre (IMC) and Sango Primary Health Centre (SPHC) all located in Saki (Plate 1). Saki is a semi-urban community 200km away from Ibadan, the capital of Oyo State. It shares border with Republic of Benin to the west and has a population of about 250,000 people. Structured

questionnaires administered to participants were used to capture demographic details and possible risk factors associated with both infections after obtaining their informed consent. Ethical approval for the study was obtained from Oyo State Ministry of Health.

**Sample collection, transportation and storage**

Three milliliter of blood was collected from each participant into a tube containing EDTA and transported to the Baptist Medical Centre Saki where the samples were centrifuged, plasma separated and stored at +4°C before shipment in triple packaging to the Department of Virology, College of Medicine, University of Ibadan, Ibadan. Samples were usually transported within 3 days of collection. At the Department of Virology, plasma samples were stored at -20°C until tested.

**Laboratory analysis**

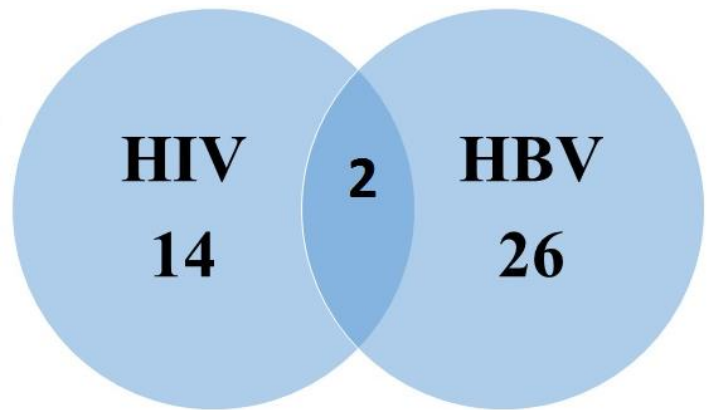
All samples were tested for presence of HBV and HIV infection using commercially available reagents. The presence of HBV infection was diagnosed using ELISA kits (Monolisat™ ULTRA HBsAg; BIORAD, France) that detects HBsAg while HIV diagnosis was carried out using a 4th generation ELISA with ability to detect both HIV1/2 antibodies and antigen (Genscreen™ ULTRA HIV Ag-Ab ELISA kit; BIORAD, France). Assays were carried out and results interpreted as recommended by the manufacturer.

**Statistical analysis**

Data analysis was done using SPSS version 16.0 software (IBM Corp. released 2011, IBM SPSS Statistics for Windows, Armonk, NY, USA). Chi square and Fischer’s exact tests were used to determine association between HIV and HBV positivity and other variables in a univariate analysis and P value <0.05 was considered statistically significant.

**RESULTS**

The age of participants ranged from 15 to 49 years (mean = 32 years). Out of 236 pregnant women enrolled, 28 (11.9%) were positive for HBsAg while 16 (6.8%) were positive for HIV and 2 (0.85%) positive for both viruses (Fig.1). Although the overall HIV/HBV coinfection was 0.85%, the rate was higher among HIV positive (12.5%) than HBV positive (7.1%) women (Table 1).



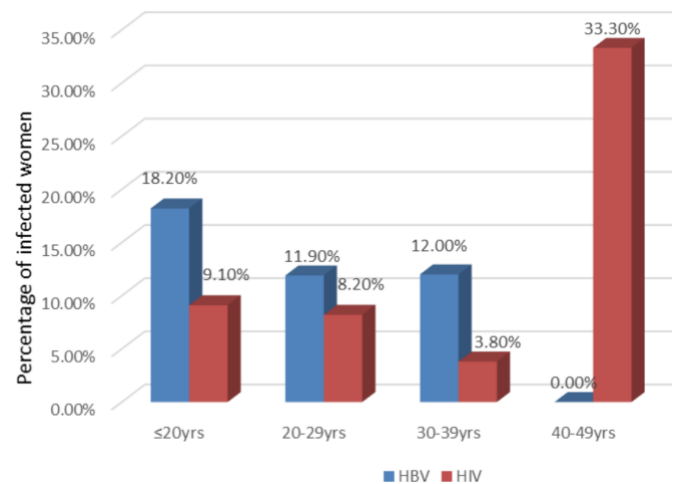
**Figure 1.** HIV and HBV co-infection among pregnant women in Saki

**Table 1:** Co-infection among HIV and HBV Positive pregnant women

Status	No Tested	No Positive	% Positive (Rate)
HIV Positive	16	2	12.5
HBV Positive	28	2	7.1



**Plate 1** Map of Nigeria (A) and Oyo State (B) showing Saki West where study was carried out



**Figure 2** Distribution of HBV and HIV infection by age of pregnant women.

**Table 2.**  
Distribution of HIV and HBV infection by health facility

Hospital Types	HBV Status		p value	HIV Status	
	No. tested	No. positive (%)		No. positive (%)	p value
<b>Secondary (2o)</b>					
BMC	45	7(15.6%)		1 (2.2%)	
SHS	70	7(10.0%)		9 (12.9%)	
Sub-total	115	14 (12.2%)	0.92	10(8.7%)	1.37
<b>Primary (1o)</b>					
IMC	75	11 (14.7)		5 (6.7%)	
SPHC	46	3 (6.5%)		1 (2.2%)	
Sub-total	121	14 (11.6%)	0.69	6 (5.0%)	0.41
Total	236	28 (11.9%)		16 (6.8)	

**Table 3.**  
Distribution of HBV/HIV Infection by occupation of pregnant women

Occupation	No. tested	HBV Status		HIV Status	
		No. positive (%)	p value	No. positive (%)	p value
Civil servant	4	2 (50%)		1 (25.0%)	0.19
Fashion designer	63	5 (7.9%)		4 (6.3%)	
Hair dressing	9	1 (11.1%)		1 (11.1%)	
Health worker	6	1 (16.7%)		2 (33.3%)	
Housewife	13	1 (7.7%)		0 (0.0%)	
Students	11	0 (0.0%)		1 (9.1%)	
Teacher	20	3 (15.0%)		1 (5.0%)	
Trader	94	11 (11.7%)		6 (6.4%)	
Others	16	4 (25.0%)		0 (0.0%)	
Total	236	28 (11.9%)	0.17	16 (6.8%)	

**Table 4.**  
Risk factors associated with HBV/HIV Infection among study participants

Risk factor	Category	HBV Status			HIV Status	
		No. Tested	No. positive (%)	p value	No. positive (%)	p value
Marital status	Single	15	0 (0.0%)	0.32	3 (20.0%)	0.15
	Married	221	28 (12.7%)		13 (5.9%)	
Blood transfusion	Yes	35	6 (17.1%)	0.04	0 (0.0%)	0.11
	No	201	22 (10.9%)		16 (8.0%)	
Injection Drug use	Yes	6	1 (16.7%)	0.41	0 (0.0%)	0.12
	No	230	27 (11.7%)		16 (7.0%)	
Sexual partner	One	222	28 (12.6%)	0.22	14 (6.3%)	0.09
	Two & above	14	0 (0.0%)		2 (14.3%)	

Figure 2 shows the distribution of HBV/HIV infection by age. The highest rate of HBV infection (18.2%) was found among those <20 years while the highest HIV infection was among the 40-49 age group (33.3%). Although the rate of both infections were higher among participants enrolled at the secondary health facility, there was no association between type of health facility and the infection rates (Table 2).

The data showed that civil servants had the highest HBV infection rate (50%) while Health workers had the highest HIV infection rates (33.3%) among study participants. However, there was no association between any of the infections and occupation (Table 3). All HBsAg positive individuals were married and the rate of HBV infection was higher (17.1%) among those with history of blood transfusion (p=0.04). Although the rate of HBV was higher among those who acknowledged use of injection drugs, the difference was not significant. Similarly, the rate (14.3%) of HIV infection was highest among pregnant women with multiple sexual partners though this was not significant (p=0.09) (Table 4).

**DISCUSSION**

The HBV prevalence of 11.9% found among pregnant women in this study is high and agrees with other reports that shows that the disease is endemic in many African countries including Nigeria (Schweitzer et al. 2015). HBV endemicity is defined as HBsAg seropositivity greater than 7% in any adult population (Hodges et al. 1998). The findings of this study in Saki, a semi urban community is similar to the 11% reported among pregnant women in Makurdi, North-central Nigeria (Mbaawuaga et al. 2010) and 12.6% in a rural North-central Nigeria community (Jombo et al. 2005). The prevalence in our study is however higher than Enugu (4.6%) an urban community in South-eastern Nigeria (Obi et al. 2006) and 8.3% among pregnant women in Ibadan, a city in Southwestern Nigeria (Anaedobe et al. 2015). Also, prevalence in our study is higher than the report of 1.53% among Afghanistan women (Todd et al. 2008) but lower than

13.8% among Senegalese pregnant women (Roingard et al. 1993).

Pregnant women below 20 years old had the highest HBV infection rate in this study, women in this age group are within the highly sexually active age bracket (Kretzschmar et al. 2001). Due to their young age and recent exposure to sexual activities, their awareness about sexually transmitted diseases may be low. Other studies from Ibadan have also shown that this group of individuals are involved in many risky sexual practices including unprotected sexual intercourse and early sexual debut, which may predispose them to the infection (Oluwatoyin and Modupe 2014). Similarly high prevalence have been reported among pregnant women between 25-29 years old in Adamawa State (Olokoba et al. 2011). Furthermore, in a national surveillance in Philippines, the highest seropositivity was found among the 20-39 years age group (Wong et al. 2013). The high rate of HBV infection found among pregnant health workers in this study is similar to a study in Turkey with 18.7% prevalence among nurses (Kosgeroglu et al. 2004). Health care workers are regularly exposed to blood and blood products in the course of their duties, thus, they are at higher risk of infection with the virus. The high rate of infection among this category of workers in our study implies that there may be poor adherence to the use of personal protective equipment in the study location. In sub-Saharan Africa, the risk of transfusion-associated infections is substantially high because of improper screening and use of paid/replacement donors (Bloch et al. 2012). In this study, significantly higher prevalence of HBV was found among women with history of blood transfusion, indicating a need to improve transfusion blood safety in Nigeria.

The HIV prevalence of 6.8% obtained in this study is higher than reports from the 2010 National HIV Sentinel Survey where Oyo, the host state for the study population had a prevalence of 3.0%. The rate of infection among the study population is comparable to that of cross river state (7.1%) in the same survey (FMOH 2010). When compared to other African countries, the prevalence found in this study is similar to reports from Kenya (6.7%) and Tanzania (6.9%), but slightly higher than 5.4% in Burkina Faso (Ilboudo et al. 2010). However, it is lower than 30.2% among South African pregnant women (Johnson et al. 2007). The high rate of infection among participants in this study could be attributed to various risk factors that are associated with this community including polygamy, multiple sexual partners and migration as a result of trading, since Saki is a border town. The enrollment criteria of only pregnant women could also play a role in the high prevalence obtained. ELISA technique which is highly sensitive was employed in this research, therefore minimizing the chances of missing out positive cases.

In the 2012 HIV sentinel survey in Nigeria, the highest national prevalence was reported among women between 35 to 39 years of age (NACA 2014) while the highest prevalence in this study was found among women in the 40 to 49 years age group. The apparent shift in peak age-specific-prevalence may be due to the effect of improved highly active antiretroviral therapy (HAART). This may have improved the survival of HIV patients, thereby, enabling them live long enough to enter into higher age-group.

The proportion of co-infection found in this study among HBV positive pregnant women (7.1%) is similar to 8.2% reported in Yola (Olokoba et al. 2011). Co-infection rates as high as 12% have been reported in Malawi and Taiwan which

are areas with high HBV endemicity (Lee et al. 2008; Nyirenda et al. 2008). The Co-infection rate found among HIV positive pregnant women (12.5%) in this study is similar to previously reported rates among similar population groups in Ibadan (Otegbayo et al. 2008) and Jos (Imade et al. 2004) of 11.9 and 11.5 respectively. However, it is lower than the rate of 20.6% and 28.4% reported in Nassarawa (Forbi et al. 2007) and in Lagos (Balogun et al. 2012) states respectively. Lower level of co-infection was observed in Senegal (3.1%) (Sall Diallo et al. 2004), 7.1% in Abuja (Hoffmann and Thio 2007) and 7.3% in Ethiopia (Tiruneh 2008). The Impact of co-infection on treatment of HBV is very important in areas where the use of ART (Antiretroviral therapy) is widespread. Some ART like Lamivudine is effective in the management of both HIV and Hepatitis B infections by reducing both HIV-1 and HBV viral replication (Wolters et al. 2002). The use of ART in parts of the world with high HBV endemicity is expected to increase long-term survival, however, liver disease due to chronic hepatitis B in HIV-infected population may be a greater public health problem (Hoffmann and Thio 2007). Also, in some co-infected patient, after the commencement of ART, immune reconstitution inflammatory syndrome, which can worsen liver disease may occur (Crane et al. 2009). For individuals on HAART, co-infection with chronic hepatitis B increases the risk of hepatotoxicity by three-to five-fold, consequently HBV co-infection with HIV may erode the gains of HIV control (Sulkowski et al. 2000).

In conclusion, the seroprevalence of 11.9% and 6.8% obtained among pregnant women for HBV and HIV infections respectively in this study re-affirms the endemicity of both diseases in Nigeria. The rate of HIV infection reported in this study is higher than the rate reported in the 2012 national sentinel survey among pregnant women in Oyo state, the location of the study sites. The high rate of HBV infection and associated risk of infectivity strongly support the need to vaccinate women of child bearing age, as there is a risk of mother-to-infant transmission. Blood transfusion was also identified as a possible risk factor for transmission of HBV in the study population.

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