

## Prevalence of Hepatitis-B virus and HIV infections in Pregnant Women Receiving Antenatal Care Services, Kano – Nigeria

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### Abstract

The dreadful nature of hepatitis-B virus (HBV) and HIV infections and their common mode of transmission during pregnancy have made them become an important global health problem and a leading cause of maternal complications and neonatal deaths in both developed and developing countries. The current study determined the seroprevalence of HBV and HIV amongst pregnant women receiving antenatal care services in Kano state. Structured questionnaires were distributed to 276 (14-49 years) consenting pregnant women across the six selected health facilities to obtain demographic and socio-economic data. Three (3) ml of venous blood sample were drawn by venipuncture and centrifuged at 3000 rpm for 5 min. The serum was tested for the presence of HIV antibodies using the Abbott Determine HIV 1/2 test kit and HBV antibodies using a rapid diagnostic test kit (DiaSpot Diagnostics, USA). The  $\chi^2$  test for independence was determined using GraphPad InStat software (version 3.0). Sociodemographic characteristics of the respondents showed 95.7% of the respondents as being married, 64.5% lived in a monogamous family, 62.4% petty traders, 26.8% unemployed, 57.4% of them are 21 – 30 years of age, 41.3% have Quranic education, 28.3% are 1st gravida while 36.9% have more than 4 children. Additionally, 1.4% of HIV and 8% of HBV cases were confirmed. The chi-squared test for independence ( $\chi^2=13.078$ ,  $P=0.0003$ ) showed a significant relationship between the two variables. HIV and HBV infections existed in the study group. Regular screening, awareness, and health education programs on the mode of their transmission should be directed to pregnant women to prevent vertical transmission.

**Keywords:** Pregnancy, HIV and Hepatitis-B virus infections

### 1. Introduction

Pregnancy is characterized as a period of reproduction during which a woman carries one or more offspring from the implantation of a fertilized zygote in the uterus throughout

gestation (Mohamed et al., 2016). However, this exciting time is known to triggers endocrine, physiological, anatomical, biochemical, and immunological response; and to have a well-known effect in the T helper 1-T helper 2 balance towards a T helper 2 response, which increases the secretion of regulatory T cells and in turn depressed immune response thereby resulting in the successful infection and proliferation of viral DNA (Borgia et al., 2012; Costantine, 2014). Human immunodeficiency virus (HIV) and hepatitis B virus (HBV) infections pose a public health challenge causing about two billion infections worldwide (Adegbesan-Omilabu et al., 2015; Platt et al., 2016), with an approximate 350 million people remaining chronically infected (Schilsky, 2013). Out of these, about 50% acquired their infections either perinatally or in early childhood (Lavanchy, 2005). The appalling nature of both viral infections and their common route of transmission through blood and body fluids especially during unprotected heterosexual contact, mother to child transmission, and ability to cause chronic disease state in affected individuals account for their dual burden of co-morbidity during pregnancy (Kourtis et al., 2012).

HBV belong to a member of the hepadnaviridae family and envelops a partially double-stranded DNA virus has numerous antigenic components such as hepatitis B envelope antigen (HBeAg), hepatitis B core antigen (HBcAg) and hepatitis B surface antigen (HBsAg) (Mekonnen et al., 2018). Due to its vertical transmission nature, hepatitis B is associated with maternal complications, and death accompanied by impaired mental and physical health of the child (Ugbebor et al., 2011). This is followed by liver cirrhosis and hepatocellular carcinoma in young adults (Negero et al., 2011). Its high prevalence (>8% of the population) has been reported in Pacific Islands, South-East Asia, China, the Amazon basin, Sub-Saharan Africa and parts of the Middle-East with intermediated prevalence (2-7%) in Eastern and Southern Europe, Central and South America, South Asia, and Russia. On the other hand, the areas with low endemicity (<2%) include Australia, Western Europe, and the United States (Te and Jensen, 2010; World Health Organization, 2013). In Nigeria, different prevalence rate of HBV in pregnant women was reported in different localities amongst which are 7.3%, 8.2% and 16.3% documented by Adegbesan-Omilabu et al. (2015), Olokoba et al. (2011) and Adeyemi et al. (2014), respectively.

Since it was first discovered in 1981 in the United States (Gottlieb et al., 1981), AIDS which was caused by HIV has become a global pandemic (Perpetus et al., 2012) with highest number of people (63%) with the virus living in sub-Saharan Africa (Adeniran et al., 2014). With about 1.9 million people currently living with HIV in Nigeria, the country has a national prevalence rate of 1.4% (i.e., 1.9% women, versus 0.9% men) among adults aged 15-49 years (Federal Ministry of Health, UNAIDS, and National Agency for the Control of AIDS, 2019). Previous estimates had indicated a national HIV prevalence of 2.8% (about 3.1 million people) (AVERT global information and education on HIV and AIDS, 2018). Potential vertical transmission of this deadly virus (HIV) during the gestation period is a major concern, because of the attendant consequences of morbidity and mortality of these infections (Kourtis et al., 2012). The infection, if it happens, pre-exposes the children to common childhood diseases like measles, diarrhoea, common cold, etc. that can be used as markers of immune decline (Makokha et al., 2003). Thus, the present study aimed to determine the prevalence of HIV and HBV amongst pregnant women attending some antenatal care services in Kano state primary health care management board.

## 2. Materials and Method

### 2.1. Target Population

The study population included primi and multi-gravid pregnant women (14-49 years) attending antenatal services in six zones in Kano state primary health care management board. A total of 276 consented pregnant women were recruited for the study.

### 2.2. Sample Size Determination

By taking Adeyemi et al. (2014)'s 16.3% prevalence rate of HBV, the sample size was determined using the formula,  $N = \frac{Z^2 p(1-p)}{d^2}$  (Bartlett et al., 2001) where

N = sample size

d = margin of error (5%)

p = prevalence of 16.3%

z = critical value at 95 % confidence level (1.96)

Substituting the above values in the given formula yields

$$N = \frac{(1.96)^2 \times 0.163(0.837)}{(0.05)^2} = 209.6$$

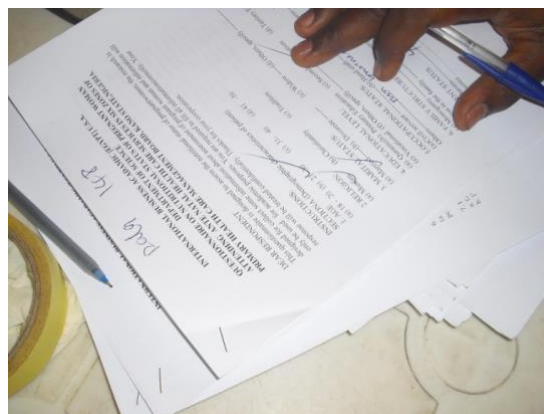
Therefore, a minimum sample size of 210 is obtained. Adjusting for attrition, the sample size was rounded up to 276 pregnant women.

### 2.3. Sampling Technique

Six hospitals (one from each zone) were randomly selected using systematic sampling. The number of consenting respondents in each hospital was 46 (totaling 276). Respondents were randomly recruited through systematic sampling for the study on different clinic days.

### 2.4. Data Collection

A structured questionnaire was designed and administered to consented pregnant women. The questionnaire contained some socio-demographic and economic characteristics of the participants. Figure 1 shows respondent filling the questionnaire.



**Figure 1.** A respondent filling the questionnaire

## 2.5. Informed Consent and Ethical Issues

Informed consents were obtained from the respondents before sample collection and all data were kept confidential in accordance with world medical association ethical principle for medical research involving human subjects (World Medical Association, 2013). Ethical clearance was sought and obtained from Kano state ministry of health prior to commencement of the study.

## 2.6. Assay

A 3 ml venous blood sample was drawn by venipuncture (Figure 2) from women and collected in a labelled plain universal specimen bottle. Each clotted sample was centrifuged at 3000 rpm for 5 min. The serum was subsequently separated from each blood sample and stored frozen (-20 °C) until further analysis. Each pregnant woman's serum was tested for the presence of HIV antibodies using Abbott Determine HIV 1/2 test kit (Abbot Laboratories, Illinois, USA) and HBV antibodies using rapid diagnostic tests (DiaSpot Diagnostics, USA). The standard operating procedures (SOPs) of each of the manufacturers were strictly followed.



Figure 2. Blood sample being drawn by venipuncture

## 2.7. Data Analysis

The data retrieved were analyzed and depicted in the tables using percentages and proportions to compute the socio-demographic and economic variables. A chi-squared test for independence was used for inferential statistics to determine the possible relationship among the variables of the study.

## 3. Results

The economic and demographic characteristics of the respondents are presented in Table 1. The majority of the respondents have Quranic education (41.3%); 2.2% studied up to the advanced level, 62.4% are petty traders and 26.8% are unemployed. Likewise, 57.4% (representing the majority) of the respondents are in the range of 21 – 30 years of age, minority (8%) are in between 41 – 50 years of age, 95.7% are married, and 64.5% are living in a monogamous family, 36.9% have more than 4 children and 28.3% are 1<sup>st</sup> gravida mothers.

**Table 1.** Socio-demographic features of the population under study

Variables	N (276)	Percentage (%)
<b>Employment type</b>		
Civil servant	10	3.6
Handcraft	18	6.5
Trading	172	62.4
Unemployed	74	26.8
Others	2	0.7
<b>Family type</b>		
Monogamy	178	64.5
Polygamy	98	36.5
<b>Marital status</b>		
Married	264	95.7
Divorced	8	2.9
Widow	4	1.4
<b>Religion</b>		
Islam	274	99.3
Christianity	02	0.7
<b>Educational level</b>		
Quranic	114	41.3
Primary	48	17.4
Secondary	106	38.4
Tertiary	6	2.2
Vocational	2	0.7
<b>Age (years)</b>		
11-20	62	22.5
21-30	142	57.4
31-40	50	18.1
41-50	22	8.0
<b>Gravidarum</b>		
1	78	28.3
2	44	15.9
3	22	8.0
4	30	10.9
4+	102	36.9

Table 2 presents the infectious status of pregnant women. Out of 276 consented pregnant women 4 are HIV seropositive giving a prevalence of 1.4%. Likewise, 22 out of 276 study participants (8%) are also seropositive for HBV test. All in all, the number of respondents with HBV infections are higher than that of HIV. The chi-squared test for independence (13.078) showed the two variables to be significantly associated with each other ( $P=0.0003$ ) and each infection had a significant relationship with the other group.

**Table 2.** Infectious status of a pregnant woman

Parameter	Reactive		Non-reactive	
	N (276)	Percentage (%)	N (276)	Percentage (%)
HIV	4	1.4	272	98.6
HBV	22	8	254	92

Chi-square: 13.078; The P value is 0.0003

The row and column variables are significantly associated.

#### 4. Discussion

Viral diseases such as HIV and HBV are life-threatening diseases that have become an important public health issue in both developed and developing countries. The problem tends to be more profound in sub-Saharan Africa including Nigeria. During pregnancy, HIV and HBV screening is important to initiate early antiretroviral therapy (ART) that improves maternal health and prevent the risk of vertical transmission (mother to child) of retroviral diseases (Günthard et al., 2016). Taking this into consideration, the present study investigated the prevalence of HIV and HBV amongst pregnant women in the study area. Results presented from the present study in Table 2 showed the prevalence of HBV infection as 8%. This value is similar to 7.9% (Jatau et al., 2009; Yakasai et al., 2012), 8.2% (Olokoba et al., 2011), 8.3% (Luka et al., 2008; Anaedobe et al., 2015) but quite differ with 2.2% (Mbamara and Obiechina, 2010), 4.89% (Caroline et al., 2016), 7.3% (Adegbesan-Omilabu et al., 2015), 12% (Mbaawuaga et al., 2014; Musa et al., 2015), 16.3% (Adeyemi et al., 2014) prevalence figures documented in various studies and in various locations in Nigeria. This level of endemicity is worrisome considering the consequences both for the mother's health and that of her baby. Without treatment, HBV infection can progress chronically and may be clinically asymptomatic, or may progress to cause liver cancer or liver damage that leads to liver failure (Molla et al., 2015). It can also progress to attack and damage ovarian follicle or placental capillary endothelium (Yu et al., 2013).

The 1.4% HIV prevalence obtained in the current study is the same as the 2019 national HIV prevalence rate of 1.4% reported by the federal ministry of health (FMOH), UNAIDS and national agency for the control of AIDS (NACA) among women of reproductive ages (15–49 years) living in Nigeria (Federal Ministry of Health et al., 2019). However, this value is lower than 2.8% of previous national estimates (AVERT global information and education on HIV and AIDS, 2018); and 3.0% (Okerentugba et al., 2015), 3.2% (Isichei et al., 2015), 4.9% (Ibrahim et al., 2013), 5.9% (Caroline et al., 2016); but higher than 0.95% (Ajoge et al., 2008) previously reported in various localities in Nigeria. The low HIV prevalence observed in the present study could be explained by the effort of various government and non-governmental agencies programs in the country in raising awareness about the importance of HIV screening and its prevention. Pregnant women infected with HIV have an increased risk of anemia, hypertensive disease, hemorrhage due to thrombocytopenia (Caroline et al., 2016), eight times higher mortality rate and three times the risk of puerperal sepsis in comparison with non-infected negative women (Calvert and Ronsmans, 2013; Zaba et al., 2013). These consequences tend to progress to their offspring, immediate family, health workers, social and economic structure (Egesie and Mbooh, 2008). In general, this prospective cohort study shows HBV infections as having a higher prevalence than HIV. Hepatitis B and human immunodeficiency viruses tests during gestation benefit the women in the reinforcement of

safe sex practices, provision of opportunity for counselling on infant feeding options, and enabling a woman to make informed choices about future pregnancies.

## 5. Conclusion

The findings of the present study conclude that viral infections of hepatitis and human immunodeficiency does exist amongst the study group with HBV having a higher endemicity of 8%. To decrease the prevalence of these viral infections, we recommend that all pregnant women should be screened for HIV and HBV, and health education programs on the mode of their transmission to prevent mother-to-child transmission should be instituted in all antenatal care clinics to raise the awareness to mothers.

## Author Statement

The authors confirm contribution to the paper as follows: study conception and design: Sulaiman Danjuma Dausayi, Isa Yunusa; data collection: Sulaiman Danjuma Dausayi, Fatima Sunusi Gaya, Anas Lawan Sulaiman; analysis and interpretation of results: Umar Muazu Yunusa, Isa Yunusa, Zulaiha Gidado Mukhtar; draft manuscript preparation: Umar Muazu Yunusa, Zulaiha Gidado Mukhtar. All authors reviewed the results and approved the final version of the manuscript.

## Conflict of Interest

The authors declare no conflict of interest.

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