



## Prevalence of HIV 1 & 2 antibodies among pregnant Women in Port Harcourt, Rivers State, Nigeria

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**ABSTRACT:** Human immunodeficiency virus (HIV) is a cause of significant morbidity and mortality across the World. This study aimed to determine the prevalence of HIV in pregnant women in Port Harcourt, Rivers State, Nigeria. A hospital-based cross-sectional survey was adopted to randomly analyze 180 pregnant women attending antenatal clinics at the University of Port Harcourt Teaching Hospital (UPTH) in Port Harcourt, Nigeria. Enzyme-Linked Immunosorbent Assay (ELISA) was used to assess HIV-1 & 2 antibodies in the samples obtained, and Chi-square analysis to determine the infection's association with socio-demographic factors. Of the 180 pregnant women, 9 (5.0%) were seropositive, while 171 of the pregnant women (95.0%) were seronegative. Regarding age, all the age groups except 20-29 years were reactive. Higher HIV 1& 2 Antibodies occurred in the age group 40-49 years (7.7%) compared to the age group 30-39 years (7.1%). No singles were seropositive, while 5.1% of the married women tested seropositive to HIV 1&2 Antibodies. A higher prevalence of HIV 1& 2 antibodies occurred among pregnant women with secondary education (21.1%) than those with tertiary education (3.1%). A higher prevalence of HIV 1& 2 antibodies occurred among pregnant women who were artisans (20.0%), followed by business executives (12.5%), traders (8.9%) and unemployed (7.1%). Zero prevalence occurred for civil servants and students. Only Christians (5.5%) were seropositive to HIV 1&2 Antibodies. A higher prevalence of HIV was observed in pregnant women in their second trimester (7.3%) compared to those in their first trimester (5.0%) and third trimester (2.9%). Higher prevalence of HIV 1&2 Antibodies was observed in pregnant women in 1-2 parity (6.5%) compared to nulliparous (4.4%), 3-4 parity (3.1%) and parity of 5 and above (0.0%). A higher HIV prevalence occurred among pregnant women with a history of abortion (5.3%) than those without such a history (4.8%). Pregnant women with a history of STDs had a higher prevalence of HIV 1&2 Antibodies (50.0%) than those without a history (4.5%). The prevalence rate of HIV in this study is low. Thus, there is still a need for adequate counselling and education about HIV and AIDS and mother-to-child transmission (MTCT) of HIV. Conclusively, this study has contributed to the information on the burden of HIV infection among pregnant women in Port Harcourt, Rivers State, Nigeria. Therefore, this study's findings have revealed the need to investigate further the prevalence of HIV and AIDS among children previously considered low risk and factors affecting HIV prevention and control in different geographical regions in Nigeria.

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**Keywords:** HIV, pregnant women, prevalence, Nigeria

### 1. INTRODUCTION

Human immunodeficiency virus (HIV) is a cause of significant morbidity and mortality across the World (WHO 2014; 2016). Although HIV prevalence among adults is minimal (3.2 %) compared to other sub-Saharan African countries such as South Africa (19.1 %) and Zambia (12.5 %), the size of Nigeria's population means that 3.2 million people were living with HIV in 2013. Globally, about 36.7 million people living with HIV, out of which about 3.5 million are Nigerians (UNAIDS, 2016).

HIV-1 serological reviews in Nigeria were introduced in 1991, and an adult prevalence of 1.8% (760,000) was reported. This figure slowly increased to 5.8% in 2001 (2.6 million) before declining to 2.9% in 2016 (3.1 million) (UNAIDS, 2018;). The

prevalence of HIV among pregnant women in Nigeria rose from 1.8% in 1991 to 5.8% in 2001 before a slow decline to 4.4% in 2005 and 4.1% in 2010 (FMoH, 2010; Ogbe et al., 2014). There have been notable advances in antiretroviral therapy (ART) since the introduction of zidovudine (AZT). With the advent of highly active retroviral therapy (HAART), HIV-1 infection is manageable in individuals who have access to medication and achieve durable virologic suppression. Highly Active Antiretroviral Therapy (HAART) provides effective treatment options for treatment-naïve and treatment-experienced individuals. Treatment of HIV and STI is now recognized as a critical prevention tool in controlling the HIV epidemic (Hayes et al., 2010; Cohen et al., 2012; Ogbe et al., 2014).

The socio-demographic risk factors for HIV infection among pregnant women in Nigeria have been reported (Sagay et al., 2005; Imade et al., 2014) as part of the Prevention of Mother-to-Child Transmission (PMTCT) of HIV in Nigeria. Thus, the study aimed to determine the prevalence of HIV in pregnant women in Port Harcourt, Rivers State, Nigeria. The findings from this study will further strengthen the evidence for screening and treatment of HIV among pregnant women as part of the prevention intervention in Nigeria.

## 2. MATERIALS AND METHODS

### 2.1. Study area

A cross-sectional research study was conducted among pregnant women attending the antenatal clinics at the University of Port Harcourt Teaching Hospital (UPTH) in Port Harcourt, Rivers State, Nigeria. Port Harcourt lies along the Bonny River in the Niger Delta region of Nigeria with its Coordinates: 4°53'23"N 6°54'18"E and covers an area of 360 km<sup>2</sup>. Port Harcourt metropolis consists of Obio/Akpor Local Government Area and Port Harcourt Local Government Area, which comprise primarily Ikwere ethnic with several other ethnic groups from all around Nigeria. According to the census of 2006, Port Harcourt city local government area and Obio/Akpor local government area populations of 1,382,592 and 878,890, respectively (NPC, 2006) and a landmass of 360 km<sup>2</sup> and 260 km<sup>2</sup>, respectively.

### 2.2. Sampling technique

Consecutive sampling of the pregnant women attending the antenatal clinics in the University of Port Harcourt Teaching Hospital (UPTH), in Port Harcourt, Rivers State, Nigeria, was done to a total of 180; this ensured that sampling was representative of the state. A sampling of 180 pregnant women was done randomly irrespective of age, gender and tribe from their registers in the hospital.

### 2.3. Ethical considerations

This study was performed in compliance with human subject research regulations and approved by the University of Port Harcourt Research Ethics Committee.

### 2.4. Study population

One hundred pregnant women attending the antenatal clinics in the University of Port Harcourt Teaching Hospital (UPTH) in Port Harcourt, Rivers State, Nigeria, participated in this study. The samples were obtained after obtaining their informed consent.

### 2.5. Sample collection and processing

A volume of five (5) ml of whole blood was collected via vein -puncture using a sterile syringe, which was transferred into a labelled sterile vial containing anticoagulants EDTA (18mg K2 EDTA/10ml; Vacutainer Brand Ref. 366643). The blood samples were transported to the Virus Research Unit, Department of Microbiology, University of Port Harcourt, with an ice pack. Plasma was obtained by centrifugation and maintained at -20°C until use.

### 2.6. Serological analysis

PRO Diagnostic Bioprobes (Milano) – Italy. The initial determination of the HIV-positive status of these pregnant women was performed by ELISA (Abbott Laboratories) with further analysis of HIV antibodies using the commercially available ELISA kit manufactured by DIA. The coloured reaction product was measured using an ELISA plate reader (Biotek ELx808i, USA) at an absorbance of 450-630nm. The micro-plates were washed in 5 cycles with an automated washer (Biotek ELx 50, USA). All stages of the ELISA tests were performed according to the manufacturer's instructions.

### 2.7. Interpretation of results

The test results were calculated using a cut-off value determined by the following formula on the mean OD450nm value of the negative control (NC): Cut-Off (Co) = NC + 0.125. The value found for the test is used to interpret the results. Test results are interpreted as the sample OD450nm (S) ratio and the Cut-Off value (Co). Mathematically S/Co, a value less than 1 indicates a negative reaction while a value greater than 1 indicates a positive one. A negative result indicates that the patients have not been infected with HIV. If the initial absorbance value was equal to or greater than the cut-off value, retest the sample in duplicate. If both retest values were less than the cut-off, the interpretation was not reactive for HIV antibodies/antigen (negative). If one or both retest values were equal to or greater than the cut-off, the interpretation of the test results was repeatedly reactive. The sample was considered reactive or positive for HIV antibodies/antigens according to the criteria of this HIV ELISA test. A positive result indicated HIV infection, so the patient should be treated accordingly.

### 2.8. Statistical analysis of data

Generated data from the study were presented with descriptive statistics (number with percentage; mean; standard deviation or median with range). Data analysis and test of significance were done using Microsoft Excel 2016 version. Differences of P<0.05 was taken to be statistically significant.

## 3. RESULTS

### 3.1. Analysis of the total study population

The total number of pregnant women included in this study was 180. The socio-demographic data for these samples were stratified and shown in Table 3.1. The age ranges from 20-49 years. The age groups 30 – 39 years constituted the most significant population making up 62.8%, followed by age groups 20-29 years (30.0%), while age groups 40-49 years were the least (7.2%). Married pregnant women predominated the study constituting 98.9% of the sample compared to 1.1% of the single population. Based on educational background, 1.1%, 10.6%, and 88.3% of pregnant women have acquired primary, secondary, and tertiary education, respectively. A lower percentage of 2.8% were artisans, 4.4% were business executives, 7.8% were students, and 15.6% were unemployed, while a more significant percentage of 31.1% and 35.6% were traders and civil servants, respectively. A higher percentage of 91.7% were Christians, Islam 2.8% and 5.6% had no religion. A higher percentage of 81.1% were married to a monogamous family. Eighty-three (46.1%) of them were in their second trimester, 42.8% were in their third trimester, and 11.1% were in their first trimester. Regarding parity, a higher percentage of 42.8% fell within 1-2 parity. A higher percentage of 58.3% had no history of abortion, and 41.7% had a history of abortion. A higher percentage of 98.9% had no history of STDs, and 1.1% had a history of STDs (Table 1).

### 3.2. Prevalence of HIV 1&2 antibodies

Of the 180 pregnant women tested, 9 (5.0%) were seropositive for HIV 1&2 antibodies, while 171 (95.0%) were seronegative (Table 1).

### 3.3. Prevalence of HIV 1&2 antibodies with age

The prevalence of HIV 1&2 antibodies with age is shown in Table 1. Concerning age, all the age groups except 20-29 years were reactive. Higher HIV 1& 2 antibodies occurred in the age group 40-49 years (7.7%) compared to the age group 30-39 years (7.1%). No significant relationship between the age groups and the prevalence of HIV 1&2 antibodies ( $\chi^2 = 2.169$ ,  $df = 2$ ,  $p > 0.05$ ).

### 3.4. Prevalence of HIV 1&2 antibodies with marital status

Table 1 shows the seropositivity rate of HIV 1&2 antibodies according to marital status. None of the single pregnant women was seropositive for HIV 1&2, while 5.1% of the married women were seropositive. Statistically, marital status was not

significantly associated with prevalence of HIV 1&2 ( $\chi^2 = 0.017$ ,  $df = 1$ ,  $p > 0.05$ ).

### 3.5. Prevalence of HIV 1&2 antibodies with educational background

The level of education of the pregnant women attending antenatal care had a significant relationship with the prevalence of HIV 1&2 ( $\chi^2 = 0.787$ ,  $df = 2$ ,  $p < 0.05$ ). A higher prevalence of HIV 1& 2 antibodies was found among pregnant women with secondary education (21.1%) than those with tertiary education (3.1%), as shown in Table 1.

### 3.6. Prevalence of HIV 1&2 antibodies with occupational status

Table 1 also shows the seropositivity rate of HIV 1&2 antibodies according to occupation. Statistically, there was a significant relationship between occupation and prevalence of HIV 1&2 ( $\chi^2 = 2.846$ ,  $df = 5$ ,  $p < 0.05$ ). A higher prevalence of HIV 1& 2 antibodies occurred among pregnant women who were artisans (20.0%), followed by the business executive (12.5%), traders (8.9%) and unemployed (7.1%). Zero prevalence occurred for civil servants and students.

### 3.7. Prevalence of HIV 1&2 antibodies with religion

Only Christians (5.5%) were seropositive to HIV 1&2 antibodies, as highlighted in Table 1. However, no significant association between religion and the prevalence of HIV 1&2 ( $\chi^2 = 5.297$ ,  $df = 2$ ,  $p > 0.05$ ).

### 3.8. Prevalence of HIV 1&2 antibodies with family type

Pregnant women with monogamous had a higher prevalence (5.5%) of HIV 1&2 infection than polygamous (2.9%), as shown in Table 1. However, a significant association between the family type and the prevalence of HIV 1&2 ( $\chi^2 = 0.941$ ,  $df = 2$ ,  $p < 0.05$ ).

### 3.9. Prevalence of HIV 1&2 antibodies during the gestation period

A higher prevalence of HIV was observed in pregnant women in their second trimester (7.3%) compared to those in their first trimester (5.0%) and third trimester (2.9%), as shown in Table 1. However, a significant association between the gestation period and the prevalence of HIV 1&2 ( $\chi^2 = 0.941$ ,  $df = 2$ ,  $p < 0.05$ ).

Table 1: Prevalence of HIV 1&amp;2 antibodies with the socio-demographic characteristics of the pregnant women

Variables		No Tested (%)	HIV + (%)	HIV – (%)
<b>Age Group (Years)</b>	20 – 29	54(30.0)	0(0.0)	54(100.0)
	30 – 39	113(62.8)	8(7.1)	105(92.9)
	40 – 49	13(7.2)	1(7.7)	12(92.3)
<b>Marital Status</b>	Single	2(1.1)	0(0.0)	2(100.0)
	Married	178(98.9)	9(5.1)	169(94.9)
<b>Educational Level</b>	Primary	2(1.1)	0(0.0)	2(100.0)
	Secondary	19(10.6)	4(21.1)	15(78.9)
	Tertiary	159(88.3)	5(3.1)	154(96.9)
<b>Occupation</b>	Student	14(7.8)	0(0.0)	14(100.0)
	Unemployed	28(15.6)	2(7.1)	26(92.9)
	Trading	56(31.1)	5(8.9)	56(91.1)
	Civil servant	64(35.6)	0(0.0)	64(100.0)
	Artisan	5(2.8)	1(20.0)	4(80.0)
	Business Executive	8(4.4)	1(12.5)	7(87.5)
<b>Religion</b>	Christian	165(91.7)	9(5.5)	156(94.5)
	Islam	5(2.8)	0(0.0)	5(100.0)
	None	10(5.6)	0(0.0)	10(100.0)
<b>Type of family</b>	Monogamous	146(81.1)	8(5.5)	138(94.5)
	Polygamous	34(18.9)	1(2.9)	33(97.1)
<b>Gestation Period</b>	1 <sup>st</sup>	20(11.1)	1(5.0)	19(95.0)
	2 <sup>nd</sup>	83(46.1)	6(7.3)	77(92.7)
	3 <sup>rd</sup>	77(42.8)	2(2.6)	75(97.4)
<b>Parity</b>	0	68(37.8)	3(4.4)	65(95.6)
	1 – 2	77(42.8)	5(6.5)	72(93.5)
	3 – 4	32(17.8)	1(3.1)	31(96.9)
	5 & Above	3(1.7)	0(0.0)	3(100.0)
<b>History of Abortion</b>	Yes	75(41.7)	4(5.3)	71(94.7)
	No	105(58.3)	5(4.8)	100(95.2)
<b>STD History</b>	Yes	2(1.1)	1(50.0)	1(50.0)
	No	178(98.9)	8(4.5)	170(95.5)
<b>Total</b>		<b>180(100.0)</b>	<b>9(5.0)</b>	<b>171(95.0)</b>

### 3.10. Prevalence of HIV 1&2 antibodies with parity

Higher prevalence of HIV 1&2 antibodies was observed in pregnant women in 1-2 parity (6.5%) compared to nulliparous (4.4%), 3-4 parity (3.1%) and parity of 5 and above (0.0%), as shown in Table 1. However, no significant association between the parity and HIV 1&2 prevalence ( $\chi^2 = 0.941$ ,  $df = 2$ ,  $p < 0.05$ ).

### 3.11. Prevalence of HIV 1&2 antibodies with a History of Abortion

A higher prevalence of HIV 1&2 antibodies was observed in pregnant women with a history of abortion (5.3%) than in those with no such history

(4.8%), as shown in Table 1. However, no significant association between the history of abortion and the prevalence of HIV 1&2 ( $\chi^2 = 0.941$ ,  $df = 2$ ,  $p > 0.05$ ).

### 3.12. Prevalence of HIV 1&2 antibodies with a history of STDs

Pregnant women with a history of STDs had a higher prevalence of HIV 1&2 antibodies (50.0%) compared to those with no such history (4.5%), as shown in Table 1. However, a significant association exist between the history of STDs and the prevalence of HIV 1&2 ( $\chi^2 = 0.941$ ,  $df = 2$ ,  $p < 0.05$ ).

#### 4. DISCUSSION

This study's overall prevalence rate was 5.0% (n=9). This study showed a low prevalence rate among pregnant women than previously reported. The prevalence rate of 5.0% reported for HIV 1 and 2 antibodies in this study is lower than the 10.0% prevalence reported by Sule et al. (2010) in Anyigba, Kogi State, the 31.0% prevalence reported in a tertiary health institution in the Niger Delta region of Nigeria (Alikor and Erhabor, 2005). This value is higher than the 1.4% overall prevalence reported for Nigeria in the 2019 national sentinel survey and the 3.8% reported for Rivers State, Nigeria (NAIIS, 2019).

The 5.0% prevalence rate reported in this present study is higher than the prevalence of 3.3% in 2001, 1.7% in 2003 and 1.0% in 2005 reported for Ibadan. In line with the assertion of Alikor and Erhabor (2005), the higher prevalence obtained in this present study compared to the national sentinel prevalence may be attributed to the study involving pregnant women for which there was already a low index of suspicion of HIV infection. This observation also brings to bare the fact that HIV infection among pregnant women residing in this part of Rivers State of Nigeria is on the decrease.

Comparatively, the HIV rate of 5.0% reported for pregnant women in this subpopulation may be a true reflection of the HIV rates in the population relatively and lower than the 3.8% reported in the 2019 national sentinel survey (NAIIS, 2019). However, it may be characteristic of the study population, which consists mainly of pregnant women who visited the hospital in antenatal clinics rather than apparently healthy women accessing voluntary counselling and testing. A similar assertion was made in a previous study on traditional crop farmers in Kogi East, Nigeria (Sule et al., 2009a). The primary determinant of pregnant women's infection is the adult population's scale and magnitude of HIV infection (Alikor and Erhabor, 2005). Several African countries have conducted large-scale HIV prevention initiatives to reduce the scale of their epidemics, including using condoms (Nasidi and Harry, 2006), providing voluntary HIV counselling and testing (VCT), and preventing Mother-to-child transmission of HIV. In many developed countries, these steps have helped to eliminate MTCT virtually. However, sub-Saharan Africa continues to be severely affected by the problem due to a lack of drugs, services and information and the shortage of testing facilities (Avert, 2010).

The prevalence rate of 7.7% recorded for the corresponding age groups 40 – 49 years and 7.1% for age groups 30-39 years confirms the report of the

UNAIDS and the WHO on the global AIDS epidemic that in the prevalence of HIV, these age groups are at a percentage of relevance. Documented risk factors for contracting HIV-1/2, such as age, sex and tribal marks, were used as bases for comparison (NASCP/FMOH 2002).

The prevalence rate of HIV for the married screened in this study is high (5.1%) than for their single counterparts (0.0%). The overall trend in HIV infection levels among patients and pregnant women in Nigeria appears to be stable. Nationally, about 4.4% [4.2%–4.6%] of women attending antenatal clinics were infected with HIV in 2005, but the prevalence in pregnant women exceeded 5% in almost a dozen states (UNAIDS/WHO, 2010). In the most recent 2008 sentinel survey, the national HIV prevalence for women attending ANC was 4.6% (UNGASS, 2010). More detailed research is required to understand the reasons for these varying patterns (Federal Ministry of Health Nigeria, 2006).

The level of education of the pregnant women attending antenatal care had a significant relationship with the prevalence of IgG antibodies against HIV 1&2. A higher prevalence of HIV 1&2 antibodies occurred among pregnant women with secondary education (21.1%) than those with tertiary education (3.1%). In this study, a higher prevalence of HIV 1&2 antibodies occurred among pregnant women who were artisans (20.0%), followed by the business executive (12.5%), traders (8.9%) and unemployed (7.1%). Zero prevalence occurred for civil servants and students. Only Christians (5.5%) were seropositive to HIV 1&2 antibodies. Pregnant women with monogamous family type had a higher prevalence (5.5%) of HIV 1&2 infection than polygamous family type (2.9%). A higher prevalence of HIV was observed in pregnant women in their second trimester (7.3%) compared to those in their first trimester (5.0%) and third trimester (2.9%). Higher prevalence of HIV 1&2 antibodies occurred in pregnant women in 1-2 parity (6.5%) compared to nulliparous (4.4%), 3-4 parity (3.1%) and parity of 5 and above (0.0%). A higher prevalence of HIV 1&2 antibodies occurred in pregnant women with a history of abortion (5.3%) than in those without a history (4.8%). Pregnant women with a history of STDs had a higher prevalence of HIV 1&2 antibodies (50.0%) than those without a history (4.5%).

#### 5. Conclusion

The prevalence rate of HIV in this study is low. Thus, there is still a need for adequate counselling and education about HIV and AIDS and mother-to-child transmission (MTCT) of HIV. Conclusively, this study has contributed to the information on the burden of HIV infection among

pregnant women in Port Harcourt, Rivers State, Nigeria. Therefore, this study's findings have revealed the need to investigate further the prevalence of HIV and AIDS among children previously considered low risk and factors affecting HIV prevention and control in different geographical regions in Nigeria. It further emphasized the urgent need for standard preventive measures and interventions, especially health education and sex education among the general populace, and risk control programmes and measures aimed at reducing the spread of HIV infection and preventing mother-to-child transmission of HIV. The provision of a more conducive voluntary HIV counselling and testing (VCT), which has been an essential part of any national prevention programme, could – and needs to be – made more widely available in most sub-Saharan African countries. The focus should be re-intensified on information dissemination on the risk of transmission, appropriate management if infected, and mode of delivery by pregnant women. Women should be educated on HIV and AIDS to prevent MTCT of the infection. All women at high risk of HIV infection should undergo HIV testing.

#### COMPETING INTERESTS

Authors have declared that no competing interests exist.

#### AUTHORS' CONTRIBUTIONS

Author IOO designed the study, performed the statistical analysis and wrote the protocol. Author TIC managed the analyses of the study. Author IOO, Author VO, Author HCI and Author TIC managed the literature searches and wrote the first draft of the manuscript. All authors read and approved the final manuscript.

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