

# Seroprevalence of Human Immunodeficiency Virus, Hepatitis B, Hepatitis C, Syphilis, and Co-infections among Antenatal Women in a Tertiary Institution in South East, Nigeria

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## Abstract

**Background:** Sexually transmitted infections and human immunodeficiency virus (HIV)/AIDS are a major public health concern owing to both their prevalence and propensity to affect offspring through vertical transmission. **Aim:** The aim was to determine the seroprevalence of HIV, hepatitis B virus (HBV), hepatitis C virus (HCV), syphilis, and co-infections among antenatal women in Enugu, South-East Nigeria. **Materials and Methods:** A retrospective study of antenatal women at the University of Nigeria Teaching Hospital, Enugu, South-East Nigeria from 1<sup>st</sup> May 2006 to 30<sup>th</sup> April 2008. A pretested data extraction form was used to obtain data on sociodemographic variables and screening test results from the antenatal records. The analysis was done with SPSS version 17 (Chicago, IL, USA). **Results:** A total of 1239 antenatal records was used for the study. The seroprevalence of HIV, HBV, HCV, and syphilis among the antenatal women were 12.4% (154/1239), 3.4% (42/1239), 2.6% (32/1239), 0.08% (1/1239), respectively. The HIV/HBV and HIV/HCV co-infection prevalence rates were 0.24% (3/1239), 0.16% (2/1239), respectively. There was no HBC and HCV co-infection among both HIV positive and negative antenatal women. There was no statistically significant difference in HBV and HCV infection between the HIV positive and negative antenatal women. The only woman that was seropositive for syphilis was also positive to HIV. **Conclusion:** The seroprevalence of HIV, HBV, HCV, and syphilis is still a challenge in Enugu. Community health education is necessary to reduce the prevalence of this infection among the most productive and economically viable age bracket.

**Keywords:** Antenatal women, Co-infection, Human immunodeficiency virus, Hepatitis C virus, Hepatitis B virus, Seroprevalence, Syphilis

## Introduction

The largest epidemic facing mankind today is human immunodeficiency virus (HIV) infection.<sup>[1]</sup> Sub-Saharan Africa, the hardest hit region, is home to more than two-thirds (69%) of people living with HIV but only about 12% of the world's population.<sup>[2]</sup> Nigeria still has the largest HIV prevalence among pregnant women, ranging from as low

as 1.6% in the west, to 8% in the South-South, 6.5% in the South-East and 10% in the North-Central.<sup>[3]</sup>

Nigeria is also endemic for hepatitis B virus (HBV) infection, the virus that shares similar transmission routes with HIV.<sup>[4]</sup> Over 2 billion of the world's population have been exposed to HBV, and an estimated 387 million of these are now chronically infected with a rate of 10 million new carriers each year.<sup>[5]</sup> Approximately, 13% of the carriers will die from the consequences of the HBV infection with an overall annual mortality of about 1 million.<sup>[6]</sup> HBV is believed to be the main etiological factor in over 75% of chronic liver disease.<sup>[6]</sup>

Hepatitis C virus (HCV) is a single-stranded ribonucleic acid virus in the flaviviridae family and also a major cause of liver disease in the world.<sup>[7]</sup> The overall prevalence of HCV

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in Sub-Saharan Africa is 3%.<sup>[7]</sup> There are several routes of transmission of HCV but direct percutaneous inoculation is the most efficient.<sup>[8]</sup> In South-Western Nigeria, a higher percentage of those with HCV infection had additional risk factors, especially scarification marks.<sup>[9]</sup>

Syphilis is also a systemic disease caused by *Treponema pallidum* which can be spread by sexual contact, blood transfusion, and via vertical transmission.<sup>[10]</sup> Syphilis can seriously complicate pregnancy and result in spontaneous abortion, prematurity, low birth weight, stillbirth as well serious sequelae in live born infected children.<sup>[11]</sup>

Due to the similarity in the routes of transmission, many individuals have been exposed to HIV, HBV, HCV, and syphilis infection in various combinations. A study on blood donors showed that seroprevalence of HIV, HBV, HCV, and syphilis was 3.8%, 4.7%, 0.7%, and 1.3%, respectively.<sup>[12]</sup> Among those with co-infections, the most common combinations were HIV-syphilis 38% and HIV-HBV 34%.<sup>[12]</sup> These co-infections have been associated with reduced survival, drug-related hepatotoxicity, drug resistance, cross-resistance, and sub-optimal response.<sup>[13,14]</sup>

There are worldwide variations in seroprevalence of these infections depending on geographic area, risk groups, and the type of exposure involved.<sup>[4]</sup>

This study is aimed at estimating the seroprevalence of HIV, HBV, HCV, syphilis, and co-infections among antenatal women in Enugu, South-East Nigeria. The outcome will help in formulating intervention policies aimed at curtailing the spread of these infections.

## Materials and Methods

### Study design

This was a retrospective study which covered the antenatal cases in the hospital between 1<sup>st</sup> May 2006 and 30<sup>th</sup> April 2008. A total of 2500 pregnant women attended the antenatal clinic within the study period. All the antenatal records with complete sociodemographic variables, HIV, HBV, HCV, and syphilis screening results were used for the study. All antenatal women whose mothers were HBV or HIV carriers were excluded. The study was approved by the Ethics Committee of University of Nigeria Teaching Hospital (UNTH), Enugu. All the antenatal records were thoroughly reviewed, and 1239 of them met the inclusion criteria while 1261 of them did not. A pretested data extraction form was used to obtain information on the socio demographic status, parity, screening for HIV, hepatitis B surface antigen (HBsAg), syphilis, and HCV from the antenatal records. The data were extracted by two trained assistants.

Hepatitis B surface antigen and antibodies to HCV were determined using Clinotech diagnostic enzyme-linked

immunosorbent (ELISA) test kits (Clinotech Laboratories, USA; Batch/Lot No. for HBsAg screening kit is F0416J2 and F0106J2 for HCV). The test sensitivity is 100% and specificity 99.7% for both HbsAg and HCV test kits. Syphilis was screened with Veneral Disease Research Laboratory (Clinotech Biotech Inc., California; Batch/Lot No. F0731J4, sensitivity 100%, specificity 99.7%). Antibodies to *T. pallidum* were confirmed with *T. pallidum* hemagglutination test. Antibodies to HIV-1 and -2 were screened with Abott Determine and Immunocomb (Alere Medical Company, Limited, Japan; Batch/Lot No. 54921U100, sensitivity 100%, specificity 99.5%). All reactive samples were confirmed using ELISA.

Statistical analysis was achieved using SPSS version 17 (Chicago, IL, USA). Chi-square analysis was used for discrete variables and  $P < 0.05$  were considered statistically significant. The results were presented in tables and simple percentages.

## Results

Out of 1239 antenatal women, 154 were HIV positive giving a seroprevalence rate of 12.4% (154/1239), 42 were HBV positive resulting in an HBV seroprevalence of 3.4% (42/1239), and 32 of them were positive to HCV antibodies with a seroprevalent rate of 2.6% (32/1239) [Table 1]. One of the pregnant women was *T. pallidum* hemoagglutination assay positive with seroprevalence rate of 0.08% (1/1239).

Three out of 1239 women were both HIV and HBV positive with co-prevalent rate of 0.24% (3/1239) [Table 2]. As was shown by the Chi-square values in Table 2, there was no statistically significant difference in HBV infection between the HIV positive and negative antenatal women ( $\chi^2 = 2.745$ ,  $df = 1$ ,  $P = 0.09$ ). Two women were both HIV and HCV positive with a seroprevalent rate of 0.16% (2/1239). Similarly, in Table 2, there was no statistically significant difference in HCV infection between the HIV positive and negative women ( $\chi^2 = 2.867$ ,  $df = 1$ ,  $P = 0.09$ ). The only patient who was *T. pallidum* hemoagglutination test positive was also HIV positive. There was no HBV, HCV,

**Table 1: Screening pattern of the antenatal women**

Screening pattern of the women	Frequency	Percentage
HIV screening pattern	$n=1239$	
Positive	154	12.4
Negative	1085	87.6
HBsAg screening pattern	$n=1239$	
Positive	42	3.4
Negative	1197	96.6
HCV screening pattern	$n=1239$	
Positive	32	2.6
Negative	1207	97.4

HIV: Human immunodeficiency virus, HCV: Hepatitis C virus, HBsAg: Hepatitis B surface antigen

and syphilis co-infection in both HIV positive and negative antenatal women in Enugu.

The most predominant age group of the women was 21–30 years 53.9% (669/1239). The mean (SD) of age was 30.1 (2.1) years [Table 3]. Four hundred and ninety-three 493/1239 (39.8%) of the women were public/civil servants followed by the unemployed group 28.7% (356/1239). Table 3 also shows that most of the antenatal women 38.7% (479/1239) were multiparous.

Table 4 reveals that the unemployed group of the antenatal women and the Artisans constitute the bulk of the women that were seropositive to HIV, HBV, and HCV antibodies.

## Discussion

The overall seroprevalence of HIV, 12.4% among antenatal women in Enugu, recorded in this study is higher than the

	HBV		Total
	Positive	Negative	
HIV			
Positive	3	151	154
Negative	39	1046	1085
Total	42	1197	1239
	$\chi^2=2.745, df=1, P=0.098$		
	HCV		
	Positive	Negative	
HIV			
Positive	2	152	154
Negative	30	1055	1085
Total	32	1207	1239
	$\chi^2=2.867, df=1, P=0.09$		

HIV: Human immunodeficiency virus, HBV: Hepatitis B virus, HCV: Hepatitis C virus

Sociodemographic characteristics	Frequency	Percentage
Age (years)	<i>n</i> =1239	
11-20	23	1.9
21-30	669	53.9
31-40	518	41.8
41-50	29	2.3
Occupation	<i>n</i> =1239	
Public/civil servants	493	39.8
Trading	197	15.9
Unemployed group	356	28.7
Artisans	79	6.4
Professionals (Doctors, Lawyer, Engineers)	114	9.2
Parity distribution	<i>n</i> =1239	
0	380	30.7
1	302	24.4
2-4	479	38.7
>5	76	6.1

national HIV prevalence of 4.6% among pregnant women.<sup>[15]</sup> It is also higher when compared with the 7.8% reported in Minna and 8.6% in Anambra state, Nigeria.<sup>[16,17]</sup>

In North West Ethiopia, a seroprevalence of 9.6% for HIV-1 was observed among pregnant women receiving antenatal services at the University of Gondar Teaching Hospital.<sup>[14]</sup> The seroprevalence in this study is lower than the 26% seroprevalence reported in Swaziland.<sup>[18]</sup> The seroprevalence of HIV, 12.4% in this study could be due to the increased level of awareness among antenatal women in Enugu and environs on the Prevention of Mother to Child Transmission (PMTCT) of HIV/AIDS as well as the functional PMTCT program in UNTH, Enugu thereby attracting more HIV-positive pregnant women to book at UNTH.

The seroprevalence of HBV 3.4%, among the women, is lower than previous reports from Nigeria; 8.2% in Yola<sup>[19]</sup> and 5% in Niger Delta.<sup>[20]</sup> It is similar to 3.7% reported in Jimma, Ethiopia.<sup>[21]</sup> Higher prevalence was recorded among pregnant Sudanese 5%<sup>[22]</sup> and India women 3.07%.<sup>[23]</sup>

However, cross-study comparisons may be misleading because of the kits used for the assay of HBsAg. In our study, HBsAg was assayed by ELISA technique. The use of polymerase chain reaction (PCR) and antibodies sensitive to the hepatitis B core antigen has been shown to be more sensitive than the serological methods used in our study and PCR could detect about 10% of occult HBV infection.<sup>[24]</sup> In addition, the differences in the socio-demographic characteristics of the women should be taken into consideration in such comparisons.

The HCV antibody prevalence among the women in the study was 2.6%. This is in agreement with the overall seroprevalence of HCV in Sub-Saharan Africa 3%.<sup>[7]</sup> It is, however, higher than the result from Niger Delta, Nigeria 0.5%,<sup>[20]</sup> Iran 0.98%,<sup>[25]</sup> and Sudan <1%.<sup>[22]</sup> These variations may be related to the differences in the modes of transmission which is influenced by sociocultural practices and environmental factors.<sup>[20]</sup> In a tertiary medical center in South-West Nigeria where over 90.8% of the women had scarification marks, a seroprevalence of 9.2% was reported.<sup>[9]</sup> The differences have also been attributed to the choice of serological tests to determine HCV prevalence especially in developing countries where intercurrent infections contribute to false-positive enzyme immunoassay results.<sup>[26]</sup>

From this study, the seroprevalence of syphilis among antenatal attendees in Enugu is 0.08%. The seroprevalence is lower than 0.13% recorded by Ozumba *et al.*<sup>[27]</sup> in the same hospital two decades ago. It is lower than the national average for syphilis in pregnant Nigeria women, 0.3%.<sup>[28]</sup> However, a higher prevalence of 10% was reported among pregnant women in Osogbo, South-Western Nigeria.<sup>[29]</sup> Among antenatal women in Gondar, Ethiopia, the seroprevalence was 1%.<sup>[10]</sup> The variation in seroprevalence could be attributed

**Table 4: Occupational distribution of the women HIV, HBsAg, and HCV infection**

Occupation	HIV		HBsAg		HCV	
	Positive	Negative	Positive	Negative	Positive	Negative
Public/civil servants	36	506	9	494	10	567
Unemployed	62	263	13	268	10	271
Trading	23	146	7	160	5	128
Artisans	27	68	9	154	7	133
Professionals	5	103	4	121	0	19
Total	153	1086	42	1197	32	1207

HIV: Human immunodeficiency virus, HBsAg: Hepatitis B surface antigen, HCV: Hepatitis C virus

to the differences in sexual practices and behavior. The seroprevalence of syphilis in Enugu is low and has declined over the past two decades. Similar observation was made in Ethiopia.<sup>[10]</sup> Early seeking of effective medical treatment for sexually transmitted infections among the largely literate urban antenatal women may explain the decline. The low prevalence has also been attributed to over-the-counter use of antibiotics for minor complaints and easy access to the drugs.<sup>[10]</sup>

The HIV and HBV co-infection prevalent rate was 0.24%. This is <0.7% reported in Anambra state.<sup>[17]</sup> In this study, 0.14% of the antenatal women were positive for HIV and HCV. The only woman who was positive for syphilis was also HIV positive and whether syphilis predisposed her to HIV and vice versa could not be ascertained. There was no HBV and HCV co-infection in both HIV positive and negative women, and this supported the study in Rwanda and Uganda<sup>[30]</sup> but varied with the results from Malekan City, Iran.<sup>[25]</sup> The difference in HBV and HCV infection in both HIV-positive and negative antenatal women in Enugu was not statistically significant. On the contrary, a study conducted in Addis Ababa, Ethiopia showed that higher prevalence of HCV antibodies was seen among HIV positive compared to HIV negative antenatal attendees (2.9% vs. 0.87%, respectively).<sup>[31]</sup> The absence of HCV and HBV infection in both HIV negative and positive women may be due to the absence of such risk factors as injection drug use commonly seen in the West and scarification marks that are not common in our area of study.

The age group of 21–40 years had the predominant HIV, HBV, and HCV prevalence and this supported the studies in Northwest Ethiopia.<sup>[10]</sup> This calls for concerted efforts aimed at preventive measures to reduce risky lifestyle practices among the most productive and economically viable age bracket.<sup>[13]</sup>

The unemployed group and artisans similarly had the highest seroprevalence of HIV, HBV, and HCV. A similar observation in Anambra State, Nigeria<sup>[17]</sup> showed that the occupation of the antenatal women influenced the infection of the women. Low socioeconomic factor initiates multiple sexual partnership, unprotected sex, and predisposes to sexually transmitted infections.<sup>[32]</sup>

The study has a number of limitations. This is an institutional study conducted in an urban area and consisted of only pregnant

women who were able to access hospital; for this reason, the seroprevalence reported here maybe a lower estimate of the true prevalence among pregnant women in Enugu. The rate might be higher in individuals who had lower socioeconomic status such that they could not even reach a hospital from the rural area. No data are available for such risk factors as residence and place of birth. The size of the population is small, and it will not be possible to generalize the outcome of the study.

## Conclusion

HIV, HBV, and HCV infection are a major global health problem necessitating a high priority in their prevention and control. There is a need for effective health education on behavioral change as well as the inclusion of HBV immunization for women of reproductive age to reduce the risk of spread to neonates through mother to child transmission. The low seroprevalence of syphilis observed in this study should not engender complacency in view of the deleterious effect of untreated maternal infection on pregnancy outcome and spread of HIV.

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How to cite this article: ????

Source of Support: Nil. Conflict of Interest: None declared.